Municipal Employees' Retirement System of Michigan

Experience Study Report for the 5-Year Period From January 1, 2019 - December 31, 2023

For the 748 Defined Benefit Plan and Hybrid Plan Municipalities

800.521.0498 | P: 248.799.9000 | www.grsconsulting.com

February 3, 2025

The Retirement Board
Municipal Employees' Retirement System of Michigan
Lansing, Michigan

Dear Board Members:

This report presents the results of the 5-year experience study from January 1, 2019, through December 31, 2023 for the Municipal Employees' Retirement System (MERS) 748 Defined Benefit Plan and Hybrid Plan municipalities.

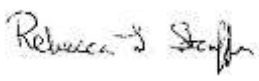
The purpose of this experience study is to review and update the actuarial assumptions used in the annual actuarial valuations of each participating municipality and court. This study was based on the census data furnished for annual actuarial valuations for the period from January 1, 2019, through December 31, 2023.

This report should not be relied on for any purpose other than described above. This report was prepared at the request of the Retirement Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with permission of the Board. GRS is not responsible for unauthorized use of this report.

Michigan Compiled Laws (MCL), Chapter 38, Section 38.1536, Sec. 36. (2)(d) states that, "The retirement board shall arrange for an annual actuarial valuation and report of the actuarial soundness of each participating municipality and court to be prepared by an independent actuary based on data compiled and supplied by employees of the retirement system. The retirement board shall adopt actuarial tables, assumptions, and formulas after consultation with the actuary." We interpret the term "actuarial soundness" from the statute to mean following the guidance of the Actuarial Standards of Practice. All calculations have been made in conformity with generally accepted actuarial principles and practices, with the Actuarial Standards of Practice issued by the Actuarial Standards Board, and with applicable statutes.

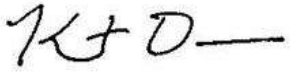
Rebecca L. Stouffer, Mark Buis, Kurt Dosson, and Shana M. Neeson are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. GRS is independent of the plan and plan sponsors and maintains independent consulting agreements with certain local units of government for services unrelated to the actuarial consulting services provided to MERS in this report.

Respectfully Submitted,



Rebecca L. Stouffer, ASA, MAAA, FCA

Mark Buis, FSA, EA, MAAA, FCA



Kurt Dosson, ASA, MAAA, FCA

Shana M. Neeson, ASA, MAAA, FCA

One Towne Square | Suite 800 | Southfield, Michigan 48076-3723

Table of Contents

I. Executive Summary

Overview

This report contains information and analysis for purposes of reviewing and recommending changes to the demographic assumptions used in the annual actuarial valuations of the defined benefit and hybrid plans participating in the Municipal Employee's Retirement System of Michigan (MERS). The experience analyzed in this report is based on the demographic experience from all MERS plan participants during the period January 1, 2019, through December 31, 2023.

The actuarial principle in force is that over time contributions and investment income must be sufficient to pay benefits throughout retirement for all plan participants. Actuarial valuations make use of a number of assumptions to estimate investment accumulation and benefit payouts in order to determine the required level percent of payroll objective. From year to year, actual experience on any assumption will not coincide exactly with assumed experience. MERS manages these continually changing differences by having annual actuarial valuations and periodic experience studies to review all assumptions. MERS performs experience studies at least every five years.

MERS has taken great strides to strengthen valuation assumptions in previous experience studies, through the implementation of fully generational mortality, lowering the assumed rate of investment income, and implementation of loads to address actual Final Average Compensation experience above expectations. As such, this experience study has proven to be more of an incremental update when compared to the recommended assumption updates of past experience studies.

This report includes many detailed recommendations. The recommendations that we expect to have the greatest impact on plan costs are as follows:

- Updating the mortality improvement assumptions which includes:
    - Updating the mortality improvement scale to MP-2021, the most recent national mortality improvement scale available (Improvement Scales have not been issued since COVID),
- Updating the retirement pattern to reflect increased public safety retirement experience.

The actual impact may vary significantly by employer, given the varying demographics and funded status of the plans. However, in aggregate the combined impact on plan liabilities was a small decrease. At a high level, our recommendations are as listed below. Additional detail may be found in the corresponding report sections.

Assumption	Proposed Change	Common Impact
Mortality Rates	Maintain the Pub-2010 mortality General rates as published by the Society of Actuaries. Scaled to MERS' experience on a liability-weighted basis.	No Impact.
Mortality Improvement	Change to the most recently available mortality improvement scales on a fully generational basis, MP-2021.	Generally, a small decrease for most divisions.
Unreduced Retirement Rates	No change for Non-Public Safety. Change 100% retirement rates for public safety to begin at age 75 vs. current 85. Update public safety rates for increased retirement experience. Change method for frozen plans to value as deferred vested commencing at earliest retirement date.	No Impact for Non-Public Safety. Generally, an increase for public safety divisions. Generally, in increase for frozen plans.
Reduced Retirement Rates	Implement a curve reflecting increased incidence of retirement as member nears unreduced retirement eligibility.	Small decrease as less retirements are expected.
Withdrawal Rates	Maintain separate assumptions for public safety and general employee divisions. Apply scaling factor to reflect increased terminations.	Generally, a decrease as more members are expected to withdrawal from the plan.
Disability Rates	No change to underlying table. Move the Duty/Non-Duty split to be based on employment classification.	No impact. Small increases.
Merit and Seniority	No change.	No Impact.
Increase in Final Average Comp.	Increase minimum to 1.5% load introduced for most employers. Minimum 0.5% load for base pay definition of compensation. Minimum 1.5% load for SLIF divisions.	Varies. Modest increase for several employers. Modest decreases for a small number of employers.
Other Assumptions	As described in the report.	Variable.

All recommendations are made based on the guidance of the Actuarial Standards of Practice.

Aggregate Results

Retired Participant Experience Summary: The summary of retired decrement experience is shown in the following table.

Retired Participant Experience				
Decrement	**Exposures**	**Actual**	**Expected**	**A/E**
Healthy Mortality				
Liability (millions)	*49,771.1*	*730.0*	*710.5*	*103%*
Disabled Mortality				
Liability (millions)	*1,895.6*	*50.8*	*48.2*	*105%*

Active Participant Experience Summary: The summary of active decrement experience is shown in the following table.

Active Experience				
Decrement	**Exposures**	**Actual**	**Expected**	**A/E**
Unreduced Retirement				
Liability (millions)	*7,744.0*	*2,247.8*	*2,086.7*	*108%*
Early reduced Retirement				
Liability (millions)	*3,523.0*	*79.8*	*140.9*	*57%*
Withdrawal				
Liability (millions)	*13,523.5*	*594.8*	*533.0*	*112%*
Disability				
Liability (millions)	*13,523.5*	*34.0*	*29.7*	*114%*

For each decrement, we performed some additional analysis. The following sections summarize our analysis. In almost every case our analysis is performed on a liability-weighted basis, which may help mitigate future gains and losses from future mortality improvement.

II. Background and Introduction

Background

MERS' Plan, Section 71(1)(d), provides that, "At intervals of five years, the actuary shall conduct an actuarial experience study of the System and report the results to the Retirement Board. The Retirement Board shall adopt actuarial tables, assumptions, and formulas after consultation with the actuary, and incorporate them into its Actuarial Policy, as amended." This is consistent with Michigan Compiled Laws (MCL), Chapter 38, Section 38.1536, Sec. 36. (2)(d).

The purpose of the experience study is to systematically review the actuarial assumptions used in the annual actuarial valuations. Actuarial valuations are mathematical models designed to meet the funding objectives.

The mathematical model is necessary in defined benefit and hybrid plans because there are "knowns" and "unknowns" which must be evaluated before the employer contribution can be determined. The knowns are:

- Who participates in the plan;
- The demographic characteristics of each active and inactive member (i.e., age, sex, salary, service, contribution balance, etc.);
- The demographic characteristics of each retired member and beneficiary (i.e., age, sex, benefit, form of payment, etc.);
- The conditions and characteristics of the plan (i.e., type and amount of benefits payable, eligibility for benefits, length of time benefit is payable, etc.);
- The current purchasing power of a dollar;
- The value of the pool of assets; and
- How the pool of assets is invested.

The unknowns are:

- Who will retire and at what age, service and final average salary;
- Who will quit before becoming vested;
- Who will quit and be entitled to a future vested benefit;
- Who will become disabled;
- How long will members and their beneficiaries live (before and after retirement);
- What is the future purchasing power of a dollar (future inflation); and
- How much income will the pool of assets generate.

The valuation model takes the "knowns," incorporates assumptions about the "unknowns" and develops the estimated cost of the plan for the current members. This cost is then financed using an actuarial cost method to determine the level contribution requirement.

Assumptions should be carefully chosen and continually monitored. A poor choice of assumptions or continued use of outdated assumptions can lead to:

- Understated costs resulting in either an inability to pay benefits when due, or sharp increases in required contributions at some point in the future; and
- Overstated costs resulting in an unnecessarily large burden on the current generation of participants, employers and taxpayers.

A single set of assumptions will not be suitable indefinitely. Conditions change, and our understanding of conditions (whether or not they are changing) also changes.

Prior to selecting new assumptions, we analyze the plans' experience over the last five years. We also look for continuing trends from previous experience studies. This experience study is unique as we must also consider the impact of COVID in our assumption setting. With COVID there are generally two schools of thought: 1) COVID is a one-time shock and experience will return to "normal" or 2) COVID will have a long-lasting impact for many years to come. Our general inclination with COVID is to not overreact until we have better information. Accordingly, most recommended changes tend to be minor adjustments. This report provides our analysis of the experience and suggestions on key assumptions.

No single 5-year experience period should be given full credibility in the setting of actuarial valuation assumptions. When we see significant differences between what is expected from our assumptions and actual experience, our strategy in recommending a change in assumptions is usually to select rates that would produce results somewhere between the actual and expected experience. In this way, with each experience study the actuarial assumptions become better and better representations of actual experience. Consequently, temporary conditions that might influence a particular experience study period will not unduly influence the choice of long-term assumptions.

We are recommending certain changes in assumptions for the annual actuarial valuations. The various assumption changes and their impact on the required contribution are described on the following pages. Actuarial assumptions were recently revised with the December 31, 2019 (economic assumptions), December 31, 2020 (demographic assumptions), December 31, 2021 (Dedicated Gains Implementation), and December 31, 2023 (Dedicated Gains application) annual actuarial valuations.

Introduction

The annual actuarial valuations are based on numerous technical assumptions. An experience study is a mathematical procedure for systematically comparing actual outcomes with expected outcomes of prior years' results based on those assumptions. The resulting analysis may or may not indicate the need for changes to the actuarial assumptions.

For purposes of this analysis, we look to the Actuarial Standards of Practice (ASOPs) for guidance. The pertinent ASOP for this purpose is:

- ASOP No. 27, Selection of Assumptions for Measuring Pension Obligations

This standard requires a rationale for selecting assumptions. Selecting assumptions in this context includes when the actuary is advising and the Board is adopting assumptions for the valuation. It does not apply for certain prescribed assumptions such as those required for reporting to the Michigan Department of Treasury under Public Act (PA) 202. Assumptions for PA 202 are not in the scope of this study.

Our understanding is that changes resulting from this experience study, if adopted by the Board, will first be reflected in the December 31, 2024, annual actuarial valuations.

Throughout the 5-year experience study period, a participant may decrement (i.e., change status) either by retiring, terminating, becoming disabled, or dying. Our analysis of the MERS decrement experience focuses on liability-weighted experience. For each decrement, the exposure is the number (or liability) of those who were subject to the specific decrement, the expected is the number (or liability) of those exposed who were assumed to decrement and the actual is the number (or liability) of those exposed who actually did decrement. The ratio of actual to expected decrements (the A/E ratio) provides a quick summary of experience for a particular decrement in total.

While the A/E ratio gives a rough indication of the actual vs. expected experience, it does not necessarily dictate what changes, if any, we may suggest. An A/E ratio of 100% does not preclude a suggested change in the assumption. The following are a few reasons we may suggest a new assumption across various A/E ratios:

(1) Experience for an assumption – or a subgroup affected by an assumption – may be too small to assign full credibility;
(2) The direction of the change in this study may be the opposite of the change made in the last study which runs the risk of flip-flopping assumptions;
(3) We may intentionally wish to maintain a ratio other than 100%, such as leaving a margin; or
(4) There may be other facts and circumstances about the underlying data, the specific experience period, or the interaction with plan provisions or other changes. In addition, even if the A/E ratio is 100% in the aggregate, we may make changes to individual rates within the full assumption set.

A headcount-weighted decrement is designed to mimic the event of a person decrementing. A liability-weighted decrement is designed to mimic the associated liability of a person decrementing, which in turn should reduce the likelihood of a gain or a loss. In general, from the perspective of mitigating gains and losses, we prefer to consider liability-weighted analysis whenever appropriate.

Actuarial assumptions may also be used for purposes other than annual valuations. We understand that the MERS Plan Document and Actuarial Policy refer to administrative practices and procedures that determine actuarial equivalence based on certain actuarial assumptions. This report contains discussion on actuarial principles related to actuarial equivalence for administrative purposes. It is important to note that the ASOPs do not generally apply to plan administration.

The experience study also provides us with an opportunity to review other actuarial methods and procedures including:

- The actuarial cost method, including miscellaneous and technical assumptions;
- The asset valuation method; and
- The amortization method and Actuarial Funding Policy.

The pertinent ASOPs for these purposes are:

- ASOP No. 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions; and
- ASOP No. 44, Selection and Use of Asset Valuation Methods for Pension Valuations.

The statistical analysis required for studying actuarial assumptions depends on the quantity and quality of the underlying data. The more reliable – or statistically "credible" – data that we have, the more refined we can make our analysis.

The pertinent ASOPs for these purposes are:

- ASOP No. 23, Data Quality; and
- ASOP No. 25, Credibility Procedures.

This report is organized as follows. Each major demographic assumption is reviewed in detail in Section III, including rates of retirement, termination, disability and mortality. Section III also contains summary information and analysis on other non-economic assumptions used in the valuation. Section IV contains analysis on economic assumptions used in the valuations. Section V contains a review of actuarial methods.

III. Demographic Assumptions

Unreduced Retirement

The current unreduced retirement assumption for non-frozen plans is replacement index-based, with separate tables for Public Safety and Non-Public Safety groups.

The Replacement Index method of measuring rates of retirement was designed specifically for MERS, because of the large variation of benefit formula and member contribution rates within MERS. We do not know of any other retirement plans that use this method. Most plans have uniform benefit and member contribution provisions, or a small number of different sets of these provisions. Such plans will often have a separate retirement rate assumption for each of their benefit provision groups, and members do not move among groups via the adoption of higher or lower benefit provisions for their employee division. The Replacement Index method works very well for a plan like MERS which includes many benefit provision choices and member contribution rate choices, and which does not limit an employer's ability to change benefit provisions and member contribution rates from time to time.

An advantage to retirement rates based on replacement index is that these rates will automatically adjust to changes in benefits and member contribution rates, which is a significant advantage for benefit design changes, because it accounts for increased incidence of retirement as benefit size grows, and also limits model complexity through limiting the number of retirement assumptions necessary to one table for Public-Safety groups and one table for Non-Public Safety groups. Additionally, analyzing the retirement decrement experience by replacement index by comparing the variance of actual to expected experience in proportion to the exposures at each replacement index, provides a variance of 0.3% indicating that it is a good fit.

Separating our experience into four categories, we can make several observations. 1) For almost all groups the A/E is above 100% indicating that we experience more retirements than expected by our assumptions. 2) Frozen plans have limited exposure and represent closed groups that are winding down. These plans are handled separately. 3) Hybrid plans have growing exposure, and generally represent open groups accepting new hires. Currently, the experience of these types of plans is not at a level to be rated separately and are combined with the Non-Public Safety (All Others) group.

Liability-Weighted ($Millions)				
	Exposure	Actual	Expected	A/E
Frozen plan	$ 33.7	$ 8.0	$ 8.8	92%
Hybrid	47.7	8.1	6.4	127%
Public Safety	1,777.4	724.8	614.3	118%
All Others	5,885.3	1,507.1	1,443.2	104%
Grand Total	**$ 7,744.2**	**$ 2,248.0**	**$ 2,072.7**	**108%**

Frozen Plans represent groups that will no longer accrue benefits and will not accept new hires into the division. The current assumption is a flat 20% decrement rate from first eligibility until age 85, when a 100% retirement assumption applies. These groups pose additional complexities in data reporting, plan administration, and valuation modeling, including but not limited to the following..

- Must be "terminated" in Pension Administration software in order to cease benefit service accruals;
- There is difficulty in reporting/validating continuing employment – which is necessary to continue valuation service accruals; and
- Questions arise (from employers and auditors) regarding treatment/reporting in valuation and participant reports and records are reported in different categories active versus terminated depending upon the report.

Considering all elements of frozen plans, we recommend eliminating the 20% decrement assumption. As a replacement method, we recommend modeling records in a frozen plan as deferred vested with assumed commencement at first eligibility. First eligibility is determined with continued accrual of valuation service for eligibility purposes. This treatment will also align with present reporting of those with cross plan freezes (i.e., Hybrid freeze to DB).

After refining our analysis to exclude those in frozen plans and combining Hybrid plans into the Non-Public Safety groups, the experience is summarized below.

Liability-Weighted ($Millions)				
	Exposure	**Actual**	**Expected**	**A/E**
Public Safety	$ 1,777.4	$ 724.8	$ 614.3	118%
All Others (Exc. Frz.)	5,933.0	1,515.2	1,449.6	105%
Grand Total	**$ 7,710.4**	**$ 2,240.0**	**$ 2,064.0**	**109%**

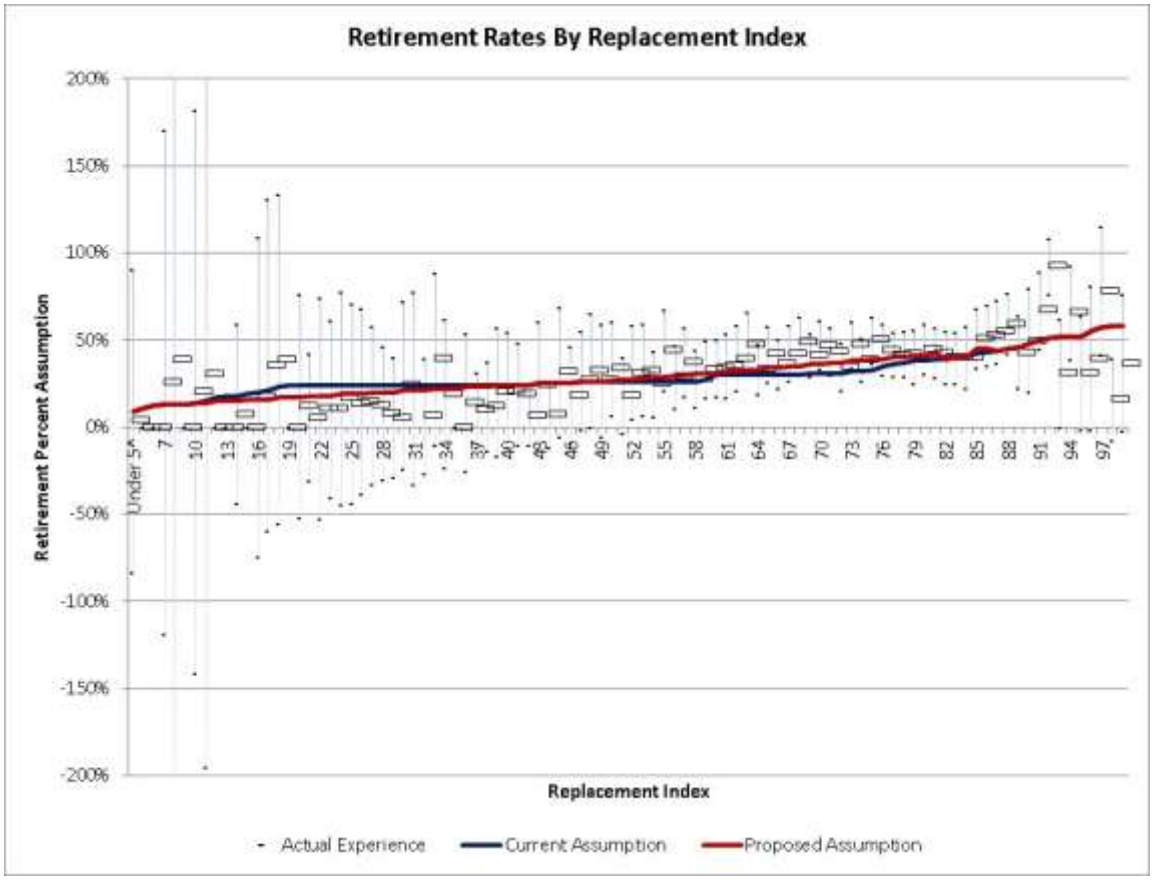
Non-Public Safety groups have an A/E ratio of 105%, indicating more retirements than expected. The experience on a year-by-years basis is mixed, with some years below 100% and others above 100% for an average of 105%. In addition, the potential impact of COVID should be considered as COVID overlaps with many of our experience years. COVID may have delayed or accelerated retirements, but it is difficult to say for certain. Combined with mixed experience for the Non-Public Safety groups, we recommend no change to the retirement pattern.

Public-Safety groups had different experience with an A/E of 118%. An A/E above 100% was experienced in each year of the study period, regardless of COVID, and continues the trend from the previous experience study. As such, we recommend increasing the rates of retirement in the Public-Safety table and adjusting the shape of the table to better fit Public-Safety experience.

