Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

STATE OF IOWA
PEACE OFFICERS' RETIREMENT, ACCIDENT AND DISABILITY SYSTEM

Five Year Experience Study
For Period Ending June 30, 2021

Submitted By:

Cavanaugh Macdonald Consulting, LLC

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October 12, 2022

Board of Trustees
Iowa Department of Public Safety
Iowa Peace Officers' Retirement,
Accident & Disability System
215 East 7th Street, 4th Floor
Des Moines, IA 50319

Dear Trustees:

It is a pleasure to submit this report of our investigation of the experience of the Iowa Peace Officers' Retirement, Accident and Disability System (System) for the period of July 1, 2016 through June 30, 2021. The purpose of this report is to communicate the results of our review of the actuarial methods and the economic and demographic assumptions to be used in the completion of the July 1, 2022 valuation. The recommended changes from the prior assumptions are designed to better anticipate the emerging experience of the Plan. Actual future experience, however, may still differ from these assumptions.

In preparing this report, we relied without audit on information supplied by the System staff. In our examination, we have found the data to be reasonably consistent and comparable with data used for other purposes. It should be noted that if any data or other information is inaccurate or incomplete, our calculations might need to be revised.

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

We further certify that, in our opinion, the assumptions developed in this report satisfy Actuarial Standards of Practice, in particular, No. 27 *(Selection of Economic Assumptions for Measuring Pension Obligations)* and No. 35 *(Selection of Demographic and Other Non-economic Assumptions for Measuring Pension Obligations)*. We have considered the available information regarding the Covid-19 pandemic, but do not believe that there is sufficient data to influence the recommended assumptions which are intended to be long-term estimates. We will continue to monitor the situation and advise the Board in the future of any adjustments that we believe would be appropriate.

In order to prepare the results in this study, we have utilized actuarial models that were developed to measure liabilities and develop actuarial costs. These models include tools that we have produced and tested, along with commercially available valuation software that we have reviewed to confirm the appropriateness and accuracy of the output. In utilizing these models, we develop and use input parameters and assumptions about future contingent events along with recognized actuarial approaches to develop the needed results.

We are available to answer any questions on the material contained in the report, or to provide explanations or further details as may be appropriate. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein.

We would like to acknowledge the help given by POR's staff in the preparation of the data for this investigation. We look forward to our discussions and the opportunity to respond to your questions and comments.

I, Patrice A. Beckham, am a member of the American Academy of Actuaries, an Enrolled Actuary and a Fellow of the Society of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,

Patrice A. Beckham, FSA, EA, FCA, MAAA
Principal & Consulting Actuary

The purpose of an actuarial valuation is to provide a timely best estimate of the ultimate costs of a retirement system. Although the System is funded by fixed statutory contribution rates, actuarial valuations of the Iowa Peace Officers' Retirement, Accident and Disability System (POR) are prepared annually to determine the current funded status of the System and to calculate the actuarial contribution rate to fund the System on an actuarial reserve basis, i.e. the current assets plus future contributions, along with investment earnings will be sufficient to provide the benefits promised by the System. The actuarial contribution rate provides an important benchmark for evaluating the sufficiency of the fixed contribution rates. In order to estimate the future benefit payments from the System, and the corresponding obligations, the valuation requires the use of certain assumptions with respect to the occurrence of future events, such as rates of death, disability, termination of employment, retirement age and salary changes.

The basic purpose of an experience study is to review the actuarial assumptions and methods currently in use to determine whether they should continue to be used or adjustments should be made. One key piece of information is to determine whether the actuarial assumptions currently in use have accurately anticipated actual emerging experience. This information, along with the professional judgment of System staff, its advisors, and the actuary, is used to evaluate the appropriateness of continued use of the current actuarial assumptions. When analyzing experience and assumptions, it is important to realize that actual experience is reported short term while assumptions are intended to be long term estimates of experience. Therefore, no single experience study period is given full credibility in setting actuarial assumptions. If significant differences exist between what is expected from our assumptions and actual experience, we first determine if the experience is credible. If so, our strategy is typically to recommend a change in assumptions that would produce results somewhere between the actual and expected experience.

Our Philosophy

Similar to an actuarial valuation, the calculation of actual and expected experience is a fairly mechanical process. From one actuary to another, there should be very little difference in these results. However, the setting of assumptions is a different story as it is more art than science. In this report, we have recommended some changes to the current assumptions. To allow a better understanding of our thought process, we offer a brief summary of our philosophy:

- **Don't Overreact**: When we see significant differences in actual versus expected experience, we generally do not adjust our rates to reflect the entire difference. If the experience is credible and we believe it reflects future expectations, we will typically recommend rates somewhere between the old rates and the new experience. If the experience during the next study period shows the same result, we will probably recognize the trend at that point in time, or at least move further in the direction of the observed experience. On the other hand, if actual experience in the next study is closer to its prior level, we will not have overreacted, possibly causing volatility in the actuarial contribution rates.

- **Anticipate Trends**: We believe that any identified trend that is expected to continue should be recognized. An example of a trend is the retiree mortality assumption. Over the last few generations, rates of mortality have been declining, meaning that people are living longer. Therefore, we believe the best estimate of liabilities in the valuation should reflect some expected increase in life expectancy.

- **Simplify**: In general, we attempt to identify which factors are significant and eliminate or ignore the ones that do not materially improve the accuracy of the liability projections.

At the request of the Board of Trustees, Cavanaugh Macdonald Consulting, LLC performed a study of the experience of the Iowa Peace Officers' Retirement, Accident and Disability System, during the period July 1, 2016 through June 30, 2021. These assumptions have been developed in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the applicable Standards of Practice adopted by the Actuarial Standards Board of the American Academy of Actuaries.

SCOPE OF THIS REPORT

The actuarial valuation utilizes various actuarial methods and two different types of assumptions: economic and demographic. Economic assumptions are related to the general economy and its impact on the System. The demographic assumptions are based on the emergence of the specific experience of the System's members. The full set of recommended assumptions discussed in this report will first be reflected in the July 1, 2022 actuarial valuation.

The remainder of this report is divided as follows:

A brief summary of the results of our findings/recommendations is shown below:

Actuarial Methods

Together the actuarial cost method, the asset valuation method and the amortization of the unfunded actuarial accrued liability (UAAL) create the cornerstone of the System's funding policy. There are three key actuarial methods that are required to complete the annual actuarial valuation. The current methods are shown below:

Actuarial Cost Method:	Entry Age Normal
Asset Valuation Method:	The actuarial value of assets spreads the difference between the actual return and the expected return evenly over five years.
Amortization Method:	Level Percent of Payroll with the July 1, 2017 UAL amortized over a closed 23-year period and subsequent changes in the UAL amortized over a closed 20-year period beginning on the date the base is established. The amortization period for changes in the UAL for plan amendments and assumption changes will be determined at the time they occur.

We are not recommending any changes to these methods.

ACTUARIAL ASSUMPTIONS

The actuarial valuation process utilizes two different types of assumptions: economic and demographic. Economic assumptions are related to the general economy and its impact on POR. Demographic assumptions are based on the emergence of the specific experience of POR members.

Economic Assumptions

The following table summarizes the current and proposed economic assumptions. Note that we are recommending only the investment return assumption be changed.

	Current Assumptions	Proposed Assumptions
Price Inflation	2.50%	2.50%
Investment Return	7.00%	6.25% to 6.75%
General Wage Increase	3.50%	3.50%
Post-retirement Escalator	3.50%	3.50%
Total Payroll Growth*	2.75%	2.75%

* Used only to determine the amortization payment on the UAAL.

Demographic Assumptions

The changes to the current demographic assumptions include:

- Investment return assumption was lowered from 7.00% to 6.50% to more closely reflect the expected return of the POR portfolio, based on information provided by the System's investment consultant. This change is consistent with the general trend of lowering investment return assumptions observed in other public retirement systems in the United States.
- Mortality assumption was changed to the Pub-2010 Safety Mortality Tables, set back 2 years for males and females, projected generationally using Scale MP-2021. For the first time, the Society of Actuaries published mortality tables based solely on public plan data, including a specific table for Public Safety members. The move to this table is expected to more accurately anticipate mortality experience for the System in the future.
- Retirement rates were changed to service-based rates to more closely model the actual experience observed in the study period.
- Termination rates were adjusted to better reflect the actual experience observed in the study period.
- Accidental and ordinary disability rates were adjusted to better reflect the actual experience observed in the study period.
- The merit salary scale was adjusted to better reflect the actual experience.

Optional Form Factors

A retiring member may elect the form of payment for his monthly benefit: e.g., single life annuity, joint and survivor annuity, life with 10 years guaranteed, etc. These different types of forms of payments are called optional forms. Optional form factors are used to convert the benefit amount for one form of benefit payment to another on an actuarial equivalent basis (i.e., no gain or loss to the System). In order for these factors to be "actuarially equivalent", as defined in statute, they must be updated when the investment return, mortality table or post-retirement escalator assumptions are changed. We will provide updated factors using the new set of assumptions, but the effective date of the new factors is a decision for the POR Board.

Financial Impact

The estimated financial impact of the proposed changes to the demographic assumptions, based on results of the July 1, 2021 actuarial valuation, are summarized below. The actual dollar amount of the impact, which will be based on the July 1, 2022 actuarial valuation, may vary from the numbers shown on the exhibit on the following page. However, the impact on the liabilities and normal cost, based on the percentage change, is expected to be similar.

Estimate of Financial Impact of Assumption Changes
(Based on July 1, 2021 Valuation)

	Current Assumptions	New Assumptions		
		6.75%	6.50%	6.25%
1. Actuarial Accrued Liability (1) – (2)	780,150,277	822,426,630	850,029,523	879,121,109
2. Actuarial Value of Assets	658,081,471	658,081,471	658,081,471	658,081,471
3. Unfunded Actuarial Accrued Liability (UAAL) (3) – (4)	$122,068,806	$164,345,159	$191,948,052	221,039,638
4. Funded Ratio (2)/(1)	84.4%	80.0%	77.4%	74.9%
5. Normal Cost Rate	30.09%	32.96%	35.32%	37.87%
6. Administrative Expenses	0.59%	0.59%	0.59%	0.59%
7. UAAL Payment	21.19%	27.07%	30.58%	34.14%
8. Actuarial Contribution Rate	51.87%	60.62%	66.49%	72.60%

Note: Actual dollar impact of the demographic assumption changes on the July 1, 2022 valuation results may vary from that shown in this table which is based on the July 1, 2021 actuarial valuation.

Actuarial valuations utilize methods to determine the liabilities, assets and contribution rates for the System. While these are not like actuarial assumptions that may change over time depending on experience, an experience study is still a good opportunity to review these methods to see if they are still appropriate for systematically funding the promised benefits.

Together the actuarial cost method, the asset valuation method and the amortization of the unfunded actuarial liability create the cornerstone of the System's funding policy.

ACTUARIAL COST METHOD

The systematic financing of a pension plan requires that contributions be made in an orderly fashion while a member is actively employed, so that the accumulation of these contributions, together with investment earnings should be sufficient to provide promised benefits and cover administration expenses. The actuarial valuation is the process used to determine when money should be contributed; i.e., as part of the budgeting process.

The actuarial valuation will not impact the amount of benefits paid or the actual cost of those benefits. In the long run, actuaries cannot change the costs of the pension plan, regardless of the funding method used or the assumptions selected. However, actuaries **will** influence the timing of costs by their choice of methods and assumptions.

The actuarial cost method is used to allocate the present value of future benefits between past service (actuarial liability) and future service (normal costs). Currently the valuation uses the entry age normal cost method. This is the most widely used cost method of large public sector plans and has demonstrated the highest degree of stability as compared to alternative methods. It also is the required actuarial cost method under calculations required by the Governmental Accounting Standards Board Statements Number 67 and 68. **We recommend the Entry Age Normal actuarial cost method be retained.**

ACTUARIAL VALUE OF ASSETS

In preparing an actuarial valuation, the actuary must assign a value to the assets of the fund. An adjusted market value is often used to smooth out the volatility that is reflected in the market value of assets. This is because most employers would rather have annual costs remain relatively smooth, as a percentage of payroll or in actual dollars, as opposed to a cost pattern that is extremely volatile.

The actuary does not have complete freedom in assigning this value. The Actuarial Standards Board also has basic principles regarding the calculation of a smoothed asset value, Actuarial Standard of Practice No. 44 (ASOP 44), *Selection and Use of Asset Valuation Methods for Pension Valuations.*

ASOP 44 provides that the asset valuation method should bear a reasonable relationship to the market value. Furthermore, the asset valuation method should be likely to satisfy both of the following:

- Produce values within a reasonable range around market value, AND
- Recognize differences from market value in a reasonable amount of time.

In lieu of both of the above, the standard will be met if either of the following requirements is satisfied:

- There is a sufficiently narrow range around the market value, OR

- The method recognizes differences from market value in a sufficiently short period.

These rules or principles prevent the asset valuation methodology from being used to distort annual funding patterns. No matter what asset valuation method is used, it is important to note that, like a cost method or actuarial assumptions, the asset valuation method does not affect the true cost of the plan; it only impacts the incidence of cost.

POR values assets, for actuarial valuation purposes, based on the principle that the difference between actual and expected investment returns should be subject to partial recognition to smooth out fluctuations in the total return achieved by the fund from year to year. This philosophy is consistent with the long-term nature of a retirement system. Under the current method, the difference between the actual investment return on the market value of assets and the assumed investment return on the market value of assets is recognized equally over a five-year period. The methodology of smoothing over equal periods is the method most commonly used by public plans, and we believe that it meets actuarial standards under ASOP 44. **We recommend the current asset smoothing method be retained.**

AMORTIZATION OF UAAL

As described earlier, actuarial accrued liability is the portion of the actuarial present value of future benefits that are not included in future normal costs. Thus, it represents the liability that, in theory, should have been funded through normal costs for past service. Unfunded actuarial accrued liability (UAAL) exists when the actuarial accrued liability exceeds the actuarial value of plan assets. These deficiencies can result from (i) plan improvements that have not been completely paid for, (ii) experience that is less favorable than expected, (iii) assumption changes that increase liabilities, or (iv) contributions that are less than the actuarial contribution rate.

There are a variety of different methods that can be used to amortize the UAAL. Each method results in a different payment stream and, therefore, has cost implications. For each methodology, there are three characteristics:

- The period over which the UAAL is amortized,
- The rate at which the amortization payment increases, and
- The number of components of UAAL (separate amortization bases).

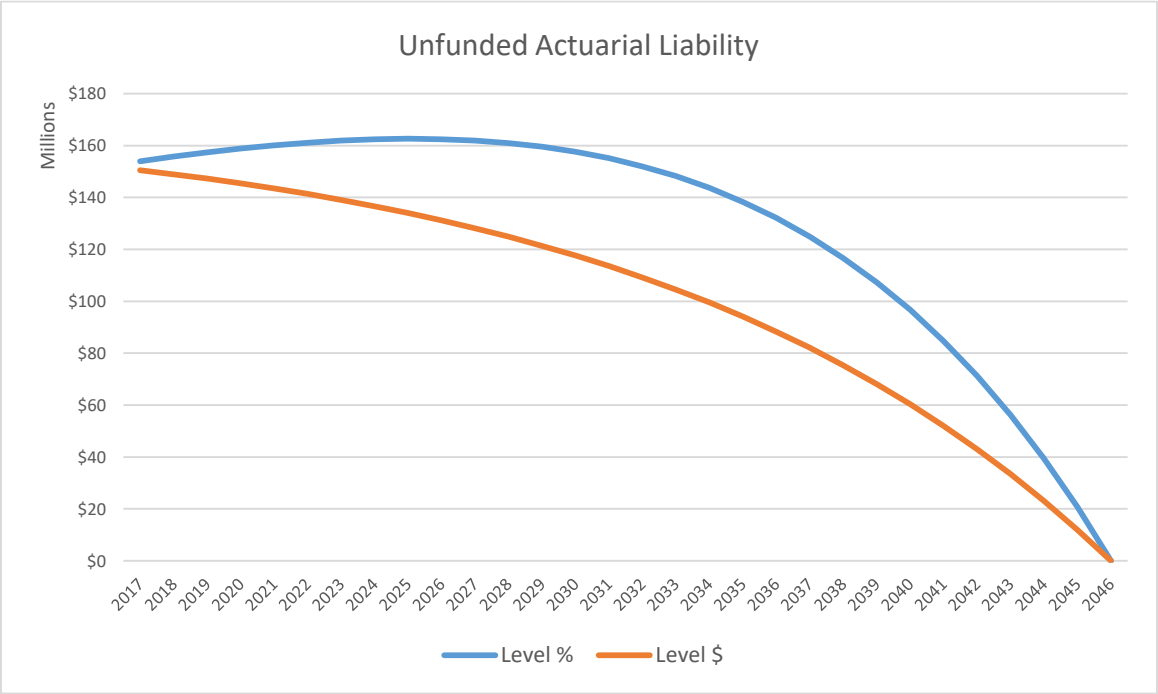
Amortization Period: The amortization period can be either closed or open. If it is a closed amortization period, the number of years remaining in the amortization period declines by one in each future valuation. Alternatively, if the amortization period is an open or rolling period, the amortization period does not decline but is reset to the same number each year. This approach essentially "refinances" the System's debt (UAAL) every year and is not intended to move the system to fully funded status.

