



Orange County Employees Retirement System

ACTUARIAL EXPERIENCE STUDY

Analysis of Actuarial Experience
During the Period
January 1, 2014 through December 31, 2016



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August 14, 2017

Board of Retirement
Orange County Employees Retirement System
2223 Wellington Avenue
Santa Ana, CA 92701

Re: Review of Actuarial Assumptions for the December 31, 2017 Actuarial Valuation

Dear Members of the Board:

We are pleased to submit this report of our review of the actuarial experience for the Orange County Employees Retirement System. This study utilizes the census data for the period January 1, 2014 to December 31, 2016 and provides the proposed actuarial assumptions, both economic and demographic, to be used in the December 31, 2017 valuation.

We are members of the American Academy of Actuaries and we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein.

We look forward to reviewing this report with you and answering any questions you may have.

Sincerely,

A handwritten signature in black ink, appearing to read "Paul Angelo", written over a horizontal line.

Paul Angelo, FSA, MAAA, FCA, EA
Senior Vice President and Actuary

A handwritten signature in black ink, appearing to read "Andy Yeung", written over a horizontal line.

Andy Yeung, ASA, MAAA, FCA, EA
Vice President and Actuary

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Table of Contents

Actuarial Experience Study

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During the Period January 1, 2014 through December 31, 2016

I. Introduction, Summary, and Recommendations	1
II. Background and Methodology	6
Economic Assumptions	6
Demographic Assumptions.....	6
III. Economic Assumptions.....	8
A. Inflation.....	8
B. Investment Return.....	10
C. Salary Increase	17
IV. Demographic Assumptions.....	24
A. Retirement Rates	24
B. Mortality Rates - Healthy.....	39
C. Mortality Rates - Disabled.....	46
D. Termination Rates.....	49
E. Disability Incidence Rates	55
F. Additional Cashouts	59
V. Cost Impact.....	60
Appendix A: Current Actuarial Assumptions	65
Appendix B: Proposed Actuarial Assumptions	72

I. Introduction, Summary, and Recommendations

To project the cost and liabilities of the pension plan, assumptions are made about all future events that could affect the amount and timing of the benefits to be paid and the assets to be accumulated. Each year actual experience is compared against the projected experience, and to the extent there are differences, the future contribution requirement is adjusted.

If assumptions are modified, contribution requirements are adjusted to take into account a change in the projected experience in all future years. There is a great difference in both philosophy and cost impact between recognizing the actuarial deviations as they occur annually and changing the actuarial assumptions. Taking into account one year's gains or losses without making a change in the assumptions means that year's experience is treated as temporary and that, over the long run, experience will return to what was originally assumed. Changing assumptions reflects a basic change in thinking about the future, and it has a much greater effect on the current contribution requirements than recognizing gains or losses as they occur.

The use of realistic actuarial assumptions is important in maintaining adequate funding, while paying the promised benefit amounts to participants already retired and to those near retirement. The actuarial assumptions used do not determine the "actual cost" of the plan. The actual cost is determined solely by the benefits and administrative expenses paid out, offset by investment income received. However, it is desirable to estimate as closely as possible what the actual cost will be so as to permit an orderly method for setting aside contributions today to provide benefits in the future, and to maintain equity among generations of participants and taxpayers.

This study was undertaken in order to review the economic and demographic actuarial assumptions and to compare the actual experience with that expected under the current assumptions during the three-year experience period from January 1, 2014 through December 31, 2016. The study was performed in accordance with Actuarial Standard of Practice (ASOP) No. 27 "Selection of Economic Assumptions for Measuring Pension Obligations" and ASOP No. 35, "Selection of Demographic and Other Non-Economic Assumptions for Measuring Pension Obligations." These Standards of Practice put forth guidelines for the selection of the various actuarial assumptions utilized in a pension plan actuarial valuation. Based on the study's results and expected future experience, we are recommending various changes in the current actuarial assumptions.

We are recommending changes in the assumptions for investment return, salary increases, retirement from active employment, retirement age for inactive vested members, reciprocity, pre-retirement mortality, post-retirement healthy and disabled life mortality, termination (refunds and deferred vested retirements), disability (non-service connected and service connected) and additional cashouts.

Our recommendations for the major actuarial assumption categories are as follows, along with reasonable alternative economic assumptions also developed in this report.

Pg #	Actuarial Assumption Categories	Recommendation
6	<p>Inflation: Future increases in the Consumer Price Index (CPI), which drives investment returns and active member salary increases, as well as cost-of-living adjustments (COLAs) for retirees.</p>	<p>Maintain the assumed rate of price inflation at 3.00% per annum as discussed in Section III (A).</p> <p>Alternative: Reduce price inflation to 2.75% per annum.</p>
10	<p>Investment Return: The estimated average future net rate of return on current and future assets of the System as of the valuation date. This rate is used to discount liabilities.</p>	<p>Reduce the current investment return assumption from 7.25% per annum to 7.00% per annum as discussed in Section III (B).</p> <p>Alternative 1: 7.00% investment return with 2.75% inflation.</p> <p>Alternative 2: 6.75% investment return with 2.75% inflation.</p>
17	<p>Individual Salary Increases: Increases in the salary of a member between the date of the valuation to the date of separation from active service. This assumption has three components:</p> <ul style="list-style-type: none"> • Inflationary salary increases • Real “across the board” salary increases • Merit and promotional increases 	<p>Maintain the current inflationary salary increase assumption at 3.00% and maintain the current real “across the board” salary increase assumption at 0.50%. This means that the combined inflationary and real “across the board” salary increases will remain unchanged at 3.50%.</p> <p>Alternative: 2.75% inflation and 3.25% combined inflationary and real “across the board” salary increases.</p> <p>We recommend adjusting the merit and promotional rates of salary increase as developed in Section III (C) to reflect past experience. The recommended assumptions anticipate slightly higher salary increases for General and slightly lower salary increases for Safety.</p>
24	<p>Retirement Rates: The probability of retirement at each age at which participants are eligible to retire.</p> <p>Other Retirement Related Assumptions including:</p> <ul style="list-style-type: none"> • Percent married and spousal age differences for members not yet retired • Retirement age for inactive vested members • Future reciprocal members and reciprocal salary increases 	<p>We recommend adjusting the retirement rates to those developed in Section IV (A).</p> <p>For active and inactive vested members, increase the percent married at retirement assumption for females from 50% to 55% and maintain the assumption at 75% for males. For inactive vested members, increase the assumed retirement age from 58 to 59 for General members and maintain the assumed retirement age at 53 for Safety members.</p> <p>Reduce the current proportion of future terminated members expected to be covered by a reciprocal system from 20% to 15% for General members and from 30% to 25% for Safety members. In addition, increase the current reciprocal salary increase assumption from 4.25% to 4.50% for General members and maintain the current reciprocal salary increase assumption at 5.00% for Safety members.</p>

Pg #	Actuarial Assumption Categories	Recommendation
39	Mortality Rates: The probability of dying at each age. Mortality rates are used to project life expectancies.	For members who retire from service, we recommend adjusting the rates as developed in Section IV (B) for General and Safety members and all beneficiaries to reflect a generational approach for anticipating future mortality improvement.
46		The disabled member mortality rates for General and Safety members have also been adjusted as developed in Section IV (C). The recommended pre-retirement mortality assumptions for General and Safety members have been adjusted as developed in Section IV (B). In addition, we recommend maintaining the assumption that all General pre-retirement deaths and 90% of Safety pre-retirement deaths are assumed to be non-service connected deaths.
49	Termination Rates: The probability of leaving employment at each age and receiving either a refund of member contributions or a deferred vested retirement benefit.	We recommend adjusting the termination rates to those developed in Section IV (D) to reflect a slightly lower incidence of termination for General All Other (non-OCTA) members, General OCTA members and Safety members. In addition, a lower proportion of members is expected to elect a withdrawal of member contributions with a higher proportion electing instead to receive a deferred vested benefit under the recommended assumptions.
55	Disability Incidence Rates: The probability of becoming disabled at each age.	We recommend adjusting the disability rates to those developed in Section IV (E) to reflect slightly higher incidence of disability for General All Other and Safety members and slightly lower incidence of disability for General OCTA members.
59	Additional Cashouts: Additional pay elements that are expected to be received during the member's final average earnings period.	We recommend adjusting the additional cashout assumptions to those developed in Section IV (F) to reflect recent years' experience.