Replacement Index

Recall that replacement index is defined as the approximate percentage of the member's pay (after reducing for member contributions) that will be replaced by the member's benefit at retirement. The index is calculated as:

Replacement Index = 100 x Accrued Benefit divided by [Pay less Member Contributions]



For each possible replacement index up to 100, we compute the liability-weighted expected retirements and compare to the actual retirements. We also determine a 95% confidence interval around each observed retirement rate. The 95% confidence interval is set to be two standard deviations above and below the observed or "crude" rate for each replacement index. In theory, it is 95% likely that the "true" retirement rates fall within these intervals. As a general rule, the narrower the confidence interval for a particular replacement index, the more credible the experience for that rate. Based on these confidence intervals, 99% of the assumed rates fall within the 95% confidence intervals. We make the general observations that observed rates for very low replacement index were somewhat higher than the current assumption and similarly, rates for very high replacement index were somewhat lower than assumed.

We recommended modest changes to the assumed rates as follows.

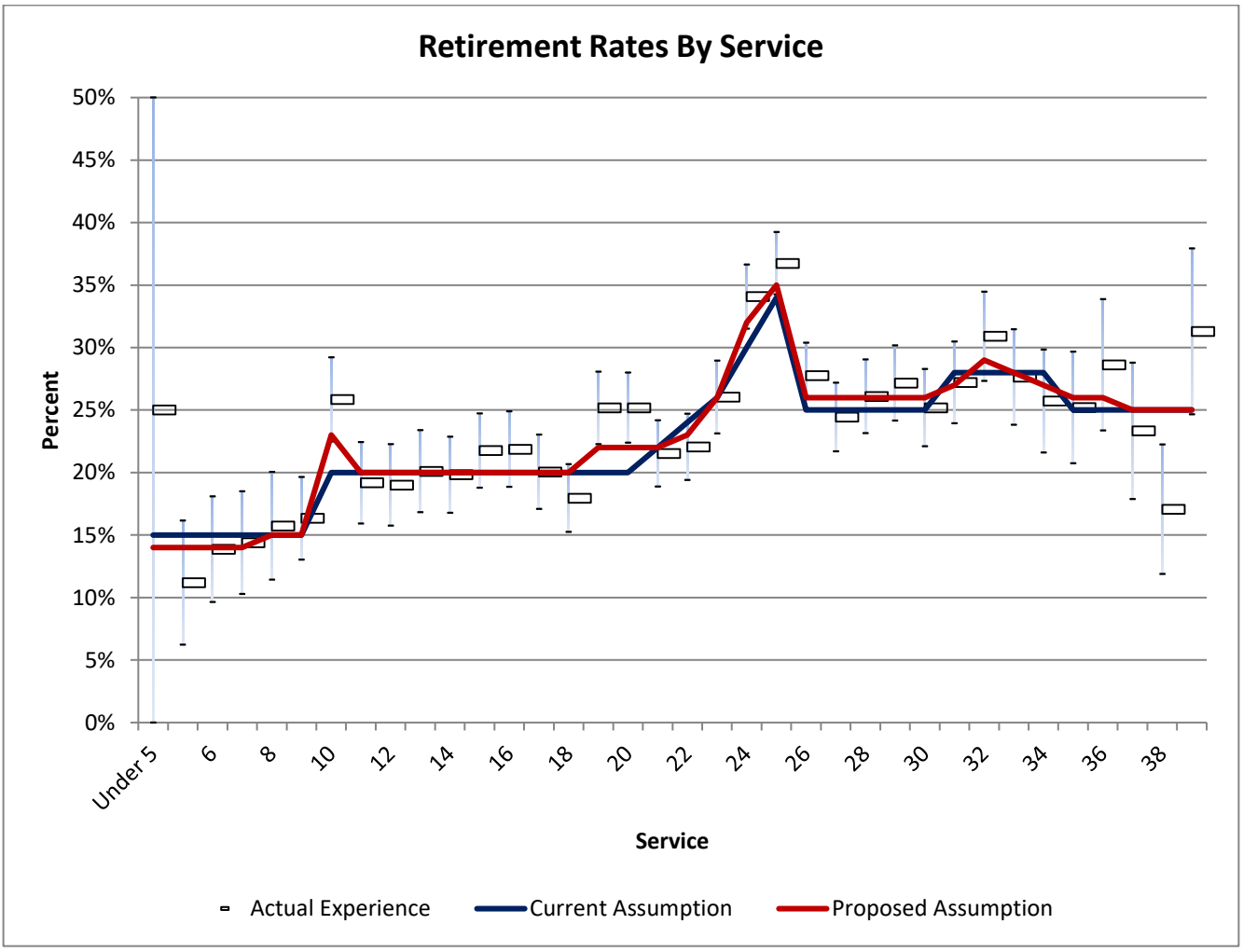
Unreduced Retirement Experience - Liability Weighted									
Public Safety Divisions, Males and Females									
Replacement-Index-Based Analysis, Liability Weighted									
Replacement Index	Actual Retirements	Exposure	Crude Rates	Sample Rates		Expected Retirements		Ratio of Actuals/Expecteds	
				Current*	Proposed	Current	Proposed	Current	Proposed
Under 5^	0.0	0.2	3.51%	8.94%	8.94%	0.0	0.0	39%	39%
5	-	0.1	0.00%	11.00%	11.00%	0.0	0.0	0%	0%
6	-	0.3	0.00%	12.00%	12.00%	0.0	0.0	0%	0%
7	0.1	0.4	25.47%	13.00%	13.00%	0.0	0.0	196%	196%
8	0.0	0.1	38.70%	13.00%	13.00%	0.0	0.0	298%	298%
9	-	0.3	0.00%	13.00%	13.00%	0.0	0.0	0%	0%
10	0.1	0.2	20.24%	14.00%	14.00%	0.0	0.0	145%	145%
11	0.1	0.2	30.18%	15.00%	14.00%	0.0	0.0	201%	216%
12	-	0.9	0.00%	17.00%	15.00%	0.2	0.1	0%	0%
13	-	0.4	0.00%	18.00%	15.00%	0.1	0.1	0%	0%
14	0.1	1.1	7.53%	18.00%	15.00%	0.2	0.2	42%	50%
15	-	0.2	0.00%	19.00%	16.00%	0.0	0.0	0%	0%
16	0.1	0.7	17.14%	20.00%	16.00%	0.1	0.1	86%	107%
17	0.4	1.0	35.33%	21.00%	16.00%	0.2	0.2	168%	221%
18	0.4	1.1	38.91%	23.00%	17.00%	0.2	0.2	169%	229%
19	-	1.2	0.00%	24.00%	17.00%	0.3	0.2	0%	0%
20	0.1	1.0	12.25%	24.00%	17.00%	0.3	0.2	51%	72%
21	0.1	1.5	5.50%	24.00%	18.00%	0.4	0.3	23%	31%
22	0.1	0.9	10.45%	24.00%	18.00%	0.2	0.2	44%	58%
23	0.2	1.4	10.41%	24.00%	18.00%	0.3	0.3	43%	58%
24	0.2	1.5	16.48%	24.00%	19.00%	0.4	0.3	69%	87%
25	0.2	1.4	13.46%	24.00%	19.00%	0.3	0.3	56%	71%
26	0.3	1.8	14.74%	24.00%	19.00%	0.4	0.3	61%	78%
27	0.3	2.1	12.43%	24.00%	20.00%	0.5	0.4	52%	62%
28	0.2	2.0	7.72%	24.00%	20.00%	0.5	0.4	32%	39%
29	0.1	1.7	5.44%	24.00%	20.00%	0.4	0.3	23%	27%
30	0.8	3.2	24.22%	24.00%	21.00%	0.8	0.7	101%	115%
31	0.5	2.3	22.10%	24.00%	21.00%	0.5	0.5	92%	105%
32	0.1	2.2	6.37%	24.00%	21.00%	0.5	0.5	27%	30%
33	1.5	3.9	39.04%	24.00%	22.00%	0.9	0.9	163%	177%
34	0.6	3.4	18.89%	24.00%	22.00%	0.8	0.7	79%	86%
35	-	4.7	0.00%	24.00%	22.00%	1.1	1.0	0%	0%
36	0.4	3.1	13.98%	24.00%	23.00%	0.7	0.7	58%	61%
37	0.7	7.7	9.65%	24.00%	23.00%	1.8	1.8	40%	42%
38	0.8	6.4	11.87%	24.00%	23.00%	1.5	1.5	49%	52%
39	1.0	4.8	20.39%	24.00%	24.00%	1.1	1.1	85%	85%
40	1.3	6.1	21.17%	24.00%	24.00%	1.5	1.5	88%	88%
41	1.3	7.0	18.61%	24.00%	24.00%	1.7	1.7	78%	78%
42	0.5	8.2	6.67%	24.00%	24.00%	2.0	2.0	28%	28%
43	1.3	5.6	24.04%	25.00%	25.00%	1.4	1.4	96%	96%
44	0.5	7.5	7.02%	25.00%	25.00%	1.9	1.9	28%	28%
45	2.0	6.2	31.52%	25.00%	25.00%	1.5	1.5	126%	126%
46	1.3	7.6	17.87%	25.00%	25.00%	1.9	1.9	71%	71%
47	2.6	9.8	26.85%	26.00%	26.00%	2.5	2.5	103%	103%
48	2.7	8.2	32.33%	26.00%	26.00%	2.1	2.1	124%	124%
49	2.0	7.5	26.79%	26.00%	26.00%	2.0	2.0	103%	103%
50	4.1	12.2	33.49%	26.00%	26.50%	3.2	3.2	129%	126%

Unreduced Retirement Experience - Liability Weighted Public Safety Divisions, Males and Females Replacement-Index-Based Analysis, Liability Weighted									
Replacement Index	Actual Retirements	Exposure	Crude Rates	Sample Rates		Expected Retirements		Ratio of Actuals/Expecteds	
				Current*	Proposed	Current	Proposed	Current	Proposed
51	2.3	12.5	18.27%	26.00%	27.00%	3.3	3.4	70%	68%
52	3.7	11.7	31.37%	26.00%	27.50%	3.0	3.2	121%	114%
53	4.2	12.8	32.71%	26.00%	28.00%	3.3	3.6	126%	117%
54	5.1	20.7	24.71%	26.00%	28.50%	5.4	5.9	95%	87%
55	8.0	18.2	43.92%	26.00%	29.00%	4.7	5.3	169%	151%
56	7.0	24.3	28.74%	26.00%	29.50%	6.3	7.2	111%	97%
57	8.8	23.6	37.26%	26.00%	30.00%	6.1	7.1	143%	124%
58	8.4	30.1	27.98%	26.00%	30.50%	7.8	9.2	108%	92%
59	10.8	33.0	32.88%	27.00%	31.00%	8.9	10.2	122%	106%
60	11.4	33.6	33.85%	30.00%	31.00%	10.1	10.4	113%	109%
61	9.3	26.4	35.26%	30.00%	32.00%	7.9	8.4	118%	110%
62	10.8	27.4	39.45%	30.00%	32.00%	8.2	8.8	131%	123%
63	14.6	30.7	47.57%	30.00%	33.00%	9.2	10.1	159%	144%
64	14.1	42.5	33.15%	30.00%	33.00%	12.7	14.0	111%	100%
65	15.8	37.9	41.68%	30.00%	34.00%	11.4	12.9	139%	123%
66	17.5	48.1	36.40%	30.00%	34.00%	14.4	16.3	121%	107%
67	16.3	38.5	42.26%	30.00%	35.00%	11.5	13.5	141%	121%
68	23.1	47.4	48.67%	30.00%	35.00%	14.2	16.6	162%	139%
69	25.8	62.4	41.39%	31.00%	36.00%	19.3	22.5	134%	115%
70	23.7	50.5	46.94%	31.00%	36.00%	15.6	18.2	151%	130%
71	22.5	52.1	43.29%	31.00%	37.00%	16.1	19.3	140%	117%
72	17.3	50.1	34.59%	31.00%	37.00%	15.5	18.5	112%	93%
73	26.8	56.8	47.23%	32.00%	38.00%	18.2	21.6	148%	124%
74	23.9	61.8	38.68%	32.00%	38.00%	19.8	23.5	121%	102%
75	29.3	58.6	49.92%	33.00%	39.00%	19.3	22.9	151%	128%
76	20.8	46.9	44.37%	35.00%	39.00%	16.4	18.3	127%	114%
77	24.5	59.1	41.53%	36.00%	40.00%	21.3	23.6	115%	104%
78	23.6	56.3	41.92%	37.00%	40.00%	20.8	22.5	113%	105%
79	16.3	40.7	40.01%	38.00%	41.00%	15.5	16.7	105%	98%
80	21.1	47.3	44.68%	38.00%	41.00%	18.0	19.4	118%	109%
81	19.9	46.7	42.57%	39.00%	42.00%	18.2	19.6	109%	101%
82	17.2	43.4	39.74%	39.00%	39.00%	16.9	16.9	102%	102%
83	17.6	44.3	39.71%	40.00%	40.00%	17.7	17.7	99%	99%
84	12.2	30.8	39.73%	40.00%	40.00%	12.3	12.3	99%	99%
85	17.5	34.7	50.59%	42.00%	45.00%	14.6	15.6	120%	112%
86	17.7	33.6	52.66%	43.00%	45.00%	14.5	15.1	122%	117%
87	16.6	30.3	54.87%	44.00%	44.00%	13.3	13.3	125%	125%
88	18.3	30.9	59.36%	45.00%	45.00%	13.9	13.9	132%	132%
89	9.7	22.6	43.01%	46.00%	46.00%	10.4	10.4	94%	94%
90	5.6	11.4	49.57%	48.00%	48.00%	5.4	5.4	103%	103%
91	12.0	18.0	66.91%	50.00%	50.00%	9.0	9.0	134%	134%
92	10.3	11.2	92.27%	51.00%	51.00%	5.7	5.7	181%	181%
93	2.8	8.9	30.91%	52.00%	52.00%	4.6	4.6	59%	59%
94	8.1	12.4	65.62%	52.00%	52.00%	6.4	6.4	126%	126%
95	2.5	8.0	31.37%	52.00%	52.00%	4.2	4.2	60%	60%
96	2.2	5.6	39.49%	55.00%	55.00%	3.1	3.1	72%	72%
97	3.9	5.0	78.00%	57.00%	57.00%	2.9	2.9	137%	137%
98	1.5	9.7	15.76%	58.00%	58.00%	5.6	5.6	27%	27%
99	2.2	6.0	36.64%	58.00%	58.00%	3.5	3.5	63%	63%
Totals	**693.9**	**1,726.2**	**40.20%**	**33.81%**	**36.70%**	**583.6**	**633.5**	**119%**	**110%**
100 & Over	30.9	51.2	60.25%	60.00%	60.00%	30.7	30.7	100%	100%
Total	**724.8**	**1,777.4**	**40.78%**	**34.56%**	**37.37%**	**614.3**	**664.2**	**118%**	**109%**

^ Current and proposed rates are weighted averages for replacement indexes below 5.

The 100% retirement rate at age 85 has been a subject of discussion between GRS and MERS' actuarial staff. There are a very limited number of Public Safety exposures between ages 70 and 75. As such, we recommend lowering the 100% retirement assumption from 85 to 75 for the Public Safety groups.

As mentioned, the retirement rates for pension annual actuarial valuations are based on replacement index. There may be circumstances when another actuary may be engaged for other actuarial valuation services for a MERS employer, such as for an OPEB valuation. In that case, the data needed to determine replacement index may not readily be available to the OPEB actuary making it difficult to implement the proposed assumption. We suggest that a head-count service-based retirement table based on this experience study could be selected as follows:



The underlying analysis is as follows:

Unreduced Retirement Experience - Count Weighted									
All Divisions, Males and Females									
Service-Based Analysis, Headcount Weighted									
	Actual		Crude	Sample Rates		Expected Retirements		Ratio of Actuals/Expecteds	
Service	Retirements	Exposure	Rates	Current	Proposed	Current	Proposed	Current	Proposed
Under 5	3.0	12.0	25.00%	15.0%	14.0%	1.8	1.7	167%	179%
5	18.0	161.0	11.18%	15.0%	14.0%	24.2	22.5	75%	80%
6	37.0	267.0	13.86%	15.0%	14.0%	40.1	37.4	92%	99%
7	42.0	292.0	14.38%	15.0%	14.0%	43.8	40.9	96%	103%
8	45.0	286.0	15.73%	15.0%	15.0%	42.9	42.9	105%	105%
9	82.0	502.0	16.33%	15.0%	15.0%	75.3	75.3	109%	109%
10	175.0	677.0	25.85%	20.0%	23.0%	135.4	155.7	129%	112%
11	112.0	584.0	19.18%	20.0%	20.0%	116.8	116.8	96%	96%
12	111.0	584.0	19.01%	20.0%	20.0%	116.8	116.8	95%	95%
13	120.0	597.0	20.10%	20.0%	20.0%	119.4	119.4	101%	101%
14	136.0	686.0	19.83%	20.0%	20.0%	137.2	137.2	99%	99%
15	168.0	772.0	21.76%	20.0%	20.0%	154.4	154.4	109%	109%
16	164.0	750.0	21.87%	20.0%	20.0%	150.0	150.0	109%	109%
17	145.0	723.0	20.06%	20.0%	20.0%	144.6	144.6	100%	100%
18	144.0	802.0	17.96%	20.0%	20.0%	160.4	160.4	90%	90%
19	226.0	898.0	25.17%	20.0%	22.0%	179.6	197.6	126%	114%
20	241.0	957.0	25.18%	20.0%	22.0%	191.4	210.5	126%	114%
21	208.0	966.0	21.53%	22.0%	22.0%	212.5	212.5	98%	98%
22	215.0	975.0	22.05%	24.0%	23.0%	234.0	224.3	92%	96%
23	238.0	914.0	26.04%	26.0%	26.0%	237.6	237.6	100%	100%
24	462.0	1,356.0	34.07%	30.0%	32.0%	406.8	433.9	114%	106%
25	546.0	1,486.0	36.74%	34.0%	35.0%	505.2	520.1	108%	105%
26	320.0	1,153.0	27.75%	25.0%	26.0%	288.3	299.8	111%	107%
27	240.0	982.0	24.44%	25.0%	26.0%	245.5	255.3	98%	94%
28	232.0	889.0	26.10%	25.0%	26.0%	222.3	231.1	104%	100%
29	236.0	869.0	27.16%	25.0%	26.0%	217.3	225.9	109%	104%
30	200.0	794.0	25.19%	25.0%	26.0%	198.5	206.4	101%	97%
31	201.0	739.0	27.20%	28.0%	27.0%	206.9	199.5	97%	101%
32	207.0	670.0	30.90%	28.0%	29.0%	187.6	194.3	110%	107%
33	152.0	550.0	27.64%	28.0%	28.0%	154.0	154.0	99%	99%
34	116.0	451.0	25.72%	28.0%	27.0%	126.3	121.8	92%	95%
35	95.0	377.0	25.20%	25.0%	26.0%	94.3	98.0	101%	97%
36	85.0	297.0	28.62%	25.0%	26.0%	74.3	77.2	114%	110%
37	56.0	240.0	23.33%	25.0%	25.0%	60.0	60.0	93%	93%
38	36.0	211.0	17.06%	25.0%	25.0%	52.8	52.8	68%	68%
39	61.0	195.0	31.28%	25.0%	25.0%	48.8	48.8	125%	125%
Totals	**5,875.0**	**23,664.0**	**24.83%**	**23.7%**	**24.0%**	**5,606.8**	**5,737.5**	**105%**	**102%**
40 & Over	186.0	739.0	25.17%	25.0%	25.0%	184.8	184.8	101%	101%
Total	**6,061.0**	**24,403.0**	**24.84%**	**23.7%**	**25.0%**	**5,791.5**	**5,922.2**	**105%**	**102%**

Of course, we leave the selection of OPEB-specific assumptions to the OPEB actuary's professional judgment.

Summary of Recommendations:

- Change 100% retirement rates to begin at age 75 vs. current age of 85, for the public safety groups. No change to the assumption for general members.
- Continue separate assumptions public safety and general employee divisions.
- Adjust the replacement index table for public safety groups, to reflect continued increased retirement incidence. No change to the non-public safety rates.
- Adjust the valuation modeling to process frozen plans as inactive vested members, commencing benefits at earliest eligibility.

Early Reduced Retirement

On a liability-weighted basis, the A/E of early reduced retirement is 57%, indicating that less early reduced retirements occurred than were expected by our assumptions. The corresponding crude rate on a liability-weighted basis was similar at 2.26%. The trend of fewer than expected retirements has continued for two consecutive studies.

Liability-Weighted ($Millions)				
	Exposure	Actual	Expected	A/E
Public Safety	498.4	16.5	19.9	83%
All Others	3,024.5	63.2	121.0	52%
Grand Total	**$ 3,523.0**	**$ 79.8**	**$ 140.9**	**57%**

The actual number of early retirements in the aggregate is too small for full credibility. Yet we observe a pattern of increasing incidence of reduced retirement the closer the member is to unreduced retirement. Coupled with potential COVID considerations, we recommend implementing a set of rates to better match experience and to move approximately 25% of the way toward an A/E of 100%.

Reduced Retirement Experience All Divisions, Males and Females Age-Based Analysis, Liability Weighted									
				Sample Rates		Expected Retirements		Ratio of Actuals/Expecteds	
Age	Actual Retirements	Exposure	Crude Rates	Current	Proposed	Current	Proposed	Current	Proposed
47	-	0.2	0.00%	4.00%	2.6%	0.0	0.0	0%	0%
48	-	0.2	0.00%	4.00%	2.6%	0.0	0.0	0%	0%
49	-	0.2	0.00%	4.00%	2.6%	0.0	0.0	0%	0%
50	2.4	186.2	1.30%	4.00%	2.6%	7.4	4.8	33%	50%
51	2.5	248.3	0.99%	4.00%	2.8%	9.9	7.0	25%	35%
52	7.8	316.9	2.47%	4.00%	3.0%	12.7	9.5	62%	82%
53	5.5	380.4	1.45%	4.00%	3.2%	15.2	12.2	36%	45%
54	7.1	434.4	1.64%	4.00%	3.4%	17.4	14.8	41%	48%
55	7.0	373.1	1.89%	4.00%	3.6%	14.9	13.4	47%	52%
56	10.2	370.7	2.76%	4.00%	3.8%	14.8	14.1	69%	73%
57	10.4	388.9	2.67%	4.00%	4.0%	15.6	15.6	67%	67%
58	11.4	397.1	2.88%	4.00%	4.0%	15.9	15.9	72%	72%
59	14.8	422.7	3.51%	4.00%	4.0%	16.9	16.9	88%	88%
60	-	1.8	0.00%	4.00%	4.0%	0.1	0.1	0%	0%
61	0.5	1.6	31.32%	4.00%	4.0%	0.1	0.1	783%	783%
Totals	**79.8**	**3,523.0**	**2.26%**	**4.00%**	**3.53%**	**140.9**	**124.3**	**57%**	**64%**

Summary of Recommendations:

- We recommend setting retirement rates to more closely mimic the increasing incidence of retirement as the member gets closer to receipt of unreduced benefits.