Amortization Payment: The level dollar amortization method is similar to the method in which a home-owner pays off a mortgage. The liability, once calculated, is financed by a constant fixed dollar amount, based on the amortization period until the liability is extinguished. This results in the liability steadily decreasing while the payments, though remaining level in dollar terms, in all probability decrease as a percentage of payroll. (Even if a plan sponsor's population is not growing, inflationary salary increases will usually be sufficient to increase the aggregate covered payroll).

The rationale behind the level percentage of payroll amortization method is that since normal costs are calculated to be a constant percentage of pay, the unfunded actuarial accrued liability should be paid off in

the same manner. When this method of amortizing the unfunded actuarial accrued liability is adopted, the initial amortization payments are lower than they would be under a level dollar amortization payment method, but the payments increase at a fixed rate each year so that ultimately the annual payment far exceeds the level dollar payment. The expectation is that total payroll will increase at the same rate so that the amortization payments will remain constant, as a percentage of payroll. In the initial years, the level percentage of payroll amortization payment is often less than the interest accruing on the unfunded actuarial accrued liability meaning that even if there are no experience losses, the dollar amount of the unfunded actuarial accrued liability will grow (called negative amortization). This is particularly true if the plan sponsor is paying off the unfunded actuarial accrued liability over a long period, such as 20 or more years.

Use of the level percentage of payroll amortization has its advantages and disadvantages. From a budgetary standpoint, it makes sense to develop UAL contribution rates that are level as a percentage of payroll, since the contributions made to fund the Plan are made as a percent of payroll. However, this approach clearly results in slower funding of the UAL, compared to level dollar amortization, as illustrated in the following graph:



Amortization Bases: The UAAL can either be amortized as one single amount or as components or "layers", each with a separate amortization base, payment and period. If the UAAL is amortized as one amount, the UAAL is recalculated each year in the valuation and experience gains/losses or other changes in the UAAL are folded into the single UAAL amortization base. The amortization payment is then the total UAAL divided by an amortization factor for the applicable amortization period.

If separate amortization bases are maintained, the UAAL is composed of multiple amortization bases, each with its own payment schedule and remaining amortization period. In each valuation, the unexpected change in the UAAL is established as a new amortization base over the appropriate amortization period beginning on that valuation date. The UAAL is then the sum of all of the outstanding amortization bases

on the valuation date and the UAAL payment is the sum of all of the amortization payments on the existing amortization bases. This approach provides transparency in that the current UAAL is paid off over a fixed period of time and the remaining components of the UAAL, and their source, are clearly identified. Adjustments to the UAAL in future years are also separately identified in each future year. One downside of this approach is that it can create some discontinuities in contribution rates when UAAL layers/components are fully paid off.

Current POR UAL Amortization Method: The current amortization method used by POR includes a legacy amortization base, initially set at a closed 30-year period in 2008, with payments determined as a level percentage of payroll. The amortization period for the legacy base has 16 years remaining as of July 1, 2022.

Amortization bases established since 2017 use the layered amortization approach. New experience bases (gains and losses) are amortized over a 20-year period, commencing on the valuation date on which the gain/loss is calculated. This provides some demographic matching as it is similar to the average expected remaining service life of active members. Changes in the UAAL resulting from other items, such as plan amendments or changes in assumptions or methods, are amortized over an appropriate period, to be determined by the POR Board after discussion with the actuary.

Additional components of the amortization policy include:

- Once the System reaches full funding, the surplus of actuarial assets over actuarial liability will be amortized, as a level percentage of payroll, over an open 30-year period.
- Upon the recommendation of the System's actuary, the Board may act to combine, offset or create any other net amortization schedule that meets their funding goals as long as it complies with Actuarial Standards of Practice.

We recommend the current UAAL amortization policy be retained.

The economic assumptions used in the POR valuation include:

- Price inflation
- Investment return (net of investment expenses)
- Wage inflation (the across-the-board portion of individual salary increases).
- Post-retirement escalator
- Payroll growth (increase in total covered payroll of active members).

The merit salary scale is actually a demographic assumption, but it is combined with the general wage increase to create the total salary increase assumption. The total salary increase assumption is discussed with the demographic assumptions.

Unlike demographic assumptions, economic assumptions do not lend themselves to analysis heavily based upon internal historical patterns because economic assumptions are influenced more by external forces in the economy. The investment return and general wage increase assumptions are generally selected on the basis of expectations in an inflation-free environment and then increased by the long-term expectation for price inflation, called the "building block" approach.

Sources of data considered in the analysis and selection of the economic assumptions included:

- Historical observations of price and wage inflation statistics and investment returns
- The 2022 Social Security Trustees Report
- Future expectations of the State's investment consultant, NEPC (2022 Q1)
- Future expectations of other investment consultants (August, 2021 Horizon Survey)
- U. S. Department of the Treasury bond rates
- Assumptions used by other large public retirement systems, based on the Public Fund Survey, published by the National Association of State Retirement Administrators (NASRA).

ACTUARIAL STANDARD OF PRACTICE NUMBER 27

Actuarial Standards of Practice are issued by the Actuarial Standards Board to provide guidance to actuaries with respect to certain aspects of performing actuarial work. Guidance regarding the selection of economic assumptions for measuring pension obligations is provided by Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. Because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. Therefore, our analysis of the expected rate of return, as well as other economic assumptions, was performed following the guidance in ASOP 27.

Due to its required application, it may be informative for others to be aware of the basic content of ASOP 27. The standard applies to the selection of economic assumptions to measure obligations under any defined benefit pension plan that is not a social insurance program (e.g., Social Security).

With respect to relevant data, the standard recommends the actuary review appropriate recent and long-term historical economic data but advises the actuary not to give undue weight to recent experience. Furthermore, it advises the actuary to consider that some historical economic data may not be appropriate for use in developing assumptions for future periods due to changes in the underlying environment. The standard also allows for some conservatism in an assumption to account for the possibility of adverse deviation. In addition, with respect to any particular valuation, each economic assumption should be

consistent with all other economic assumptions over the measurement period, absent any conservatism for adverse deviation.

ASOP 27 recognizes that economic data and analyses are available from a variety of sources, including representatives of the plan sponsor, investment advisors, economists, and other professionals. The actuary is permitted to incorporate the views of experts, but the selection or advice must reflect the actuary's professional judgement.

Recognizing that there is no correct answer, the standard calls for the actuary to select a "reasonable" economic assumption. For this purpose, an assumption is deemed reasonable if it has the following characteristics:

a. it is appropriate for the purpose of the measurement;

b. it reflects the actuary's professional judgement.

c. it takes into account historical and current economic data that is relevant as of the measurement date.

d. it reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and

e. it has no significant bias (i.e., it is neither significantly optimistic nor pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included.

The standard also discusses a "range of reasonable assumptions" which in part states "the actuary should also recognize that different actuaries will apply different professional judgment 1and may choose different reasonable assumptions. As a result, a range of reasonable assumptions may develop both for an individual actuary and across actuarial practice."

The remaining section of this report will address the relevant types of economic assumptions used in the actuarial valuation to determine the obligations of the System. In our opinion, the economic assumptions proposed in this report have been developed in accordance with ASOP No. 27.

The following table summarizes the current and proposed economic assumptions:

	Current Assumptions	Proposed Assumptions
Price Inflation	2.50%	2.50%
Investment Return	7.00%	6.25% to 6.75%
General Wage Increase	3.50%	3.50%
Post-retirement Escalator	3.50%	3.50%
Total Payroll Growth*	2.75%	2.75%

* Used only to determine the amortization payment on the UAAL.

Price Inflation

Use in the Valuation: Future price inflation has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment return and general wage increases, which also impacts the assumptions for the post-retirement escalator and individual salary increases.

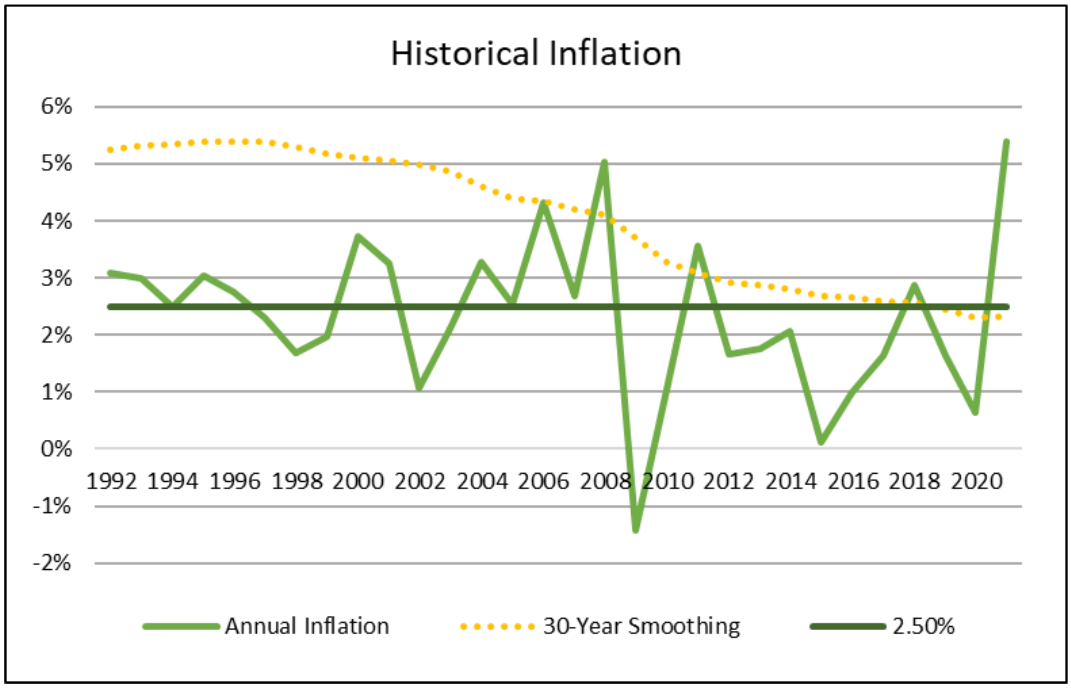
The long-term relationship between price inflation and investment return has long been recognized by economists. The basic principle is that the investor demands a more or less level "real return" – the excess of actual investment return over price inflation. If inflation rates are expected to be high, investment return rates are also expected to be high, while low inflation rates are expected to result in lower expected investment returns, at least in the long run.

The current assumption for price inflation is 2.50% per year.

Past Experience: Although economic activities, in general, and inflation in particular, do not lend themselves to prediction solely on the basis of historical analysis, historical patterns and long-term trends are factors to be considered in developing the inflation assumption. The Consumer Price Index, US City Average, All Urban Consumers, CPI (U), has been used as the basis for reviewing historical levels of price inflation. The following table provides historical annualized rates of the CPI-U over periods ending December 31st.

Period	Number of Years	Annualized Rate of Inflation
1921 – 2021	100	2.82%
1961 – 2021	60	3.79%
1971 – 2021	50	3.90%
1981 – 2021	40	2.76%
1991 – 2021	30	2.37%
2001 - 2021	20	2.31%
2011 - 2021	10	2.14%

The following graph illustrates the historical annual change in price inflation, measured as of December 31 for each of the last 70 years, as well as the thirty-year rolling average.



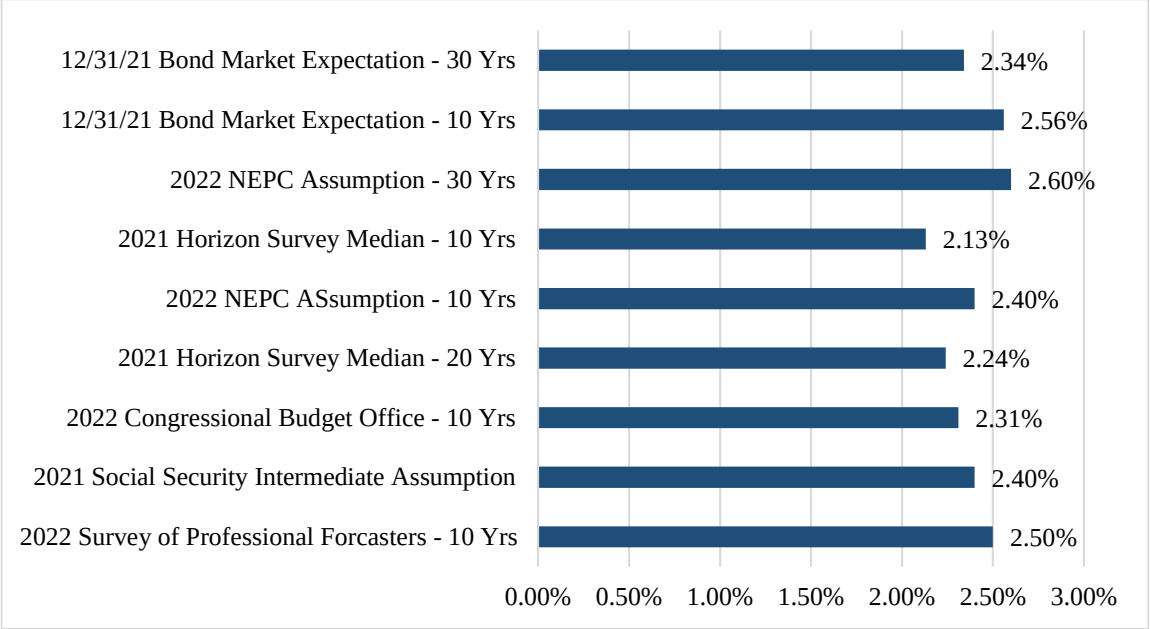
Over more recent periods, measured from December 31, 2021, the average annual rate of increase in the CPI-U has been below the current assumption of 2.50%. The period of high inflation from 1973 to 1981 has a significant impact on the averages over periods which include these rates. While there has been a

steady decline in inflation in the last 30 years, as shown in the data presented above, we note that 2021 is a clear exception. There are varying opinions as to the cause of the recent spike in inflation, but the current market pricing of Treasuries and TIPS suggest that the financial markets anticipate the high inflation to only last a few years. At this point, it is difficult to determine what the recent increase tells us about long-term inflation.

Forecasts of Inflation: Additional information to consider in formulating this assumption is obtained from measuring the spread on Treasury Inflation Protected Securities (TIPS) and from the prevailing economic forecasts. The spread between the nominal yield on treasury securities (bonds) and the inflation indexed yield on TIPS of the same maturity is referred to as the "breakeven rate of inflation" and represents the bond market's expectation of inflation over the period to maturity. As of December 31, 2021, the market rate of inflation over the next 30 years was 2.34%. Current market prices as of March 2022 suggest that investors expect inflation to be around 3.6% over the next five years and 2.6% over the next 30 years. These rates have been volatile recently, making market pricing difficult to use for developing a long-term assumption.