We have estimated the impact of the recommended and alternative assumption changes as if they were applied to the December 31, 2016 actuarial valuation.

Cost Impact of Recommended Assumptions		
<u>Change in Costs</u>	<u>Contribution Rate</u>	<u>Estimated Annual Dollar Amount in Thousands*</u>
Total Normal Cost	3.68%	\$65,260
Member Normal Cost	1.61%	\$28,559
Employer Normal Cost	2.07%	\$36,701
Employer UAAL Payments	<u>5.87%</u>	<u>\$103,710</u>
Total for Employer	7.94%	\$140,411

* Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.

Cost Impact of Alternative 1 Assumptions (7.00% Investment Return Assumption & 2.75% Inflation)		
<u>Change in Costs</u>	Contribution Rate	Estimated Annual Dollar Amount in Thousands*
Total Normal Cost	1.88%	\$32,321
Member Normal Cost	0.77%	\$13,232
Employer Normal Cost	1.11%	\$19,089
Employer UAAL Payments	<u>3.53%</u>	<u>\$61,450</u>
Total for Employer	4.64%	\$80,539

* Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.

Cost Impact of Alternative 2 Assumptions (6.75% Investment Return Assumption & 2.75% Inflation)		
<u>Change in Costs</u>	Contribution Rate	Estimated Annual Dollar Amount in Thousands*
Total Normal Cost	3.77%	\$65,566
Member Normal Cost	1.59%	\$27,567
Employer Normal Cost	2.18%	\$37,999
Employer UAAL Payments	<u>5.84%</u>	<u>\$102,078</u>
Total for Employer	8.02%	\$140,077

* Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.

The breakdown of the contribution impacts due only to the recommended demographic assumption changes (as recommended in Section IV of this report) and the contribution rate impacts (after implementing the demographic assumption changes) due to the recommended and alternative economic assumption changes (as recommended in Section III of this report), as well as the changes in funded status, are summarized in the following table.

Cost Impact			
	Recommended (7.00% Return & 3.00% Inflation)	Alternative 1 (7.00% Return & 2.75% Inflation)	Alternative 2 (6.75% Return & 2.75% Inflation)
<u>Impact on Employer</u>			
Change due to demographic assumptions	3.94%	3.94%	3.94%
Change due to economic assumptions	<u>4.00%</u>	<u>0.70%</u>	<u>4.08%</u>
Total change in employer rate	7.94%	4.64%	8.02%
Total estimated change in annual dollar amount (\$000s)	\$140,411	\$80,539	\$140,077
<u>Impact on Member</u>			
Change due to demographic assumptions	0.57%	0.57%	0.57%
Change due to economic assumptions	<u>1.04%</u>	<u>0.20%</u>	<u>1.02%</u>
Total change in member rate	1.61%	0.77%	1.59%
Total estimated change in annual dollar amount (\$000s)	\$28,559	\$13,232	\$27,567
<u>Impact on UAAL and Funded Percentage</u>			
Change in UAAL	\$1,404 million	\$763 million	\$1,385 million
Change in funded percentage	From 73.1% to 67.7%	From 73.1% to 70.1%	From 73.1% to 67.9%

Section II provides some background on the basic principles and methodology used for the experience study and for the review of the economic and demographic actuarial assumptions. A detailed discussion of each assumption and reasons for the proposed changes are found in Section III for the economic assumptions and Section IV for the demographic assumptions. The cost impact of the proposed changes is detailed in Section V.

II. Background and Methodology

In this report, we analyzed both economic and demographic (“non-economic”) assumptions. The primary economic assumptions reviewed are inflation, investment return, and salary increases. Demographic assumptions include the probabilities of certain events occurring in the population of members, referred to as “decrements,” e.g., termination from service, disability retirement, service retirement, and death before and after retirement. In addition to decrements, other demographic assumptions reviewed in this study include the percentage of members with an eligible spouse or domestic partner, spousal age difference, percentage of members assumed to go on to work for a reciprocal system, reciprocal salary increases and additional cashouts.

Economic Assumptions

Economic assumptions consist of:

- **Inflation:** Increases in the price of goods and services. The inflation assumption reflects the basic return that investors expect from securities markets. It also reflects the expected basic salary increase for active employees and drives increases in the allowances of retired members.
- **Investment Return:** Expected long-term rate of return on the System’s investments after expenses. This assumption has a significant impact on contribution rates.
- **Salary Increases:** In addition to inflationary increases, it is assumed that salaries will also grow by “across the board” real pay increases in excess of price inflation. It is also assumed that employees will receive raises above these average increases as they advance in their careers. These are commonly referred to as merit and promotional increases. Payments to amortize any Unfunded Actuarial Accrued Liability (UAAL) are assumed to increase each year by the price inflation rate plus any “across the board” real pay increases that are assumed.

The setting of these economic assumptions is described in Section III.

Demographic Assumptions

In order to determine the probability of an event occurring, we examine the “decrements” and “exposures” of that event. For example, taking termination from service, we compare the number of employees who actually terminate in a certain age and/or service category (i.e., the number of “decrements”) with those who could have terminated (i.e., the number of “exposures”). For example, if there were 500 active employees in the 20-24 age group at the beginning of the year and 50 of them terminate during the year, we would say the probability of termination in that age group is $50 \div 500$ or 10%.

The reliability of the resulting probability is highly dependent on both the number of decrements and the number of exposures. For example, if there are only a few people in a high age category at the beginning of the year (number of exposures), we would not lend as much credibility to the

probability of termination developed for that age category, especially if it is out of line with the pattern shown for the other age groups. Similarly, if we are considering the death decrement, there may be a large number of exposures in, say, the age 20-24 category, but very few decrements (actual deaths); therefore, we would not be able to rely heavily on the probability developed for that category.

One reason we use several years of experience for such a study is to have more exposures and decrements, and therefore more statistical reliability. Another reason for using several years of data is to smooth out fluctuations that may occur from one year to the next. However, we also calculate the rates on a year-to-year basis to check for any trend that may be developing in the later years.

III. Economic Assumptions

A. Inflation

Unless an investment grows at least as fast as prices increase, investors will experience a reduction in the inflation-adjusted value of their investment. There may be times when “riskless” investments return more or less than inflation, but over the long term, investment market forces will generally require an issuer of fixed income securities to maintain a minimum return which protects investors from inflation.

The inflation assumption is long term in nature, so our analysis included a review of historical information. Following is an analysis of 15 and 30 year moving averages of historical inflation rates:

HISTORICAL CONSUMER PRICE INDEX – 1930 TO 2016¹ (U.S. City Average - All Urban Consumers)

	25 th Percentile	Median	75 th Percentile
15-year moving averages	2.5%	3.4%	4.5%
30-year moving averages	3.1%	3.9%	4.8%

The average inflation rates have continued to decline gradually over the last several years due to the relatively low inflationary period over the past two decades. Also, the later of the 15-year averages during the period are lower as they do not include the high inflation years of the mid-1970s and early 1980s.

Based on information found in the Public Plans Data website, which is produced in partnership with the National Association of State Retirement Administrators (NASRA), the median inflation assumption used by 142 large public retirement funds in their 2015 fiscal year valuations was 3.00%. In California, San Mateo County uses an inflation assumption of 2.50%, CalPERS, CalSTRS, Contra Costa County, Los Angeles County, and two other 1937 Act CERL systems use an inflation assumption of 2.75%, San Joaquin County uses an inflation assumption of 2.90% while OCERS and eleven other 1937 Act CERL systems use an inflation assumption of 3.00%.

OCERS’ investment consultant, Meketa, anticipates an annual inflation rate of 2.60%, while the average inflation assumption provided by Meketa and seven other investment advisory firms retained by Segal’s California public sector clients was 2.32%. Note that, in general, investment consultants use a time horizon² for this assumption that is shorter than the time horizon of the actuarial valuation.

¹ Source: Bureau of Labor Statistics – Based on CPI for All items in U.S. city average, all urban consumers, not seasonally adjusted (Series Id: CUUR0000SA0)

² After removing an outlier, the time horizon used by the remaining seven investment consultants included in our review range from 10 years to 30 years. Most of those investment consultants use 10 years and Meketa uses 20 years.