Withdrawal

For purposes of pension actuarial valuations, a withdrawal is a termination from employment prior to retirement which is not the result of a disability. This assumption is also sometimes referred to as the turnover assumption. Active participants may or may not be vested upon termination. Often, turnover is higher at younger ages or low service as individuals change careers and lower at higher ages or service as individuals get close to retirement.

The previous experience study continued the use of a service-based withdrawal table but moved to separate assumptions public safety vs. non-public safety. The service-based analysis has a low variance, 0.1%, on a liability-weighted basis.

On a liability-weighted basis, the A/E ratio is 112%. Again, from the perspective of aligning the assumptions with gains and losses, we suggest performing the analysis on a liability-weighted basis. The A/E ratio of 112% suggests that a change in assumptions may be needed. As with other assumptions, COVID also impacts withdrawal. The Great Resignation is considered to have occurred in years 2021 and 2022. We considered year-by-year experience and found that 2019 and 2020 had an A/E below 100% - indicating less liability removed from the rolls than expected under the assumptions. This aligns with COVID and a general "pause on all things" during 2020. During 2021 and 2022, and continuing through 2023, we have A/E showing more withdrawals than expected. We must again consider whether this is a COVID blip or the new normal. For the withdrawal decrement, the increased termination has been and continues to be seen across industries and the private/public sector markets. We will continue to monitor terminations in future experience studies, however given the continued elevated terminations, we recommend scaling the table to move approximately 25% (instead of the usual 50%) toward an A/E of 100%, providing partial credit to COVID.

Liability-Weighted ($Millions)				
	Exposure	Actual	Expected	A/E
Public Safety	$ 5,458.7	$ 162.9	$ 143.5	114%
All Others	8,064.8	431.8	389.5	111%
Grand Total	**$ 13,523.5**	**$ 594.8**	**$ 533.0**	**112%**

The detailed analysis for this assumption in the aggregate is shown in the table on the following pages.

Withdrawal Retirement Experience - Liability Weighted									
General Divisions, Males and Females									
Service-Based Analysis, Liability Weighted									
				Sample Rates		Expected Retirements		Ratio of Actuals/Expecteds	
Service	Actual Withdrawals	Exposure	Crude Rates	Current	Proposed	Current	Proposed	Current	Proposed
0	0.4	2.2	20.11%	23.40%	24.60%	0.5	0.5	84%	82%
1	9.5	51.0	18.56%	19.50%	20.50%	10.2	10.4	93%	91%
2	14.4	96.6	14.87%	15.80%	16.60%	15.8	16.0	91%	90%
3	17.8	145.0	12.30%	12.50%	13.10%	18.7	19.0	95%	94%
4	20.0	195.3	10.26%	10.30%	10.80%	20.7	21.1	97%	95%
5	22.2	232.7	9.54%	8.30%	8.70%	19.8	20.2	112%	110%
6	22.8	261.9	8.71%	7.20%	7.60%	19.2	19.9	119%	115%
7	19.5	275.9	7.06%	6.60%	6.90%	18.6	19.0	105%	102%
8	20.0	299.1	6.68%	6.00%	6.30%	18.4	18.8	109%	106%
9	23.0	294.6	7.80%	5.70%	6.00%	17.1	17.7	134%	130%
10	24.1	287.1	8.40%	5.40%	5.70%	15.8	16.4	153%	147%
11	19.5	307.9	6.34%	5.20%	5.50%	16.3	16.9	119%	115%
12	17.5	327.2	5.34%	4.70%	4.90%	15.8	16.0	111%	109%
13	17.6	363.1	4.86%	4.50%	4.70%	16.8	17.1	105%	103%
14	16.8	356.9	4.70%	4.20%	4.40%	15.5	15.7	108%	107%
15	19.4	345.4	5.61%	4.00%	4.20%	14.3	14.5	136%	134%
16	15.0	347.5	4.31%	3.90%	4.10%	13.9	14.2	107%	105%
17	17.4	395.8	4.38%	3.70%	3.90%	15.1	15.4	115%	112%
18	16.4	433.0	3.78%	3.40%	3.60%	15.3	15.6	107%	105%
19	22.4	466.0	4.80%	3.20%	3.40%	15.5	15.8	145%	141%
20	15.3	485.2	3.16%	3.10%	3.30%	15.5	16.0	99%	96%
21	13.7	512.8	2.67%	3.00%	3.20%	15.9	16.4	86%	83%
22	13.7	494.9	2.77%	2.80%	2.90%	14.3	14.4	96%	95%
23	13.8	475.0	2.90%	2.80%	2.90%	13.8	13.8	100%	100%
24	9.8	292.5	3.35%	2.70%	2.80%	8.2	8.2	119%	120%
25	4.7	113.7	4.17%	2.60%	2.70%	3.0	3.1	156%	154%
26	1.6	72.5	2.15%	2.60%	2.70%	1.9	2.0	81%	80%
27	1.6	50.8	3.21%	2.60%	2.70%	1.4	1.4	120%	119%
28	0.8	35.9	2.10%	2.60%	2.70%	1.0	1.0	78%	78%
29	0.4	20.7	1.92%	2.60%	2.70%	0.5	0.6	73%	71%
30	0.2	10.7	2.03%	2.60%	2.70%	0.3	0.3	79%	75%
31	0.0	7.1	0.36%	2.60%	2.70%	0.2	0.2	14%	13%
32	0.1	4.1	2.73%	2.60%	2.70%	0.1	0.1	109%	101%
33	0.1	2.1	6.95%	2.60%	2.70%	0.0	0.1	288%	257%
34	0.3	1.9	18.58%	2.60%	2.70%	0.0	0.1	735%	688%
35	0.0	0.5	9.52%	2.60%	2.70%	0.0	0.0	377%	353%
Totals	**431.8**	**8,064.4**	**5.35%**	**4.83%**	**4.93%**	**389.5**	**397.9**	**111%**	**109%**
36 & Over	-	0.4	0.00%	2.60%	2.70%	0.0	0.0	0%	0%
Total	**431.8**	**8,064.8**	**5.35%**	**4.83%**	**4.93%**	**389.5**	**397.9**	**111%**	**109%**

Withdrawal Retirement Experience - Liability Weighted									
Public Safety Divisions, Males and Females									
Service-Based Analysis, Liability Weighted									
				Sample Rates		Expected Retirements		Ratio of Actuals/Expecteds	
Service	Actual Withdrawals	Exposure	Crude Rates	Current	Proposed	Current	Proposed	Current	Proposed
0	0.1	0.4	14.99%	13.90%	16.50%	0.1	0.1	88%	91%
1	1.5	12.0	12.64%	11.60%	13.80%	1.8	1.7	84%	92%
2	2.7	24.0	11.24%	9.40%	11.20%	2.9	2.7	92%	100%
3	3.5	37.1	9.44%	7.40%	8.80%	3.5	3.3	99%	107%
4	4.5	50.3	8.98%	6.10%	7.30%	3.9	3.7	117%	123%
5	4.0	61.3	6.57%	4.90%	5.80%	3.7	3.6	110%	113%
6	5.0	74.6	6.67%	4.30%	5.10%	3.8	3.8	129%	131%
7	3.9	85.8	4.55%	3.90%	4.60%	4.3	3.9	90%	99%
8	5.3	93.0	5.67%	3.60%	4.30%	4.6	4.0	115%	132%
9	4.3	97.8	4.39%	3.40%	4.00%	4.2	3.9	102%	110%
10	6.7	108.4	6.20%	3.20%	3.80%	4.3	4.1	158%	163%
11	5.6	131.9	4.23%	3.10%	3.70%	5.2	4.9	107%	114%
12	8.5	159.7	5.30%	2.80%	3.30%	5.6	5.3	151%	161%
13	6.5	180.5	3.60%	2.70%	3.20%	5.8	5.8	111%	112%
14	7.3	211.7	3.43%	2.50%	3.00%	6.0	6.4	122%	114%
15	6.8	236.4	2.86%	2.40%	2.90%	6.1	6.9	111%	99%
16	5.7	265.9	2.13%	2.30%	2.70%	6.5	7.2	87%	79%
17	8.7	306.1	2.83%	2.20%	2.60%	7.5	8.0	116%	109%
18	9.1	345.5	2.62%	2.00%	2.40%	7.7	8.3	118%	109%
19	8.6	388.0	2.22%	1.90%	2.30%	8.1	8.9	107%	96%
20	8.6	436.7	1.96%	1.80%	2.10%	8.7	9.2	99%	93%
21	10.7	473.0	2.26%	1.80%	2.10%	9.2	9.9	116%	108%
22	6.4	493.8	1.30%	1.70%	2.00%	8.9	9.9	72%	65%
23	6.1	539.4	1.14%	1.70%	2.00%	10.2	10.8	60%	57%
24	8.6	342.3	2.52%	1.60%	1.90%	6.0	6.5	143%	133%
25	5.4	146.4	3.72%	1.50%	1.80%	2.4	2.6	230%	206%
26	3.7	91.1	4.09%	1.50%	1.80%	1.5	1.6	249%	227%
27	4.6	40.0	11.49%	1.50%	1.80%	0.7	0.7	701%	638%
28	-	18.7	0.00%	1.50%	1.80%	0.3	0.3	0%	0%
29	0.7	3.8	17.99%	1.50%	1.80%	0.1	0.1	1200%	1000%
30	-	2.1	0.00%	1.50%	1.80%	0.0	0.0	0%	0%
31	-	0.8	0.00%	1.50%	1.80%	0.0	0.0	0%	0%
32	-	-	N/A	1.50%	0.00%	-	-	N/A	N/A
33	-	-	N/A	1.50%	0.00%	-	-	N/A	N/A
34	-	-	N/A	1.50%	0.00%	-	-	N/A	N/A
35	-	-	N/A	1.50%	0.00%	-	-	N/A	N/A
Totals	**162.9**	**5,458.7**	**2.98%**	**2.63%**	**2.71%**	**143.5**	**147.9**	**114%**	**110%**
36 & Over	-	-	N/A	N/A	0.00%	-	-	N/A	N/A
Total	**162.9**	**5,458.7**	**2.98%**	**2.63%**	**2.71%**	**143.5**	**147.9**	**114%**	**110%**

Summary of Recommendations:

- Maintain separate assumptions public safety and general employee divisions.
- Apply scaling factor to the rates to account for continued increased turnover, moving approximately 25% of the way to an A/E of 100%.

Disability

The disability assumption only applies prior to retirement eligibility and comprises a small portion of the total Plan liability. The number of disabilities who were not retirement eligible, 143, is too small to be fully credible.

An additional assumption is needed to differentiate Disability retirement into work related (Duty) or non-work related (Non-Duty) disabilities. The current assumption for Duty vs. Non-Duty incidence is set based upon whether the division offers enhanced disability benefits (D2) or standard disability benefits (Non-D2). For members covered by Benefit Program D-2, 59% of disabilities were duty related compared to the current assumption of 60%, which could support continuation of Duty vs. Non-Duty incidence based upon benefit provisions.

However, during this experience review we also analyzed the disability experience by employment classification. We find that ***Duty*** disability retirements are consistently more likely to occur in a public safety division. This follows logically, as a public safety employment type is generally exposed to more hazards. The incidence of Duty Disability retirements for public safety employments is between 52%-58%.

Considering non-public safety disability retirements, we find only 3 actual retirements with a D2 benefit. This small amount of experience is not sufficient to be credible. We find that 93% of non-public safety disability retirements are ***Non-Duty***.

	Public Safety			Current
D2	**Y (26)**	**N (3)**	**Aggregate (29)**	**Assumption**
Duty	58%	67%	59%	60%
Non-Duty	42%	33%	41%	40%

	Public Safety			Current
Non-D2	**Y (46)**	**N (68)**	**Aggregate (114)**	**Assumption**
Duty	52%	7%	25%	20%
Non-Duty	48%	93%	75%	80%

Summary of Recommendations:

- We recommend no change to the disability decrement assumptions.
- We recommend determining duty vs. non-duty incidence to be based upon employment category.
    - Public Safety: 55% Duty, 45% Non-Duty
    - Non-Public Safety: 15% Duty, 85% Non-Duty

Post-Retirement Mortality

Perhaps the most critical demographic assumption used in pension valuations is mortality. Rates of mortality affect our estimate of how long each individual is expected to live and consequently how long each individual is expected to receive a pension. Life expectancy in turn has a direct impact on pension plan liabilities.

Mortality rates have generally decreased over time in the U.S., meaning that life expectancies have generally increased over time. The assumption for future decreases in mortality is referred to as the "mortality improvement assumption." In general, the mortality and mortality improvement assumptions are treated separately. The analysis in this section covers the period of 2019 through 2023. During this time, mortality improvement may have been impacted by COVID.

Based on the prior study, MERS approved the use of sex-distinct post-retirement mortality assumptions equal to 106% of the PubG-2010 healthy retiree table for General employees. This adjustment is to scale the base tables only and does not reflect any future mortality improvements.

Based on our analysis of retiree mortality, the ratio of actual to expected deaths under the current assumption is 103% on a liability-weighted basis, indicating that more liability was removed from the roles than our assumptions expected. A liability-weighted margin provides for *mitigating future gains and losses* from future mortality improvement. The A/E for disabled lives on a liability weighted basis is similar at 105%.

In this analysis, we looked at the experience of General and Public Safety retirees separately and in total. For this purpose, Public Safety retirees are defined as those with division codes 02, 05, 20-29, 50-59. It is possible that some Hybrid divisions also include Public Safety participants, but that information was unavailable.

Liability-Weighted ($ millions)					
	Exposures	Expected	Actual	A/E	Ajdusted A/E
Public Safety Retirees	13,469.57	164.19	162.76	99%	100%
All other Retirees	36,301.58	546.35	567.27	104%	104%
Total	49,771.15	710.54	730.03	103%	103%

The A/E ratio for Public Safety is slightly lower than all other retirees. If we perform a partial credibility adjustment, the adjusted A/E ratio for Public Safety is 100%. Given that the adjusted A/E ratio for Public Safety is not significantly different from the remainder of the population and that administrative complexity increases with multiple assumptions, we suggest using the same mortality assumption for public safety and other retirees.

The A/E across the study period is 103%, indicating that somewhat more liability was removed from the roles than expected. We look further into the year-by-year experience and found that experience years 2018-2019 and 2022-2023 had an A/E below 100%, while experience years 2019-2020, 2020-2021, and 2021-2022 had an A/E >100%. This could indicate a blip of increased mortality resulting from COVID with a corresponding return to normal (i.e., COVID is complete, and the healthy lives remain). In an effort to not overreact to potential changes, we recommend continuation of the present assumptions, as we monitor additional emerging data.

Note that the Pub-2010 tables do not include rates at all ages. For purposes of selecting mortality rates that are not otherwise published, we use the corresponding Employee or Healthy Retiree rates as applicable.

Summary of Recommendations:

- We recommend continued use of the Pub-2010 mortality General, sex-distinct, rates as published by the Society of Actuaries, adjusted by a factor of 106%.
- We recommend continued use of the present disability mortality assumption, sex-distinct PubNS-2010 disabled tables, unadjusted.
- For vested deferred members, retiree mortality rates apply.

Pre-Retirement Mortality

We recommended no change to the post-retirement base mortality table. Actual pre-retirement mortality experience is very low, and not fully credible. This assumption can be difficult to analyze. Therefore, we recommend continuing the present assumption based on the Employee tables corresponding to the Healthy Retiree tables selected from the Pub-2010 assumption set. A full set of assumptions is included in the appendix.

Summary of Recommendations:

- We recommend continuing the current assumptions, Pub-2010 General Employees table without adjustment.
- We recommend no change to the non-duty/duty weighted, currently set at 90%/10% respectively.

Mortality Improvement

Mortality improvement is a separate component of the mortality assumption. The current assumption assumes fully generational mortality with improvements based upon a standard improvement scale issued by the Society of Actuaries, presently MP-2019. The fully generation method explicitly assumes gradual increases each year in the future. In theory, a fully generational assumption should need less significant "resetting" with each subsequent experience study.

Typically, the RPEC (Retirement Plans Experience Committee – a committee of the Society of Actuaries (SOA)), reviews and releases an updated mortality improvement scale in October each year. The scale is titled MP-20xx and incorporates data through 20xx – 2 years. The most recent scale issued by the RPEC was MP-2021, data through 2019 (pre-pandemic).

COVID lead to a sharp increase in mortality rates, which appear to have mostly declined, but there appears to be excess mortality in the 65+ population. The SOA feels there is not yet enough post pandemic mortality to release an updated scale (since MP2021). With waiting for enough years of "post pandemic" data, smoothing periods, and availability of data may indicate an updated scale could be ***several years out still, possibly*** as far out as fall of 2029.

There are very few plans with enough experience to utilize an adjusted mortality improvement scale or to determine their own improvement scale. A common practice for reflecting updates to mortality improvement scales, is to reflect the most recently available improvement scale issued by the SOA.

Summary of Recommendations:

- We recommend updating the mortality improvement scale to the most recently issued mortality improvement scale, MP-2021.

Pay Increases Due to Merit and Seniority

The valuation assumes rates of pay increases for each active participant each year. The current assumption consists of a wage inflation assumption of 3.00% per year and merit and seniority assumptions by age. The purpose of this analysis is to focus on the merit and seniority components of individual pay increases.

Technically, pay increases due to merit and seniority are considered economic assumptions subject to ASOP No. 27. However, because the selection of this assumption is informed by reviewing MERS' demographic experience, we include it in this section of demographic assumptions.

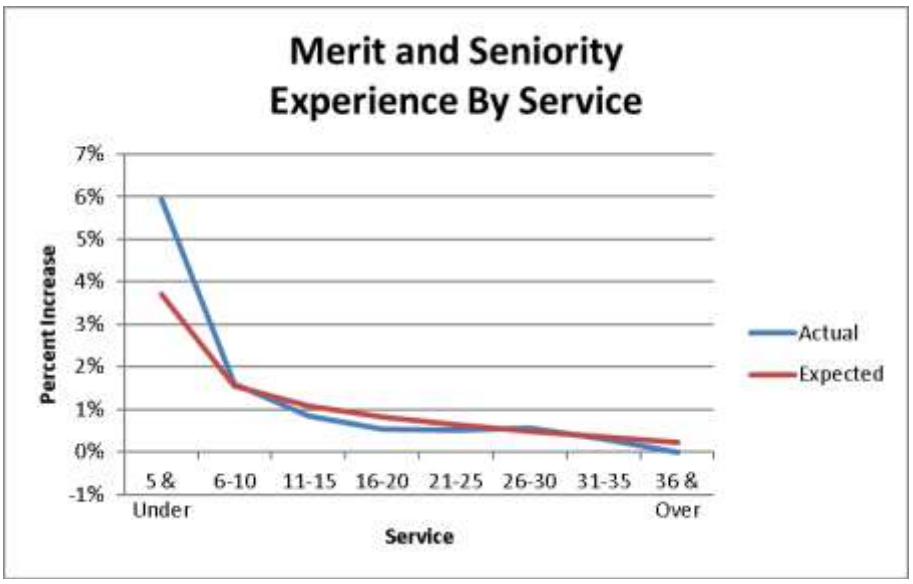
In order to review individual merit and seniority increases, we first must separate the portion of total pay increases attributable to wage inflation. For purposes of this analysis, we estimate the wage inflation experience by all MERS participating employers during the experience study period. There are multiple ways of estimating actual wage inflation over a fixed historical period for a group. The approach that we use is to review the increase in average pay for all active participants from year to year during the experience study period. The aggregate experience is summarized as follows:

Valuation Date December 31	Number Active	Annual Payroll ($Millions)	Average Pay	Percent Increase	Adjusted Percent Increase
2018	33,891	$ 1,813	$ 53,488		
2019	33,710	1,850	54,889	2.6%	2.6%
2020	32,314	1,852	57,299	4.4%	4.4%
2021	31,019	1,834	59,114	3.2%	2.2%
2022	30,438	1,891	62,116	5.1%	4.1%
2023	30,153	1,958	64,935	4.5%	4.5%
		Overall Average:		**4.0%**	**3.6%**

The average increase during the experience study period was 4.0%. COVID impacted many/all areas of this experience study. For several years, the MERS Plan Document had special provisions regarding the treatment of service and pay related to COVID furloughs. This data required self-reporting of employers and was not readily available in the valuation extracts. A result is a potential overstatement of the change in pay in years 2021 and 2022. As such, we used professional judgment to adjust the rate of increase for these years. It is important to keep in mind that the actual wage inflation experience of 4.0%/3.6% during this 5-year period does not necessarily invalidate the prior or current wage inflation assumption of 3.00% (just as the actual investment return experience over a 5-year period does not necessarily invalidate an assumed rate of return). This analysis is not intended to be a review of the wage inflation assumption; rather, it is to determine a measure relevant to this experience study period to review the pay increases net of wage inflation.

We generally refer to pay increases net of wage inflation as real pay increases. We have performed analysis of real pay increases for the experience study period in two different ways: age-based rates, and service-based rates. The current assumption is a service-based assumption. Many municipalities in Michigan have pay structures that are service-based rather than age-based.

The results of our analysis of service-based real pay increases are shown in the following table and graph.