In addition, it is worth noting that NEPC, the investment consultant retained by the State Treasurer's office, publishes 30-year assumptions which include inflation in the U.S. Their current long-term (30 year) inflation assumption is 2.6%, compared to their short-term inflation assumption of 2.4%. The Philadelphia Federal Reserve Survey of Professional Forecasters in the first quarter of 2022 indicated that inflation over the next ten years is expected to be 2.5%.

Other sources of forecasting information we considered include that of NEPC, the State's investment consultant, the Horizon Actuarial Services survey of investment advisors, and the Congressional Budget Office. The following chart summarizes all of these forward-looking estimates.



Social Security Projections

Although many economists forecast lower inflation than the assumptions used by retirement systems, they are generally looking at a shorter time horizon (10 years) than is appropriate for a pension valuation. To consider a longer, similar time frame, we looked at the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the most recent set of assumptions (June 2022), the projected average annual increase in the CPI over the next 75 years was estimated to be 2.4%, under the intermediate (best estimate) cost assumption. The range of price inflation used in the Social Security 75-year modeling, which includes a low- and high-cost scenario, in addition to the intermediate cost projection, was 1.8% to 3.0%.

Peer System Comparison

While we do not recommend the selection of any assumption based on what other systems use, it does provide another set of relevant information to consider. According to the Public Plan Database (a survey of over 130 state and local retirement systems maintained by a collaboration between the Center for Retirement Research at Boston College, the Center for State and Local Government Excellence, and the National Association of State Retirement Administrators) the average inflation assumption for statewide systems has been steadily declining. As of 2020, the average assumption is 2.59%, which is consistent with POR's current assumption.

Conclusion

The current inflation assumption is 2.50%. Actual inflation for the last 20-30 years has averaged less than 2.5% and rarely exceeded 3% in any year. However, since early 2021, inflation has increased sharply to levels not seen in decades. Actuarial standards caution against assigning too much weight to recent experience, and so we are hesitant to make any significant changes based on the high inflation in the last year. By the time the next experience study is performed, we should have a better sense of whether or not the recent high inflation is likely to be a long-term trend. Based on the information analyzed, **we recommend retaining the inflation assumption at 2.50%.**

Consumer Price Inflation	
Current Assumption	2.50%
Recommended Assumption	2.50%

INVESTMENT RETURN

Use in the Valuation: The investment return assumption reflects the anticipated returns on the current and future assets. It is one of the primary determinants in the allocation of the expected cost of the System's benefits, providing a discount of the estimated future benefit payments to reflect the time value of money. This assumption has a direct and powerful impact on the calculation of liabilities, normal costs and actuarial contribution rates. Generally, the investment return assumption should be set with consideration of the asset allocation policy, expected long-term real rates of return on the specific asset classes, the underlying price inflation rate, and investment expenses. However, the selection of an investment return assumption is also impacted by the funding dynamics of the system along with the risk tolerance and preferences of the Board.

The current investment return assumption is 7.00%, net of investment-related expenses. This is referred to as the nominal return and is composed of two components. The first component is price inflation (previously discussed). Any excess return over price inflation is referred to as the real rate of return. Based on the current set of assumptions, the real rate of return is 4.50% (the nominal return of 7.00% less 2.50% inflation).

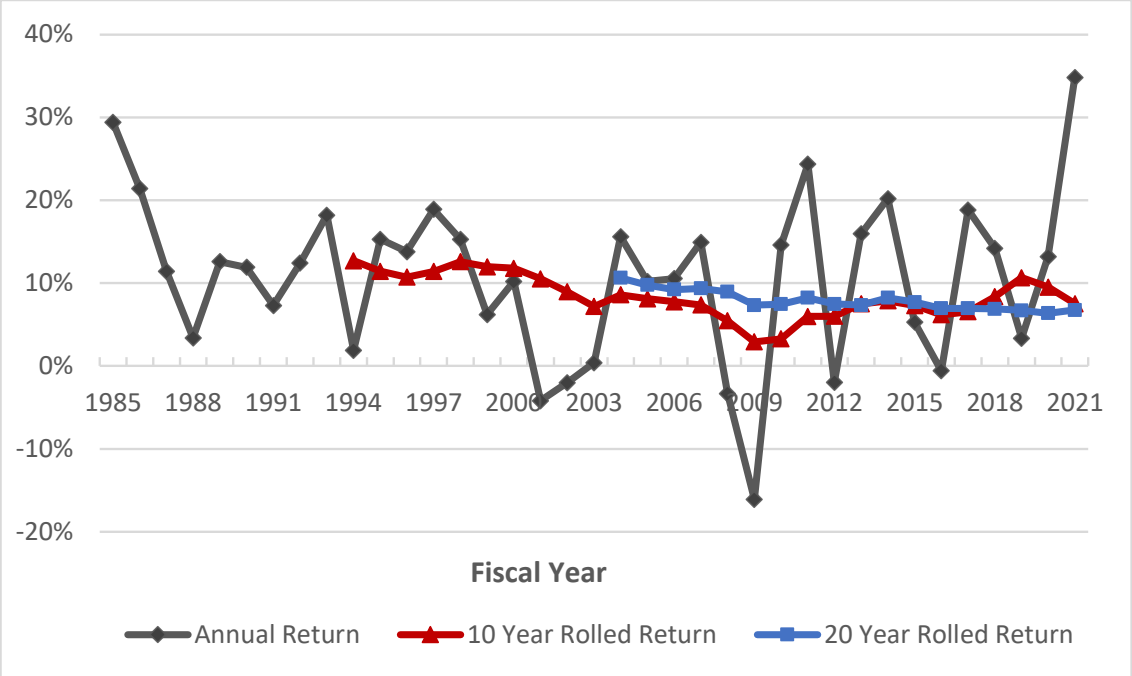
Long Term Perspective

Because the economy is constantly changing, assumptions about what may occur in the near term are volatile. Asset managers and investment consultants usually focus on this near-term horizon in order to make prudent choices regarding how to invest the trust funds, i.e. asset allocation. For actuarial calculations, we typically consider very long periods of time as some current employees will still be receiving benefit payments more than 80 years from now. For example, a newly-hired officer who is 25 years old may work for 30 years, to age 55, and live another 30 years, to age 85. The retirement system would receive contributions for the first 30 years and then pay out benefits for the next 30 years. During the entire 60-year period, the system is investing assets on behalf of the member. For such a typical career employee, more than one-half of the investment income earned on assets accumulated to pay benefits is received after the employee retires. In addition, in an open ongoing plan like POR, the stream of benefit payments is continually increasing as new hires replace current members who leave covered employment due to death, termination of employment, and retirement. This difference in the time horizon used by actuaries and investment consultants is frequently a source of debate and confusion when setting economic assumptions.

POR Historical Perspective

One of the inherent problems with analyzing historical data is that the results can look significantly different depending on the timeframe used, especially if the year-to-year results vary widely. In addition, the asset allocation can also impact the investment returns so comparing actual results over long periods when different asset allocations were in place may not be meaningful.

The following graph shows the actual fiscal year (June 30) net returns for the POR portfolio for the last 26 years. Despite significant volatility in the results from year to year the actual geometric (compound) return over the last twenty years was 8.73% and over the last 33 years was 9.55%. As the graph illustrates, there is considerable noise (volatility) in returns from year to year.



Forward Looking Analysis

We believe the most appropriate analysis to consider in setting the investment return assumption is to model the expected returns using the system's target asset allocation and forward-looking capital market assumptions. However, we are trained as actuaries and not as investment professionals. As such, we rely heavily on professional investment consultants to provide investment expertise including capital market assumptions.

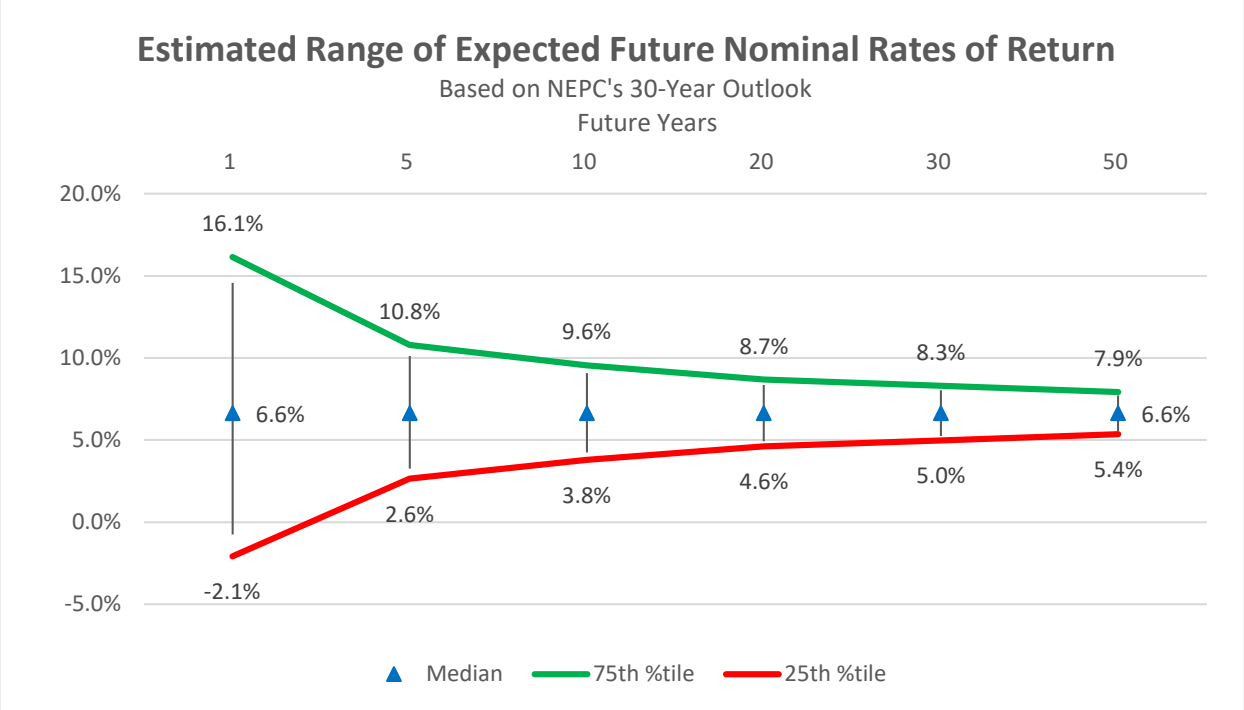
In performing our analysis, we use the building block approach which allows for the real rate of return of the portfolio to be modeled based on the target asset allocation. The expected return is then added to the price inflation assumption. Therefore, our analysis focuses on the real rate of return while the analysis of the investment consultants more typically focuses on the nominal return in their asset allocation consulting.

POR's assets are invested by the Iowa State Treasurer's office with the guidance of their investment consultant, New England Pension Consultants (NEPC). Since ASOP 27 provides that the actuary may rely on outside experts, it seems appropriate to heavily weight the market outlook and expectations provided by NEPC. In connection with this experience study, NEPC provided their first quarter of 2022 capital market assumptions and expected returns.

NEPC's 30-year inflation assumption is 2.60% and our current and recommended assumption is 2.50%. Consequently, an adjustment to NEPC's nominal return assumption is necessary to ensure the underlying inflation assumption is consistent. Our analysis is based on the POR target asset allocation as shown below:

Asset Class	Target Allocation	Expected Return	Standard Deviation
Large Cap Equities	20.00%	7.31%	16.61%
Small Cap Equities	15.00%	8.46%	20.65%
International Equities	18.75%	7.88%	19.57%
US Aggregate	17.75%	3.27%	5.65%
High Yield Corporate	2.25%	5.99%	11.23%
Real Estate - Core	4.00%	6.57%	15.05%
Real Estate - Noncore	6.00%	8.28%	17.50%
Private Debt	5.00%	8.49%	11.62%
Private Equity	5.00%	12.66%	25.20%
Emerging Markets	6.25%	12.00%	28.33%

It is worth noting that the variability year-to-year is significant, but over time, the expected return converges and becomes more stable. The following graph illustrates this (using NEPC's 2.6% inflation assumption):



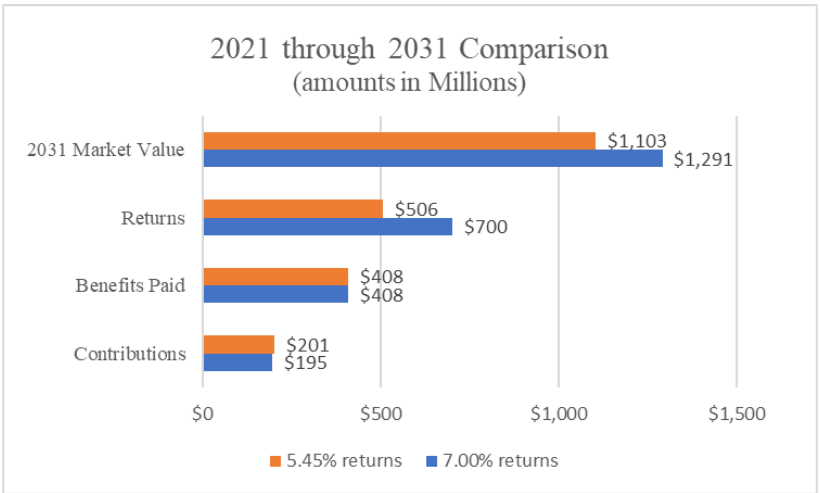
Using projection results, an expected range of rates of return is produced over a 50-year time horizon. Looking at one year's results produces an expected return of 6.63%, but also has a high standard deviation or measurement of volatility. By expanding the time horizon, the average return does not change much, but the volatility declines significantly. The table below provides a summary of results.

Time Span In Years	Mean Return	Standard Deviation	Real Returns by Percentile				
			5th	25th	50th	75th	95th
1	7.49%	13.66%	-13.41%	-2.09%	6.63%	16.14%	31.31%
5	6.80	6.05	-2.85	2.64	6.63	10.78	17.04
10	6.72	4.27	-0.16	3.79	6.63	9.55	13.89
20	6.68	3.02	1.78	4.62	6.63	8.69	11.71
30	6.66	2.46	2.66	4.98	6.63	8.31	10.76
50	6.65	1.91	3.54	5.35	6.63	7.93	9.82

The percentile results are the percentage of random returns over the time span shown that are expected to be less than the amount indicated. Thus, for the 10-year time span, 5% of the real rates of return will be below -0.16% and 95% will be above that. As the time span increases, the results begin to converge. Over a 50-year time span, the results indicate a 25% chance that returns will be below 5.35% and a 25% chance they will be above 7.93%. There is a 50% chance the returns will be 6.63% or above and a 50% chance the returns will be below 6.63%.

Based on their first quarter 2022 capital market assumptions, NEPC's 10-year expected nominal compound return is 5.45% over the next 10 years. Considering NEPC's short-term inflation assumption of 2.40%, the expected real return for the next 10 years is 3.05%. However, using NEPC's 30-year assumptions, the expected real compound return is 4.03% (6.63% less 2.60% inflation). These movements in expected return over time illustrate the variability of expected returns and the awareness that today's markets are expected to improve over time.

Another factor in using the information provided by NEPC is reflecting both the short term and long-term expectations. While actuaries typically consider a long-term perspective, they cannot ignore that the short-term must occur before the long term can occur. This is especially relevant in the present economic environment where bond yields are relatively low from a historical perspective and expected to increase. This movement is likely to dampen investment returns in the short term, which is seen in NEPC's short term expectations being lower. To evaluate the impact of lower returns in the short run, the projected financial results in ten years were compared assuming actual returns of 6.00% per year vs. 7.00% (the current assumed return). The following graph shows the results.



Note that the cash flows are unchanged (because under both scenarios the System is assumed to reach 85% funded ratio in the 2022 valuation and the supplemental state contribution ends), but there is a net outflow of around $200 million over 10 years This negative cash flow means that even though returns are expected to be higher in the long term, the higher returns will apply to a smaller asset base and, therefore, the effective long-term return will not be as high as the NEPC estimate which ignores net cash flows.