To find a forecast of inflation based on a longer time horizon, we referred to the 2017 report on the financial status of the Social Security program.³ The projected average increase in the Consumer Price Index (CPI) over the next 75 years under the intermediate cost assumptions used in that report was 2.60%. (Besides projecting the results under the intermediate cost assumptions using an inflation of 2.60%, alternative projections were also made using a lower and a higher inflation assumption of 2.00% and 3.20%, respectively.)

We also compared the yields on the thirty-year inflation indexed U.S. Treasury bonds to comparable traditional U.S. Treasury bonds.⁴ As of June 2017, the difference in yields is about 1.87%, which provides a measure of market expectations of inflation.

Based on all of the above information, we recommend that the current 3.00% annual inflation assumption be maintained for the December 31, 2017 actuarial valuation.

The setting of the inflation assumption using the information outlined above is a somewhat subjective process, and Segal does not apply a specific weight to each of the metrics in determining our recommended inflation assumption. Based on a consideration of all these metrics, we have recently been recommending the same 3.00% inflation assumption in our experience studies for our California based public retirement system clients.

However, we note that the metrics presented above could also lead to a lower inflation assumption, and that in particular Segal would find 2.75% to be a reasonable inflation assumption. As discussed on the previous page of this report, several large California public retirement systems have recently adopted a 2.75% inflation assumption in their valuations, including one system (Contra Costa County ERA) that is a Segal client.

Retiree Cost of Living Increases

In the last valuation, as of December 31, 2016, consistent with the 3.00% annual inflation assumption used by the Board for that valuation, the Board used a 3.00% cost-of-living adjustment for all retirees.

Consistent with our recommended inflation assumptions, we also recommend maintaining the current assumptions to value the post-retirement cost-of-living adjustments (COLA).

In developing the COLA assumption, we also considered the results of a stochastic approach that would attempt to account for the possible impact of low inflation that could occur before COLA banks are able to be established for the member. Although the results of this type of analysis might justify the use of a lower COLA assumption, we are not recommending that at this time. The reasons for this conclusion include the following:

- The results of the stochastic modeling are significantly dependent on assuming that lower levels of inflation will persist in the early years of the projections. If this is not assumed, then the stochastic modeling will produce results similar to our proposed COLA assumptions.

³ Source: Social Security Administration – The 2017 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds

⁴ Source: Board of Governors of the Federal Reserve System

- Using a lower long-term COLA assumption based on a stochastic analysis would mean that an actuarial loss would occur even when the inflation assumption of 3.00% is met in a year. We question the reasonableness of this result.

We do not see the stochastic possibility of COLAs averaging less than those predicted by the assumed rate of inflation as a reliable source of cost savings that should be anticipated in our COLA assumptions. Therefore, we continue to recommend setting the COLA assumptions based on the long-term annual inflation assumption, as we have in prior years.

B. Investment Return

The investment return assumption is comprised of two primary components, inflation and real rate of investment return, with adjustments for expenses and risk.

Real Rate of Investment Return

This component represents the portfolio's incremental investment market returns over inflation. Theory has it that as an investor takes a greater investment risk, the return on the investment is expected to also be greater, at least in the long run. This additional return is expected to vary by asset class and empirical data supports that expectation. For that reason, the real rate of return assumptions are developed by asset class. Therefore, the real rate of return assumption for a retirement association's portfolio will vary with the Board's asset allocation among asset classes.

The following is the System's current target asset allocation and the assumed real rate of return assumptions by asset class. The first column of real rate of return assumptions are determined by reducing Meketa's total or "nominal" 2017 return assumptions by their assumed 2.60% inflation rate. The second column of returns (except for Core Infrastructure, Natural Resources, Risk Mitigation, Mezzanine/Distressed Debts and Private Equity) represents the average of a sample of real rate of return assumptions. The sample includes the expected annual real rate of return provided to us by Meketa and seven other investment advisory firms retained by Segal's public sector clients. We believe these averages are a reasonable consensus forecast of long-term future market returns in excess of inflation.⁵

⁵ Note that, just as for the inflation assumption, in general the time horizon used by the investment consultants in determining the real rate of return assumption is shorter than the time horizon encompassed by the actuarial valuation.

OCERS' TARGET ASSET ALLOCATION AND ASSUMED ARITHMETIC REAL RATE OF RETURN ASSUMPTIONS BY ASSET CLASS AND FOR THE PORTFOLIO

Asset Class	Percentage of Portfolio	Meketa' Assumed Real Rate of Return ⁶	Average Assumed Real Rate of Return from a Sample of Consultants to Segal's California Public Sector Clients ⁷
Global Equity	35.0%	7.11%	6.38%
Core Bonds	13.0%	0.98%	1.03%
High Yield Bonds	4.0%	4.18%	3.52%
Bank Loan	2.0%	3.40%	2.86%
TIPS	4.0%	1.18%	0.96%
Emerging Market Debt	4.0%	3.99%	3.78%
Real Estate	10.0%	5.92%	4.33%
Core Infrastructure	2.0%	5.48%	5.48% ⁸
Natural Resources	10.0%	7.86%	7.86% ⁸
Risk Mitigation	5.0%	4.66%	4.66% ⁸
Mezzanine/Distressed Debts	3.0%	6.53%	6.53% ⁸
Private Equity	8.0%	9.48%	9.48% ⁸
Total	100.0%	5.73%	5.27%

The above are representative of “indexed” returns and do not include any additional returns (“alpha”) from active management. This is consistent with the Actuarial Standard of Practice No. 27, Section 3.6.3.d, which states:

“Investment Manager Performance - Anticipating superior (or inferior) investment manager performance may be unduly optimistic (or pessimistic). The actuary should not assume that superior or inferior returns will be achieved, net of investment expenses, from an active investment management strategy compared to a passive investment management strategy unless the actuary believes, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the measurement period.”

The following are some observations about the returns provided above:

1. The investment consultants to our California public sector clients have each provided us with their expected real rates of return for each asset class, over various future periods of time. However, in general, the returns available from investment consultants are projected over time periods shorter than the durations of a retirement plan's liabilities.
2. Using a sample average of expected real rate of returns allows the System's investment return assumption to reflect a broader range of capital market information and should help reduce year to year volatility in the investment return assumption.

⁶ Derived by reducing Meketa's nominal rate of return assumptions by their assumed 2.60% inflation rate.

⁷ These are based on the projected arithmetic returns provided by Meketa and seven other investment advisory firms serving the county retirement system of Orange and 16 other city and county retirement systems in California. These return assumptions are gross of any applicable investment expenses.

⁸ For these asset classes, Meketa's assumption is applied in lieu of the average because there is a larger disparity in returns for these asset classes among the firms surveyed and using Meketa's assumption should more closely reflect the underlying investments made specifically for OCERS.

3. Therefore, we recommend that the 5.27% portfolio real rate of return be used to determine the System’s investment return assumption. This is 0.06% lower than the return that was used three years ago in the review to prepare the recommended investment return assumption for the December 31, 2014 valuation. The difference is due to changes in the System’s target asset allocation (-0.08%), changes in the real rate of return assumptions provided to us by the investment advisory firms (-0.07%) and the interaction effect between these changes (+0.09%).

System Expenses

For funding purposes, the real rate of return assumption for the portfolio needs to be adjusted for investment and administrative expenses expected to be paid from investment income. The following table provides the investment and administrative expenses in relation to the actuarial value of assets for the five years ending December 31, 2016.