Service Index Beginning of Year	Number	Net of Wage 3.6% Inflation	
		Actual	Expected
5 & Under	48,078	5.96 %	3.70 %
6-10	25,221	1.60 %	1.56 %
11-15	18,520	0.84 %	1.09 %
16-20	19,415	0.53 %	0.81 %
21-25	16,737	0.51 %	0.64 %
26-30	7,312	0.55 %	0.48 %
31-35	3,139	0.29 %	0.34 %
36 & Over	1,398	(0.01)%	0.23 %
Total	139,820		

The "Expected" increase in this case is the average of the current age-based assumptions in effect for the various subgroups of the population by service index as shown. In this case, the graph clearly shows a convergence of the actual and expected increases for 6+ years of service. The actual increases for 5 years of service and under are higher than expected. In addition, the subgroup of active participants with 5 or fewer years of service makes up approximately 1/3 of the total exposure. However, the spread between actual and expected salary increase is shrinking compared to the previous experience study.

For a service-based approach, the pay changes in the first few years may not be fully reliable. Partial years of service for new hires may introduce distortions even if pays are annualized for new hires. We generally assign less weight to the experience observed in early years of service. For purposes of this analysis, we only consider those participants who were active at the beginning and the end of the year in a specific year of the study. In addition, we excluded a small number of frozen plan active participants and consolidated pay for duplicate records. A full set of assumptions is included in the Appendix.

Summary of Recommendations:

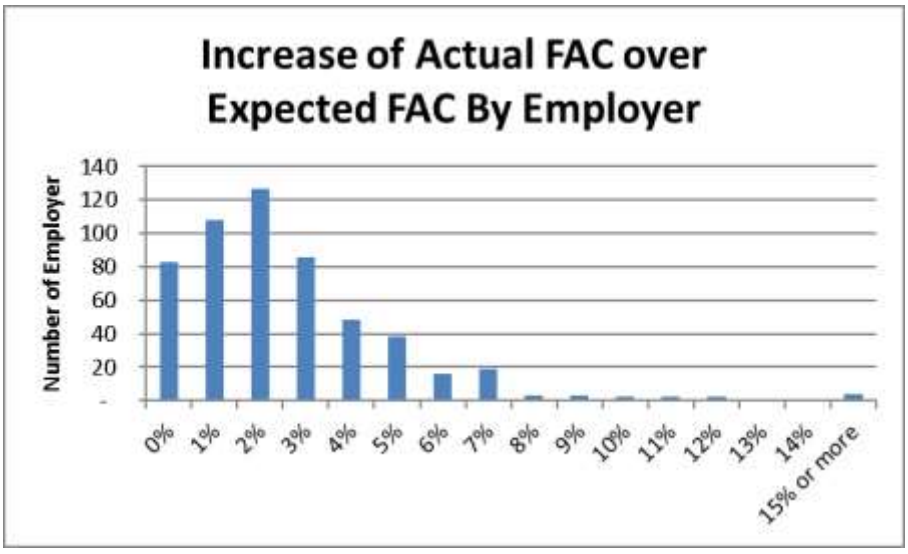
- We recommend no change to the service-based assumption.

Increases in Final Average Compensation at Retirement

We have analyzed expected Final Average Compensation (FAC) vs. actual FAC for new retirees during the experience study period. Experience is generally similar to the last two studies in that the actual FAC is often higher than expected. For purposes of this analysis, the expected FAC is based on projected individual pay using valuation assumptions excluding any loads and subject to the minimum FAC as reported for the valuation.

Overall, the average increases were about 2.6% higher than expected, up somewhat slightly from the prior experience study in which the average was about a 2% increase, and continues the trend of higher-than-expected FACs from the second prior study. During the previous study a minimum FAC load was implemented of 1.0%. The continued trend of actual FACs above expectations, at a level above 1.0%, supports our recommendation to increase the minimum FAC load to 1.5%.

Our analysis separately studies divisions that have adopted base compensation as the definition of pensionable earnings, and found increases of approximately 0.5%. It is reasonable to expect that retirees with base compensation only, would experience less volatility in their final average compensation and consequently need a smaller separate load for unexpected increases.



As with other assumptions, we generally prefer to move part way from the current assumption to the recent experience. In some cases, there were very few retirements, if any, during the study period. In order to proceed, we established the following procedure for the experience study:

- Review each division with sick leave included in FAC separately;
- For divisions with compensation defined as base wages only, set the load to 0.5%;
- For all other divisions, apply a partial credibility factor to the actual experience based on the count of retirements during the study period as follows:

Count	Partial Credibility
0	0%
10	10%
25	20%
100	30%
160	40%
240	50%

- Round the resulting load to the nearest whole percent;
- Restrict the load to a minimum of 1.5%, for FAC and a maximum of 15%.

Based on this procedure, the change in FAC load for employers with active employees and compensation other than base wages changed as follows:

Change in FAC load	Count of Employers	Percent of Employers
More than 1% decrease	0	0.0%
-1.00%	3	0.4%
0.00%	368	50.1%
0.50%	361	49.1%
1.00%	3	0.4%
More than 1% increase	0	0.0%
Total	735	100%

We have reviewed the loads for the divisions that have adopted Sick Leave in FAC (SLIF) on a case-by-case analysis. Our review consisted of considering the maximum number of sick leave days allowed in proportion to a full year (260 days = 5 days per week X 52 weeks per year) divided by the number of years of final average earnings. There are several divisions with a calculated SLIF load of <1.5%. We recommend applying the same minimum level of FAC load as non-SLIF divisions, 1.5%.

Summary of Recommendations:

- We recommend a 0.5% FAC load for base wages definitions of compensation.
- We recommend an increase in minimum FAC load for pay definitions other than base wages from 1% to 1.5%.
- We recommend applying the 1.5% minimum FAC load to SLIF divisions.

Optional Forms of Payment and Marriage Assumption

The previous experience study observed 68% of males and 37% of females electing a J&S form of payment and indicated that the female percentage had increased from the prior study. We see this trend continuing with 70% of males and 40% of females electing a J&S form of payment.

	Count			Percent		
Electing	**Males**	**Females**	**Total**	**Males**	**Females**	**Total**
Percent Certain	96	135	231	3%	4%	4%
Joint & Survivor	2,403	1,231	3,634	70%	40%	56%
Benefit Program RS	69	56	125	2%	2%	2%
Straight Life	858	1,689	2,547	25%	54%	39%
Total	**3,426**	**3,111**	**6,537**	**100%**	**100%**	**100%**

For purposes of the valuation, the marriage assumption is currently 80% for both males and females for death-in-service. Due to the small number, data on actual deaths-in-service during the experience study period is not fully credible. Another approach to estimating marriage percentages is to study those retirees who were eligible for an automatic spousal survivor benefit but elected a life annuity:

	Male	Female	Total
Eligible for automatic J&S	307	132	439
Elected Life	26	21	47
Implied percent married	92%	84%	89%

This suggests the marriage assumption could be increased for the valuation and possibly could be different for males and females.

Summary of Recommendations:

- We recommend increasing the marriage assumption from 80% to 85%.

Future Service Accrual for Active Employees

Most active employees participating in a defined benefit or hybrid plan are full-time employees. In some circumstances, it is possible for an ongoing active member to earn less than a full year of service in a plan. Partial years of service without annualizing pay may result in calculations of final average compensation lower than that of a similarly situated individual earning full years of service.

The current valuation assumes that all active members will work a full year each year until retirement, termination, disability, or death. An assumption that overstates service accruals may – or may not – result in an overstated final average compensation estimate. On the other hand, late career conversions from part-time to full-time and/or service purchases may offset some of the impact of low service accruals in the final average compensation calculation.

In order to study the actual experience, we looked at service accruals for all active members who were active both at the beginning and end of a year during the experience study. During the experience study period, we observed ~140,000 instances of members active at the beginning and end of a year in the study period. For those actives, the average benefit service earned was 0.988 years and the average eligibility service earned was 0.988 years. For both types of service, the result is very close to 1 year earned each year.

We did not have sufficient data to study conversions from part-time to full-time and/or actual service purchases during the study period. Each of these may result in actual end of career service accruals (or impact on final average compensation) that is higher than what is observed during employment. In some instances, this may warrant assuming average service accrual slightly higher than what was observed.

Since the current assumption of 1 year of service accrual each year is close to but slightly higher than the average service accrual observed, we recommend no change to this assumption.

Summary of Recommendations:

- No change.

DROP

Certain plans may adopt a Deferred Retirement Option Plan (DROP).

If a participant is covered by the Benefit Program DROP and is eligible for retirement, they have the option to elect a specified DROP period in which they will cease to accrue any additional retirement benefits but remain employed by the participating municipality or court. The participant must elect a DROP period at least six months after the beginning date, but no more than sixty months after the beginning date, in one-month increments.

Upon the participant's election of DROP and the receipt of an application to enroll in DROP, MERS will calculate the participant's service retirement benefit at the time of entering the DROP. The Retirement System also shall calculate any age differential between the participant and the participant's beneficiary as of the calendar year of the DROP exit date in accordance with Treas. Reg. § 1.401(a)(9)-6. Upon the beginning date of the DROP period, the participant shall be responsible to continue employee contributions, if any.

On the next available benefit payment date after processing is complete, and monthly thereafter, an amount equal to the employer selected 1%-100% of the monthly service retirement benefit payment the participant would have received if he or she had retired as of the DROP beginning date will be credited to a notional account for the benefit of the participant. Funds in the DROP account are credited with the employer selected interest in the amount of 0% or 3% annually, prorated in the event of a DROP period that is less than twelve months. Additionally, if the division provides a COLA benefit, the employer may elect to commence COLA increase during the DROP period or to defer COLA increases until after DROP exit.

Upon the end date, the participant shall receive a lump-sum distribution of the participant's DROP account and on the first day of the calendar month following end date, the participant will begin receiving monthly service retirement benefit payments.

From an actuarial valuation perspective, a DROP is generally considered a plan provision that is difficult to value under ASOP No. 4. This is because of the additional complexity of the member's choice of variable DROP periods at multiple possible future dates. The funding calculation is also complicated by the fact that member contributions are made to the plan during the DROP period but employer normal cost contributions are not. Additional provisions apply for terminating prior to the DROP end date, death and disability during the DROP period.

Since the previous experience study, the MERS Plan Document expanded employer choice in designing a DROP benefit. In conjunction with the Plan Document change, our methods for modeling the DROP have changed. As such we, have reviewed the current DROP load for each division with the DROP provisions in effect December 31, 2019, or earlier. We determined the level of load necessary to model the DROP provision under current assumptions, as though the employer were putting the DROP benefits in place as of December 31, 2023.

As of December 31, 2023, 11 divisions have elected the DROP benefit, most have elected this provision within the most recent 1-2 valuation cycles. For recent elections, a separate DROP study was completed to determine the appropriate load. We recommend maintaining the recently determined loads until more experience emerges in the next experience study cycle.

For purposes of modeling a DROP, we currently develop a load to apply to the present value of benefits, actuarial accrued liability and normal cost. In any specific case, the actual impact on the present value of benefits, accrued liability and normal cost may vary, but ultimately the impact on the present value of benefits captures the whole cost. Therefore, the load we develop in this analysis is based on the change in present value of benefits. In cases where the estimated increase is zero or negative, no load will be applied in the valuation and consequently no cost increase will be reflected.

In addition to various DROP features affecting the cost, the actual cost impact of a DROP is highly dependent on the actual elections made by eligible employees. Generally, a DROP will reduce long-term cost of a plan if the eligible employees entering the DROP extend their period of employment beyond what it would have been had the DROP not been in place. Conversely, a DROP may incent employees to enter the DROP earlier than they may have otherwise retired and generate a cost (similar to the cost of an unreduced early retirement). In practice, it is difficult if not impossible to know for certain how much employee behavior is affected by the introduction of a DROP.

For purposes of this analysis, we have estimated the impact of the DROP assuming that each active member of the division enters the DROP for a period of up to three years and exits the DROP under the current retirement assumption used in the AAV. For each individual, this means the assumed rates of DROP exit are the assumed rates of retirement under the current plan provisions, and implicitly assumes an individual enters DROP up to three years earlier than retiring in a no DROP scenario. A different assumption would produce different results.

Analysis was prepared for Employer 7301, Division 20; Employer 5406, Division 01; and Employer 6314, Division 02. All three divisions are closed and will have decreasing active population counts.

Analysis of the 4 active members of Employer 7301, Division 20 results in a recommend increase in the DROP load from 6% to 11%.

Analysis of the 0 active members of Employer 5406, Division 01 results in a recommend removal of the DROP load, since no new member are expected to join the division.

Analysis of the 1 active members of Employer 6314, Division 02 supports maintaining the DROP load of 7%.

Since there is no explicit DROP entry assumption, there is no explicit adjustment for attribution to DROP under GASB. We recommend no change at this point.

New plans that implement a DROP will require a separate study to determine the appropriate load.

Summary of Recommendations:

- We recommend increasing the DROP load from 6% to 11% for divisions 7301-20.
- We recommend maintaining the load for division 6314-02 at 7%.
- We recommend removing the load for divisions 5406-01, since the division is closed and there are no remaining actives members.

DROP+

Certain plans have adopted a Deferred Retirement Option Plan (DROP) or a Delayed Retirement Option Partial Lump Sum (DROP+). DROP+ may not be adopted after June 30, 2013.

Any member who is eligible to retire with full, immediate retirement benefits has the option to:

(i) Retire immediately and receive a monthly benefit payable immediately; or
(ii) Delay their retirement date and continue to work.

If the member is covered by DROP+ and they retire at least 12 months after first becoming eligible for unreduced benefits, at actual retirement the member has the option to receive a partial lump sum and a reduced monthly benefit:

(i) The member can elect a lump sum equal to 12, 24, 36, 48, or 60 times their monthly accrued benefit (if they have delayed retirement at least that many months).
(ii) For each 12 months included in the lump sum, the member's lifetime benefit is reduced by the DROP+ percentage adopted by the employer. The employer can adopt any of the following DROP+ reduction percentages: 6%, 7%, 8%, 9% or 10%.

From an actuarial valuation perspective, a DROP+ may be considered a plan provision that is difficult to value under ASOP No. 4. The is because of the additional complexity of the member's choice of variable lump sums at multiple possible future dates.

For those covered by Benefit Program DROP+, we performed analysis for each plan to estimate the impact of various lump sum options at various retirement ages to determine an appropriate load. The load is currently applied to each active member present value of future benefits, actuarial accrued liability, and total normal cost.

As of December 31, 2023, there are two divisions with a DROP+: Employer 3501, Division 40 and Employer 6321, Division 02. These divisions have 1 active member and 6 active members respectively as of December 31, 2023. The groups are too small to be fully credible for the purposes of analyzing the actual DROP+ experience during the 5-year study. Instead, we study the forward-looking impact of the DROP+ under various scenarios for each division. The results of the analysis are as follows.

- **3501-40** – DROP+ (4%) has a current load of 22%. We estimated the impact of the DROP+ for the one individual in this plan by assuming they would retire between 1-5 years after first eligible and take a lump sum of 12-60 times their monthly pension. Our analysis considered 12-60 month lump sums up to a possible retirement age of 65. The resulting range of loads is 4% to 25%. Given the wide range of loads, we believe the current load of 22% is reasonable and recommend no change. Note that this is a single-member division, with a different member from the previous experience study. Should this member turnover before the next experience study, an updated load assumption may be necessary.

- **6321-02 –** DROP+ (4%) has a current load 16%. This division is closed to new hires and reduced in active population from 11 to 6 since that previous experience study. Our analysis reviewed the remaining active members and individually considered a 1-5 year DROP+ up to a possible retirement age of 65, like division 3501-40. The resulting range of loads is 3% to 25%. Given the wide range of loads, and reducing population size, we believe the current load of 16% is reasonable and recommend no change.

Summary of Recommendations:

- We recommend no change to the loads.

Annuity Withdrawal

An employer may adopt the Annuity Withdrawal Program (AWP). Under the AWP, a retiring member may elect to receive a refund of their accumulated member contributions with interest in a lump sum at retirement. The member's monthly pension would then be reduced by the actuarial equivalent of the lump sum payment. The employer has two options for the interest discount rate used to compute the actuarial equivalent reduction:

(i) The current investment return assumption used in the annual actuarial valuations (currently 6.93%); or
(ii) The most recent December 31 interest rate used for crediting interest on member contributions.

For those with T-Bill interest, the proposed 1-year T-Bill assumption discussed in Section IV of this report is 2.75%. The impact of this provision is dependent on the rate of interest and mortality assumption used to convert the annuity. We will not know for certain the administrative assumptions (in particular, mortality) adopted as a result of this experience study until well after this report is published. For purposes of this discussion and analysis, we have assumed a 50/50 unisex weighting of the proposed retiree mortality with improvement projected under MP-2021.

In the case when the interest for conversion is the valuation assumption of 6.93%, the conversion is generally considered actuarially equivalent, and no adjustment is made in the valuation. Technically, there is a potential for anti-selection which means that an individual may elect this program with additional knowledge that could skew the actual experience. For example, if the administrative assumption uses the valuation mortality (with a unisex blend), that implies that each member electing this program will live an average lifetime. When many individuals elect this program and they have average experience, the cost is equally borne through the actuarial equivalent adjustment. However, an individual may have reason to believe that he or she may not live as long as the average member. In this case, if the member elects this program, he or she would receive a refund up front and a smaller benefit over a shorter lifetime – thus increasing the average cost of this benefit. As we have no reasonable method to analyze actual experience, we have made no adjustment for anti-selection.

In the case when the interest conversion is the T-Bill rate, the annuity withdrawal is effectively a subsidized benefit in the current low-interest environment. This is because the reduction received is based on a present value of the member account balance at the lower T-Bill rate. Therefore, the asset paid out has a higher value than the valuation liability released. The magnitude of this subsidy varies depending on the timing of an individual's retirement and the size of their accumulated member contributions relative to the accrued benefit. The current assumption includes a load on active liabilities for divisions with this provision. We performed analysis on a sample of affected individuals and observed potential increases vary by individual. Many of the divisions with this provision are closed and not accepting new hires. Additionally, as the Dedicated Gains policy systematically lowers the assumed rate of investment return closer to the T-Bill interest rate, the amount of subsidy reduces.

Summary of Recommendations:

- We have reviewed this load with revised assumptions and recommend no change to the assumption for divisions with T-Bill interest conversion at (i.e. the load remains 6%).

Death during Deferral

A retirement allowance shall be paid for life to the surviving spouse of a deceased vested former member if each of the following conditions is met:

(i) The vested former member was married to the surviving spouse at the time of death;
(ii) The vested former member had not named another individual as monthly pension beneficiary in the manner set forth in Section 35 at the time of death; and
(iii) The vested former member was not receiving any form of benefits from the System at the time of death.

A load is used to model this benefit as surviving spouse data is not generally provided in the inactive data. Vested former employee liabilities are currently increased by 2% to reflect the value of the potential survivor benefit payable in case of death during the benefit deferral period. This assumption may be impacted by the change in the assumed rate of return and mortality assumptions. We have reviewed this assumption using the proposed mortality assumption and 6.93% assumed rate of return and recommend no change. This load also applies to the vesting decrement of an active employee.

Summary of Recommendations:

- We recommend no change to this assumption.

Promotion Assumptions between Divisions

In some circumstances, active participants may transfer between divisions with different benefit formulas prior to retirement. For example, a promotion from police patrol to police command often results in a change in benefit formula. To the extent that past service benefits increase upon transfer and have not been funded, there will be an actuarial loss in the valuation.

In our review, we noted that the number of transfers between divisions, carve-ins, carve-outs, and other changes throughout the experience study period significantly complicated the analysis. In addition, divisions affected by promotion between divisions may fall under a variety of funding arrangements, funding each division individually, including funding under a blended rate, and/or being subject to an employer contribution cap arrangement. Thus, it becomes difficult to propose a one-size fits all approach for a promotion assumption.

For these reasons, and the flexibility through adoption of an Administrative Service Agreement, which employers have to freeze/limit the benefit change upon transfer, we recommend not adopting any assumptions for valuation purposes at this time.

Summary of Recommendations:

- We recommend no change to this assumption.

Data Adjustments

There are certain data adjustments in the December 31, 2023, valuations. The adjustments vary from year to year based on the quality of the data received for the valuation. In general, data adjustments do not need to be formally adopted by the Board during the experience study as the actuary will need to make minor modifications in any given year.

Certain adjustments recur every year, some of which are described and reviewed below:

- The gender was not reported for a small number of active members. These active members are currently assumed to be female. We recommend continuing this assumption, as it is slightly more conservative than assuming a male.

- Active members with frozen benefits use pay as provided on the record without adjustment. We recommend the removal of this assumption, as it is no longer needed with the method change for valuing frozen plans.

- Active members with frozen benefits use a frozen benefit as provided. In cases where a frozen benefit is not provided, one is estimated using service, multiplier, and FAC information on the record. In conjunction with the method change for frozen plans, we recommend removing the word "Active."

- Valuation data reports actual FAC as of the valuation date for each active record. Actual FAC, without adjustment, is used as the minimum FAC in the development of the present value of future benefits. When not reported, historical compensation is used in the development of the FAC. We recommend no change to this assumption.

- Certain retirees were reported without a beneficiary date of birth. The current assumption is that in the event this data was necessary to value a retired liability, a 3-year age difference was assumed. We recommend no change to this assumption.

- Retired records reported with a recipient type of MEMB, optional form involving a joint and survivor, and beneficiary count of 0, were assumed to have the surviving beneficiary predecease the retiree. These records were valued as straight life. We recommend no change to this assumption.

Additional assumptions for missing or incomplete data may be needed from time to time with each annual actuarial valuation. Therefore, the data adjustments in this section are not intended to be an exhaustive list.

Summary of Recommendations:

- We recommend changes as described above.

IV. Economic Assumptions

Overview

The relevant Actuarial Standard of Practice (ASOP) for economic assumptions is ASOP No. 27, Selection of Economic Assumptions for Measuring Pension Obligations. Under ASOP No. 27, Section 3.6, an economic assumption is reasonable if it has the following characteristics:

- It is appropriate for the purpose of the measurement;
- It reflects the actuary's professional judgment;
- It takes into account current and historical data that is relevant to selecting the assumption for the measurement date, to the extent such relevant data is reasonably available;
- It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data (if any), or a combination thereof; and
- It is expected to have no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included (as discussed in Section 3.5.1) or when alternative assumptions are used for the assessment of risk, in accordance with ASOP No. 51, *Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions*.