Different firms use different approaches in setting capital market assumptions, so we believe it is helpful to consider the assumptions and outlook of investment professionals other than the System's consultant. Using the 2021 Horizon Survey, we considered the range of capital market assumptions for the group of 39 investment firms who participated in the survey, which includes most major investment consultants. This provides another point of view from firms familiar with public plans. We believe there is value in considering both sets of capital market assumptions in our analysis.

Frequently investment consultants develop their expected return assumptions based on a timeframe of 5 to 10 years because they are used to making decisions regarding asset allocation. However, those assumptions may not necessarily be appropriate for the longer timeframe used by actuaries for funding (30 to 50 years). Since both NEPC and the Horizon Survey have developed longer term market return assumptions (30 and 20 years respectively), the expected returns from their assumptions are reasonably in line with the timeframe used by actuaries. Due to the timing of NEPC's capital market assumptions (2022 Q1, their set of assumptions is not directly comparable to the Horizon Survey assumptions which was published in August of 2021). NEPC's assumptions reflect the impact of the pandemic and subsequent market recovery in 2021 as well as the actions taken by the Federal Reserve and Congress. Nonetheless, there is still value in comparing the results which are summarized in the following table:

Source	Nominal Return	Consultant's Inflation Assumption	Real Rate of Return
NEPC (10 years)	5.4%	2.4%	**3.0%**
NEPC (30 years)	6.6%	2.6%	**4.0%**
Horizon Survey (10 years)	6.1%	2.1%	**4.0%**
Horizon Survey (20 years)	6.9%	2.2%	**4.7%**

Note: NEPC's assumptions are from Q1 2022 while the Horizon Survey is from 2021.

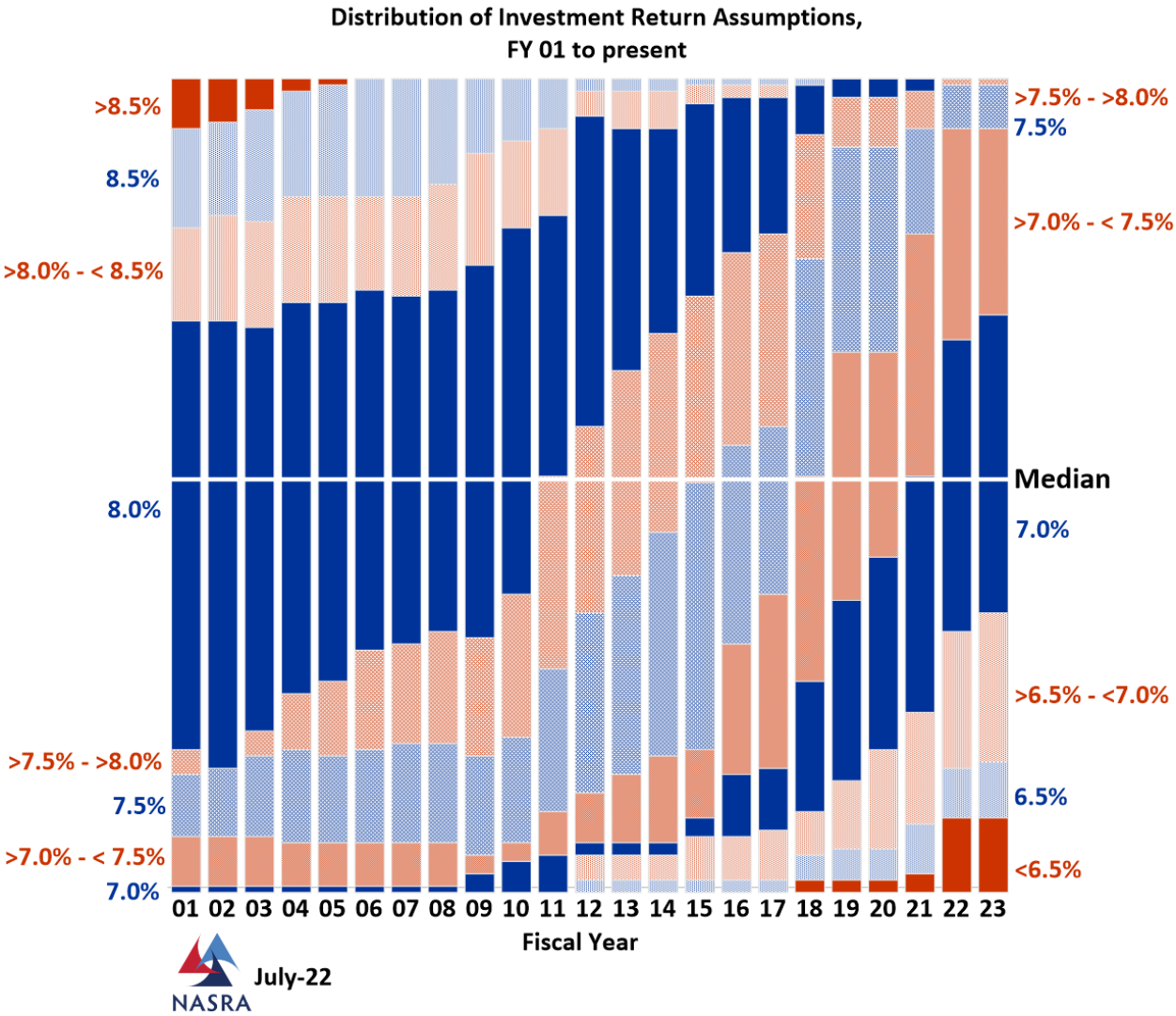
Given the uncertainty of capital market assumptions over a twenty to thirty-year period and the different timeframes in which the assumptions were published, the difference between NEPC's expected real return and the real return using the median assumption in the Horizon Survey is not material.

With higher inflation and strong market returns in 2021, many advisors have made significant changes to their capital market assumptions. Therefore, the value of the Horizon Survey results is more limited in this experience study compared to those in the past. It is important to note that the capital market assumptions used in modeling expected returns are generally based on indexed returns and do not reflect any additional returns that may be earned due to active asset managers outperforming the market ("alpha"), net of investment expenses.

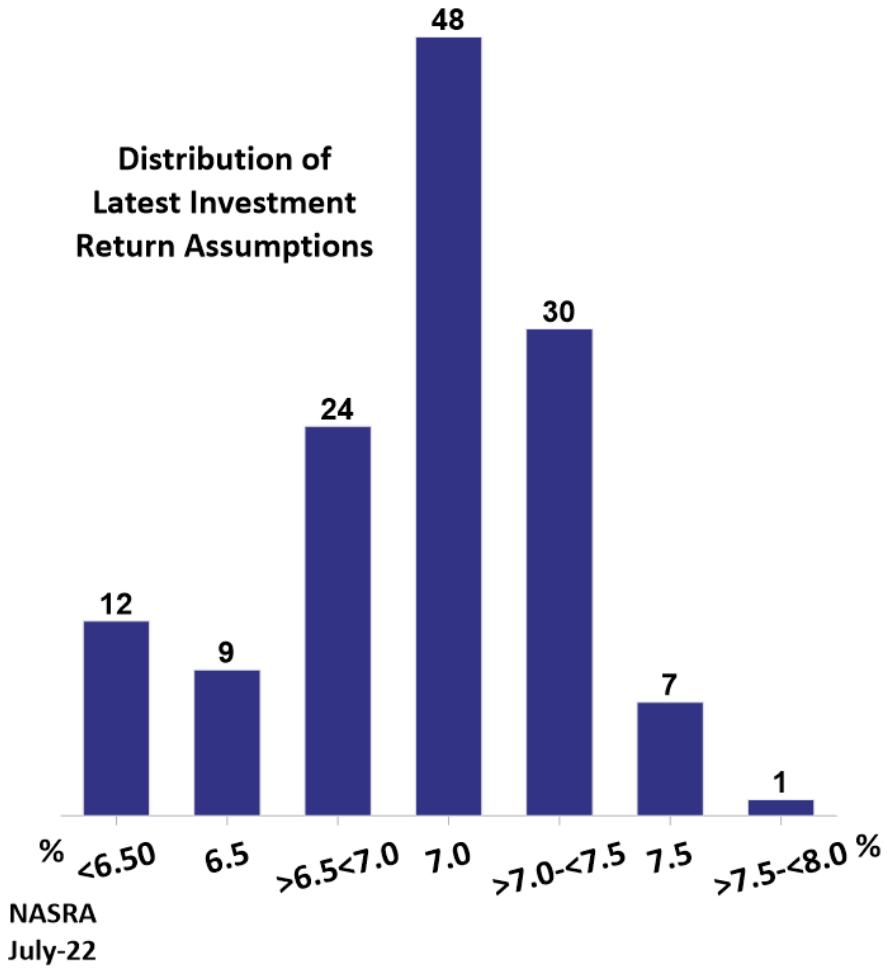
Peer System Comparison

Public retirement systems have historically compared their investment performance to their peer group. While we believe there is some merit in assessing the movement in the assumed rate of return for other systems, this is not an appropriate basis for setting this assumption in our opinion. For example, different plans have different plan dynamics which will impact their choice of the assumed investment return. This peer group information merely provides another set of relevant data to consider as long as we recognize that asset allocation and the board's risk perspective vary from system to system.

The following graph shows the change in the distribution of the investment return assumption from fiscal year 2001 through July, 2022 for the 120+ large public retirement systems included in the NASRA Public Fund Survey. As it indicates, the investment return assumptions used by public plans have decreased over the last twenty years. It is worth noting that the median investment return assumption dropped from 8.00% in 2011 to 7.00% in 2022. During this time, the median inflation assumption also declined over 1% as the typical assumed real return (nominal return net of inflation) actually increased slightly.



Another way to analyze this data is to consider the number of public retirement systems currently using an investment return assumption in each range. Note that like any survey, this information is constantly changing. Results are similar but there is only one system using an assumed return above 7.50%.



Significant credibility is assigned to NEPC's assumptions as they are the investment consultant for the trust assets and better understand the investment strategy and asset classes in which the POR fund is invested. We do recognize that since the work on the experience study commenced in early 2022, the value of the trust fund has decreased significantly, and the return outlook has likely been impacted. We recognize that fact, however in evaluating our recommendation for the investment return assumption we do not want to let short-term experience impact the recommendation for a long-term assumption.

The following table shows a narrower range for the investment return assumption that we believe is reasonable. This shows the nominal 10-year and 30-year NEPC returns using their inflation assumption (2.4% over 10 years and 2.6% over 30 years). Our recommended inflation assumption is 2.5% which is very close to both NEPC's short and long-term inflation assumption. Therefore, no adjustment for the difference in the inflation assumption has been made to the NEPC nominal returns shown in this table.

EXPECTED RETURNS

Percentile	NEPC Nominal Returns by Percentile	
	10-Year	30-Year
55th	5.67%	6.94%
50th	**5.36%**	**6.63%**
45th	5.05%	6.32%

Recommendation:

By actuarial standards, we are required to maintain a long-term perspective in setting all assumptions, including the investment return assumption. Therefore, we believe we must be careful not to let recent experience or the short-term expectations impact our judgment regarding the appropriate assumption over the long term.

This is a challenging time to develop a recommendation for the investment return assumption as there are many conflicting factors to consider. We need to recognize that there is no right answer to the question as no one knows what the future holds. Each Board has a different risk perspective which impacts where they select to be in the reasonable range for this assumption. Given POR's funding mechanism (fixed contribution rates), it seems reasonable and perhaps even prudent to select an assumption on the conservative end of the range because it increases the probability of meeting or exceeding the assumed return. Based on all available information, **we believe an investment return assumption in the range of 6.25% to 6.75%** is justifiable and would be considered reasonable under actuarial standards.

Investment Return	
Current Assumption	7.00%
Recommended Assumption	6.25% to 6.75%

ADMINISTRATIVE EXPENSES

Administrative expenses are reflected as a separate component of the actuarial contribution rate in the funding valuation. For this purpose, the actual administrative expense for the prior year is used to approximate the administrative expense in the current valuation year.

This explicit approach provides the most transparency and permits the discount rate in the GASB accounting valuation to be developed on a consistent basis with the funding valuation (assuming assets are not projected to be depleted in the GASB projection of fiduciary net position). Therefore, **we recommend the current method for addressing administrative expenses remain in place.**

GENERAL WAGE INCREASE (WAGE INFLATION)

Background: General wage increase/growth, thought of as the "across the board" rate of salary increases, is composed of the price inflation assumption combined with an assumption for the real rate of wage increases/real wage growth. The excess of wage growth over price inflation represents the increase in the standard of living, also called productivity growth.

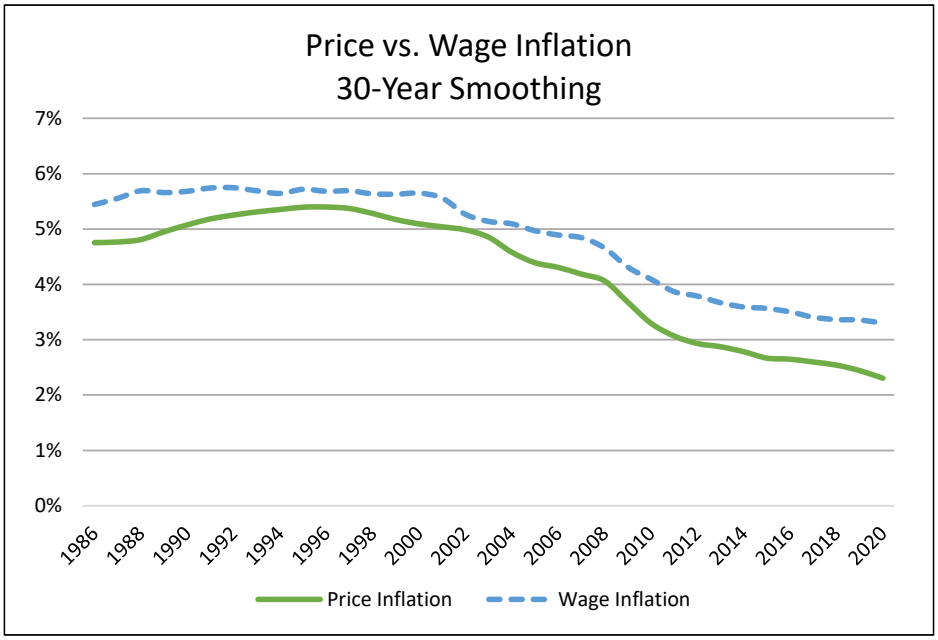
In constructing the individual salary increase assumption used to project future salary increases, the general wage increase assumption is further combined with an assumption for service-based salary increases (called a merit scale). The merit scale salary increase assumption is discussed later in this report. Given the current price inflation assumption of 2.50%, the current general wage increase of 3.50% implies assumed real wage growth of 1.00%.

Historical Perspective: When performing this analysis for general civilian populations, we frequently use statistics from the Social Security System on the National Average Wage back to 1951. However, because the National Average Wage is based on all wage earners in the country who are covered by Social Security, it can be influenced by the mix of jobs (full-time vs. part-time, manufacturing vs. service, etc.) as well as by changes in some segments of the workforce that are not seen in all segments (e.g. regional changes or growth in computer technology). Further, if compensation is shifted between wages and benefits, the wage index would not accurately reflect increases in total compensation. POR's membership is a homogeneous group composed exclusively of state patrol members living in Iowa who are not covered by Social Security so this national database is of limited value. As a result, the wage growth of POR membership and the nation may be less directly correlated.

None the less, the wages of POR members will be influenced by the general economy and the wage growth of other companies which impacts the labor market so we do study the change in the National Average Wage over time. The excess of wage growth over price inflation represents the real wage growth rate. The following table shows the US compounded wage growth over various periods, along with the comparable price inflation rate for the same period. The differences represent the real wage growth rate.

Years	General Wage Inflation	CPI Increase	Real Wage Inflation
Last 10 Years	2.9%	1.7%	1.2%
Last 20 Years	2.8%	2.0%	0.8%
Last 30 Years	3.3%	2.3%	1.0%
Last 40 Years	3.8%	2.8%	1.0%
Last 50 Years	4.5%	3.8%	0.7%

Similar information over rolling thirty-year periods is shown in the following graph:



Over the past 30 years, the real wage growth, as measured by the Social Security Administration, has been 1.0% per year, on average. Over the last 10 years, the Bureau of Labor Statistics data indicates that total compensation for state and local governmental workers increased at an average annual rate of 1.02% above inflation. Because this includes the cost of benefits, the growth in wages could be somewhat lower over this period.