ADMINISTRATIVE AND INVESTMENT EXPENSES AS A PERCENTAGE OF VALUATION VALUE OF ASSETS (Dollars in 000's)

Plan Year	Valuation Value of Assets ⁹	Administrative Expenses	Investment Expenses ¹⁰	Administrative %	Investment %	Total %
2009	\$7,748,380	\$10,893	\$34,819	0.14	0.45	0.59
2010	8,154,687	12,448	68,027 ¹¹	0.15	0.83	0.98 ¹¹
2011	8,672,592	15,479	39,023	0.18	0.45	0.63
2012	9,064,355	14,295	40,992	0.16	0.45	0.61
2013	9,469,208	14,904	38,759	0.16	0.41	0.57
2014	10,417,125	11,905	41,487	0.11	0.40	0.51
2015	11,449,911	12,521	54,532	0.11	0.48	0.59
2016	12,228,009	16,870	80,810 ¹²	0.14	0.66	0.80 ¹²
Last Experience Study Five-Year Average (2009 – 2013)				0.16	0.52	0.68
Current Experience Study Five-Year Average (2012 – 2016)				0.14	0.48	0.62
Recommendation						0.80

The average administrative and investment expenses percentage over this five-year period in the current experience study is 0.62% of the valuation value of assets (over the five-year period in the last experience study, that average was 0.68%). However, the total expenses percentage went up to 0.80% for plan year 2016 when the “at-source” investment managed fees started to be disclosed in the financial statements instead of being treated as a reduction in the investment

⁹ As of beginning of plan year.

¹⁰ Net of securities lending expenses. Because we do not assume any additional net return for this program, we effectively assume that any securities lending expenses will be offset by related income.

¹¹ We understand that the 2010 investment expenses included some one-time expenses such as foreign tax expense that is expected to be offset by future tax reclaim.

¹² Per OCERS, the increase in the investment expenses for plan year 2016 is primarily due to the reporting of the “at-source” investment management fees in the financial statement that were previously netted against the investment returns.

returns. Taking into account how the investment expenses are reported starting with the 2016 plan year, we believe that it is reasonable to increase the future expense component from 0.60% used in the last review in 2014 to 0.80%.

We understand that this increase reflects a change in how expenses are reported, and not an increase in the level of actual expenses. This means that, for comparison purposes, it may be helpful to consider a restatement of our 2014 analysis reflecting the higher 0.80% expense component. We have included those restated values in the analysis that follows.

Note related to investment expenses paid to active managers – As cited above, under Section 3.6.3.d of ASOP No. 27, the effect of an active investment management strategy should be considered “net of investment expenses...unless the actuary believes, based on relevant data, that such superior or inferior returns represent a reasonable expectation over the measurement period.” For OCERS, nearly all of the investment expenses were paid for expenses associated with active managers.

We have not performed a detailed analysis to measure how much of the investment expenses paid to active managers might have been offset by additional returns (“alpha”) earned by that active management. However, we observed based on information provided in the CAFR that the total fund return on a net of investment expense basis was lower than the policy benchmark by about 0.6% over the last five years. We will work with the System’s staff to determine whether future studies might potentially exclude the level of investment expenses for active managers that are expected to be offset by investment returns. For now, we will continue to use the current approach that any “alpha” that may be identified would be treated as an increase in the risk adjustment and corresponding confidence level. For example, 0.25% of alpha would increase the confidence level by 3% (see discussions that follow on definitions of risk adjustment and confidence level).

Risk Adjustment

The real rate of return assumption for the portfolio is adjusted to reflect the potential risk of shortfalls in the return assumptions. The System’s asset allocation determines this portfolio risk, since risk levels are driven by the variability of returns for the various asset classes and the correlation of returns among those asset classes. This portfolio risk is incorporated into the real rate of return assumption through a risk adjustment.

The purpose of the risk adjustment (as measured by the corresponding confidence level) is to increase the likelihood of achieving the actuarial investment return assumption in the long term.¹³ The 5.27% expected real rate of return developed earlier in this report was based on expected mean or average arithmetic returns. This means there is a 50% chance of the actual return in each year being at least as great as the average (assuming a symmetrical distribution of future returns). The risk adjustment is intended to increase that probability somewhat above the 50% level. This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not. Note that, based on the investment return assumptions recently adopted by systems that have been analyzed under this model, we observe a confidence level generally in the range of 50% to 60%.

¹³ This type of risk adjustment is sometimes referred to as a “margin for adverse deviation.”

Three years ago, the Board adopted an investment return assumption of 7.25%. That return implied a risk adjustment of 0.48%, reflecting a confidence level of 56% that the actual average return over 15 years would not fall below the assumed return, assuming that the distribution of returns over that period follows the normal statistical distribution.¹⁴

In our model, the confidence level associated with a particular risk adjustment represents the likelihood that the actual average return would equal or exceed the assumed value over a 15-year period. For example, if we set our real rate of return assumption using a risk adjustment that produces a confidence level of 60%, then there would be a 60% chance (6 out of 10) that the average return over 15 years will be equal to or greater than the assumed value. The 15-year time horizon represents an approximation of the “duration” of the fund’s liabilities, where the duration of a liability represents the sensitivity of that liability to interest rate variations.

If we use the same 56% confidence level from our last study to set this year’s risk adjustment, based on the current long-term portfolio standard deviation of 12.95% provided by Meketa, the corresponding risk adjustment would be 0.51%. Together with the other investment return components, this would result in an investment return assumption of 6.96%, which is lower than the current assumption of 7.25%.

Based on the general practice of using one-quarter percentage point increments for economic assumptions, we evaluated the effect on the confidence level of other alternative investment return assumptions. In particular, a net investment return assumption of 7.00%, together with the other investment return components, would produce a risk adjustment of 0.47%, which corresponds to a confidence level of 55%. This is slightly lower than the confidence level of 56% used in OCERS’ last study for the December 31, 2014 valuation. This analysis supports reducing the current assumption from 7.25% to 7.00%. Note that this comparison does not reflect any restatement of the 2014 analysis for higher reported investment expenses.

The table below shows OCERS’ investment return assumptions and for the years when this analysis was performed, the risk adjustments and corresponding confidence levels compared to the values for prior studies. For comparison purposes we have included values for 2014-2016 both as originally developed and after restatement for higher reported investment expenses. For any given investment return assumption, higher expenses will mean a lower risk adjustment and so a lower confidence level. As shown below, with an expense component of 0.80% instead of 0.60% the 2014-2016 investment return of 7.25% would have had a confidence level of 53% rather than 56%.

¹⁴ Based on an annual portfolio return standard deviation of 12.30% provided by the prior investment consultant in 2014. Strictly speaking, future compounded long-term investment returns will tend to follow a log-normal distribution. However, we believe the Normal distribution assumption is reasonable for purposes of setting this type of risk adjustment.

HISTORICAL INVESTMENT RETURN ASSUMPTIONS, RISK ADJUSTMENTS AND CONFIDENCE LEVELS BASED ON ASSUMPTIONS ADOPTED BY THE BOARD

Year Ending December 31	Investment Return	Risk Adjustment	Corresponding Confidence Level
2004 - 2007	7.75%	0.39%	56%
2008 - 2010	7.75%	0.80%	61%
2011	7.75%	-0.23%	<50%
2012 - 2013	7.25%	0.34%	55%
2014 - 2016	7.25%	0.48%	56%
2014 - 2016 (restated)	7.25%	0.28%	53%
2017 (Recommended)	7.00%	0.47%	55%

As we have discussed in prior experience studies, the risk adjustment model and associated confidence level is most useful as a means for comparing how the System has positioned itself relative to risk over periods of time.¹⁵ The use of a 55% confidence level should be considered in context with other factors, including:

- As noted above, the confidence level is more of a relative measure than an absolute measure, and so can be reevaluated and reset for future comparisons.
- The confidence level is based on the standard deviation of the portfolio that is determined and provided to us by Meketa. The standard deviation is a statistical measure of the future volatility of the portfolio and so is itself based on assumptions about future portfolio volatility and can be considered somewhat of a “soft” number.
- A confidence level of 55% is within the range of about 50% to 60% that corresponds to the risk adjustments used by most of Segal’s other California public retirement system clients. Most public retirement systems that have recently reviewed their investment return assumptions have seen decreases in their confidence level even though they adopted more conservative investment return assumptions for their valuations.
- As with any model, the results of the risk adjustment model should be evaluated for reasonableness and consistency. This is discussed in the later section on “Comparison with Other Public Retirement Systems”.

Taking into account the factors above, our recommendation is to reduce the net investment return assumption from 7.25% to 7.00%. As noted above, this return implies a 0.47% risk adjustment, reflecting a confidence level of 55% that the actual average return over 15 years would not fall below the assumed return.

¹⁵ In particular, it would not be appropriate to use this type of risk adjustment as a measure of determining an investment return rate that is “risk-free.”