For purposes of budgeting contributions and measuring liabilities for public employee retirement systems, the assumed rate of investment return is used as the discount rate to determine the present value of a system's pension obligations. For most valuations, an actuarial investment return assumption based on expected future experience is a single estimate for all years and, therefore, implicitly assumes that returns above and below expectations will average out over time. In other words, the expected risk premium is reflected in the assumed rate of investment return in advance of being earned, while the investment risk (i.e., volatility) is not reflected until actual experience emerges with each valuation.

The analysis of the investment return assumption in this report is based on forward-looking measures of expected investment return outcomes for the asset classes in the System's current investment policy. For purposes of this analysis, we have analyzed the System's investment policy with the capital market assumptions from twelve nationally recognized investment firms.

Price Inflation

Price Inflation is the first building block for other economic assumptions. The assumed rate of inflation, as other economic assumptions, must be a forward-looking expectation of future experience. We survey multiple sources for future price inflation expectations over the next 30 years. A summary of this information is shown in the following table.

Forward-Looking Price Inflation Forecasts[a]	
Congressional Budget Office[b]	
5-Year Annual Average	2.44%
10-Year Annual Average	2.32%
Federal Reserve Bank of Philadelphia[c]	
5-Year Annual Average	2.40%
10-Year Annual Average	2.30%
Federal Reserve Bank of Cleveland[d]	
10-Year Expectation	2.12%
20-Year Expectation	2.23%
30-Year Expectation	2.32%
Federal Reserve Bank of St. Louis[e]	
10-Year Breakeven Inflation	2.11%
20-Year Breakeven Inflation	2.30%
30-Year Breakeven Inflation	2.11%
U.S. Department of the Treasury[f]	
10-Year Breakeven Inflation	2.03%
20-Year Breakeven Inflation	2.32%
30-Year Breakeven Inflation	2.21%
50-Year Breakeven Inflation	2.32%
100-Year Breakeven Inflation	2.40%
Social Security Trustees[g]	
Ultimate Intermediate Assumption	2.40%

[a] End of the Third Quarter, 2024. Version 2024-10-14 by Gabriel, Roeder, Smith & Company
[b] *An Update to the Budget and Economic Outlook: 2024 to 2034, Release Date: June 2024, Consumer Price Index (CPI-U), Percentage Change from Year to Year, 5-Year Annual Average (2024 - 2028), 10-Year Annual Average (2024 - 2033).*
[c] *Third Quarter 2024 Survey of Professional Forecasters, Release Date: August 9, 2024, Headline CPI, Annualized Percentage Points, 5-Year Annual Average (2024 - 2028), 10-Year Annual Average (2024 - 2033).*
[d] Inflation Expectations, Model output date: September 1, 2024.
[e] The breakeven inflation rate represents a measure of expected inflation derived from X-Year Treasury Constant Maturity Securities and X-Year Treasury Inflation-Indexed Constant Maturity Securities. Observation date: September 2024.
[f] *The Treasury Breakeven Inflation (TBI) Curve, Monthly Average Rates, September 2024.*
[g] *The 2024 Annual Report of The Board of Trustees of The Federal Old-Age And Survivors Insurance and Federal Disability Insurance Trust Funds, May 6, 2024, p. 10, Key Assumptions and Summary Measures for Long-Range (75-year) Projections, Intermediate, Consumer Price Index (CPI-W).*

While recent inflation experience is higher than expected, price inflation is based on a long-term forward-looking assumption. The current price inflation assumption is 2.50% and is consistent with averages across the country, 2.0% to 2.5%. It is reasonable to maintain the present price inflation assumption, and continue to monitor the assumption.

Wage Inflation

Macroeconomic theory suggests that wage inflation will generally exceed price due to productivity increases. Historically, wage inflation assumptions have traditionally exceeded price inflation assumptions by 50-100 basis point per year, however in recent years that spread has narrowed considerably. In general, it would be reasonable to expect wage increases to exceed price inflation increases by 25-75 basis points per year in the future.

Payroll growth for an active workforce with a constant headcount and stable demographics will generally be equal to wage inflation. Between 2018 and 2023, MERS experienced wage inflation between 2.0% and 4.0% on a 5-year average and 1.7% to 3.0% on a 10-year average. The current assumption of 3.00% is in line with both the 5- and 10-year averages.

U.S. History

Year	Annual Increase in Prices (CPI-U)	Wages (NAE)	Difference
1964-1973	4.1%	5.6%	1.5%
1974-1983	8.2%	7.2%	-1.0%
1984-1993	3.7%	4.3%	0.6%
1994-2003	2.4%	3.9%	1.5%
2004-2013	2.4%	2.8%	0.4%
2014-2023	2.8%	4.0%	1.2%
3-Year Avg	5.6%	5.9%	0.3%
5-Year Avg	4.1%	4.9%	0.8%
10-Year Avg	2.8%	4.0%	1.2%
20-Year Avg	2.6%	3.4%	0.8%
30-Year Avg	2.5%	3.6%	1.1%
50-Year Avg	3.9%	4.4%	0.5%

MERS History

Year	Average Wage Inflation 1-Year	5-Year	10-Year
2013	1.0%	1.5%	2.7%
2014	1.9%	1.4%	2.4%
2015	2.5%	1.5%	2.3%
2016	0.8%	1.4%	2.0%
2017	2.0%	1.6%	1.8%
2018	2.7%	2.0%	1.7%
2019	2.6%	2.1%	1.8%
2020	4.4%	2.5%	2.0%
2021	3.2%	3.0%	2.2%
2022	5.1%	3.6%	2.6%
2023	4.6%	4.0%	3.0%

CPI-U: Consumer Price Index for All Urban Consumers
NAE: National Average Earnings

The current wage inflation assumption is 3.00%, corresponding to a spread of 0.50% over price inflation. We recommend maintaining the wage inflation assumption.

Assumed Rate of Investment Return

For purposes of budgeting contributions as a level percentage of payroll, the assumed rate of investment return is used as the discount rate to determine the present value of the System's pension obligations. It is important to note that an actuarial investment return assumption based on expected future experience is a single estimate for all years and therefore implicitly assumes that returns above and below expectations will "average out" over time. In other words, the expected risk premium is reflected in the assumed rate of investment return in advance of being earned, while the investment risk is not reflected until actual experience emerges with each valuation.

The assumed rate of investment return generally depends on factors such as plan's investment policy, asset allocation and capital market expectations.

Because GRS is a benefits consulting firm and does not develop or maintain its own capital market expectations, we request and monitor forward-looking expectations developed by several major investment firms. Our analysis is based on the GRS 2024 Capital Market Assumption Modeler (CMAM[1]). The purpose of the CMAM is to assess the reasonability of the assumed rate of return for use in the actuarial valuations for the plan. In our professional judgment, the CMAM has the capability to provide results that are consistent with this purpose. A description of the strengths, limitations and weaknesses of the model are incorporated in this report. In our opinion, the limitations and weaknesses are not material. We performed tests to ensure that the model reasonably represents that which is intended to be modeled. We are relying on the GRS actuaries and Internal Software, Training, and Processes Team who developed and maintain the model.

We update our CMAM on an annual basis. The capital market assumptions in the 2024 CMAM are from the following investment firms (in alphabetical order): Aon, Blackrock, BNY Mellon, Callan, Cambridge, JPMorgan, Meketa, Mercer, NEPC, Northern Trust, RVK, Verus, and Wilshire. We believe that the benefit of performing this analysis using multiple investment firms is to recognize the uncertain nature of the items affecting the selection of the investment return assumption. While there may be differences in asset classes, investment horizons, inflation assumptions, treatment of investment expenses, excess manager performance (i.e., alpha), etc. we have attempted to align the various assumption sets from the different investment firms to be as consistent as possible. In some cases, we have made minor adjustments or assumptions to align the various assumptions sets with our model.

Each investment firm provided capital market assumptions over an investment horizon of approximately 10 years. Although investment firms often refer to this period as "short-term," it is important to remember that 10 years is actually a very long time. In fact, the duration of the liabilities of the MERS plan is ~12 years. Therefore, returns during the next ten years will affect the plan's funding materially. A subset of six investment firms provided capital market expectations over a longer horizon, varying between 20 and 30 years. For purposes of this report, the analysis is generally based on the 10-year expectations provided by the investment firms.

In general, our understanding is that the methodology for developing these capital market expectations is forward-looking, not purely backward-looking. Over the years, we have observed a general decreasing trend in capital market expectations. However, we have also observed that some of the investment firms' assumption sets are dependent on the market conditions at the time they are developed and consequently may be sensitive to short-term market fluctuations. Some expectations are contrarian – meaning that when the market is high, future expectations are lowered and when the market is low, future expectations are raised.

[1] *Issued 2024-04-15.*

The amount of these fluctuations as they appear in the year-to-year capital market assumptions varies between the various investment firms.

Each year, the GRS CMAM reflects the most up-to-date information at the time the data was collected (typically reflecting the firms' expectations at the beginning of the calendar year). Compared to the 2023 survey, the 2024 survey generally shows slightly lower return expectations for domestic public equity. This is perhaps due in part to the favorable U.S. stock market performance for the 2023 calendar year.

To the best of our ability, we have adapted the System's investment policy to fit with the investment firms' assumptions adjusting for these known differences in assumptions and methodology. The asset classes in the system's investment allocation often do not exactly align with the asset classes of all investment firms in the survey. This may require us to make approximations which can introduce some subjectivity into the process. In the following charts, to the extent possible all returns are net of passive investment expenses [and administrative expenses] and have no assumption for excess manager performance (alpha) in excess of active management fees.

For purposes of this analysis, we have reviewed the following investment allocation based on the Board's Investment Policy:

Asset Class	Target Weight
Global Equity	**60%**
US Equity	30%
Europe Equity	9%
Pacific Equity	12%
EM Equity	9%
Global Fixed Income	**20%**
Us Treasury	10%
US High Yield	4%
EM Debt	4%
Cash	2%
Private Investments	**20%**
Real Assets	10%
Private Equity	5%
Diversifying Strategies	5%
Total Portfolio	**100%**

The assumed rate of return is computed net of expenses for funding purposes and net of investment expenses for GASB No. 68 employer reporting purposes. For this reason, before we study the expected return, we review the recent history of plan expenses. We received the following information from MERS on administrative expenses.

Year Ended	Assets	Admin Expenses	Invest Expenses	Adm & Inv Exp	Admin Basis Points	Invest Basis Points	Total Basis Points	20-Year Average Admin Basis Points	20-Year Average Invest Basis Points	20-Year Average Total Basis Points
December 31, 2004	4,619,495,661	9,957,057	12,061,649	22,018,706	21.55	26.11	47.66	13.13	21.34	34.47
December 31, 2005	4,907,441,995	11,557,044	16,500,475	28,057,519	23.55	33.62	57.17	13.84	22.11	35.95
December 31, 2006	5,590,042,692	12,540,010	17,032,361	29,572,371	22.43	30.47	52.90	14.48	23.01	37.49
December 31, 2007	6,066,336,985	13,903,553	21,268,479	35,172,032	22.92	35.06	57.98	15.21	23.63	38.84
December 31, 2008	4,512,260,955	16,364,800	17,725,760	34,090,560	36.27	39.28	75.55	16.63	24.65	41.29
December 31, 2009	5,276,645,338	18,792,644	18,020,598	36,813,242	35.61	34.15	69.77	17.94	25.45	43.39
December 31, 2010	5,973,038,840	20,951,372	20,093,406	41,044,778	35.08	33.64	68.72	19.13	26.21	45.34
December 31, 2011	5,937,904,259	22,069,613	19,164,458	41,234,071	37.17	32.27	69.44	20.39	26.82	47.21
December 31, 2012	6,872,454,000	24,412,000	16,702,000	41,114,000	35.52	24.30	59.82	21.61	27.11	48.72
December 31, 2013	7,676,016,000	20,271,000	18,930,000	39,201,000	26.41	24.66	51.07	22.40	27.33	49.72
December 31, 2014	8,077,998,000	17,804,000	16,229,000	34,033,000	22.04	20.09	42.13	22.98	27.38	50.35
December 31, 2015	7,886,586,000	17,665,000	19,399,000	37,064,000	22.40	24.60	47.00	23.59	27.54	51.12
December 31, 2016	8,473,498,000	17,446,000	15,253,000	32,699,000	20.59	18.00	38.59	24.11	27.05	51.16
December 31, 2017	9,476,123,000	17,689,000	12,702,000	30,391,000	18.67	13.40	32.07	24.12	26.17	50.29
December 31, 2018	8,967,305,000	18,263,000	12,648,000	30,911,000	20.37	14.10	34.47	24.42	25.80	50.23
December 31, 2019	9,915,328,000	20,783,000	11,397,000	32,180,000	20.96	11.49	32.45	24.78	25.49	50.26
December 31, 2020	11,136,850,000	19,929,000	8,533,000	28,462,000	17.89	7.66	25.56	24.81	24.83	49.65
December 31, 2021	12,580,836,000	17,801,000	9,386,000	27,187,000	14.15	7.46	21.61	24.73	24.07	48.80
December 31, 2022	10,979,692,000	21,343,290	10,504,089	31,847,379	19.44	9.57	29.01	24.64	23.19	47.83
December 31, 2023	12,398,664,000	25,339,000	10,034,000	35,373,000	20.45	8.10	28.55	24.67	22.40	47.08

The average administrative expense over the last 20 years was 25 basis points. If administrative expenses are not reimbursed by the employers through contributions, they must be netted out of the assumed rate of return. The current assumption is 0.25% for administrative expenses when adjusting the assumption between funding and GASB. We recommend leaving this assumption unchanged. For purposes of the analysis of return expectations, we use 0.25% in the analysis below.

We continue with our analysis of the assumed rate of return.

The arithmetic expected return developed from this asset allocation is shown in the table below. The CMAM begins with the nominal expected return from each Capital Market Assumption (CMA) set (column 2), takes out each CMA's price inflation assumption (column 3) to arrive at the real return (column 4). We then incorporate the current price inflation assumption of 2.50% (column 5) to get the adjusted nominal return (column 6). Investment expenses not already netted out of the return and/or administrative expenses paid out of trust assets which are not reflected in the employer contributions (column 7) are netted out of the return. The final arithmetic expected return is shown in column 8. We believe that this is reasonable provided that the current price inflation assumption does not differ materially from the assumptions used by the investment firms. Note that the arithmetic return is in general higher than the median return due to the compounding effect of random returns. In general, the difference between the arithmetic and median return will be larger for larger standard deviation of returns. We have shown the standard deviation of returns as the investment risk in column 9. The average arithmetic return and standard deviation from the last three years of CMAMs are shown at the bottom of the table for reference.

ASOP No. 27, Section 3.6.2, states that "[d]ue to the uncertain nature of the items for which assumptions are selected, the actuary may consider several different assumptions reasonable for a given measurement. Different actuaries will apply different professional judgment and may choose different reasonable assumptions. As a result, a range of reasonable assumptions may develop, both for an individual actuary and across actuarial practice." This range of different expectations from the CMAs is evident from the summaries we show from our CMAM.

GRS 2024 CMAM								
Capital Market Assumption Set (CMA)	CMA Expected Nominal Return	CMA Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Plan Incurred Administrative Expenses	Expected Nominal Return Net of Expenses (6)-(7)	Standard Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	6.67%	2.60%	4.07%	2.50%	6.57%	0.25%	6.32%	13.89%
2	7.01%	2.25%	4.76%	2.50%	7.26%	0.25%	7.01%	13.52%
3	7.78%	2.70%	5.08%	2.50%	7.58%	0.25%	7.33%	13.91%
4	7.56%	2.40%	5.16%	2.50%	7.66%	0.25%	7.41%	13.18%
5	7.50%	2.20%	5.30%	2.50%	7.80%	0.25%	7.55%	13.08%
6	7.68%	2.21%	5.47%	2.50%	7.97%	0.25%	7.72%	14.22%
7	7.62%	2.21%	5.41%	2.50%	7.91%	0.25%	7.66%	13.21%
8	7.99%	2.44%	5.55%	2.50%	8.05%	0.25%	7.80%	13.53%
9	8.20%	2.51%	5.68%	2.50%	8.18%	0.25%	7.93%	14.08%
10	8.13%	2.50%	5.63%	2.50%	8.13%	0.25%	7.88%	13.60%
11	8.08%	2.13%	5.95%	2.50%	8.45%	0.25%	8.20%	13.20%
12	8.53%	2.51%	6.02%	2.50%	8.52%	0.25%	8.27%	12.57%
Average	**7.73%**	**2.39%**	**5.34%**	**2.50%**	**7.84%**	**0.25%**	**7.59%**	**13.50%**
					Average from last 3 CMAMs		**7.26%**	**13.51%**

The average expected nominal return from column 8 is 7.59%. This is the average arithmetic rate of return. Note that the arithmetic rate of return represents the average future expected return which is higher than the median future expected. Accumulating assets and cash flows at the average arithmetic rate of return is expected to produce the average asset amount over time. However, in any given year it is less than 50% likely that the arithmetic average rate of return will be achieved. Moreover, over a period of longer than one year, the realized rate of return is generally computed as a geometric average. Additional analysis is required to adjust to the median (or geometric average) return.

Next, we compare the probabilities of achieving returns over a 10-year horizon. We compute the 40th, 50th, and 60th percentiles of returns as well as the probability of achieving the current assumption of 6.93% over a 10-year horizon. These estimates assume that the distribution of returns for the next 10 years is the same each year. The average median return from the last three years of CMAMs is shown at the bottom of the table for reference.

GRS 2024 CMAM				
Capital Market Assumption Set (CMA)	Distribution of 10-Year Average Geometric Net Nominal Return			Probability of exceeding
	40th	50th	60th	6.93%
(1)	(2)	(3)	(4)	(5)
1	4.33%	5.42%	6.53%	36.49%
2	5.10%	6.17%	7.24%	42.85%
3	5.35%	6.44%	7.55%	45.55%
4	5.57%	6.61%	7.65%	46.86%
5	5.74%	6.77%	7.81%	48.41%
6	5.67%	6.79%	7.92%	48.74%
7	5.81%	6.85%	7.91%	49.28%
8	5.90%	6.96%	8.04%	50.32%
9	5.92%	7.03%	8.15%	50.88%
10	5.96%	7.04%	8.12%	50.99%
11	6.36%	7.40%	8.45%	54.56%
12	6.56%	7.55%	8.55%	56.26%
Average	**5.69%**	**6.75%**	**7.83%**	**48.43%**
Average from last 3 CMAMs over 10-year horizon		**6.42%**		

Summary of Results

Effective in 2021, MERS implemented a Dedicated Gains Policy to systematically and automatically lower the assumed rate of investment return in years of excess market returns. The Dedicated Gains Policy is the primary mechanism for adjusting the assumed rate of investment return. Our analysis generally indicates forward-looking expectations equal to or lower than currently assumed for price inflation, wage inflation, and the assumed rate of return. The analysis provides a range of outcomes for each assumption. We focus on the 3-year average to aid further in smoothing the expectations. The current 3-year average expectations of 6.42% to 7.26% are heavily impacted by 2022 experience, the lowest expectations ever. Conversely, 2023 experience saw the largest one-time swing in expectations, ~150 basis point increase. This experience in conjunction with the Dedicated Gains Policy supports the continued use of a preferred range of 6.50% to 7.40%.

Preferred Range of Expectations	Price Inflation	Wage Inflation	Assumed Rate of Investment Return	Current Assumed Rate of Investment Return^
Low End of Range	2.00%	2.75%	6.40%	6.50%
Mid Point	2.25%	3.00%	6.85%	6.95%
High End of Range	2.50%	3.25%	7.30%	7.40%
Current Assumption	2.50%	3.00%	6.93%	N/A

^Based on 3-Year average ending 2021.

Note that the range for the assumed rate of return is between the median and the arithmetic return (rounded) from the analysis based on a price inflation assumption of 2.50%. A price inflation assumption other than 2.50% would result in a different range.

Additional Analysis

There are certain additional economic assumptions used which warrant a review during this analysis. Our recommendations for additional economic assumption changes are as follows:

Interest on Member Contributions

Interest on member contributions is based on the T-Bill rate. The current assumption is 2.75% and is between the wage and price inflation assumption. We recommend maintaining the method of assuming the interest credit on member contribution assumption falls between the price and wage inflation assumptions. With no recommended change to the price or wage inflation assumptions in this analysis, we recommend continuing the 2.75% interest crediting assumption.

Maximum Deferral and Compensation Limit Increases

The Internal Revenue Code Section 415(b) and 401(a)(17) limits are increased each year under federal statute. The amount of future increase depends on actual price inflation. The current assumption is that the limits will increase with price inflation. We recommend maintaining the use of the price inflation assumption, of 2.50%. This change is consistent with the statutory methodology for updating limits.

CPI-Based COLAs

A few select divisions have benefit COLAs that are indexed to the Consumer Price Index (CPI) limited to 3% or 4%. The proposed CPI assumption is 2.5% per year. It is possible that even if the average CPI is 2.5% over a number of years that the limited CPI may differ. We have estimated the potential difference with a stochastic, lognormal model of projected CPI over 10 years with expected CPI of 2.5% and standard deviation of 1%. Based on this analysis, the limited CPI on average would be 2.49% if capped at 3% and 2.50% if capped at 4%.

The current assumption is to assume the annual COLAs of this type will be 2.5% per year. We believe this assumption is reasonable and recommend making no change.

V. Actuarial Methods

Actuarial Cost Method

The pertinent ASOP for actuarial cost methods and amortization methods is ASOP No. 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions. The pertinent ASOP for the asset valuation method is ASOP No. 44, Selection and Use of Asset Valuation Methods for Pension Valuations. For purposes of this experience study, we review the methods within the context of the current ASOPs.