POR Experience: We compared the salary schedules for POR members over the last ten fiscal years to analyze the actual general wage increase for the group. The effective annual increase over this time was around 2.9% and price inflation was about 1.9% implying a real wage growth of about 1.0%, the current assumption.

Forecasts of Future Wages: The wage index used for the historical analysis is projected forward by the Office of the Chief Actuary of the Social Security Administration in their 75-year projections. In the June, 2022 Trustees Report, the annual increase in the National Average Wage Index under the intermediate cost assumption (best estimate) was 1.15% and the range was 0.53% to 1.77% per year.

Analysis and Conclusion: Both the actual real wage growth on a national basis and the actual POR wage growth have been close to the current assumption. We believe the current assumption is reasonable for the long-term, but the current labor shortage in the US could lead to wage pressure in the short term. It would be reasonable for the board to consider a higher general wage increase for the next five to seven years in order to anticipate the impact of higher wages on the System's liability. Alternately, the board could elect to use the long-term assumption and if actual experience is higher than expected, there will be resulting actuarial losses as liabilities are higher than expected.

Based on the available data and our professional judgment, **we recommend that the long-term assumed real wage growth remain 1.00%. When coupled with the recommended price inflation assumption of 2.50%, the resulting long-term general wage increase assumption remains 3.50%. We are open to**

using a higher general wage increase in the short term if the Board wishes to adopt such an assumption.

POST-RETIREMENT ESCALATOR

The benefit structure for POR includes a post-retirement increase that is based on the change in the wages for the rank of the officer at retirement. Essentially, this type of post-retirement escalator is wage-based rather than inflation-based. Because the post-retirement benefit increase is linked to the change in wages, the general wage increase assumption is used to model future benefit increases after retirement. **We recommend the current assumption of 3.50% be retained.**

PAYROLL GROWTH ASSUMPTION

Amortization payments on the unfunded actuarial liability are determined as a level percent of payroll. Therefore, the valuation requires an assumption regarding future annual increases in covered payroll. The payroll growth assumption is the combined impact of an assumption regarding the size of the active membership and the general increase in wages over time. The current payroll growth assumption for POR is 2.75%.

The following table illustrates the actual covered payroll and active member count over the last twenty years:

Year End June 30	Covered Payroll ($M)	Active Count
2001	31.8	640
2006	36.2	618
2011	43.5	644
2016	44.8	563
2021	49.1	547

Size of Active Membership: The valuation implicitly assumes the active membership will remain constant, i.e. no future growth or decline in membership will occur. However, given the decline in the number of active members over the last twenty years, it seems prudent to continue to include some conservatism in this assumption by using a lower payroll growth assumption than the general wage increase assumption.

General Wage Increases: This assumption was previously discussed and our recommendation was to retain the current assumption of 3.50%. Given the assumed constant size of the active membership, we typically see the general wage increase assumption used as the payroll growth assumption. However, a review of the actual payroll increase for the POR system indicates the average salary from 2001 through 2021 increased 3.00%, but covered payroll grew only 2.2%, due to the decrease in the active population.

Given the trend of past experience, we believe it is prudent to build some conservatism into this assumption by using a total covered payroll growth assumption that is less than the general wage growth assumption of 3.50%. **Therefore, we recommend the total payroll growth assumption for amortizing the UAAL remain at 2.75%.**

There are several demographic assumptions used in the actuarial valuation performed for the Peace Officers' Retirement, Accident and Disability System. They include:

- Mortality
- Service Retirement
- Disability Retirement
- Termination of Employment (Withdrawal)
- Salary Increase for Merit and Promotions

ASOP 35 General Considerations and Application

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

Each individual demographic assumption should satisfy the criteria of *ASOP 35*. In selecting demographic assumptions, the actuary should also consider: the internal consistency between the assumptions, materiality, cost effectiveness, and the combined effect of all assumptions. At each measurement date the actuary should consider whether the selected assumptions continue to be reasonable, but the actuary is not required to do a complete assumption study at each measurement date. In our opinion, the demographic assumptions recommended in this report have been developed in accordance with *ASOP 35*.

Overview of Analysis

The purpose of a study of demographic experience is to compare what actually happened to the individual members of the System during the study period (fiscal years ending in 2017 through 2021) with what was expected to happen based on the actuarial assumptions. A single five-year period is a relatively short observation period. In addition, the System's size limits the full credibility of the findings. Therefore, we have considered the results of the prior Experience Study when practical to do so, but a considerable amount of professional judgment was used to develop the recommendations in this study.

Studies of demographic experience generally involve three steps:

- First, the number of members changing membership status, called decrements, during the study is tabulated by age, duration, gender, group, and membership class (active, retired, etc.).

- Next, the number of members expected to change status is calculated by multiplying certain membership statistics, called exposure, by the expected rates of decrement.

- Finally, the number of actual decrements is compared with the number of expected decrements. The comparison is called the actual to expected ratio (A/E Ratio), and is expressed as a percentage.

In general, if the actual experience differs significantly from the overall expected results, or if the pattern of actual decrements, or rates of decrement, by age, sex, or duration deviates significantly from the expected pattern, new assumptions are considered. Recommended revisions are normally not an exact representation of the experience during the observation period. Professional judgment is required to anticipate future experience from past trends and current member behavior, including a determination of the amount of weight to assign to the most recent experience. Determining the credibility of the recent experience is as much an art as a science, and Actuarial Standards recognize that the assignment of credibility will vary between actuaries. In particular, we frequently look to the prior study for confirmation of trends.

As in the past, we have continued the concept of analyzing the experience using a liability- weighted approach. This is approximated by using the member's compensation and years of service to estimate the member's benefit level for active decrements. The exposure and actual occurrences are then multiplied by the benefit level to provide the liability-weighted experience. For retiree mortality experience, the member's benefit amount is used to weight the experience. While we reviewed experience on both a count and liability-weighted basis, we generally used the liability-weighted results to evaluate experience and develop new assumptions, if necessary. Revised rates of decrement are tested by using them to recalculate the expected number of decrements during the study period, and the results are shown as revised Actual To Expected Ratios.

It takes a fair amount of data to perform a credible study of demographic assumptions. Because the membership or certain subsets of the membership are relatively small, some assumptions have been selected based more on our professional judgment of reasonable future outcomes than on the actual experience.

MORTALITY

Background: One of the most important demographic assumptions is mortality because this assumption anticipates when retirement payments will stop (the duration of benefit payments). It also predicts when pre-retirement death benefits will be paid. The life expectancies of current and future retirees are predicated on the assumed rates of mortality at each age. Mortality rates have generally declined over the past century with advances in public health and medical techniques, and most actuaries reflect the expectation of this trend continuing in their selection of a mortality assumption. Furthermore, large, public retirement systems typically exhibit better mortality than the general population.

ASOP 35 states that the actuary should consider the effect of mortality improvement both prior to and subsequent to the valuation date. This implies the need to make a specific assumption with respect to future improvements in mortality, even if the assumption is that there will be no future improvement. Over the last few generations, rates of mortality have been declining, meaning people are generally living longer. We believe that trend will continue in the future, although the rate at which future improvements will unfold is a source of debate. However, we believe it is appropriate for a retirement system to reflect some future mortality improvements in the mortality assumption. For the POR valuation, this is accomplished by the use of a generational mortality assumption where the probability of death at a given age is projected to be slightly lower each year in the future.

Because benefits are usually paid over a retiree's lifetime, it is important to appropriately model a typical lifetime of the members. Therefore, one of the most important demographic assumptions used in the valuation process is the mortality assumption because it predicts when retirement payments will stop. In addition, deaths before retirement may also result in the payout of benefits to a spouse or survivor. For valuation purposes, mortality assumptions must be set for retirees, beneficiaries, disabled retirees and active members.

Retiree Mortality: The post-retirement mortality rates used in the valuation project the percentage of retirees who are expected to die in a given future year. This assumption typically has the most significant impact on liability projections of any demographic assumption.

The POR valuation currently uses separate mortality assumptions for male and female members, based on the RP-2014 Mortality Table with a one-year age setback for males and no age adjustment for females, with generational mortality improvements anticipated by Scale MP-2016. The terms set forward and set back are used to indicate that mortality rates are adjusted by using rates for an older age (set forward) or a younger age (set back). Thus, a one year set forward indicates that a 55-year-old is assumed to have the mortality rate associated with a 56-year-old in the mortality table.

In examining the results of the Experience Study, if the A/E Ratio is greater than 100% the assumptions have predicted fewer deaths than actually occurred and with an A/E Ratio less than 100% the assumptions have predicted more deaths than have actually occurred. Sometimes a mortality table is selected with the explicit purpose of anticipating fewer deaths so there is room for mortality improvements in the future (called "margin"). Using generational mortality, we expect the A/E Ratio to be around 100% as mortality improvements in future years are directly reflected in the valuation by projecting lower mortality rates for future years, i.e., no margin in the current rates is needed. Due to the size of the group, it is not unusual for the A/E ratio to deviate somewhat from 100%.

The observed A/E Ratios for male retirees during the study period are shown in the following table. We studied mortality experience on both a count basis and a benefit-weighted basis (a better indicator of liability

experience). There is an insufficient number of female retirees to provide any reasonable analysis for the group so that information is not shown. Due to the lower number of exposures at the younger ages combined with a low probability of death, our goal was to find a standard table, with age adjustments, that was a reasonable fit at ages 60 to 90.

				A/E Ratio	
	Exposure	Actual	Expected	Count	Weighted
Total	**3,086**	**71**	**76**	**93%**	**88%**

The actual number of deaths for healthy male retirees age 60 to 90 were close to the number expected (71 actual compared to 76 over the five-year study period) based on the current assumption with a resulting A/E ratio of 93%. When experience is weighted based on the benefit amounts, the A/E ratio is drops to 88%. This indicates that the amount of liability actually being released in the valuation as a result of retiree deaths has been less than anticipated. One cause of this discrepancy can be differences in mortality patterns between retirees with lower monthly benefits and those with higher monthly benefits, which we have observed in other systems.

In 2019, the Society of Actuaries released a family of mortality tables based entirely on public retirement plan data. Different mortality tables have been developed for general government employees and retirees, public safety employees and retirees, and teacher employees and retirees. We typically find that these tables are a better fit for public plans, requiring less adjustment, particularly with the fit of retirees under 65. (In private plans, retirements before age 65 are less common and so the mortality patterns seem to differ.)

We note that a portion of the data during this study period included observations from early 2020 through June 30, 2021 which included the height of the Covid-19 pandemic. We analyzed the mortality data by year, but it did not show that the death rates were noticeably higher during the key time periods of the pandemic. This is consistent with our experience with other statewide retirement systems, and likely reflects that public plan retirees tend to be in comparatively better socio-economic groups relative to the general population. To the extent that there were additional deaths arising from the pandemic, the result would be to increase mortality rates slightly (at older ages) relative to what they would have been in the absence of Covid-19. Therefore, we believe that our recommendations are based on the best available information. Between now and the next study, we will continue to monitor the actual deaths versus the assumed deaths and will suggest changes to this assumption if we believe they are warranted.

We recommend moving to the most recent mortality table, based solely on public plan data, in particular public safety members, the Pub-2010 Public Safety Median Mortality Table with a two-year age setback for males and females, with generational mortality improvements anticipated by Scale MP-2021. Using the recommended assumption, the A/E Ratio is 101% on a count basis and 98% on a benefit-weighted basis for ages 60 to 90. Note that our recommendation is that this projection scale continue to be used until the next experience study is completed and a new recommendation for future mortality improvements be made at that time.

Beneficiaries: The retirement benefits under POR are paid for both the life of the member and the spouse. This group is very small so any results would not be credible. W**e recommend that the same family of mortality tables be used as for retirees, i.e. the Pub-2010 Public Safety Contingent Annuitant Median**

Mortality Table with a two-year age setback for males and females, with MP-2021 Scale be used for valuing the benefits payable to beneficiaries.

Disabled Members: The valuation assumption for disabled members uses the RP-2014 Healthy Annuitant Mortality Tables (generational with Scale MP-2016) with a four year age set-forward for valuing the disabled annuitants. There is a very small number of disabled retirees so the results are not statistically reliable. Again, we want to use the same family of mortality tables so we recommend using the **Pub-2010 Disabled Annuitant Median Mortality Table with a two-year age setback, generational with Scale MP-2021.**

Active Members: This assumption predicts eligibility for death benefits prior to retirement, rather than the expected lifetime for pension payments. In smaller groups, the mortality rates for active members are often set based on the same assumption as is used for healthy retirees. Given the low probability of death while active and the relatively low exposure at each age, the results are not credible on their own. We prefer to keep the mortality assumption for active and retired members on a consistent basis. **Therefore, we recommend the active member mortality also be changed to the Pub-2010 Public Safety Median Employee Mortality Table with a two-year age setback for males and females, using Scale MP-2021 to anticipate mortality improvements in future years.**

The valuation also uses a specific assumption for accidental death while an active member, currently .00085 (8.5 deaths per 10,000 exposed). There is insufficient data to perform any analysis so this assumption is set based on professional judgment. **The current assumption is reasonable, and we recommend it be retained.**

SERVICE RETIREMENT

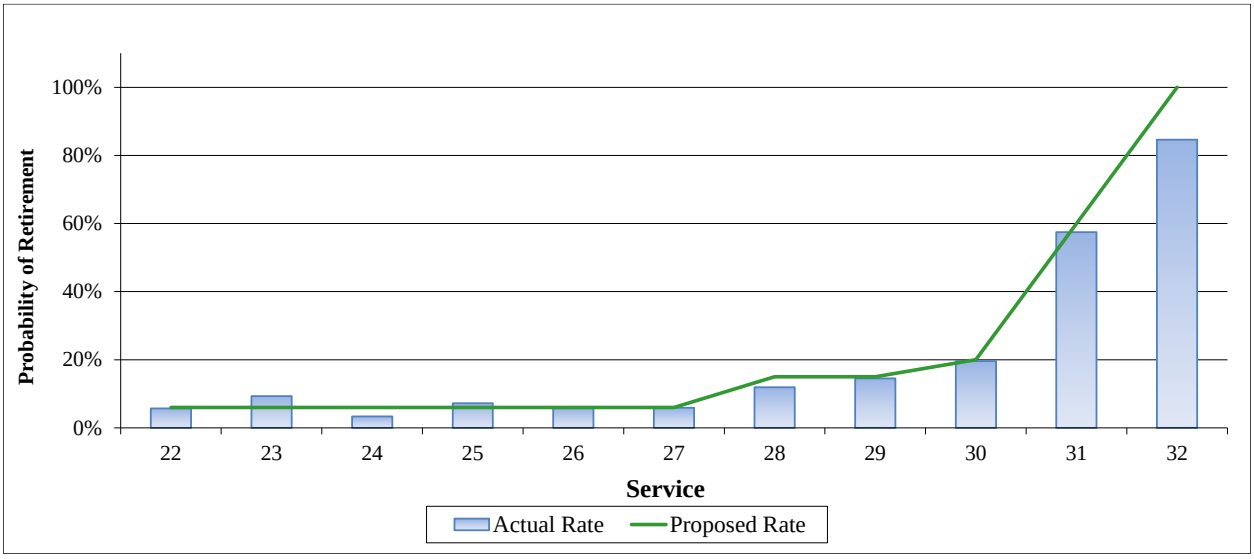
Service retirement measures the change in status from active membership directly to retirement. This assumption does not include the retirement patterns of members who terminated from active membership years prior to their retirement. A separate assumption addresses that situation.

The POR plan provisions for service retirement require that a member be age 55 with at least 22 years of service. Early retirement (with reduced benefits) is available age 50 with 22 years of service. Benefit accruals cease after 32 years of service with a resulting benefit of 88% of final average salary so there is little incentive for members to remain in covered employment after reaching that benchmark since the member contribution rate if 11.40% of pay. Actual retirement behavior confirms this expectation.