Recommended Investment Return Assumption

The following table summarizes the components of the investment return assumption developed in the previous discussion. For comparison purposes, we have also included similar values from the last study, both before and after restatement for higher reported investment expenses.

CALCULATION OF NET INVESTMENT RETURN ASSUMPTION

Assumption Component	Recommended Value	Restated Expenses	Adopted Value
	December 31, 2017	December 31, 2014	December 31, 2014
Inflation	3.00%	3.00%	3.00%
Plus Average Real Rate of Return	5.27%	5.33%	5.33%
Minus Expense Adjustment	(0.80%)	(0.80%)	(0.60%)
Minus Risk Adjustment	(0.47%)	(0.28%)	(0.48%)
Total	7.00%	7.25%	7.25%
Confidence Level	55%	53%	56%

Based on this analysis, our recommended investment return assumption is a decrease from 7.25% to 7.00% per annum to maintain a confidence level associated with this assumption at a level consistent with values developed in prior reviews of this assumption.

Comparing with Other Public Retirement Systems

One final test of the recommended investment return assumption is to compare it against those used by other public retirement systems, both in California and nationwide.

We note that a 7.00% investment return assumption is becoming more common among California public sector retirement systems. In particular, five County employees retirement systems (Contra Costa, Fresno, Mendocino, Sacramento and Santa Barbara) use a 7.00% earnings assumption. Furthermore, the CalPERS Board has approved a reduction in the earnings assumption from 7.50% to 7.00% over the next three years. In addition, CalSTRS recently adopted a 7.25% earnings assumption for the 2016 valuation (down from 7.50%) and a 7.00% earnings assumption for the 2017 valuation.

The following table compares OCERS' recommended net investment return assumption against those of the nationwide public retirement systems that participated in the National Association of State Retirement Administrators (NASRA) 2016 Public Fund Survey for 142 large public retirement funds in their 2015 fiscal year valuations:

Assumption	OCERS	NASRA 2016 Public Fund Survey ¹⁶		
		Low	Median	High
Net Investment Return	7.00%	4.29%	7.50%	8.50%

The detailed survey results show that more than one-half of the systems have an investment return assumption in the range of 6.75% to 7.75%, and over half of those systems have used an

¹⁶ Public Plans Data website – Produced in partnership with the National Association of State Retirement Administrators (NASRA)

assumption of 7.50%. The survey also notes that several plans have reduced their investment return assumption during the last year. State systems outside of California tend to change their economic assumptions less frequently and so may lag behind emerging practices in this area.

In summary, we believe that both the risk adjustment model and other considerations indicate a lower earnings assumption. The recommended assumption of 7.00% provides for a risk margin within the risk adjustment model consistent with recent OCERS practice, and it is consistent with OCERS’ current practice relative to other public systems.

Alternative Economic Assumptions

As we noted above in our discussion of the inflation assumption, the metrics presented in that section could also lead to an inflation assumption lower than our recommended 3.00%, and in particular Segal would find 2.75% to be a reasonable inflation assumption. In this section we present for the Board’s consideration alternative investment return assumptions based on an inflation component of 2.75%.

We note that several California public retirement systems have lowered their inflation assumptions at the same time that they lowered their investment return assumptions. Whether this results in more conservative or more aggressive assumptions depends on the change in the real return, i.e., the difference between the two assumptions. We have analyzed two sets of alternative economic assumptions in the table below.

ALTERNATIVE INFLATION AND INVESTMENT RETURN ASSUMPTIONS

Assumption Component	Recommended 7.00% Investment 3.00% Inflation	Alternative 1 7.00% Investment 2.75% Inflation	Alternative 2 6.75% Investment 2.75% Inflation
Inflation	3.00%	2.75%	2.75%
Plus Portfolio Real Rate of Return	5.27%	5.27%	5.27%
Minus Expense Adjustment	(0.80%)	(0.80%)	(0.80%)
Minus Risk Adjustment	(0.47%)	(0.22%)	(0.47%)
Total	7.00%	7.00%	6.75%
Confidence Level	55%	53%	55%

Segal would find any of these three sets of economic assumptions to be reasonable.

C. Salary Increase

Salary increases impact plan costs in two ways: (i) by increasing members’ benefits (since benefits are a function of the members’ highest average pay) and future normal cost collections; and (ii) by increasing total active member payroll which in turn generates lower UAAL contribution rates. The components of the salary increase assumption are discussed below.

As an employee progresses through his or her career, increases in pay are expected to come from three sources:

1. **Inflation:** Unless pay grows at least as fast as consumer prices grow, employees will experience a reduction in their standard of living. There may be times when pay increases lag or exceed inflation, but over the long term, labor market forces will require an employer to maintain its employees' standards of living.

As discussed earlier in this report, we are recommending that the assumed rate of inflation be maintained at 3.00% per annum. This inflation component is used as part of the salary increase assumption.

2. **Real “Across the Board” Pay Increases:** These increases are typically termed productivity increases since they are considered to be derived from the ability of an organization or an economy to produce goods and services in a more efficient manner. As that occurs, at least some portion of the value of these improvements can provide a source for pay increases. These increases are typically assumed to extend to all employees “across the board”. The State and Local Government Workers Employment Cost Index produced by the Department of Labor provides evidence that real “across the board” pay increases have averaged about 0.6% - 0.9% annually during the last ten to twenty years.

We also referred to the annual report on the financial status of the Social Security program published in July 2017. In that report, real “across the board” pay increases are forecast to be 1.2% per year under the intermediate assumptions.

The real pay increase assumption is generally considered a more “macroeconomic” assumption, that is not necessarily based on individual plan experience. We note that the actual pay increases over the past five years were less than CPI increases, as shown below. However, this recent experience may not be a credible predictor of future experience.

Valuation Date	Actual Average Pay Increase ¹⁷	Actual Change in CPI ¹⁸
December 31, 2012	0.03%	2.04%
December 31, 2013	-0.83%	1.08%
December 31, 2014	2.22%	1.35%
December 31, 2015	-1.22%	0.91%
December 31, 2016	6.66%	1.89%
Average¹⁹	1.37%	1.45%

Considering these factors, we recommend maintaining the real “across the board” salary increase assumption at 0.50%. This means that the combined inflation and “across the board” salary increase assumption will remain unchanged at 3.50%.

Note that under the alternative 2.75% inflation assumption, the combined inflation and “across the board” salary increase assumption would decrease from 3.50% to 3.25%.

¹⁷ Reflects the increase in average salary for members at the beginning of the year versus those at the end of the year. It does not reflect the average salary increases received by members who worked the full year.

¹⁸ Based on the change in the Annual CPI for the Los Angeles-Riverside-Orange County area compared to the prior year.

¹⁹ In the last experience study, the actual average increased in salary was 1.56% while the actual average change in CPI was 1.24% during the five-year period ending on December 31, 2013.

3. **Merit and Promotional Increases:** As the name implies, these increases come from an employee's career advances. This form of pay increase differs from the previous two, since it is specific to the individual. For OCERS, there are service-specific merit and promotional increases.

The annual merit and promotional increases are determined by measuring the actual increases received by members over the experience period, net of the inflationary and real "across the board" pay increases. Increases are measured separately for General and Safety members. This is accomplished by:

- a. Measuring each continuing member's actual salary increase over each year of the experience period;
- b. Excluding any members with large increases (in the case of OCERS, we have excluded increases greater than 50%) or any decreases during any particular year;
- c. Categorizing these increases according to member demographics;
- d. Removing the wage inflation component from these increases (assumed to be equal to the increase in the members' average salary during the year);
- e. Averaging these annual increases over the three-year experience period; and
- f. Modifying current assumptions to reflect some portion of these measured increases reflective of their "credibility."

To be consistent with the other economic assumptions, these merit and promotional assumptions should be used in combination with the 3.50% assumed inflation and real "across the board" increases.

The following table shows the General members' actual average merit and promotional increases by years of service over the three-year period from January 1, 2014 through December 31, 2016 along with the actual average increases based on combining the current three-year period with the three years from the prior experience study. The current and proposed assumptions are also shown. The actual average total salary increases for the most recent three-year period were reduced by the actual average inflation plus "across the board" increase (i.e., wage inflation, estimated as the increase in average salaries) for each year over the current three-year experience period (2.4% on average).