The preliminary actuarial calculation for each member in the valuation is to compute the present value of future benefits based on the plan provisions and adopted actuarial assumptions. An actuarial cost method is a process for spreading the present value of benefits over time based on the funding objectives of the Board. An actuarial cost method generally determines a normal cost – the portion of the present value of future benefits allocated to the current year – and may also determine an actuarial accrued liability - the portion of the present value of future benefits allocated to past service. All three calculations, the present value of future benefits, the normal cost, and the actuarial accrued liability, are critical components of the funding valuation.

Section II, 1 of the MERS Actuary Policy as of June 13, 2024, identifies MERS' funding policy goals of adequacy, equity, contribution stability, transparency and governance. The actuarial implementation of these goals is to select an actuarial cost method that achieves the following major objectives:

- Develop level required contribution rates as a percentage of payroll (for divisions that are open to
- new hires);
- Finance benefits earned by present employees on a current basis;
- Accumulate assets to enhance members' benefit security;
- Produce investment earnings on accumulated assets to help meet future benefit costs;
- Make it possible to estimate the long-term actuarial cost of proposed amendments to System
- provisions; and
- Assist in maintaining the Retirement System's long-term financial viability.

The basic funding objective is a level pattern of cost as a percentage of pay throughout each member's working lifetime.

The funding method used in this actuarial valuation – the entry age normal cost method – was first used for the December 31, 1993, actuarial valuations and is intended to:

(i) Meet this funding objective; and
(ii) Result in a relatively level long-term contribution requirement as a percentage of pay.

Under the entry age normal cost method, the total actuarially determined contribution requirement is equal to the sum of the normal cost plus the payment required to fund the unfunded actuarial accrued liability over a period of years. Funding or amortizing the unfunded actuarial accrued liability includes a payment toward the liability (principal) plus a payment to reflect the time value of money (interest).

Normal Cost

In general terms, the normal cost is the cost of benefit rights accruing on the basis of current service. Technically, the normal cost rate is the level percentage-of-pay contribution required each year, with respect to each member, to accumulate over their projected working lifetime the reserves needed to meet the cost of earned benefits. The normal cost represents the ultimate cost of the Retirement System, if the unfunded liability is paid up and the actual experience of the System conforms to the assumptions.

For purposes of Plan funding and State reporting, the normal cost for each member is calculated based on the prospective benefit formula for that member (referred to as the replacement life method). For accounting purposes, the normal cost for each member is calculated as the level contribution over the member's entire career which is anticipated to accumulate to the value of benefits at the end of the career.

Actuarial Accrued Liability

The total actuarial present value of future benefits is computed using the valuation's actuarial assumptions.

Subtracting the present value of future normal costs results in the actuarial accrued liability.
The total actuarial accrued liability essentially represents the amount that would have been accumulated as of a given valuation date, if:

(i) Contributions sufficient to meet the normal costs of the Retirement System had been made each year in the past;
(ii) Benefit provisions had always been the same as current benefit provisions; and
(iii) Actual past experience had always conformed to current actuarial assumptions.

If assets equaled the total accrued liability, there would be no unfunded liability and future contribution requirements would consist solely of the calculated normal cost rates.

In our opinion, the entry age normal actuarial cost method is appropriate for the purpose of the funding valuations.

Treatment of Ad Hoc COLAs

In reviewing the actuarial cost method, we reviewed the treatment of ad hoc COLAs. An ad hoc COLA is one that is not fixed in the plan provisions, but periodically adopted by an employer. Currently, substantively automatic COLAs are valued in the GASB liabilities but not the funding liabilities. Changing this method would potentially have implications on how benefit COLAs are currently funded.

Currently, these types of COLAs are generally funded with an employer contribution equal to the change in actuarial accrued liability determined by a supplemental valuation each year they are adopted. To the extent these ad hoc COLAs recur regularly, an argument can be made that the employer should pre-fund future COLAs as if they will continue to occur with the same regularity. This could be modeled in the valuation by assuming a permanent COLA in proportion to the frequency of the regularly adopted COLAs. As a result, the actuarial accrued liability and normal cost would increase. The change in actuarial accrued liability would be amortized over a number of years as a method change. Consequently, the funded ratio would decrease and employer contributions would increase.

This would be a fundamental change in funding ad hoc COLAs. To a certain extent, it would make permanent a process that is currently ad hoc. We recommend exploring the implications of such a change before considering changing the actuarial method. Currently, we expect this would affect only a handful of divisions.

Plan Administrative Expenses

Another consideration is the treatment of plan expenses. For purposes of funding, all plan expenses are assumed to be paid by the system's investment return. In other words, the assumed rate of return is computed net of all expenses. There is a different treatment for the GASB Statement No. 68 accounting disclosures in that the GASB requires the assumed rate of return to be net of investment expenses only. Administrative expenses must be accounted for separately. In our review of the economic assumptions, we determined that the current estimate of administrative expenses of 0.25% of assets continues to be reasonable. The assumed rate of return for funding purposes effective with the December 31, 2023, annual actuarial valuations is 6.93%, net of all expenses. The assumed rate of return for GASB No. 68 accounting purposes effective with the December 31, 2023, annual actuarial valuations is 7.18%, net of investment expenses.

It is important to note that the actuarial cost method for funding purposes could be adjusted to track administrative assumptions separately. In other words, we could use an assumed rate of return net of investment expenses only, provided that the actuarial cost method properly reflected the administrative expenses in the employer contributions.

The most common approach in this case is to include a provision for administrative expenses in the normal cost. The normal cost is determined as a level percent of payroll. Anticipated administrative expenses could also be estimated as a percent of total payroll and applied to all normal cost calculations. For example, the current administrative expenses are estimated to be 0.25% of assets per year. As of December 31, 2023, the market value of assets was $12.4 billion for implied administrative expenses of $31.0 million (0.25% x $12.4 billion). The total payroll for active participants as of December 31, 2023, was $1.96 billion resulting in an administrative expense load for the normal cost of 1.58% of payroll ($31.0 million / $1.96 billion).

This approach has the advantage of funding administrative expenses directly through employer contributions and is not uncommon for single employer defined benefit pension plan funding. The disadvantage of this approach is that some divisions have no active members and no associated payroll. Under this approach, those divisions would not bear any of the cost of administrative expenses. For this reason, this approach is less common for agent multiple employer plans such as MERS.

A second approach is to reflect administrative expenses as a percentage of pension obligation and determine an associated employer contribution. The total actuarial accrued liability as of December 31, 2023, was $18.03 billion. The associated administrative expenses are 0.17% of actuarial accrued liability. This could be added to the annual employer contribution for all divisions with an adjustment to the appropriate fiscal start by employer. Again, this approach has the advantage of funding administrative expenses directly through employer contributions. However, it is very uncommon in practice.

A disadvantage of this approach for MERS is that some divisions are very well funded and currently have no employer contribution requirement under the MERS Actuarial Policy. This approach would charge those employers a contribution for administrative expenses in this case.

For these reasons, we do not recommend either of these changes at this time.

Recent Changes to ASOP No. 4

There has been an update to ASOP 4 since the issuance of the previous experience study. Updates impacting MERS include additional disclosures of the annual gain or loss on actuarial accrued liability and the actuarial value of assets and the disclosure of a market value based liability, the LDROM or Low Default Risk Obligation Measure. These additional disclosures have been incorporated into the summary report issued for MERS in total each year.

In addition, another change to ASOP No. 4 includes a requirement for the actuary to opine on the reasonableness of the actuarially determined contribution (ADC). One requirement is that the ADC must not allow perpetual negative amortization. Negative amortization can exist under the contribution policy if the unfunded actuarial accrued liability is expected to increase when all contributions are made and all assumptions are met. Perpetual negative amortization results in an ever-increasing unfunded actuarial accrued liability. Under present economic assumptions, with the 6.93% (interest rate)/3.00% (wage growth) and a 15-year amortization period, there is no expected negative amortization. It is possible that some divisions with a longer amortization period (24 years or longer) will have negative amortization for a few years, but not in perpetuity. Therefore, while we monitor the valuation results, we do not expect this change in the ASOP to impact MERS.

Funding Policy Changes

The MERS Actuarial Policy includes additional information about the amortization periods. Generally, a review of amortization policy may be considered as part of an experience study review under ASOP No. 4 with the actuarial cost method and asset smoothing method. GRS and MERS staff have reviewed the present Actuarial Policy and offer several minor recommendations of adjustments to the policy. These will be presented to the Board in a separate communication. Discussions in one area, related to potential tail volatility of the employer contribution, as layers are recognized – continue with GRS and MERS staff. If recommendations arise, they will be brought to the Board at a later date.

Asset Valuation Method and Dedicated Gains Policy

The pertinent ASOP for the asset valuation method is ASOP No. 44. The asset valuation method determines the actuarial value of assets on each valuation date.

The actuarial value of assets is determined on the basis of a method that calculates expected investment income at the valuation rate of return and adds a portion of the difference between the expected investment income and actual investment income earned on a market value basis. The difference in investment income between expected return and market return is recognized over a 5-year period at the rate of 20% per year. Effective February 17, 2022, and first implemented with the December 31, 2021, annual valuation, a dedicated gains policy is used to systematically lower the assumed rate of return. This Dedicated Gains policy applies to any market gains remaining after the preliminary application of the Asset Method. The asset valuation method and Dedicated Gains Policy are applied as follows:

Actuarial Value of Assets (AVA) equals:

(i) Actuarial value of assets from the previous actuarial valuation; plus
(ii) Aggregate employer and member contributions since the last valuation; minus
(iii) Benefit payments and refunds of member contributions since the last valuation; plus
(iv) Estimated investment income at the 7.00% valuation interest rate (for December 31, 2022, and December 31, 2023), changing to 6.93% (prospectively); plus
(v) A portion of gain (loss) recognized in the current valuation; plus
(vi) Application of the Dedicated Gains policy.

For the above purpose, gain/(loss) is defined as the excess during the period of the investment return on the market value of assets over the expected investment income. The portion recognized in the valuation is 20% of the current year's gain/(loss) plus 20% of the gain/(loss) from each of the 4 preceding years. A previous asset valuation method included 10-year asset smoothing. MERS moved to a 5-year asset smoothing effective December 31, 2016; the transition to 5-year smoothing was fully recognized as of December 31, 2019.

The Dedicated Gains Policy applies to market gains remaining after recognition of the current year's asset gain/(loss), item (v) above. If the preliminary AVA ((i) + (ii) + (iii) + (iv)) is between 80% and 120% of the market value of assets, as of the same date, remaining market gains are used to buy down the assumed rate of return. The amount of buy down occurs in one basis point increments, based upon thresholds and where the current assumption falls in the range of reasonable assumptions, as described in the Actuarial Policy. In years where gains are accelerated, remaining unrecognized gains and losses will be combined and recognized over the regular remaining period.

Since the implementation of the Dedicated Gains policy, the assumed rate of investment return has lowered twice from 7.35% to 7.00%, as of December 31, 2021, and to 6.93%, as of December 31, 2023; while also mitigating the first-year impact on employer contribution requirements. As of December 31, 2023, the current valuation assumption is below the midpoint of the range. Application of the Dedicated Gains policy will apply one-half of any remaining gain to lower the assumed rate of investment return. The remaining one-half of the current year gain will be used to offset potential short-term market volatility.

ASOP No. 44 requires that the actuarial value bear a reasonable relationship to the market value of assets. Specifically, Section 3.3 of ASOP No. 44 states the following:

a. Given the inherent volatility of markets, the asset valuation method is likely to produce actuarial values of assets that are sometimes greater than and sometimes less than the corresponding market values.

b. The asset valuation method is likely to produce actuarial values of assets that, in the actuary's professional judgment, satisfy both of the following:

1. The asset values fall within a reasonable range around the corresponding market values. For example, there might be a corridor centered at market value, outside of which the actuarial value of assets may not fall, in order to assure that the difference from market value is not greater than the actuary deems reasonable.

2. Any differences between the actuarial value of assets and the market value are recognized within a reasonable period of time. For example, a formula addresses differences between the actuarial value of assets and the market value in a manner that, in the actuary's professional judgment, is rational, systematic, and produces an actuarial value of assets that is expected to converge toward market value at a pace that the actuary deems reasonable, assuming constant asset returns in future periods.

In lieu of satisfying both (1) and (2) above, an actuarial valuation method could satisfy section 3.3(b) if, in the actuary's professional judgment, the asset valuation method either (i) produces values within a sufficiently narrow range around market value or (ii) recognizes differences from market value in a sufficiently short period.

When using a smoothed asset value, ASOP No. 44 states that the actuary should consider and disclose if the asset valuation method has significant systematic bias. An asset valuation method has significant systematic bias if, in the actuary's professional judgment, the method's design is expected to produce a distribution of actuarial values that is significantly skewed toward understatement or overstatement relative to the corresponding market values.

The Asset Valuation Method satisfies ASOP No. 44 requirements through the use of a short period, 5-years, for recognition of short-term market volatility and also by limiting the fluctuation of smoothed asset value to a be within +/-20% of the market value, known as a 20% corridor. In general, a corridor will not take effect unless there are extreme positive or negative returns on the market value of assets.

Additionally, the Dedicated Gains Policy does not create systematic bias, as advancing the recognition of a portion of asset gains is coupled with an increased actuarial liability, through the lowering the assumed rate of investment return.

The Dedicated Gains Policy provides for lowering the assumed rate of investment return in 1 basis point increments. The thresholds designed to help mitigate the increase in liability and increase in first year normal cost, resulting from lowering the assumed rate of investment return. These thresholds were initially determined for the period of time from policy implementation to the next scheduled experience study, December 31, 2021 – December 31, 2023. Continuing the same goal, mitigating the first-year employer contribution impact, the 2023 valuation results and sensitivity scenarios were used to determine the per basis point thresholds for the upcoming experience period.

Valuation Date	Threshold (in Millions) (1 basis point increment)
December 31, 2024	$27
December 31, 2025	$28
December 31, 2026	$29
December 31, 2027	$30
December 31, 2028	$31

We recommend no changes to the present Asset Valuation Method. We recommend no changes to the Dedicated Gains Policy language at this time. We recommend defining the buy-down threshold per basis point for the coming 5-year period at the aforementioned levels.

Appendix

Proposed Actuarial Assumptions

Unreduced Retirement Rates:

Sample Replacement Index	Percent of Eligible Active Members Retiring Within the Next Year	
	Public Safety	General
0	6.0%	5.0%
1	7.0	6.0
2	7.0	6.0
3	8.0	7.0
4	10.0	8.0
5	11.0	9.0
6	12.0	10.0
7	13.0	10.0
8	13.0	10.0
9	13.0	10.0
10	14.0	11.0
11	15.0	12.0
12	17.0	13.0
13	18.0	14.0
14	18.0	14.0
15	19.0	15.0
16	20.0	16.0
17	21.0	17.0
18	23.0	18.0
19	24.0	19.0
20	24.0	19.0
21	24.0	19.0
22	24.0	19.0
23	24.0	19.0
24	24.0	19.0
25	24.0	19.0
26	24.0	19.0
27	24.0	19.0
28	24.0	19.0
29	24.0	19.0
30	24.0	19.0
31	24.0	19.0
32	24.0	19.0
33	24.0	19.0
34	24.0	19.0

Sample Replacement Index	Percent of Eligible Active Members Retiring Within the Next Year	
	Public Safety	General
35	24.0%	19.0%
36	24.0	19.0
37	24.0	19.0
38	24.0	19.0
39	24.0	19.0
40	24.0	19.0
41	24.0	19.0
42	24.0	19.0
43	25.0	20.0
44	25.0	20.0
45	25.0	20.0
46	25.0	20.0
47	26.0	21.0
48	26.0	21.0
49	26.0	21.0
50	26.0	21.0
51	26.0	21.0
52	26.0	21.0
53	26.0	21.0
54	26.0	21.0
55	26.0	21.0
56	26.0	21.0
57	26.0	21.0
58	26.0	21.0
59	27.0	22.0
60	30.0	24.0
61	30.0	24.0
62	30.0	24.0
63	30.0	24.0
64	30.0	24.0
65	30.0	24.0
66	30.0	24.0
67	30.0	24.0
68	30.0	24.0
69	31.0	25.0

Unreduced Retirement Rates (Concluded):

Sample Replacement Index	Percent of Eligible Active Members Retiring Within the Next Year	
	Public Safety	General
70	31.0%	25.0%
71	31.0	25.0
72	31.0	25.0
73	32.0	26.0
74	32.0	26.0
75	33.0	27.0
76	35.0	28.0
77	36.0	29.0
78	37.0	29.0
79	38.0	30.0
80	38.0	30.0
81	39.0	31.0
82	39.0	31.0
83	40.0	32.0
84	40.0	32.0
85	42.0	33.0
86	43.0	34.0
87	44.0	35.0
88	45.0	36.0
89	46.0	37.0
90	48.0	38.0
91	50.0	40.0
92	51.0	41.0
93	52.0	42.0
94	52.0	42.0
95	52.0	42.0
96	55.0	44.0
97	57.0	46.0
98	58.0	47.0
99	58.0	47.0
100	60.0	48.0

Early Reduced Retirement Rates:

Age	Active Members Retiring Within the Next Year
50	2.6%
51	2.8%
52	3.0%
53	3.2%
54	3.4%
55	3.6%
56	3.8%
57	4.0%
58	4.0%
59	4.0%
60	4.0%

Withdrawal Rates:

Sample Years of Service	% of Active Members Withdrawing Within the Next Year	
	Public Safety	General
0	16.50%	24.60%
1	13.80	20.50
2	11.20	16.60
3	8.80	13.10
4	7.30	10.80
5	5.80	8.70
6	5.10	7.60
7	4.60	6.90
8	4.30	6.30
9	4.00	6.00
10	3.80	5.70
11	3.70	5.50
12	3.30	4.90
13	3.20	4.70
14	3.00	4.40
15	2.90	4.20
16	2.70	4.10
17	2.60	3.90
18	2.40	3.60
19	2.30	3.40
20	2.10	3.30
21	2.10	3.20
22	2.00	2.90
23	2.00	2.90
24	1.90	2.80
25 and Over	1.80	2.70

Disability Rates:

Age	% Becoming Disabled Within the Next Year
1	0.02%
2	0.02%
3	0.02%
4	0.02%
5	0.02%
6	0.02%
7	0.02%
8	0.02%
9	0.02%
10	0.02%
11	0.02%
12	0.02%
13	0.02%
14	0.02%
15	0.02%
16	0.02%
17	0.02%
18	0.02%
19	0.02%
20	0.02%
21	0.02%
22	0.02%
23	0.02%
24	0.02%
25	0.02%
26	0.02%
27	0.02%
28	0.02%
29	0.02%
30	0.02%
31	0.03%
32	0.04%
33	0.04%
34	0.04%
35	0.05%
36	0.06%
37	0.07%
38	0.08%
39	0.08%
40	0.08%
41	0.10%
42	0.13%
43	0.16%
44	0.18%
45	0.20%
46	0.21%
47	0.22%
48	0.25%
49	0.27%
50	0.29%

Age	% Becoming Disabled Within the Next Year
51	0.31%
52	0.33%
53	0.36%
54	0.37%
55	0.38%
56	0.39%
57	0.39%
58	0.39%
59	0.39%
60	0.39%
61	0.39%
62	0.39%
63	0.39%
64	0.39%
65	0.39%
66	0.39%
67	0.39%
68	0.39%
69	0.39%
70	0.39%
71	0.39%
72	0.39%
73	0.39%
74	0.39%
75	0.39%
76	0.39%
77	0.39%
78	0.39%
79	0.39%
80	0.39%
81	0.39%
82	0.39%
83	0.39%
84	0.39%
85	0.39%
86	0.39%
87	0.39%
88	0.39%
89	0.39%
90	0.39%
91	0.39%
92	0.39%
93	0.39%
94	0.39%
95	0.39%
96	0.39%
97	0.39%
98	0.39%
99	0.39%
100	0.39%

Merit and Seniority Increases:

Sample Years of Service	Base (Wage Inflation)	Merit and Longevity	Total Percentage Increase in Pay
0	3.00%	6.70%	9.70%
1	3.00	4.60	7.60
2	3.00	3.20	6.20
3	3.00	2.70	5.70
4	3.00	2.30	5.30
5	3.00	1.90	4.90
6	3.00	1.70	4.70
7	3.00	1.30	4.30
8	3.00	1.20	4.20
9	3.00	1.20	4.20
10	3.00	1.10	4.10
11	3.00	1.10	4.10
12	3.00	0.90	3.90
13	3.00	0.90	3.90
14	3.00	0.80	3.80
15	3.00	0.70	3.70
16	3.00	0.70	3.70
17	3.00	0.60	3.60
18	3.00	0.60	3.60
19	3.00	0.60	3.60
20	3.00	0.60	3.60
21	3.00	0.60	3.60
22	3.00	0.50	3.50
23	3.00	0.40	3.40
24	3.00	0.40	3.40
25	3.00	0.40	3.40
26	3.00	0.30	3.30
27	3.00	0.30	3.30
28	3.00	0.30	3.30
29	3.00	0.30	3.30
30	3.00	0.20	3.20
31	3.00	0.20	3.20
32	3.00	0.20	3.20
33	3.00	0.20	3.20
34	3.00	0.20	3.20
35	3.00	0.10	3.10
36	3.00	0.10	3.10
37	3.00	0.10	3.10
38	3.00	0.10	3.10
39	3.00	0.10	3.10
40 and Over	3.00	0.00	3.00

Pre-retirement Mortality Rates (Base Year 2010):