The current retirement assumption varies by whether or not the member has 30 or more years of service, reflecting higher rates of retirement for those with 30 or more years of service. The actual and expected retirement experience for the period is summarized in the following table:

	Actual	Expected	AE Ratio (Count Basis)	AE Ratio (Liability-Weighted)
Less Than 30 Years of Service	42	38	111%	112%
30 or More Years of Service	50	41	122%	122%

Given the limited number of exposure and input from the POR staff about the retirement behavior of members, we recommend simplifying the assumption by moving to a strictly service-based assumption.



The revised A/E ratio, using the recommended assumption, is 92% on a liability-weighted basis.

Inactive Vested Members: We currently assume inactive vested members retire at age 55. There are very few such members so no reliable data is available. **We recommend keeping the current assumption that benefits will commencement at the earliest unreduced retirement age as it is a reasonable assumption and provides a conservative estimate of the liability for inactive vested members.**

Miscellaneous Assumptions: There are several miscellaneous assumptions that are set largely on the basis of professional judgement. These include the percentage of members married at retirement (currently 90%) and the age difference between male and female spouses (currently the female is assumed to be 4 years younger). **Both of these assumptions are reasonable, and we recommend they be retained.**

Different benefit amounts are paid depending on whether a disability is ordinary or accidental (in the line of duty). Therefore, separate disability rates are currently used to model accidental and ordinary disability. Currently, the accidental disability rates are 150% of the ordinary disability rates, reflecting a higher incidence of accidental disability.

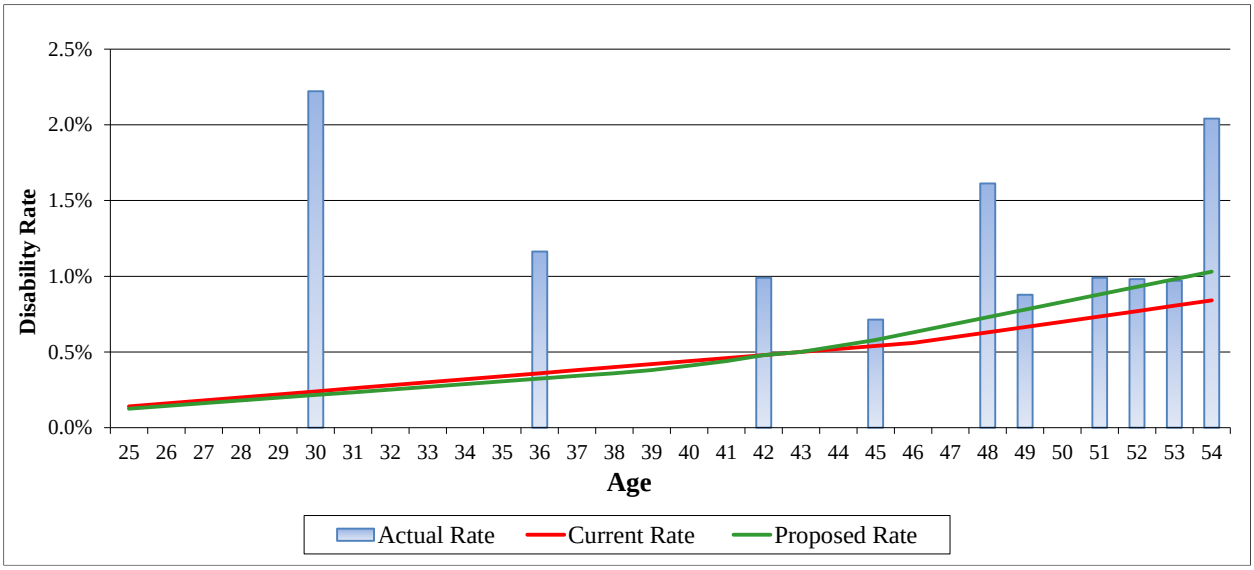
The size of the System, coupled with the small probability of disablement at most ages, does not permit credible derivation of disability rates based solely on the System's experience. Nonetheless, the actual to expected ratio was calculated for disabilities as one factor to consider in evaluating the current assumption.

The table below indicates the number of actual and expected disabilities for the current and the two prior study periods along with the resulting A/E Ratios. In general, ratios below 100% indicate fewer disabilities than expected which would typically result in lower actuarial liabilities.

	Observations		A/E Ratio
Disabilities	Actual	Expected	Current
2011 - 2016	11	14	79%
2016 - 2021	12	13	92%
2011 - 2021	23	27	85%

Given the size of the active membership and the relatively low probability of disability, it is not surprising to observe volatility in the actual number of disabilities in different periods. However, there is typically a higher probability of disability as the member ages. While the current assumption reflects that general trend, the actual experience is even more pronounced.

On the basis of this analysis and our professional judgement, **we are recommending the current disability rates be increased largely at the older ages to better reflect the actual experience (see graph below).**



Using the proposed assumption, the A/E ratio moves from 92% to 86%, but the fit of the assumption to the actual experience improves.

Percentage of Accidental Disabilities: In this study period, there were a total of 12 disabilities, 11 of which were ordinary disabilities. Historically, most of the disabilities that occur are accidental which is expected given the nature of the job. In the last experience study, we increased the percent of disabilities assumed to be accidental from 70% to 80%. Although the actual percentage is higher in the current study period, there are very few disabilities so the difference of one or two over the five-year study period could dramatically change the A/E ratio. Therefore, we cannot assign too much credibility to the actual experience. **Given that the assumption was recently changed and the size of the group is very small, we recommend the current assumption that 80% of all disabilities are accidental be retained.**

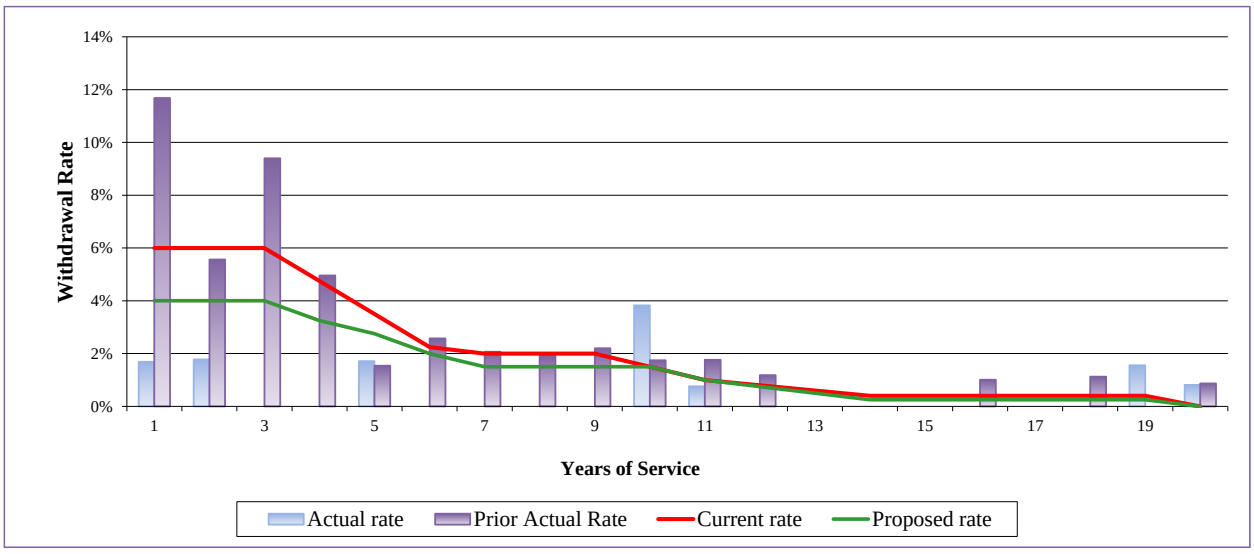
This section of the report summarizes the results of our study of terminations of employment for reasons other than death, retirement, or disability. Rates of termination can vary by both age and years of service. In general, rates of termination tend to be highest at younger ages and in the early years of employment. The current termination of employment assumption is based solely on years of service. The current rates are low, grading down from 4% in the first year dropping to below 2% with 7 years of service, eventually reaching 0% for members with 20 or more years of service.

The number of withdrawals includes all members reported to have terminated employment - whether voluntarily or not. The number of terminations of employment in this study period was very different than that observed in the last study period, as shown in the table below.

Termination of Employment				
	Observations			
Study Period FYE	Actual	Expected	A/E Ratio (Count)	A/E Ratio (Weighted)
2006 - 2011	29	42	69%	67%
2011 - 2016	42	27	154%	151%
2017 - 2021	12	25	49%	86%

There is significant variation in the termination of employment experience looking back over the last three study periods. Many factors can impact the actual experience including state budget conditions, the number of new hires, the labor market, societal factors, and changes in leadership to name a few. Given the dramatic change in the current study period, we want to be cautious and move incrementally to avoid over-adjusting. This assumption can be reevaluated in the next experience study to determine if further change is needed.

The following graph shows both the actual termination rates in the current and prior study periods, along with those expected based on the current and recommended assumptions:



The A/E ratio, using the recommended assumption, is 65% on a count basis and 107% on a liability-weighted basis, reflecting adjustment to the shorter durations of the assumption to partially recognize the observed experience.

Estimates of future salaries are based on assumptions for two types of increases:

1. Increases in each individual's salary due to promotion or longevity (often called merit scale), and

2. Increases in the general wage level of the membership, which are directly related to price and wage inflation.

Earlier in this report, we recommended that the second of these rates, general wage growth remain at 3.50% (2.50% price inflation and 1.00% real wage growth).

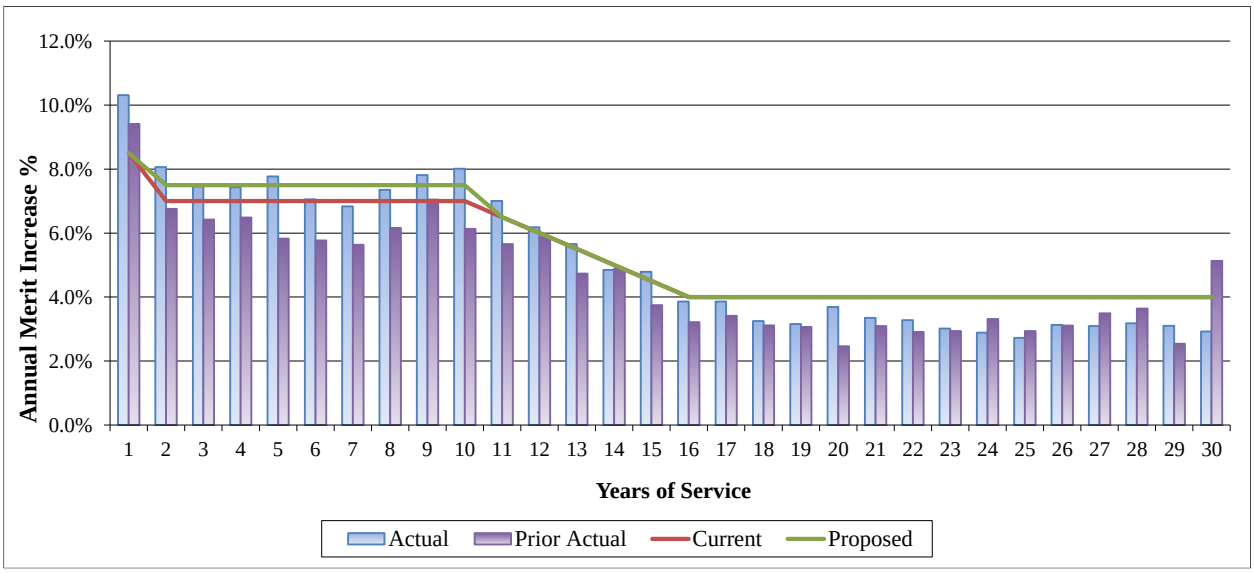
Although future salary increases are the result of two components, it is not always possible to distinguish the true salary adjustments due to inflation, productivity and merit. Therefore, the experience study reviews total salary increases for the study period. Typically, the percentage attributable to general wage growth is eliminated in an attempt to isolate the merit scale. The general wage growth for the period is usually identified by reviewing actual salary increases by duration (years of service). Those members with a high number of years of service are assumed to have no merit scale applied. Therefore, all of their salary increase is assumed attributable to increases in the general wage level.

We compared the individual salary increases for all members who were active in any two consecutive periods (e.g. 2016 and 2017, 2017 and 2018, etc.). The overall results for the years in the current study period are shown below:

Fiscal Year End	Actual	Expected	Difference
2017	5.05%	4.91%	0.14%
2018	3.66%	4.84%	(1.18%)
2019	4.43%	4.88%	(0.45%)
2020	4.18%	4.87%	(0.69%)
2021	5.23%	4.81%	0.42%
2017 - 2021	4.51%	4.86%	(0.35%)

The actual salary increases during the five-year study period averaged 4.51% and the expected increases were 4.86%, a difference of 0.35%. During this period, the actual wage inflation for POR was about 3.00% compared to the assumption of 3.50% so we would have expected actual salary increases to be about 0.50% lower than assumed. The difference of 0.35% is close to the 50-basis point difference expected.

The current merit scale is based on years of service and we recommend that approach be maintained. Although the general shape of the merit scale is reasonable, we believe some modifications would improve the fit of the assumption to actual increases observed. We are recommending some adjustment to the salary increase assumption in the first ten years of service to partially reflect the actual observed experience. The graph below reflects the proposed salary increase assumption (green line), as well as the actual pay experience in the current and prior study period along with the current salary increase assumption (red line).



The recommended assumption results in a total salary increase of 4.96%, a slight increase from the current assumption. Given the tight labor market that exists, the Board may want to consider a select and ultimate assumption where salary increases over the next five to ten years are higher than the rates shown here. Essentially, the recommended rates shown above would be the ultimate rates, used for increases in FY 2033 and beyond. Because salary increases also impact the post-retirement escalator, this approach would provide some margin for adverse experience in the short term. We are happy to discuss this further with the Board, if desired.

Actuarial Cost Method

Liabilities and contributions shown in this report are computed using the Individual Entry Age method of funding.

Sometimes called "funding method," this is a particular technique used by actuaries for establishing the amount of the annual actuarial cost of pension System benefits, or normal cost, and the related unfunded actuarial accrued liability. Ordinarily the annual contribution to the System is comprised of (1) the normal cost and (2) an amortization payment on the unfunded actuarial accrued liability.

Under the Entry Age Actuarial Cost Method, the Normal Cost is computed as the level percentage of pay which, if paid from the earliest time each member would have been eligible to join the System if it then existed (thus, entry age) until his retirement or termination, would accumulate with interest at the rate assumed in the valuation to a fund sufficient to pay all benefits under the System.

The Actuarial Accrued Liability under this method at any point in time is the theoretical amount of the fund that would have accumulated had annual contributions equal to the normal cost been made in prior years (it does not represent the liability for benefits accrued to the valuation date). The Unfunded Actuarial Accrued Liability (UAAL) is the excess of the actuarial accrued liability over the actuarial value of System assets on the valuation date.

Under this method experience gains or losses, i.e. decreases or increases in accrued liabilities attributable to deviations in experience from the actuarial assumptions, adjust the unfunded actuarial accrued liability.

UAAL Amortization Method

The Board has elected to amortize the legacy unfunded actuarial accrued liability as of July 1, 2017 as a level-percent of payroll, over a closed 30-year period beginning July 1, 2008. New layers of unfunded actuarial accrued liability will be created on each actuarial valuation date and will be amortized, as a level-percent of payroll, over a closed 20-year period. Changes in the unfunded actuarial accrued liability that are created by a change in assumptions or changes in benefit structure will be amortized over a reasonable time period, as selected by the Board after consultation with their actuary. If the System's funded ratio reaches or exceeds 100%, all amortization bases will be eliminated and the surplus (actuarial assets minus actuarial liability) will be amortized over an open 30 year period.