**GENERAL
MERIT AND PROMOTIONAL INCREASES
(Actual vs. Proposed Assumption)**

Years of Service	Rate (%)			
	Current Assumption	Actual Average Increase (Last 3 Years)	Actual Average Increase from Current and Prior Study	Proposed Assumption
Less than 1	10.00	6.48	7.78	9.00
1	7.25	7.14	7.67	7.25
2	6.00	6.61	6.05	6.00
3	4.75	5.76	4.90	5.00
4	4.00	4.62	4.13	4.00
5	3.25	3.70	3.48	3.50
6	2.25	3.17	2.99	2.50
7	2.00	2.91	2.69	2.25
8	1.50	2.76	2.29	1.75
9	1.25	2.55	1.97	1.50
10	1.25	1.95	1.64	1.50
11	1.25	2.04	1.55	1.50
12	1.25	1.83	1.43	1.50
13	1.25	1.81	1.45	1.50
14	1.25	1.64	1.57	1.50
15	1.25	1.72	1.54	1.50
16	0.75	1.51	1.14	1.00
17	0.75	1.56	1.11	1.00
18	0.75	1.87	1.28	1.00
19	0.75	1.48	0.91	1.00
20 & over	0.75	1.37	1.09	1.00

The following table provides the same information for Safety members. The actual average total salary increases for the most recent three-year period were reduced by the actual average inflation plus “across the board” increase (i.e., wage inflation, estimated as the increase in average salaries) for each year over the current three-year experience period (3.8% on average).

SAFETY
MERIT AND PROMOTIONAL INCREASES
(Actual vs. Proposed Assumption)

Years of Service	Rate (%)			
	Current Assumption	Actual Average Increase (Last 3 Years)	Actual Average Increase from Current and Prior Study	Proposed Assumption
Less than 1	14.00	13.91	13.92	14.00
1	10.00	6.23	10.66	10.00
2	8.50	5.67	7.13	7.75
3	6.75	4.80	5.18	6.00
4	5.25	6.61	6.06	5.50
5	4.50	4.22	4.86	4.50
6	3.50	3.93	4.26	3.75
7	3.25	3.12	3.53	3.25
8	2.25	2.68	2.64	2.50
9	2.25	2.21	2.41	2.25
10	1.75	1.61	2.14	1.75
11	1.75	1.59	1.70	1.75
12	1.75	1.24	1.60	1.75
13	1.75	1.69	1.68	1.75
14	1.75	1.41	1.69	1.75
15	1.75	1.67	2.26	1.75
16	1.50	1.53	1.65	1.50
17	1.50	1.89	2.07	1.50
18	1.50	2.23	2.26	1.50
19	1.50	2.19	2.00	1.50
20 & over	1.50	1.28	1.78	1.50

Charts 1 and 2 provide a graphical comparison of the actual merit and promotional increases, compared to the proposed and current assumptions. The charts also show the actual merit and promotional increases based on an average of both the current and previous three-year experience periods. This is discussed above. Chart 1 shows this information for General members and Chart 2 for Safety members.

Based on this experience, we are proposing slight increases overall in the merit and promotional salary increases for General and slight decreases overall in the merit and promotional increases for Safety members. Overall, salary increases are assumed to be higher for General members and lower for Safety members since we are not recommending a change to the price inflation assumption or the “across the board” assumption.

Active Member Payroll

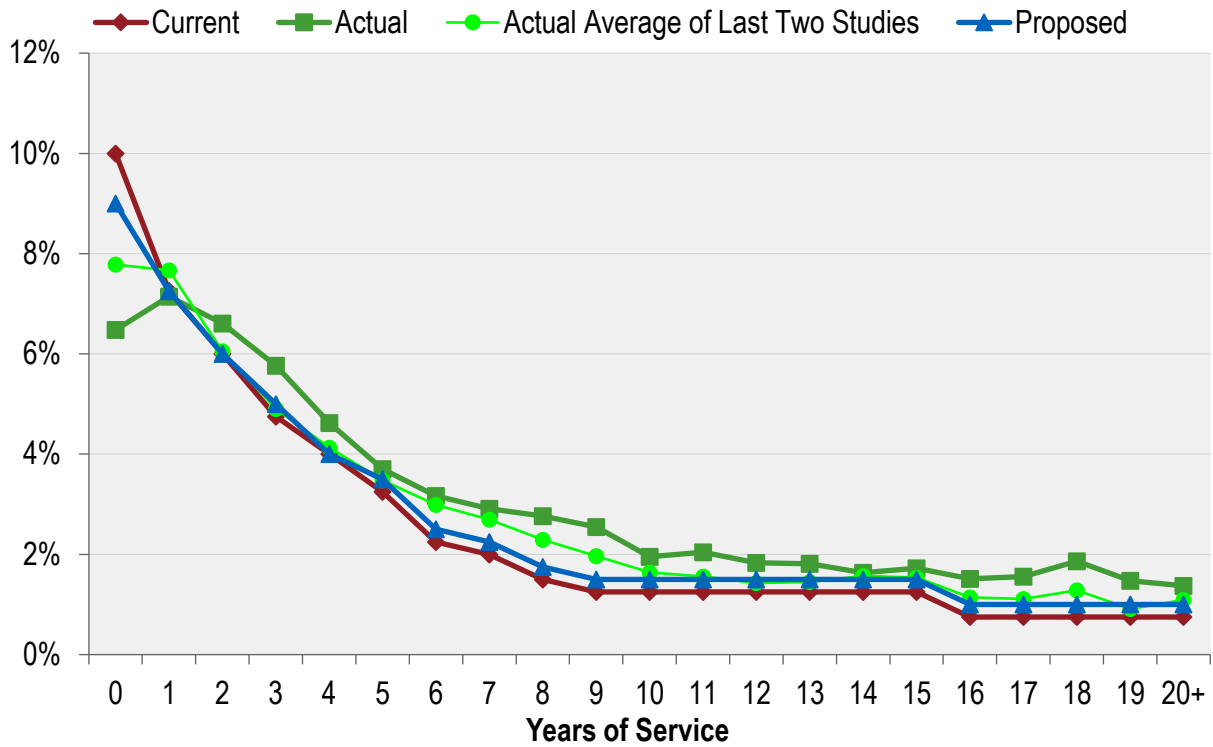
Projected active member payrolls are used to develop the UAAL contribution rate. Future values are determined as a product of the number of employees in the workforce and the average pay for all employees. The average pay for all employees increases only by inflation and real “across the board” pay increases. The merit and promotional increases are not an influence, because this average pay is not specific to an individual.

Under the Board’s current practice, the UAAL contribution rate is developed by assuming that the total payroll for all active members will increase annually over the amortization periods at the same assumed rates of inflation plus real “across the board” salary increase assumptions as are used to project the members’ future benefits.