Age in 2023	Generational Mortality Rates	
	Male	Female
1	0.016%	0.016%
2	0.013%	0.010%
3	0.011%	0.008%
4	0.010%	0.008%
5	0.010%	0.008%
6	0.009%	0.009%
7	0.009%	0.009%
8	0.009%	0.008%
9	0.008%	0.008%
10	0.009%	0.009%
11	0.009%	0.009%
12	0.011%	0.008%
13	0.012%	0.008%
14	0.015%	0.009%
15	0.018%	0.010%
16	0.024%	0.012%
17	0.032%	0.013%
18	0.037%	0.014%
19	0.039%	0.014%
20	0.038%	0.014%
21	0.038%	0.013%
22	0.035%	0.013%
23	0.034%	0.012%
24	0.033%	0.011%
25	0.033%	0.011%
26	0.037%	0.013%
27	0.039%	0.014%
28	0.044%	0.016%
29	0.047%	0.018%
30	0.051%	0.021%
31	0.055%	0.023%
32	0.059%	0.026%
33	0.063%	0.027%
34	0.067%	0.030%
35	0.072%	0.032%
36	0.076%	0.035%
37	0.079%	0.038%
38	0.083%	0.039%
39	0.086%	0.041%
40	0.090%	0.043%

Age in 2023	Generational Mortality Rates	
	Male	Female
41	0.093%	0.046%
42	0.096%	0.047%
43	0.099%	0.049%
44	0.102%	0.051%
45	0.107%	0.055%
46	0.112%	0.058%
47	0.117%	0.061%
48	0.124%	0.065%
49	0.132%	0.070%
50	0.140%	0.076%
51	0.151%	0.083%
52	0.163%	0.090%
53	0.176%	0.099%
54	0.191%	0.109%
55	0.208%	0.121%
56	0.228%	0.133%
57	0.250%	0.147%
58	0.274%	0.161%
59	0.300%	0.176%
60	0.326%	0.192%
61	0.354%	0.208%
62	0.383%	0.225%
63	0.412%	0.243%
64	0.441%	0.262%
65	0.471%	0.282%
66	0.501%	0.304%
67	0.533%	0.330%
68	0.567%	0.358%
69	0.606%	0.390%
70	0.649%	0.427%
71	0.698%	0.469%
72	0.753%	0.517%
73	0.816%	0.572%
74	0.887%	0.635%
75	0.968%	0.706%
76	1.059%	0.785%
77	1.161%	0.874%
78	1.273%	0.974%
79	1.399%	1.085%
80	1.540%	1.208%

Age in 2023	Generational Mortality Rates	
	Male	Female
81	4.806%	3.466%
82	5.440%	3.942%
83	6.152%	4.485%
84	6.953%	5.108%
85	7.845%	5.819%
86	8.826%	6.630%
87	9.898%	7.549%
88	11.067%	8.578%
89	12.334%	9.712%
90	13.691%	10.935%
91	15.128%	12.231%
92	16.629%	13.576%
93	18.183%	14.968%
94	19.785%	16.397%
95	21.416%	17.882%
96	23.196%	19.511%
97	25.039%	21.234%
98	26.939%	23.057%
99	28.905%	24.982%
100	30.907%	27.003%
101	32.930%	29.091%
102	34.951%	31.210%
103	36.958%	33.336%
104	38.921%	35.449%
105	40.824%	37.539%
106	42.671%	39.570%
107	44.458%	41.547%
108	46.143%	43.454%
109	47.755%	45.267%
110	49.068%	46.989%
111	49.235%	48.618%
112	49.403%	49.537%
113	49.582%	49.681%
114	49.761%	49.810%
115	49.930%	49.950%
116	49.960%	49.975%
117	49.980%	49.985%
118	49.995%	50.000%
119	50.000%	50.000%
120	100.000%	100.000%

Post-retirement Mortality Rates (Base Year 2010):

Age in 2023	Generational			
	Expected Years of Life Remaining		Mortality Rates	
	Male	Female	Male	Female
1	87.14	90.02	0.016%	0.017%
2	86.07	88.96	0.014%	0.010%
3	84.99	87.90	0.012%	0.008%
4	83.91	86.84	0.011%	0.008%
5	82.83	85.77	0.011%	0.008%
6	81.75	84.71	0.010%	0.009%
7	80.67	83.64	0.010%	0.009%
8	79.59	82.58	0.010%	0.008%
9	78.51	81.51	0.009%	0.008%
10	77.42	80.45	0.010%	0.009%
11	76.34	79.38	0.010%	0.009%
12	75.25	78.31	0.012%	0.008%
13	74.17	77.25	0.013%	0.008%
14	73.09	76.18	0.015%	0.009%
15	72.01	75.11	0.019%	0.010%
16	70.93	74.04	0.025%	0.013%
17	69.86	72.98	0.034%	0.014%
18	68.79	71.91	0.039%	0.015%
19	67.72	70.85	0.042%	0.015%
20	66.66	69.78	0.041%	0.015%
21	65.59	68.71	0.040%	0.014%
22	64.52	67.65	0.038%	0.013%
23	63.45	66.58	0.036%	0.012%
24	62.38	65.51	0.035%	0.011%
25	61.31	64.44	0.035%	0.012%
26	60.24	63.37	0.039%	0.013%
27	59.16	62.30	0.042%	0.015%
28	58.10	61.23	0.046%	0.017%
29	57.03	60.16	0.049%	0.019%
30	55.96	59.10	0.054%	0.022%
31	54.90	58.03	0.058%	0.024%
32	53.83	56.96	0.063%	0.027%
33	52.78	55.90	0.067%	0.029%
34	51.72	54.84	0.071%	0.032%
35	50.66	53.78	0.076%	0.034%
36	49.61	52.72	0.080%	0.037%
37	48.55	51.66	0.084%	0.040%
38	47.50	50.60	0.088%	0.041%
39	46.45	49.54	0.091%	0.044%
40	45.40	48.48	0.095%	0.046%

Age in 2023	Generational			
	Expected Years of Life Remaining		Mortality Rates	
	Male	Female	Male	Female
41	44.36	47.43	0.098%	0.048%
42	43.31	46.37	0.102%	0.050%
43	42.26	45.31	0.105%	0.052%
44	41.22	44.26	0.108%	0.054%
45	40.18	43.20	0.113%	0.058%
46	39.13	42.15	0.119%	0.061%
47	38.09	41.10	0.124%	0.065%
48	37.05	40.04	0.132%	0.069%
49	36.02	38.99	0.140%	0.074%
50	34.98	37.94	0.298%	0.214%
51	34.00	36.94	0.318%	0.226%
52	33.02	35.95	0.341%	0.242%
53	32.04	34.95	0.368%	0.260%
54	31.07	33.96	0.400%	0.278%
55	30.11	32.98	0.435%	0.298%
56	29.16	32.00	0.474%	0.320%
57	28.21	31.02	0.517%	0.343%
58	27.27	30.05	0.564%	0.367%
59	26.34	29.09	0.615%	0.393%
60	25.42	28.13	0.667%	0.421%
61	24.50	27.17	0.722%	0.453%
62	23.60	26.22	0.779%	0.487%
63	22.71	25.28	0.839%	0.527%
64	21.83	24.35	0.902%	0.569%
65	20.95	23.42	0.973%	0.618%
66	20.08	22.50	1.052%	0.672%
67	19.23	21.59	1.142%	0.733%
68	18.38	20.69	1.244%	0.805%
69	17.55	19.80	1.360%	0.887%
70	16.73	18.92	1.493%	0.983%
71	15.92	18.05	1.643%	1.094%
72	15.13	17.19	1.816%	1.224%
73	14.35	16.34	2.013%	1.373%
74	13.59	15.51	2.240%	1.545%
75	12.85	14.70	2.501%	1.743%
76	12.12	13.90	2.800%	1.967%
77	11.41	13.13	3.144%	2.224%
78	10.72	12.37	3.538%	2.517%
79	10.06	11.63	3.988%	2.851%
80	9.42	10.92	4.504%	3.234%

Post-retirement Mortality Rates (Base Year 2010) (Concluded):

	Generational			
Age in	Expected Years of Life		Mortality Rates	
2023	Male	Female	Male	Female
81	8.80	10.23	5.094%	3.674%
82	8.21	9.57	5.766%	4.178%
83	7.65	8.93	6.521%	4.754%
84	7.12	8.32	7.370%	5.414%
85	6.62	7.74	8.316%	6.168%
86	6.15	7.19	9.356%	7.028%
87	5.71	6.67	10.492%	8.002%
88	5.31	6.19	11.731%	9.093%
89	4.93	5.74	13.074%	10.294%
90	4.57	5.33	14.512%	11.591%
91	4.25	4.94	16.036%	12.965%
92	3.95	4.59	17.626%	14.390%
93	3.68	4.27	19.274%	15.866%
94	3.43	3.97	20.972%	17.381%
95	3.20	3.70	22.701%	18.955%
96	2.98	3.44	24.588%	20.681%
97	2.78	3.19	26.541%	22.508%
98	2.60	2.97	28.556%	24.440%
99	2.43	2.77	30.639%	26.481%
100	2.28	2.58	32.761%	28.623%
101	2.14	2.40	34.906%	30.837%
102	2.02	2.25	37.048%	33.083%
103	1.90	2.11	39.176%	35.336%
104	1.80	1.98	41.256%	37.576%
105	1.71	1.86	43.273%	39.791%
106	1.63	1.76	45.231%	41.944%
107	1.56	1.67	47.126%	44.040%
108	1.50	1.59	48.911%	46.061%
109	1.45	1.52	50.621%	47.983%
110	1.42	1.46	52.012%	49.808%
111	1.41	1.42	52.190%	51.535%
112	1.40	1.40	52.368%	52.509%
113	1.39	1.39	52.557%	52.662%
114	1.38	1.38	52.746%	52.799%
115	1.37	1.37	52.926%	52.947%
116	1.34	1.34	52.958%	52.974%
117	1.30	1.29	52.979%	52.984%
118	1.19	1.19	52.995%	53.000%
119	0.97	0.97	53.000%	53.000%
120	0.50	0.50	100.000%	100.000%

Post-disabled Mortality Rates (Base Year 2010):

Age in 2023	Generational			
	Expected Years of Life		Mortality Rates	
	Male	Female	Male	Female
1	75.37	79.15	0.016%	0.016%
2	74.18	77.99	0.013%	0.010%
3	73.00	76.82	0.011%	0.008%
4	71.81	75.65	0.010%	0.008%
5	70.62	74.48	0.010%	0.008%
6	69.43	73.31	0.009%	0.009%
7	68.24	72.14	0.009%	0.009%
8	67.04	70.96	0.009%	0.008%
9	65.85	69.79	0.008%	0.008%
10	64.65	68.61	0.009%	0.009%
11	63.46	67.44	0.009%	0.009%
12	62.26	66.26	0.011%	0.008%
13	61.07	65.08	0.012%	0.008%
14	59.87	63.90	0.015%	0.009%
15	58.68	62.73	0.018%	0.010%
16	57.49	61.55	0.024%	0.012%
17	56.31	60.37	0.032%	0.013%
18	55.13	59.20	0.416%	0.268%
19	54.16	58.18	0.435%	0.267%
20	53.20	57.15	0.426%	0.254%
21	52.23	56.11	0.405%	0.239%
22	51.24	55.07	0.378%	0.221%
23	50.24	54.01	0.349%	0.205%
24	49.23	52.94	0.329%	0.196%
25	48.20	51.87	0.328%	0.201%
26	47.17	50.79	0.358%	0.226%
27	46.15	49.73	0.389%	0.254%
28	45.14	48.68	0.424%	0.286%
29	44.15	47.65	0.461%	0.320%
30	43.17	46.63	0.499%	0.357%
31	42.21	45.63	0.539%	0.397%
32	41.27	44.64	0.579%	0.438%
33	40.34	43.68	0.619%	0.481%
34	39.42	42.73	0.659%	0.523%
35	38.52	41.80	0.697%	0.565%
36	37.64	40.88	0.735%	0.604%
37	36.76	39.98	0.772%	0.643%
38	35.90	39.10	0.808%	0.680%
39	35.05	38.22	0.843%	0.716%
40	34.21	37.36	0.878%	0.751%

Age in 2023	Generational			
	Expected Years of Life		Mortality Rates	
	Male	Female	Male	Female
41	33.37	36.50	0.914%	0.787%
42	32.55	35.66	0.952%	0.824%
43	31.73	34.82	0.993%	0.863%
44	30.92	33.99	1.041%	0.908%
45	30.12	33.17	1.095%	0.958%
46	29.33	32.35	1.159%	1.015%
47	28.55	31.55	1.232%	1.081%
48	27.78	30.76	1.315%	1.158%
49	27.03	29.99	1.408%	1.248%
50	26.29	29.23	1.512%	1.349%
51	25.57	28.49	1.598%	1.407%
52	24.86	27.76	1.692%	1.474%
53	24.16	27.04	1.793%	1.550%
54	23.47	26.34	1.900%	1.631%
55	22.79	25.64	2.012%	1.714%
56	22.13	24.96	2.126%	1.794%
57	21.49	24.28	2.238%	1.867%
58	20.85	23.62	2.350%	1.930%
59	20.23	22.97	2.457%	1.982%
60	19.62	22.31	2.561%	2.023%
61	19.02	21.67	2.661%	2.053%
62	18.43	21.01	2.761%	2.077%
63	17.84	20.36	2.861%	2.098%
64	17.26	19.70	2.961%	2.120%
65	16.69	19.04	3.060%	2.146%
66	16.12	18.37	3.159%	2.181%
67	15.56	17.70	3.260%	2.230%
68	15.00	17.02	3.364%	2.297%
69	14.44	16.34	3.476%	2.384%
70	13.88	15.67	3.600%	2.497%
71	13.32	14.99	3.744%	2.634%
72	12.76	14.32	3.908%	2.801%
73	12.21	13.66	4.102%	2.998%
74	11.66	13.01	4.326%	3.228%
75	11.12	12.37	4.586%	3.495%
76	10.58	11.75	4.884%	3.800%
77	10.05	11.14	5.225%	4.145%
78	9.53	10.55	5.612%	4.534%
79	9.03	9.97	6.050%	4.970%
80	8.53	9.43	6.540%	5.455%

Post-disabled Mortality Rates (Base Year 2010) (Concluded):

	Generational			
Age in 2023	Expected Years of Life		Mortality Rates	
	Male	Female	Male	Female
81	8.06	8.90	7.090%	5.995%
82	7.60	8.40	7.699%	6.591%
83	7.16	7.92	8.364%	7.246%
84	6.74	7.47	9.090%	7.965%
85	6.33	7.04	9.876%	8.750%
86	5.95	6.64	10.720%	9.570%
87	5.58	6.26	11.625%	10.410%
88	5.22	5.91	12.601%	11.263%
89	4.89	5.58	13.823%	12.127%
90	4.57	5.27	15.166%	13.009%
91	4.28	4.96	16.542%	13.932%
92	4.02	4.67	17.923%	14.907%
93	3.78	4.39	19.304%	15.957%
94	3.55	4.12	20.695%	17.089%
95	3.33	3.86	22.098%	18.331%
96	3.13	3.61	23.661%	19.776%
97	2.94	3.37	25.312%	21.392%
98	2.75	3.14	27.065%	23.133%
99	2.58	2.93	28.941%	25.003%
100	2.43	2.73	30.907%	27.003%
101	2.28	2.55	32.930%	29.091%
102	2.15	2.39	34.951%	31.210%
103	2.03	2.24	36.958%	33.336%
104	1.93	2.11	38.921%	35.449%
105	1.83	1.99	40.824%	37.539%
106	1.75	1.89	42.671%	39.570%
107	1.68	1.79	44.458%	41.547%
108	1.61	1.71	46.143%	43.454%
109	1.56	1.64	47.755%	45.267%
110	1.53	1.58	49.068%	46.989%
111	1.52	1.53	49.235%	48.618%
112	1.51	1.51	49.403%	49.537%
113	1.50	1.50	49.582%	49.681%
114	1.49	1.49	49.761%	49.810%
115	1.47	1.47	49.930%	49.950%
116	1.44	1.44	49.960%	49.975%
117	1.38	1.38	49.980%	49.985%
118	1.25	1.25	49.995%	50.000%
119	1.00	1.00	50.000%	50.000%
120	0.50	0.50	100.000%	100.000%

FAC Load By Employer*:

Employer	Current FAC Load	Proposed FAC Load
101	2.0%	2.0%
201	2.0%	2.0%
202	3.0%	3.0%
203	2.0%	2.0%
301	5.0%	5.0%
302	3.0%	3.0%
303	2.0%	2.0%
304	1.0%	1.5%
305	1.0%	1.5%
306	1.0%	1.5%
307	1.0%	1.5%
308	1.0%	1.5%
309	2.0%	2.0%
310	1.0%	1.5%
311	1.0%	1.5%
313	1.0%	1.5%
401	2.0%	2.0%
402	1.0%	1.5%
403	1.0%	1.5%
404	1.0%	1.5%
406	1.0%	1.5%
501	1.0%	1.5%
502	2.0%	2.0%
504	1.0%	1.5%
506	1.0%	1.5%
601	1.0%	1.5%
602	2.0%	2.0%
603	1.0%	1.5%
604	4.0%	4.0%
605	1.0%	1.5%
606	1.0%	1.5%
701	4.0%	4.0%
702	2.0%	2.0%
703	2.0%	2.0%
704	2.0%	2.0%
705	1.0%	1.5%
801	1.0%	1.5%
802	2.0%	2.0%
803	1.0%	1.5%
804	1.0%	1.5%
807	4.0%	4.0%
901	3.0%	3.0%
902	3.0%	3.0%
903	3.0%	3.0%
904	1.0%	1.5%
905	2.0%	2.0%
906	1.0%	1.5%
907	4.0%	4.0%
1001	2.0%	2.0%
1002	1.0%	1.5%
1003	2.0%	2.0%
1004	5.0%	5.0%
1005	1.0%	1.5%
1006	1.0%	1.5%
1007	1.0%	1.5%
1101	2.0%	2.0%
1102	1.0%	1.5%
1103	1.0%	1.5%
1104	1.0%	1.5%
1105	2.0%	2.0%
1106	1.0%	1.5%
1107	1.0%	1.5%
1108	1.0%	1.5%
1109	1.0%	1.5%
1110	1.0%	1.5%
1112	1.0%	1.5%
1113	1.0%	1.5%
1114	2.0%	2.0%
1115	7.0%	7.0%
1117	1.0%	1.5%
1118	1.0%	1.5%
1119	1.0%	1.5%
1120	1.0%	1.5%
1121	1.0%	1.5%
1122	1.0%	1.5%
1201	3.0%	3.0%
1202	2.0%	2.0%
1203	5.0%	5.0%
1204	3.0%	3.0%
1205	3.0%	3.0%
1301	1.0%	1.5%
1302	3.0%	2.0%
1303	2.0%	2.0%
1304	1.0%	1.5%
1306	3.0%	3.0%
1308	1.0%	1.5%
1309	1.0%	1.5%
1310	2.0%	2.0%
1311	2.0%	2.0%
1312	1.0%	1.5%
1313	1.0%	1.5%
1316	1.0%	1.5%
1401	1.0%	1.5%
1402	3.0%	3.0%
1403	2.0%	2.0%
1404	1.0%	1.5%
1405	1.0%	1.5%
1406	1.0%	1.5%
1501	1.0%	1.5%
1502	3.0%	3.0%
1503	2.0%	2.0%
1504	1.0%	1.5%
1505	3.0%	3.0%
1506	1.0%	1.5%
1507	1.0%	1.5%
1508	1.0%	1.5%
1509	1.0%	1.5%
1601	3.0%	3.0%
1602	2.0%	2.0%
1603	3.0%	3.0%
1604	1.0%	1.5%
1606	2.0%	2.0%
1701	4.0%	4.0%
1702	1.0%	1.5%
1703	2.0%	2.0%
1704	2.0%	2.0%
1705	1.0%	1.5%
1706	1.0%	1.5%
1707	2.0%	2.0%
1708	1.0%	1.5%
1709	1.0%	1.5%
1801	2.0%	2.0%
1802	2.0%	2.0%
1803	1.0%	1.5%
1804	1.0%	1.5%
1805	2.0%	2.0%
1806	1.0%	1.5%
1807	1.0%	1.5%
1901	4.0%	4.0%
1902	3.0%	3.0%
1903	3.0%	3.0%
1904	1.0%	1.5%
1905	2.0%	2.0%
1907	1.0%	1.5%
1908	2.0%	2.0%
1909	3.0%	3.0%
1910	2.0%	2.0%
1915	3.0%	3.0%
2001	4.0%	4.0%
2002	2.0%	2.0%
2003	2.0%	2.0%
2004	1.0%	1.5%
2102	3.0%	3.0%
2103	2.0%	2.0%
2105	2.0%	2.0%
2106	6.0%	6.0%
2107	1.0%	1.5%
2201	4.0%	4.0%
2202	4.0%	4.0%
2203	2.0%	2.0%

*Closed employers have no active members and thus have a 0% load. The load for divisions with a base wage definition of compensation is 0.5%. The minimum load for a division with Sick Leave in FAC is 1.5%.