Asset Valuation Method

The System uses an asset valuation method to smooth the effects of market fluctuations. The actuarial value of assets spreads the difference between the actual return and the expected return evenly over five years.

Actuarial Assumptions

Investment Return: 7.00% per year, net of investment expenses.

Price Inflation: 2.50% per year.

Payroll Growth: 2.75% per year, including price inflation.

Active Members:

1. Ordinary death rate — RP-2014 Total Dataset Mortality Table with a one-year age set-back for males and Generational Projection, using MP-2016.

2. Accidental death rate — 8.5 deaths per 10,000 exposed for one year.

3. Disability rates

Age	Accidental Disability	Ordinary Disability
22	0.06%	0.02%
27	0.14%	0.04%
32	0.22%	0.06%
37	0.30%	0.08%
42	0.38%	0.10%
47	0.48%	0.12%
52	0.62%	0.15%

4. Withdrawal rate — The following table is used:

Service	Rate
0-3	6.00%
4	4.75%
5	3.50%
6	2.25%
7-9	2.00%
10	1.50%
11	1.00%
12	0.80%
13	0.60%
14-19	0.40%
20	0.00%

5. Retirement age

30 or More Years of Service

Age	Probability of Retirement
55-61	60%
62	100%

Less than 30 Years of Service

Age	Probability of Retirement
55-61	33%
62	100%

Inactive vested members are assumed to begin receiving benefits at age 55.

6. Salary scale

Year	Increase
1	8.50%
5	7.00%
10	7.00%
15	4.50%
20+	4.00%

7. Post-retirement adjustments — Same as for retired members.

Retired Members and Other Beneficiaries:

1. Mortality rate - Service retirees — Service retirements and beneficiaries: RP-2014 Total Dataset Mortality Table with a one-year age set-back for males and Generational Projection, using MP-2016.

2. Mortality rate - Disabled retirees — Disability retirements: RP-2014 Total Dataset Mortality Table with a four-year age set-forward for males and Generational Projection, using MP-2016.

3. Annual readjustment of pensions — Wages for the same rank are assumed to increase 3.50%.

Dependency Ratios:

1.	Ordinary death benefit	Alternate benefits payable to widow and minor children in 90% of cases.
2.	Pension to spouse and children of deceased pensioned member	In 90% of cases, with 1 child per member.

Interest Credited to Member Contributions: 4.00% per year.

Marriage Assumption: 90% married, with males 4 years older than females.

Administrative Expenses: Based on actual amount for the prior year increased with inflation.

Actuarial Cost Method

Liabilities and contributions shown in this report are computed using the Individual Entry Age method of funding.

Sometimes called "funding method," this is a particular technique used by actuaries for establishing the amount of the annual actuarial cost of pension System benefits, or normal cost, and the related unfunded actuarial accrued liability. Ordinarily the annual contribution to the System is comprised of (1) the normal cost and (2) an amortization payment on the unfunded actuarial accrued liability.

Under the Entry Age Actuarial Cost Method, the **Normal Cost** is computed as the level percentage of pay which, if paid from the earliest time each member would have been eligible to join the System if it then existed (thus, entry age) until his retirement or termination, would accumulate with interest at the rate assumed in the valuation to a fund sufficient to pay all benefits under the System.

The **Actuarial Accrued Liability** under this method at any point in time is the theoretical amount of the fund that would have accumulated had annual contributions equal to the normal cost been made in prior years (it does not represent the liability for benefits accrued to the valuation date). The **Unfunded Actuarial Accrued Liability (UAAL)** is the excess of the actuarial accrued liability over the actuarial value of System assets on the valuation date.

Under this method experience gains or losses, i.e. decreases or increases in accrued liabilities attributable to deviations in experience from the actuarial assumptions, adjust the unfunded actuarial accrued liability.

UAAL Amortization Method

The recommendation is to continue to amortize the legacy unfunded actuarial accrued liability as of July 1, 2017, as a level percent of payroll, over a closed 30-year period beginning July 1, 2008. New layers of unfunded actuarial accrued liability will be created on each actuarial valuation date and will be amortized, as a level percent of payroll, over a new 20-year period. Changes in the unfunded actuarial accrued liability that are created by a change in assumptions or changes in benefit structure will be amortized over a reasonable time period as selected by the Board after consultation with their actuary. If the System's funded ratio reaches or exceeds 100%, all amortization bases will be eliminated and the surplus (actuarial assets minus actuarial liability) will be amortized over an open 30 year period.

Asset Valuation Method

The System uses an asset valuation method to smooth the effects of market fluctuations. The actuarial value of assets spreads the difference between the actual return and the expected return evenly over five years.

Actuarial Assumptions

Investment Return: 6.50% per year.

Price Inflation: 2.50% per year.

Payroll Growth: 2.75% per year, including price inflation.

Active Members:

1. Ordinary death rate — Pub-2010 Safety Employees Median Mortality Table, set back 2 years for males and females, projected generationally using Scale MP-2021.

2. Accidental death rate — 8.5 deaths per 10,000 exposed for one year.

3. Disability rates

Age	Accidental Disability	Ordinary Disability
20	0.029%	0.007%
25	0.101%	0.025%
30	0.173%	0.043%
35	0.245%	0.061%
40	0.328%	0.082%
45	0.464%	0.116%
50	0.664%	0.166%

80% of disabilities are assumed to be accidental.

4. Withdrawal rate — The following table is used:

Service	Rate
0-3	4.00%
4	3.25%
5	2.75%
6	2.00%
7-10	1.50%
11	1.00%
12	0.75%
13	0.50%
14-19	0.25%
20	0.00%

5. Retirement age

Service	Probability of Retirement
22-27	6%
28	15%
29	15%
30	20%
31	60%
32	100%

Inactive vested members are assumed to begin receiving benefits at age 55.

6. Salary scale

Year	Increase
1	8.50%
5	7.50%
10	7.50%
15	4.50%
20+	4.00%

7. Post-retirement adjustments — Same as for retired members.

Retired Members and Other Beneficiaries:

1. Mortality rate - Service retirees — Pub-2010 Safety Retirees Median Mortality Table, set back 2 years for males and females, projected generationally using Scale MP-2021.

2. Mortality rates - Beneficiaries — Pub-2010 Contingent Survivors Mortality Table, set back 2 years for males and females, projected generationally using Scale MP-2021.

3. Mortality rate - Disabled retirees — Pub-2010 Safety Disabled Retirees Mortality Table, set back 2 years for males and females, projected generationally using Scale MP-2021.

4. Annual readjustment of pensions — Wages for the same rank are assumed to increase 3.50%.

Dependency Ratios:

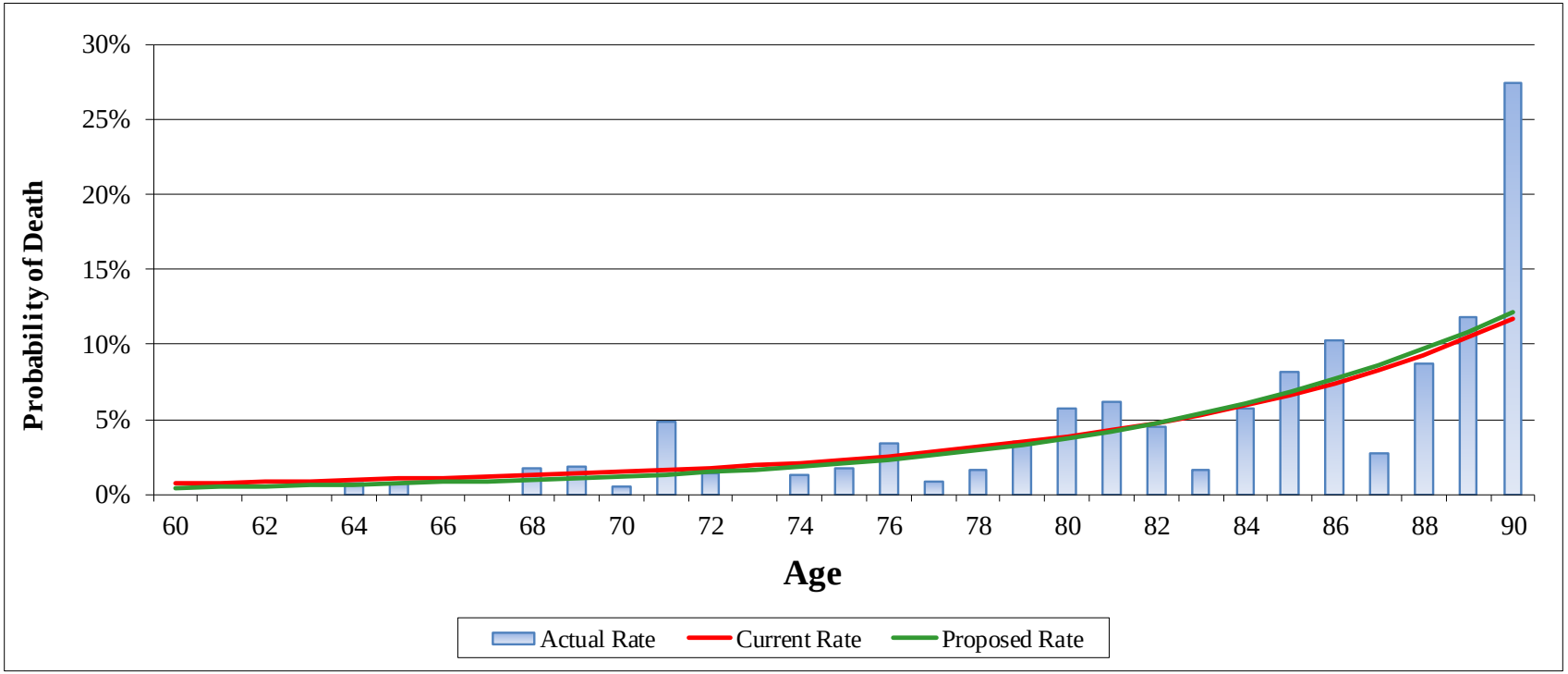
1.	Ordinary death benefit	Alternate benefits payable to widow and minor children in 90% of cases.
2.	Pension to spouse and children of deceased pensioned member	In 90% of cases, with 1 child per member.

Interest Credited to Member Contributions: 4.00% per year.

Marriage Assumption: 90% married, with males 4 years older than females.

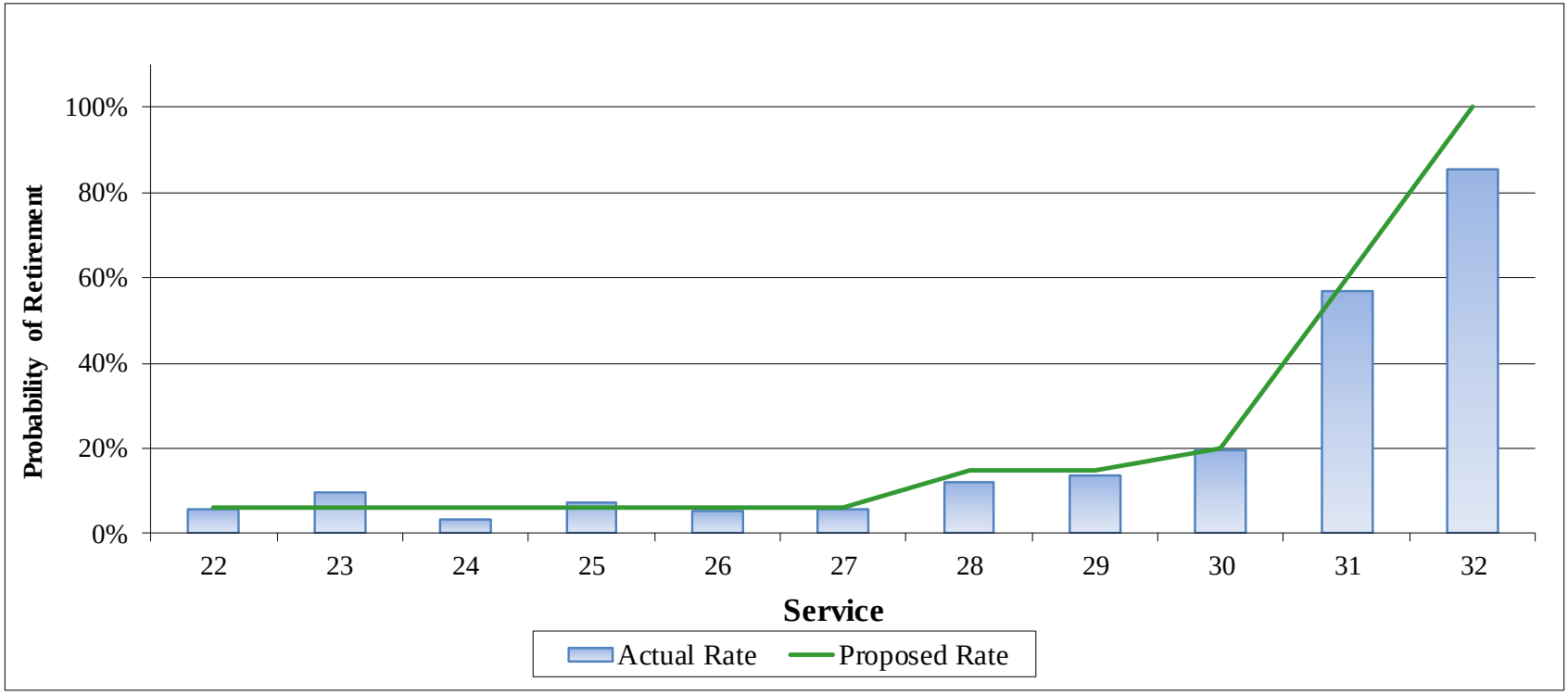
Administrative Expenses: Based on actual amount for the prior year increased with inflation.