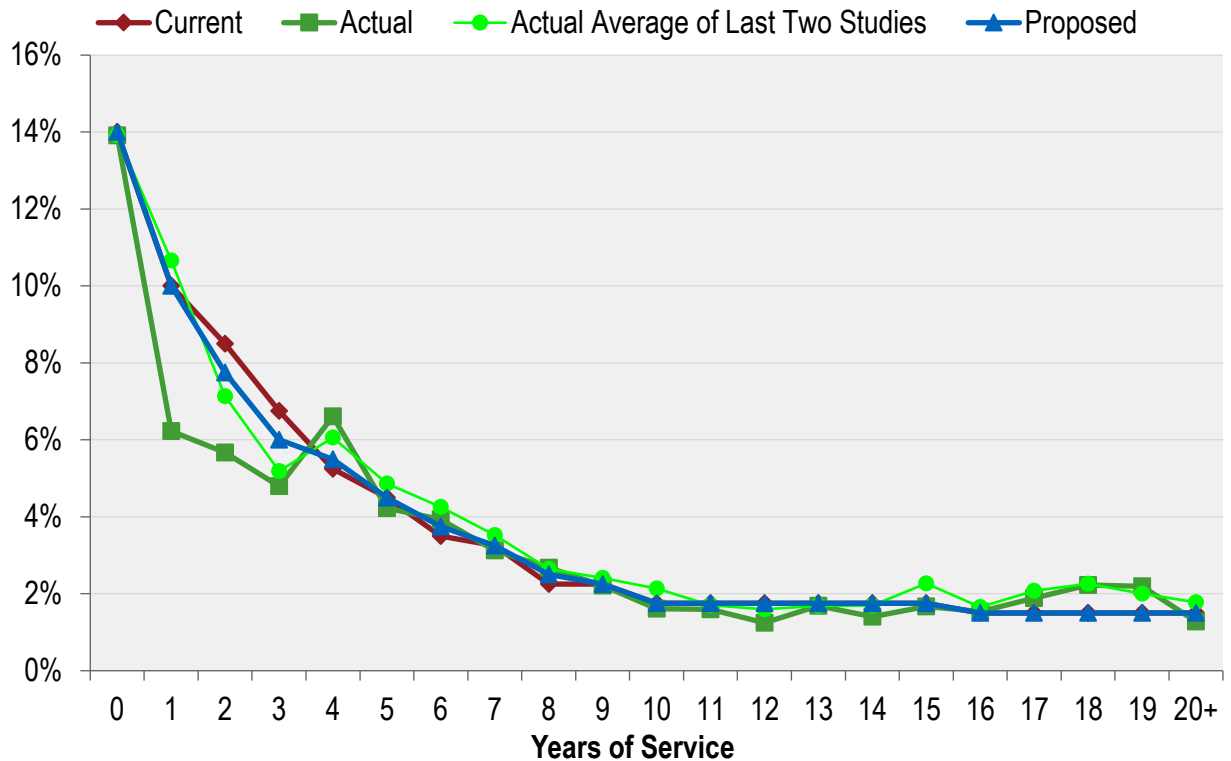
We recommend that the active member payroll increase assumption be maintained at 3.50% annually, consistent with the combined inflation plus real “across the board” salary increase assumptions.

Note that under the alternative 2.75% inflation assumption, the active member payroll increase assumption would decrease from 3.50% to 3.25%.

**CHART 1: MERIT AND PROMOTIONAL SALARY INCREASE RATES
GENERAL MEMBERS**



**CHART 2: MERIT AND PROMOTIONAL SALARY INCREASE RATES
SAFETY MEMBERS**



IV. Demographic Assumptions

A. Retirement Rates

The age at which a member retires from service (i.e., who did not retire on a disability pension) will affect both the amount and duration of the benefits that will be paid to that member as well as the period over which funding must take place. Following prior practice, we have continued to use age as a predictor as to when a member would retire from OCERS. Subsequent to our last experience study, we were asked to consider whether other factors such as service could be a better predictor in determining when a member would retire. We have reviewed the retirement experience using service and documented in the following sub-section why we would not recommend a change to use service at this time.

The System's current retirement rates for the non-CalPEPRA Plans²⁰ are separated into:

- (1) General Enhanced
- (2) General Non-Enhanced²¹
- (3) General SJC (2.0% @ 57 under §31676.12)
- (4) Safety Law Enforcement (3.0% @ 50 under §31664.1)
- (5) Safety Law Enforcement (3.0% @ 55 under §31664.2)
- (6) Safety Fire (3.0% @ 50 under §31664.1)
- (7) Safety Fire (3.0% @ 55 under §31664.2)
- (8) Safety Probation (3.0% @ 50 under §31664.1)

For members who are covered under the CalPEPRA Plans, the retirement rates are separated into:

- (1) CalPEPRA General
- (2) CalPEPRA Safety Probation
- (3) CalPEPRA Safety Law Enforcement
- (4) CalPEPRA Safety Fire

The tables on the following pages show the observed service retirement rates for each of the above non-CalPEPRA categories based on the actual experience over the past three years. The observed service retirement rates were determined by comparing those members who actually retired from service to those eligible to retire from service. This same methodology is followed throughout this report and was described in Section II. Also shown are the current rates assumed and the rates we propose:

²⁰ CalPEPRA or California Public Employees' Pension Reform Act of 2013 imposed lower benefit tiers for General and Safety members together with other changes.

²¹ These assumptions are also used for the CalPEPRA 1.62% @ 65 formula (§31676.01).

Rate of Retirement (%)						
	General Enhanced			General Non-Enhanced		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
Under 49	0.00	0.00	0.00	0.00	0.00	0.00
49*	0.00	55.56**	30.00	0.00	100.00***	25.00
50	2.50	2.69	2.50	2.50	1.42	2.00
51	2.00	1.92	2.00	2.50	0.00	2.00
52	2.00	2.98	2.50	2.50	0.58	2.00
53	2.00	2.67	2.50	2.50	3.47	2.75
54	5.00	7.46	5.50	2.50	3.61	2.75
55	15.00	15.11	15.00	3.00	3.80	3.25
56	10.00	9.73	10.00	3.50	3.98	3.50
57	10.00	9.20	10.00	5.00	6.09	5.50
58	10.00	11.51	11.00	5.00	6.84	5.50
59	11.00	10.78	11.00	7.00	5.50	6.50
60	12.00	13.28	12.00	9.00	9.47	9.25
61	12.00	11.35	12.00	10.00	17.16	12.00
62	15.00	12.75	14.00	16.00	16.94	16.00
63	16.00	13.79	16.00	16.00	12.28	16.00
64	16.00	16.83	16.00	18.00	16.82	18.00
65	21.00	26.80	22.00	21.00	24.72	22.00
66	22.00	21.75	22.00	26.00	32.84	28.00
67	23.00	23.81	23.00	21.00	26.32	24.00
68	23.00	21.67	23.00	21.00	30.23	24.00
69	23.00	16.67	23.00	21.00	10.00	20.00
70	40.00	19.67	25.00	30.00	26.67	20.00
71	40.00	15.31	25.00	30.00	29.63	25.00
72	40.00	7.41	25.00	30.00	15.38	25.00
73	40.00	13.70	25.00	30.00	37.50	25.00
74	40.00	20.75	25.00	30.00	14.29	25.00
75 & Over	100.00	21.85	100.00	100.00	30.00	100.00

* These rates are applicable to General members with 30 or more years of service.

** Based on 5 members who retired during the last 3 years.

*** Based on 1 member who retired during the last 3 years.

As shown above, we are recommending slight increases in the retirement rates at early ages and decreases in the retirement rates at later ages for General Enhanced members and overall slight increases in the retirement rates for General Non-Enhanced members.

Chart 3 that follows later in this section compares actual experience with the current and proposed rates of retirement for General Enhanced members and Chart 4 has the same data for General Non-Enhanced members.

Age	Rate of Retirement (%)					
	Safety Law Enforcement (31664.1)*			Safety Fire (31664.1)**		
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
49***	10.00	16.39	12.00	0.00	1.56	2.00
50	16.00	20.30	18.00	6.00	4.60	5.00
51	16.00	20.57	18.00	8.00	6.15	7.00
52	16.00	16.91	17.00	9.00	10.13	9.50
53	16.00	18.49	17.00	10.00	12.00	10.50
54	22.00	17.20	22.00	16.00	7.23	15.00
55	22.00	22.06	22.00	19.00	14.49	18.00
56	20.00	13.64	20.00	20.00	21.43	20.00
57	20.00	25.81	20.00	23.00	14.63	21.00
58	20.00	22.73	20.00	30.00	25.58	28.00
59	26.00	25.00	26.00	30.00	26.09	28.00
60	45.00	18.18	35.00	45.00	20.00	30.00
61	45.00	26.32	35.00	45.00	11.11	30.00
62	45.00	40.00	40.00	45.00	18.18	35.00
63	45.00	28.57	40.00	45.00	25.00	35.00
64	45.00	40.00	40.00	45.00	0.00	35.00
65 & Over	100.00	43.75	100.00	100.00	0.00	100.00

* Retirement rate is 100% after a Safety Law Enforcement member accrues a benefit of 100% of final average earnings.

** Retirement rate is currently assumed at 100% after a Safety Fire member accrues a benefit of 100% of final average earnings. However, we are recommending removing this assumption as we only observed a 20% retirement rate for those Safety Fire members who accrued a benefit of 100% of final average earnings during the last three years.

***These rates are applicable to Safety members with 20 or more years of service.

As shown above, we are recommending slight increases in the retirement rates at early ages and decreases in the retirement rates at later ages for Safety Law Enforcement (3.0% @ 50 under §31664.1) members and decreases overall in the retirement rates for Safety Fire (3.0% @ 50 under §31664.1) members.