FAC Load By Employer* (Continued):

Employer	Current FAC Load	Proposed FAC Load
2204	7.0%	7.0%
2205	1.0%	1.5%
2206	5.0%	5.0%
2207	4.0%	4.0%
2301	2.0%	2.0%
2302	2.0%	2.0%
2303	2.0%	2.0%
2304	1.0%	1.5%
2305	2.0%	2.0%
2306	8.0%	8.0%
2307	1.0%	1.5%
2308	5.0%	5.0%
2309	2.0%	2.0%
2310	1.0%	1.5%
2312	1.0%	1.5%
2313	1.0%	1.5%
2316	1.0%	1.5%
2401	6.0%	6.0%
2402	3.0%	3.0%
2404	1.0%	1.5%
2405	3.0%	3.0%
2406	1.0%	1.5%
2407	1.0%	1.5%
2501	1.0%	1.5%
2502	4.0%	4.0%
2503	2.0%	2.0%
2504	2.0%	2.0%
2505	2.0%	2.0%
2506	1.0%	1.5%
2507	3.0%	3.0%
2508	1.0%	1.5%
2509	1.0%	1.5%
2510	3.0%	3.0%
2511	1.0%	1.5%
2512	2.0%	2.0%
2513	2.0%	2.0%
2514	3.0%	3.0%
2515	1.0%	1.5%
2516	3.0%	3.0%
2517	1.0%	1.5%
2518	2.0%	2.0%
2519	1.0%	1.5%
2521	1.0%	1.5%
2522	2.0%	2.0%
2523	1.0%	1.5%
2525	1.0%	1.5%
2530	5.0%	4.0%
2532	1.0%	1.5%
2601	7.0%	7.0%
2602	2.0%	2.0%
2605	1.0%	1.5%
2607	2.0%	2.0%
2608	1.0%	1.5%
2701	4.0%	4.0%
2702	2.0%	2.0%
2703	1.0%	1.5%
2704	1.0%	1.5%
2706	2.5%	3.0%
2801	2.0%	2.0%
2802	2.0%	2.0%
2803	2.0%	2.0%
2805	5.0%	5.0%
2807	1.0%	1.5%
2808	3.0%	3.0%
2809	1.0%	1.5%
2810	1.0%	1.5%
2811	1.0%	1.5%
2901	3.0%	3.0%
2902	2.0%	2.0%
2903	3.0%	3.0%
2904	2.0%	2.0%
2905	2.0%	2.0%
2906	1.0%	1.5%
2908	1.0%	1.5%
2909	1.0%	1.5%
3001	3.0%	3.0%
3002	2.0%	2.0%
3003	1.0%	1.5%
3004	4.0%	4.0%
3005	1.0%	1.5%
3006	1.0%	1.5%
3007	2.0%	2.0%
3101	2.0%	2.0%
3102	1.0%	1.5%
3103	3.0%	3.0%
3104	2.0%	2.0%
3105	1.0%	1.5%
3106	1.0%	1.5%
3107	2.0%	2.0%
3108	1.0%	1.5%
3109	1.0%	1.5%
3201	3.0%	3.0%
3202	4.0%	4.0%
3203	2.0%	2.0%
3204	3.0%	3.0%
3205	1.0%	1.5%
3206	1.0%	1.5%
3207	1.0%	1.5%
3208	1.0%	1.5%
3209	1.0%	1.5%
3210	1.0%	1.5%
3211	1.0%	1.5%
3212	2.0%	2.0%
3214	1.0%	1.5%
3215	2.0%	2.0%
3301	5.0%	5.0%
3303	3.0%	3.0%
3304	5.0%	5.0%
3305	3.0%	3.0%
3307	2.0%	2.0%
3308	2.0%	2.0%
3310	4.0%	4.0%
3311	2.0%	2.0%
3313	1.0%	1.5%
3314	1.0%	1.5%
3315	1.0%	1.5%
3316	2.0%	2.0%
3317	1.0%	1.5%
3318	1.0%	1.5%
3319	1.0%	1.5%
3320	2.0%	2.0%
3328	1.0%	1.5%
3401	3.0%	3.0%
3402	1.0%	1.5%
3403	3.0%	3.0%
3405	1.0%	1.5%
3406	2.0%	2.0%
3407	1.0%	1.5%
3408	4.0%	4.0%
3410	2.0%	2.0%
3411	1.0%	1.5%
3412	1.0%	1.5%
3413	1.0%	1.5%
3501	2.0%	2.0%
3502	3.0%	3.0%
3503	1.0%	1.5%
3504	3.0%	3.0%
3601	6.0%	6.0%
3602	1.0%	1.5%
3603	5.0%	5.0%
3605	1.0%	1.5%
3606	3.0%	3.0%
3608	2.0%	2.0%
3611	1.0%	1.5%
3612	2.0%	2.0%
3614	1.0%	1.5%
3615	1.0%	1.5%
3616	1.0%	1.5%
3617	1.0%	1.5%
3701	4.0%	4.0%

*Closed employers have no active members and thus have a 0% load. The load for divisions with a base wage definition of compensation is 0.5%. The minimum load for a division with Sick Leave in FAC is 1.5%.

FAC Load By Employer* (Continued):

Employer	Current FAC Load	Proposed FAC Load
3702	2.2%	2.2%
3703	2.0%	2.0%
3704	1.0%	1.5%
3705	2.0%	2.0%
3707	2.0%	2.0%
3708	2.0%	2.0%
3709	1.0%	1.5%
3801	1.0%	1.5%
3802	3.0%	3.0%
3803	1.0%	1.5%
3804	1.0%	1.5%
3805	1.0%	1.5%
3806	3.0%	3.0%
3815	1.0%	1.5%
3901	1.0%	1.5%
3902	1.0%	1.5%
3903	1.0%	1.5%
3904	1.0%	1.5%
3907	1.0%	1.5%
4001	2.0%	2.0%
4002	1.0%	1.5%
4003	1.0%	1.5%
4004	4.0%	4.0%
4005	1.0%	1.5%
4102	3.0%	3.0%
4103	1.0%	1.5%
4104	2.0%	2.0%
4105	2.0%	2.0%
4106	1.0%	1.5%
4107	1.0%	1.5%
4108	3.0%	3.0%
4109	2.0%	2.0%
4110	1.0%	1.5%
4111	1.0%	1.5%
4112	2.0%	2.0%
4116	1.0%	1.5%
4201	3.0%	3.0%
4202	1.0%	1.5%
4301	2.0%	2.0%
4302	1.0%	1.5%
4401	2.0%	2.0%
4402	2.0%	2.0%
4403	2.0%	2.0%
4404	2.0%	2.0%
4405	2.0%	2.0%
4406	1.0%	1.5%
4407	2.0%	2.0%
4408	1.0%	1.5%
4409	1.0%	1.5%
4410	1.0%	1.5%
4501	1.0%	1.5%
4503	2.0%	2.0%
4504	1.0%	1.5%
4506	1.0%	1.5%
4601	3.0%	3.0%
4602	2.0%	2.0%
4603	1.0%	1.5%
4604	1.0%	1.5%
4605	1.0%	1.5%
4606	2.0%	2.0%
4607	1.0%	1.5%
4701	1.0%	1.5%
4702	2.0%	2.0%
4703	1.0%	1.5%
4704	2.0%	2.0%
4705	1.0%	1.5%
4706	1.0%	1.5%
4707	1.0%	1.5%
4708	1.0%	1.5%
4709	2.0%	2.0%
4710	1.0%	1.5%
4711	1.0%	1.5%
4712	2.0%	2.0%
4713	1.0%	1.5%
4714	2.0%	2.0%
4715	1.0%	1.5%
4716	1.0%	1.5%
4717	1.0%	1.5%
4801	3.0%	3.0%
4802	1.0%	1.5%
4803	2.0%	2.0%
4804	1.0%	1.5%
4805	3.0%	3.0%
4806	1.0%	1.5%
4901	1.0%	1.5%
4902	2.0%	2.0%
4903	3.0%	3.0%
4904	3.0%	3.0%
4905	4.0%	4.0%
4906	5.0%	5.0%
5001	2.0%	2.0%
5002	4.0%	4.0%
5003	7.0%	7.0%
5005	1.0%	1.5%
5006	1.0%	1.5%
5007	2.0%	2.0%
5008	4.0%	4.0%
5009	2.0%	2.0%
5010	2.0%	2.0%
5011	1.0%	1.5%
5012	1.0%	1.5%
5014	2.0%	2.0%
5016	3.0%	3.0%
5019	7.0%	6.0%
5022	1.0%	1.5%
5101	1.0%	1.5%
5103	2.0%	2.0%
5104	2.0%	2.0%
5105	2.0%	2.0%
5107	1.0%	1.5%
5109	1.0%	1.5%
5201	7.0%	7.0%
5202	3.0%	3.0%
5203	4.0%	4.0%
5204	4.0%	4.0%
5206	3.0%	3.0%
5207	1.0%	1.5%
5208	1.0%	1.5%
5209	3.0%	3.0%
5211	4.0%	4.0%
5212	8.0%	8.0%
5213	1.0%	1.5%
5214	3.0%	3.0%
5215	1.0%	1.5%
5216	2.0%	2.0%
5217	1.0%	1.5%
5218	1.0%	1.5%
5301	2.0%	2.0%
5302	2.0%	2.0%
5303	1.0%	1.5%
5304	3.0%	3.0%
5305	1.0%	1.5%
5308	2.0%	2.0%
5401	3.0%	3.0%
5402	4.0%	4.0%
5403	2.0%	2.0%
5405	2.0%	2.0%
5406	2.0%	2.0%
5501	1.0%	1.5%
5502	3.0%	3.0%
5503	4.0%	4.0%
5504	1.0%	1.5%
5601	5.0%	5.0%
5602	4.0%	4.0%
5603	1.0%	1.5%
5604	2.0%	2.0%
5702	1.0%	1.5%
5801	3.0%	3.0%
5802	3.0%	3.0%
5803	1.0%	1.5%

*Closed employers have no active members and thus have a 0% load. The load for divisions with a base wage definition of compensation is 0.5%. The minimum load for a division with Sick Leave in FAC is 1.5%.

FAC Load By Employer* (Continued):

Employer	Current FAC Load	Proposed FAC Load
5804	1.0%	1.5%
5805	4.0%	4.0%
5806	1.0%	1.5%
5807	1.0%	1.5%
5808	2.0%	2.0%
5810	2.0%	2.0%
5812	1.0%	1.5%
5901	2.0%	2.0%
5902	1.0%	1.5%
5903	1.0%	1.5%
5904	1.0%	1.5%
5905	2.0%	2.0%
5906	1.0%	1.5%
5907	6.0%	6.0%
5909	1.0%	1.5%
6001	3.0%	3.0%
6002	1.0%	1.5%
6101	3.0%	3.0%
6102	2.0%	2.0%
6103	2.0%	2.0%
6104	2.0%	2.0%
6105	1.0%	1.5%
6106	3.0%	3.0%
6107	1.0%	1.5%
6108	1.0%	1.5%
6109	1.0%	1.5%
6110	2.0%	2.0%
6111	1.0%	1.5%
6112	3.0%	3.0%
6113	1.0%	1.5%
6114	1.0%	1.5%
6115	2.0%	2.0%
6116	2.0%	3.0%
6117	1.0%	1.5%
6201	2.0%	2.0%
6203	2.0%	2.0%
6204	1.0%	1.5%
6205	1.0%	1.5%
6206	2.0%	2.0%
6207	2.0%	2.0%
6208	1.0%	1.5%
6209	1.0%	1.5%
6211	1.0%	1.5%
6212	1.0%	1.5%
6214	1.0%	1.5%
6301	2.0%	2.0%
6302	3.0%	3.0%
6303	3.0%	3.0%
6304	3.0%	3.0%
6305	1.0%	1.5%
6306	2.0%	2.0%
6307	1.0%	1.5%
6308	4.0%	4.0%
6309	2.0%	2.0%
6310	1.0%	1.5%
6311	2.0%	2.0%
6312	1.0%	1.5%
6313	1.0%	1.5%
6314	1.0%	1.5%
6315	4.0%	4.0%
6316	6.0%	6.0%
6317	2.0%	2.0%
6318	3.0%	3.0%
6319	2.0%	2.0%
6320	2.0%	2.0%
6321	1.0%	1.5%
6322	2.0%	2.0%
6323	1.0%	1.5%
6324	4.0%	4.0%
6325	1.0%	1.5%
6326	2.0%	2.0%
6327	1.0%	1.5%
6328	2.0%	2.0%
6329	2.0%	2.0%
6332	1.0%	1.5%
6333	1.0%	1.5%
6335	1.0%	1.5%
6336	1.0%	1.5%
6343	5.0%	5.0%
6345	1.0%	1.5%
6401	2.0%	2.0%
6402	2.0%	2.0%
6403	1.0%	1.5%
6501	1.0%	1.5%
6502	1.0%	1.5%
6503	2.0%	2.0%
6504	1.0%	1.5%
6505	2.0%	2.0%
6506	1.0%	1.5%
6508	1.0%	1.5%
6509	1.0%	1.5%
6510	1.0%	1.5%
6602	2.0%	2.0%
6603	2.0%	2.0%
6604	2.0%	2.0%
6605	1.0%	1.5%
6701	2.0%	2.0%
6702	2.0%	2.0%
6703	1.0%	1.5%
6704	1.0%	1.5%
6705	1.0%	1.5%
6801	2.0%	2.0%
6802	2.0%	2.0%
6803	2.0%	2.0%
6901	3.0%	3.0%
6902	2.0%	2.0%
6903	2.0%	2.0%
6904	1.0%	1.5%
7001	4.0%	4.0%
7002	3.0%	3.0%
7003	2.0%	2.0%
7004	1.0%	1.5%
7005	1.0%	1.5%
7008	1.0%	1.5%
7009	1.0%	1.5%
7010	2.0%	2.0%
7011	1.0%	1.5%
7012	3.0%	3.0%
7013	1.0%	1.5%
7014	1.0%	1.5%
7015	1.0%	1.5%
7016	1.0%	1.5%
7018	1.0%	1.5%
7026	2.0%	2.0%
7101	3.0%	3.0%
7102	3.0%	3.0%
7103	2.0%	2.0%
7104	1.0%	1.5%
7105	1.0%	1.5%
7106	1.0%	1.5%
7201	1.0%	1.5%
7202	1.0%	1.5%
7203	1.0%	1.5%
7205	3.0%	3.0%
7301	12.0%	13.0%
7303	1.0%	1.5%
7304	3.0%	3.0%
7305	2.0%	2.0%
7306	2.0%	2.0%
7307	2.0%	2.0%
7308	3.0%	3.0%
7309	1.0%	1.5%
7310	2.0%	2.0%
7311	2.0%	2.0%
7312	8.0%	8.0%
7313	5.0%	5.0%
7314	5.0%	5.0%
7315	1.0%	1.5%
7316	3.0%	3.0%
7317	1.0%	1.5%

*Closed employers have no active members and thus have a 0% load. The load for divisions with a base wage definition of compensation is 0.5%. The minimum load for a division with Sick Leave in FAC is 1.5%.

FAC Load By Employer* (Concluded):

Employer	Current FAC Load	Proposed FAC Load
7318	2.0%	2.0%
7319	1.0%	1.5%
7320	1.0%	1.5%
7321	7.0%	7.0%
7322	1.0%	1.5%
7323	1.0%	1.5%
7401	2.0%	2.0%
7402	1.0%	1.5%
7403	1.0%	1.5%
7404	1.0%	1.5%
7405	1.0%	1.5%
7407	1.0%	1.5%
7410	1.0%	1.5%
7501	4.0%	4.0%
7503	1.0%	1.5%
7504	4.0%	4.0%
7505	2.0%	2.0%
7506	1.0%	1.5%
7508	1.0%	1.5%
7601	5.0%	5.0%
7602	2.0%	3.0%
7603	1.0%	1.5%
7604	2.0%	2.0%
7605	1.0%	1.5%
7606	1.0%	1.5%
7607	4.0%	4.0%
7608	1.0%	1.5%
7609	1.0%	1.5%
7610	1.0%	1.5%
7611	1.0%	1.5%
7701	1.0%	1.5%
7702	4.0%	4.0%
7703	1.0%	1.5%
7705	1.0%	1.5%
7706	1.0%	1.5%
7707	2.0%	2.0%
7708	2.0%	2.0%
7709	3.0%	3.0%
7711	2.0%	2.0%
7712	5.0%	5.0%
7715	1.0%	1.5%
7801	3.0%	3.0%
7803	2.0%	2.0%
7804	1.0%	1.5%
7805	1.0%	1.5%
7806	1.0%	1.5%
7901	1.0%	1.5%
7902	3.0%	3.0%
7903	2.0%	2.0%
7904	1.0%	1.5%
7906	2.0%	2.0%
7907	2.0%	2.0%
7908	1.0%	1.5%
8001	2.0%	2.0%
8002	4.0%	4.0%
8003	1.0%	1.5%
8004	1.0%	1.5%
8005	7.0%	7.0%
8006	3.0%	3.0%
8007	3.0%	3.0%
8010	1.0%	1.5%
8101	3.0%	3.0%
8102	6.0%	6.0%
8103	2.0%	2.0%
8104	8.0%	8.0%
8105	5.0%	5.0%
8106	8.0%	8.0%
8107	1.0%	1.5%
8109	1.0%	1.5%
8110	1.0%	1.5%
8111	1.0%	1.5%
8112	1.0%	1.5%
8113	5.0%	5.0%
8115	2.0%	2.0%
8116	1.0%	1.5%
8117	1.0%	1.5%
8118	1.0%	1.5%
8201	4.0%	4.0%
8202	1.0%	1.5%
8203	2.0%	2.0%
8204	1.0%	1.5%
8205	3.0%	3.0%
8206	6.0%	6.0%
8207	7.0%	7.0%
8208	4.0%	4.0%
8209	10.0%	10.0%
8210	4.0%	4.0%
8211	3.0%	3.0%
8212	2.0%	2.0%
8213	4.0%	4.0%
8214	1.0%	1.5%
8215	3.0%	3.0%
8216	2.0%	2.0%
8217	1.0%	1.5%
8218	3.0%	3.0%
8219	1.0%	1.5%
8220	1.0%	1.5%
8221	1.0%	1.5%
8223	1.0%	1.5%
8224	4.0%	4.0%
8225	3.0%	3.0%
8226	1.0%	1.5%
8228	1.0%	1.5%
8229	2.0%	2.0%
8230	4.0%	4.0%
8231	1.0%	1.5%
8232	1.0%	1.5%
8233	3.0%	3.0%
8234	3.0%	3.0%
8235	3.0%	3.0%
8236	1.0%	1.5%
8237	1.0%	1.5%
8238	2.0%	2.0%
8241	2.0%	2.0%
8242	1.0%	1.5%
8243	3.0%	3.0%
8244	4.0%	4.0%
8247	1.0%	1.5%
8250	1.0%	1.5%
8251	1.0%	1.5%
8252	1.0%	1.5%
8255	3.0%	3.0%
8260	4.0%	4.0%
8262	1.0%	1.5%
8268	1.0%	1.5%
8301	1.0%	1.5%
8302	3.0%	3.0%
8303	2.0%	2.0%
8304	1.0%	1.5%
8305	2.0%	2.0%
8306	1.0%	1.5%
8401	1.0%	1.5%
8402	1.0%	1.5%
8403	1.0%	1.5%
8404	1.0%	1.5%

*Closed employers have no active members and thus have a 0% load. The load for divisions with a base wage definition of compensation is 0.5%. The minimum load for a division with Sick Leave in FAC is 1.5%.

Glossary

The following glossary is intended to provide definitions of a number of terms which are used throughout this report, and which are somewhat unique to the discussion of an Experience Study.

Actuarial Decrement. The actual number of decrements which occurred during the study. This number is a straight tabulation of the actual number of occurrences of the decrement in question. Normally, the actual number of decrements will be subdivided by age and possibly sex.

Aggregate Assumptions. Assumptions which vary only by sex and/or age. The impact of year of service on the decrement is ignored. All experience is combined by age and/or sex without regard to service. Rates of death and disablement are more appropriate to aggregate measurement in a retirement system.

Crude Rate of Decrement. The rate of decrement determined by dividing the actual number of the respective decrement for that age and sex by the corresponding exposure for that age and sex. The rate is described as a crude rate because no smoothing or elimination of statistical fluctuations has been made. It is indicative of the underlying true rate of the decrement and is the basis used in graduation to obtain the graduated or tabular rate.

Decrements. The decrements are the means by which a member ceases to be a member. For active members, the decrements are death, withdrawal, service retirement, and disability retirement. For retired members, the only decrement is death. The purpose of the Experience Study is to determine the underlying rates of each decrement.

Expected Decrement. This is the number of occurrences of a given decrement expected to occur for a given age and sex based on the number of lives exposed to the risk of the particular decrement and the current assumed rate for that decrement. It may also be referred to as the tabular number of decrements. It is the number of deaths, withdrawals, retirements, or disabilities (whichever is applicable) that would have actually occurred had the actuarial assumptions been exactly realized.

Exposure. The number of lives exposed to a given risk of decrement for a particular age and sex. It represents the number of members who could have potentially died, retired, become disabled, or withdrawn at that particular age and for that particular sex. This term will also be described as "the number exposed to a given risk."

Graduated Rates. Graduation is the mathematical process by which a set of crude rates of a particular type is translated into graduated or tabular rates. The graduation process attempts to smooth out statistical fluctuations and to arrive at a set of rates that adequately fit the underlying actual experience of the crude rates that are being graduated. The graduation process involves smoothing the results, but at the same time trying to fit the results to be consistent with the original data. It requires that the actuary exercise his or her judgment in what the underlying shape of the risk curve should look like.

Interpolated Rates. For the active rates of decrement (death, disability, retirement, and withdrawal), the actuary will develop graduated rates based on quinquennial age groupings (see definition). To arrive at the rates of decrement for ages between two quinquennial ages, the graduated quinquennial rates must be interpolated for these intermediate ages. The interpolated results are arrived at by applying a mathematical interpolation formula to the quinquennial graduated rates.

Merit and Seniority Pay Increase Rate. The portion of the total salary scale which varies by service. It reflects the impact of moving up the salary grid in a given year, rather than the increase in the overall grid. It includes the salary increase associated with promotions during the year.

Quinquennial Age Groupings. For the active decrements, it is preferable to group the experience in five-year age groups for graduation and analysis purposes to minimize statistical fluctuations resulting from a lack of exposure which may occur for individual ages. Quinquennial age grouping is the five-year age grouping which is used to develop the graduated rates of decrement for active membership. The quinquennial age is the central age of the five-year grouping.

Tabular Rates. The tabular rate of decrement or salary increase is the rate determined by the graduation and interpolation process. It is the expected rate of change as opposed to the crude rate of change. It is deemed to be the underlying rate applicable to the decrement or to the rate of salary increase. In the first phase of the study, the actual results are compared to the expected results based on the tabular rates developed by the previous study. The second phase of the study determines the new tabular rates based on the crude rates. The final phase of the study compares the actual decrement to the expected decrement based on the new tabular rates.

Wage Inflation. The general rate of increase in salaries during a year. It is the component of the total salary scale which is independent of age or service. It consists of two components: inflation and productivity increases. It may be viewed as the ultimate rate of increase if there are no more step-rate/promotional increases applicable.