EXHIBIT C-1
Mortality



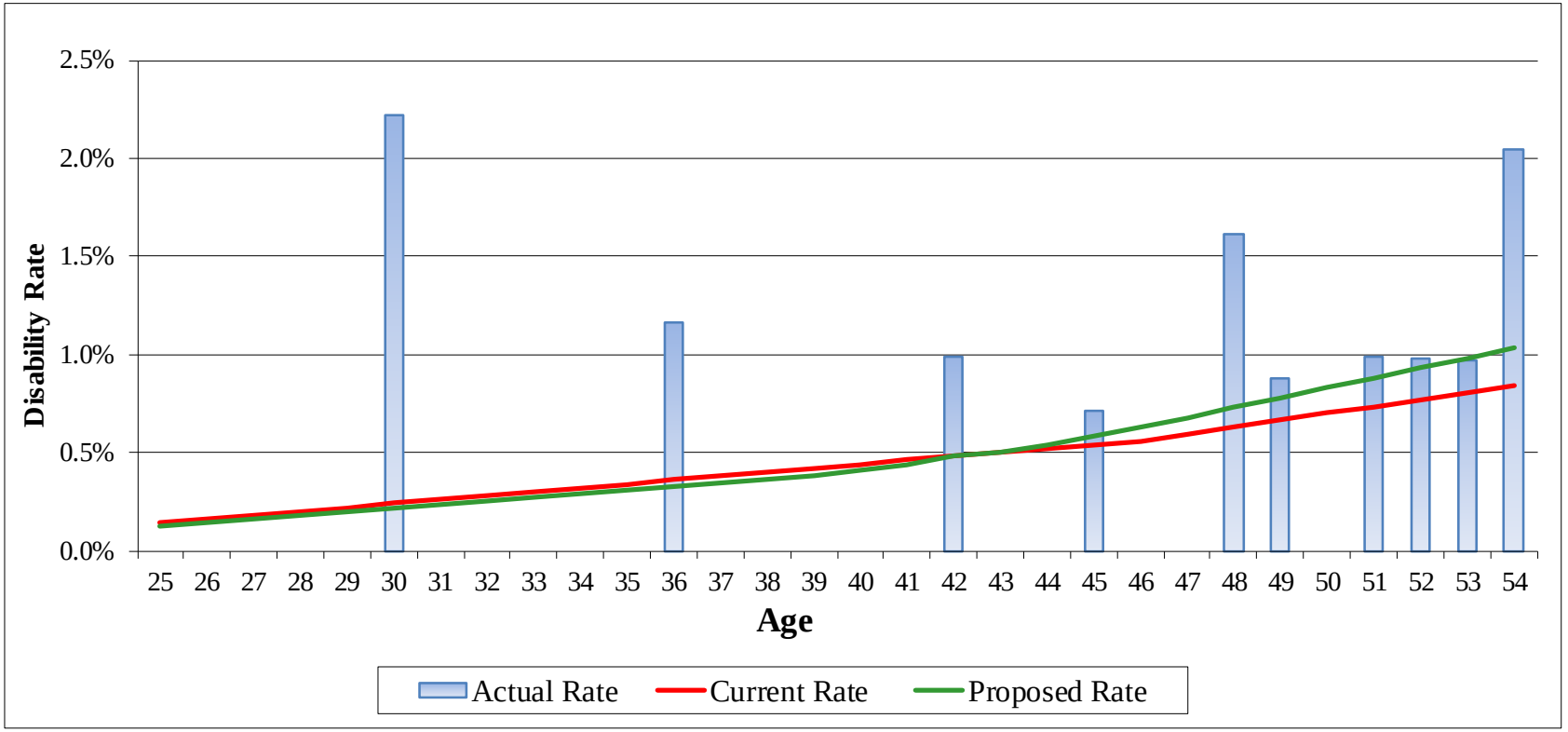
	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Weighted Count	3,265,598	3,691,658	3,321,793
Actual/Expected		88%	98%

EXHIBIT C-2
Retirement



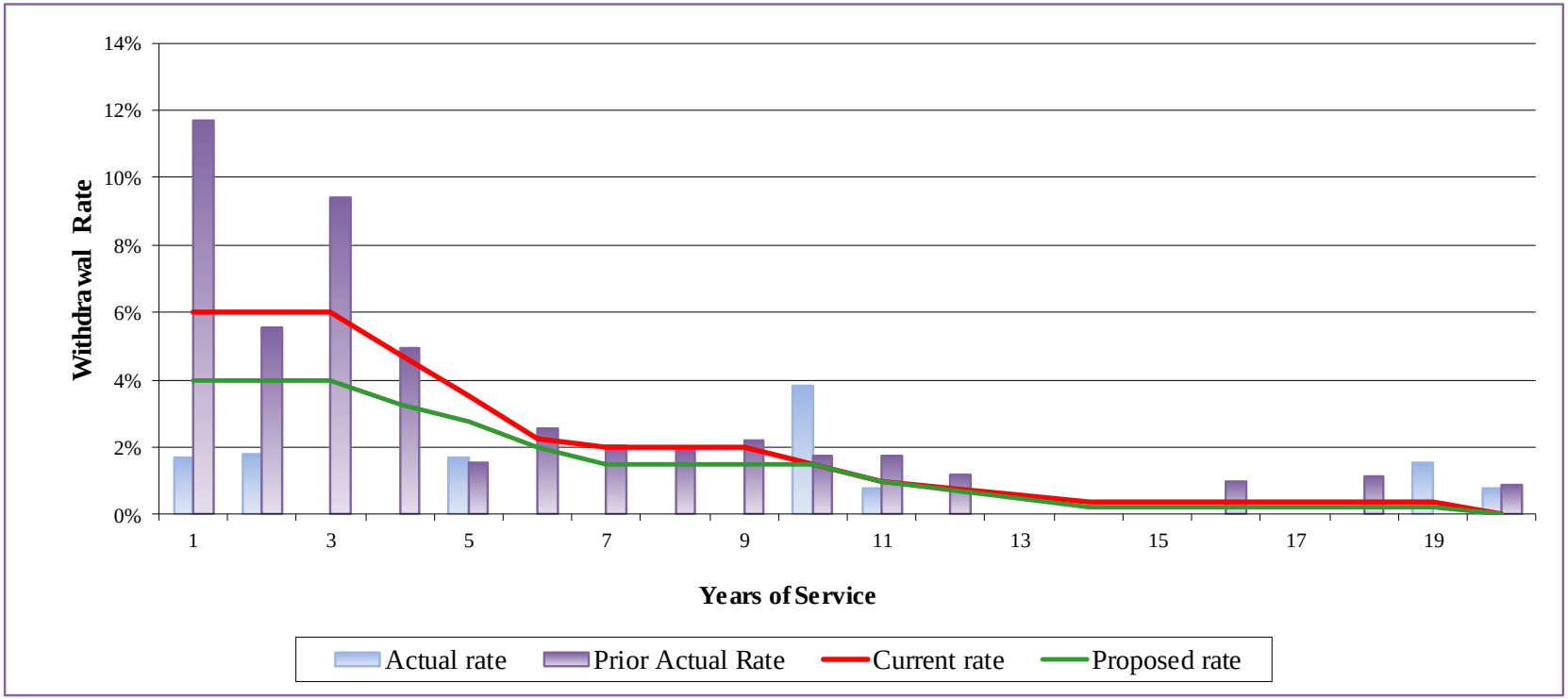
	Actual	Expected - Proposed Assumptions
Weighted Count	240	260
Actual/Expected		92%

EXHIBIT C-3
Disability



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Total Count	12	13	14
Actual/Expected		92%	86%

EXHIBIT C-4
Termination of Employment



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Weighted Count	9	11	9
Actual/Expected		86%	107%

EXHIBIT C-5
Salary Increases

	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions
Average Increase	4.51%	4.86%	4.96%
Actual/Expected		93%	91%

EXHIBIT D-1
Mortality

Age	Exposure	Actual Deaths	Actual Rate	Current Expected	Current Rate	Proposed Expected	Proposed Rate
60	8,516,205	-	0.000%	61,701.6	0.725%	36,034.3	0.423%
61	8,717,550	-	0.000%	67,385.0	0.773%	41,316.4	0.474%
62	8,691,157	-	0.000%	71,716.6	0.825%	46,066.6	0.530%
63	8,513,190	-	0.000%	75,066.8	0.882%	50,349.7	0.591%
64	8,098,873	56,450	0.697%	76,437.0	0.944%	53,234.8	0.657%
65	8,380,761	56,878	0.679%	84,825.7	1.012%	61,002.5	0.728%
66	8,243,065	-	0.000%	89,660.4	1.088%	66,315.1	0.804%
67	8,405,260	-	0.000%	98,465.2	1.171%	74,644.9	0.888%
68	8,495,674	145,120	1.708%	107,441.4	1.265%	83,249.7	0.980%
69	8,605,212	157,528	1.831%	117,790.2	1.369%	93,127.0	1.082%
70	8,063,502	43,835	0.544%	119,810.6	1.486%	96,521.7	1.197%
71	7,569,975	365,369	4.827%	122,407.4	1.617%	100,496.5	1.328%
72	6,730,361	90,447	1.344%	118,707.5	1.764%	99,385.9	1.477%
73	6,319,371	-	0.000%	121,892.9	1.929%	104,150.3	1.648%
74	6,264,326	80,711	1.288%	132,437.4	2.114%	115,489.5	1.844%
75	5,660,260	99,339	1.755%	131,462.2	2.323%	116,948.5	2.066%
76	5,745,580	197,563	3.439%	146,894.4	2.557%	133,348.0	2.321%
77	5,176,611	41,964	0.811%	145,984.4	2.820%	135,147.6	2.611%
78	4,869,173	76,704	1.575%	151,816.6	3.118%	143,146.3	2.940%
79	4,262,626	150,932	3.541%	147,238.3	3.454%	141,226.8	3.313%
80	3,924,303	225,254	5.740%	150,469.9	3.834%	146,629.3	3.736%
81	3,498,827	215,815	6.168%	149,233.7	4.265%	147,500.2	4.216%
82	2,913,986	130,145	4.466%	138,527.5	4.754%	138,627.5	4.757%
83	2,651,455	42,581	1.606%	140,667.8	5.305%	142,345.0	5.369%
84	2,489,405	143,776	5.776%	147,623.8	5.930%	150,786.0	6.057%
85	2,255,992	184,268	8.168%	149,673.4	6.634%	153,967.7	6.825%
86	1,799,935	184,220	10.235%	133,722.6	7.429%	138,321.5	7.685%
87	1,526,418	42,288	2.770%	127,040.6	8.323%	131,893.5	8.641%
88	1,332,316	115,884	8.698%	124,216.0	9.323%	129,260.3	9.702%
89	1,172,271	138,966	11.854%	122,405.6	10.442%	127,450.8	10.872%
90	1,017,311	279,561	27.480%	118,935.8	11.691%	123,808.9	12.170%
	169,910,950	3,265,598	1.922%	3,691,658.3	2.173%	3,321,792.9	1.955%

EXHIBIT D-2
Retirement

Duration	Exposure	Actual Retirements	Actual Rate	Proposed Expected	Proposed Rate
22	68	4	5.533%	4.1	6.000%
23	88	9	9.866%	5.3	6.000%
24	133	4	3.249%	8.0	6.000%
25	163	12	7.098%	9.8	6.000%
26	215	11	5.276%	12.9	6.000%
27	211	12	5.709%	12.6	6.000%
28	221	27	12.070%	33.2	15.000%
29	170	23	13.821%	25.5	15.000%
30	151	30	19.719%	30.2	20.000%
31	125	71	56.949%	74.9	60.000%
32	44	37	85.539%	43.6	100.000%
	1,587	240	15.116%	259.9	16.374%

EXHIBIT D-3
Disability

Age	Exposure	Actual Disabilities	Actual Rate	Current Expected	Current Rate	Proposed Expected	Proposed Rate
25	26	-	0.000%	0.0	0.140%	0.0	0.126%
26	34	-	0.000%	0.1	0.160%	0.0	0.144%
27	40	-	0.000%	0.1	0.180%	0.1	0.162%
28	37	-	0.000%	0.1	0.200%	0.1	0.180%
29	38	-	0.000%	0.1	0.220%	0.1	0.198%
30	45	1	2.222%	0.1	0.240%	0.1	0.216%
31	52	-	0.000%	0.1	0.260%	0.1	0.234%
32	61	-	0.000%	0.2	0.280%	0.2	0.252%
33	71	-	0.000%	0.2	0.300%	0.2	0.270%
34	78	-	0.000%	0.2	0.320%	0.2	0.288%
35	81	-	0.000%	0.3	0.340%	0.2	0.306%
36	86	1	1.163%	0.3	0.360%	0.3	0.324%
37	81	-	0.000%	0.3	0.380%	0.3	0.342%
38	80	-	0.000%	0.3	0.400%	0.3	0.360%
39	79	-	0.000%	0.3	0.420%	0.3	0.380%
40	72	-	0.000%	0.3	0.440%	0.3	0.410%
41	89	-	0.000%	0.4	0.460%	0.4	0.440%
42	101	1	0.990%	0.5	0.480%	0.5	0.480%
43	114	-	0.000%	0.6	0.500%	0.6	0.500%
44	122	-	0.000%	0.6	0.520%	0.7	0.540%
45	140	1	0.714%	0.8	0.540%	0.8	0.580%
46	138	-	0.000%	0.8	0.560%	0.9	0.630%
47	136	-	0.000%	0.8	0.595%	0.9	0.680%
48	124	2	1.613%	0.8	0.630%	0.9	0.730%
49	114	1	0.877%	0.8	0.665%	0.9	0.780%
50	108	-	0.000%	0.8	0.700%	0.9	0.830%
51	101	1	0.990%	0.7	0.735%	0.9	0.880%
52	102	1	0.980%	0.8	0.770%	0.9	0.930%
53	103	1	0.971%	0.8	0.805%	1.0	0.980%
54	98	2	2.041%	0.8	0.840%	1.0	1.030%
	2,551	12	0.470%	13.0	0.508%	14.0	0.550%

EXHIBIT D-4
Termination of Employment

Duration	Exposure	Actual Terminations	Actual Rate	Current Expected	Current Rate	Proposed Expected	Proposed Rate
1	3	0	1.692%	0.2	6.000%	0.1	4.000%
2	8	0	1.781%	0.5	6.000%	0.3	4.000%
3	8	-	0.000%	0.5	6.000%	0.3	4.000%
4	9	-	0.000%	0.4	4.750%	0.3	3.250%
5	16	0	1.717%	0.6	3.500%	0.4	2.750%
6	16	-	0.000%	0.4	2.250%	0.3	2.000%
7	11	-	0.000%	0.2	2.000%	0.2	1.500%
8	23	-	0.000%	0.5	2.000%	0.3	1.500%
9	41	-	0.000%	0.8	2.000%	0.6	1.500%
10	87	3	3.823%	1.3	1.500%	1.3	1.500%
11	118	1	0.760%	1.2	1.000%	1.2	1.000%
12	137	-	0.000%	1.1	0.800%	1.0	0.750%
13	135	-	0.000%	0.8	0.600%	0.7	0.500%
14	117	-	0.000%	0.5	0.400%	0.3	0.250%
15	54	-	0.000%	0.2	0.400%	0.1	0.250%
16	44	-	0.000%	0.2	0.400%	0.1	0.250%
17	84	-	0.000%	0.3	0.400%	0.2	0.250%
18	137	-	0.000%	0.5	0.400%	0.3	0.250%
19	188	3	1.558%	0.8	0.400%	0.5	0.250%
20	215	2	0.809%	-	0.000%	-	0.000%
	1,451	9	0.644%	10.9	0.751%	8.7	0.599%

EXHIBIT D-5
Salary Increases

Duration	Initial Salary (Millions)	Subsequent Salary (Millions)	Actual Rate	Current Expected (Millions)	Current Rate	Proposed Expected (Millions)	Proposed Rate
1	3.3	3.6	10.3%	3.5	8.5%	3.5	8.5%
2	3.8	4.1	8.1%	4.0	7.0%	4.1	8.0%
3	2.8	3.0	7.5%	3.0	7.0%	3.0	7.8%
4	2.1	2.3	7.4%	2.3	7.0%	2.3	7.5%
5	3.1	3.4	7.8%	3.4	7.0%	3.4	7.5%
6	2.7	2.9	7.1%	2.9	7.0%	2.9	7.5%
7	1.6	1.7	6.8%	1.7	7.0%	1.7	7.5%
8	2.9	3.1	7.4%	3.1	7.0%	3.1	7.5%
9	4.6	4.9	7.8%	4.9	7.0%	4.9	7.5%
10	8.3	8.9	8.0%	8.9	7.0%	8.9	7.5%
11	10.6	11.4	7.0%	11.3	6.5%	11.3	6.8%
12	11.4	12.1	6.2%	12.1	6.0%	12.1	6.0%
13	10.4	11.0	5.7%	11.0	5.5%	11.0	5.5%
14	8.3	8.7	4.8%	8.7	5.0%	8.7	5.0%
15	3.5	3.7	4.8%	3.7	4.5%	3.7	4.5%
16	2.7	2.8	3.9%	2.8	4.0%	2.8	4.0%
17	4.9	5.1	3.9%	5.1	4.0%	5.1	4.0%
18	7.6	7.8	3.3%	7.9	4.0%	7.9	4.0%
19	9.7	10.0	3.2%	10.1	4.0%	10.1	4.0%
20	10.7	11.1	3.7%	11.1	4.0%	11.1	4.0%
21	12.2	12.6	3.3%	12.7	4.0%	12.7	4.0%
22	14.1	14.6	3.3%	14.7	4.0%	14.7	4.0%
23	14.9	15.4	3.0%	15.5	4.0%	15.5	4.0%
24	14.1	14.5	2.9%	14.7	4.0%	14.7	4.0%
25	12.0	12.3	2.7%	12.5	4.0%	12.5	4.0%
26	10.5	10.9	3.1%	11.0	4.0%	11.0	4.0%
27	8.0	8.3	3.1%	8.3	4.0%	8.3	4.0%
28	5.2	5.3	3.2%	5.4	4.0%	5.4	4.0%
29	4.9	5.0	3.1%	5.1	4.0%	5.1	4.0%
30	4.0	4.1	2.9%	4.1	4.0%	4.1	4.0%
	215.0	224.7	4.5%	225.4	4.8%	225.6	4.9%