Chart 5 that follows later in this section compares actual experience with the current and proposed rates of retirement for Safety Law Enforcement (3.0% @ 50 under §31664.1) members and Chart 6 has the same data for Safety Fire (3.0% @ 50 under §31664.1) members.

	Rate of Retirement (%)		
	Safety Probation (31664.1)*		
Age	Current Rate	Actual Rate	Proposed Rate
49	0.00	2.86	0.00
50	3.00	6.90	3.25
51	3.00	3.70	3.25
52	4.00	8.51	4.25
53	4.00	4.26	4.25
54	6.00	13.16	7.00
55	11.00	14.71	12.00
56	11.00	9.38	12.00
57	17.00	21.43	18.00
58	20.00	17.39	18.00
59	20.00	14.29	18.00
60	20.00	23.81	20.00
61	20.00	7.69	20.00
62	25.00	33.33	25.00
63	50.00	30.00	40.00
64	50.00	20.00	40.00
65 & Over	100.00	33.33	100.00

* Retirement rate is 100% after a Safety Probation member accrues a benefit of 100% of final average earnings.

As shown above, we are recommending slight increases in the retirement rates at early ages and decreases in the retirement rates at later ages for Safety Probation members.

Chart 7 that follows later in this section compares actual experience with the current and proposed rates of retirement for Safety Probation members.

For General SJC under (2.0% @ 57 under §31676.12), Safety Law Enforcement (3.0% @ 55 under §31664.2) and Safety Fire (3.0% @ 55 under §31664.2), we do not have credible experience from the past three years to propose new rates based on actual retirement from members of the newer plans. However, we are recommending lowering some of the rates at later ages currently used for those plans to commensurate with the overall later retirement assumptions that we observed and are recommending from the other older plans.

Rate of Retirement (%)						
	General SJC (31676.12)		Safety Law Enforcement (31664.2)*		Safety Fire (31664.2)**	
Age	Current Rate	Proposed Rate	Current Rate	Proposed Rate	Current Rate	Proposed Rate
50	3.00	3.00	11.50	11.50	8.00	8.00
51	3.00	3.00	12.00	12.00	10.00	10.00
52	3.00	3.00	12.70	12.70	11.00	11.00
53	3.00	3.00	17.90	17.90	12.00	12.00
54	3.00	3.00	18.80	18.80	14.00	14.00
55	4.00	4.00	30.70	30.70	24.00	24.00
56	5.00	5.00	20.00	20.00	23.00	23.00
57	6.00	6.00	20.00	20.00	27.00	27.00
58	7.00	7.00	25.00	25.00	27.00	27.00
59	9.00	9.00	30.00	30.00	36.00	36.00
60	11.00	11.00	100.00	40.00	100.00	40.00
61	13.00	13.00	100.00	40.00	100.00	40.00
62	15.00	15.00	100.00	40.00	100.00	40.00
63	15.00	15.00	100.00	40.00	100.00	40.00
64	20.00	20.00	100.00	40.00	100.00	40.00
65	20.00	20.00	100.00	100.00	100.00	100.00
66	24.00	24.00	100.00	100.00	100.00	100.00
67	24.00	24.00	100.00	100.00	100.00	100.00
68	24.00	24.00	100.00	100.00	100.00	100.00
69	24.00	24.00	100.00	100.00	100.00	100.00
70	100.00	50.00	100.00	100.00	100.00	100.00
71	100.00	50.00	100.00	100.00	100.00	100.00
72	100.00	50.00	100.00	100.00	100.00	100.00
73	100.00	50.00	100.00	100.00	100.00	100.00
74	100.00	50.00	100.00	100.00	100.00	100.00
75 & Over	100.00	100.00	100.00	100.00	100.00	100.00

* Retirement rate is 100% after a Safety Law Enforcement member accrues a benefit of 100% of final average earnings.

** Retirement rate is currently assumed at 100% after a Safety Fire member accrues a benefit of 100% of final average earnings. However, we are recommending removing this assumption to be consistent to what we proposed for the Non-CalPEPRA Safety Fire members covered under §31664.1.

Chart 8 compares the current rates with the proposed rates of retirement for General SJC under (2.0% @ 57 under §31676.12). Chart 9 has the same data for Safety Law Enforcement (3.0% @ 55 under §31664.2). Chart 10 has the same data for Safety Fire (3.0% @ 55 under §31664.2).

Note that effective January 1, 2013, new CalPEPRA formulas were implemented for new General and Safety tiers. For these new formulas, we do not have credible experience from the past three years to propose new rates based on actual retirement from members of the newer plans. However, we have lowered our recommended rates for CalPEPRA General and Safety formulas at later ages so that those rates will remain comparable to the proposed retirement rates we are recommending for the non-CalPEPRA General and Safety formulas.

Rate of Retirement (%)								
Age	CalPEPRA – General		CalPEPRA – Safety Probation*		CalPEPRA – Safety Law Enforcement*		CalPEPRA – Safety Fire**	
	Current Rate	Proposed Rate	Current Rate	Proposed Rate	Current Rate	Proposed Rate	Current Rate	Proposed Rate
50	0.00	0.00	2.50	2.50	11.00	11.00	6.50	6.00
51	0.00	0.00	2.50	2.50	11.50	11.50	8.00	7.00
52	4.00	4.00	3.00	3.00	12.00	12.00	9.00	9.00
53	1.50	1.50	3.00	3.00	16.00	16.00	10.00	10.00
54	1.50	1.50	5.50	5.50	17.00	17.00	12.00	11.50
55	2.50	2.50	10.00	10.00	28.00	28.00	21.00	21.00
56	3.50	3.50	10.00	10.00	18.00	18.00	20.00	20.00
57	5.50	5.50	15.00	15.00	17.50	17.50	22.00	22.00
58	7.50	7.50	20.00	20.00	22.00	22.00	25.00	25.00
59	7.50	7.50	20.00	20.00	26.00	26.00	31.50	30.00
60	7.50	7.50	100.00	40.00	100.00	40.00	100.00	40.00
61	7.50	7.50	100.00	40.00	100.00	40.00	100.00	40.00
62	14.00	14.00	100.00	40.00	100.00	40.00	100.00	40.00
63	14.00	14.00	100.00	40.00	100.00	40.00	100.00	40.00
64	14.00	14.00	100.00	40.00	100.00	40.00	100.00	40.00
65	18.00	18.00	100.00	100.00	100.00	100.00	100.00	100.00
66	22.00	22.00	100.00	100.00	100.00	100.00	100.00	100.00
67	23.00	23.00	100.00	100.00	100.00	100.00	100.00	100.00
68	23.00	23.00	100.00	100.00	100.00	100.00	100.00	100.00
69	23.00	23.00	100.00	100.00	100.00	100.00	100.00	100.00
70	30.00	25.00	100.00	100.00	100.00	100.00	100.00	100.00
71	30.00	25.00	100.00	100.00	100.00	100.00	100.00	100.00
72	30.00	25.00	100.00	100.00	100.00	100.00	100.00	100.00
73	30.00	25.00	100.00	100.00	100.00	100.00	100.00	100.00
74	30.00	25.00	100.00	100.00	100.00	100.00	100.00	100.00
75 & Over	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

* Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings.

** Retirement rate is currently assumed at 100% after a Safety Fire member accrues a benefit of 100% of final average earnings. However, we are recommending removing this assumption to be consistent to what we proposed for the Non-CalPEPRA Safety Fire members.

For ages where we are extending the retirement rates in the two tables above, we did not reduce the retirement rates to the level used for the older plans with credible experience since the current rates for those plans are already less than 100%.

Chart 11 compares the current rates with the proposed rates of retirement for CalPEPRA General members. Chart 12 has the same data for CalPEPRA Safety Probation members. Chart 13 has the same data for CalPEPRA Safety Law Enforcement members. Chart 14 has the same data for CalPEPRA Safety Fire members.

Use of Age-Based Versus Service-Based Retirement Assumptions

We have also looked into the desirability of developing and applying the retirement assumptions based on service instead of age at retirement. The table below is based on a high-level review by combining the retirement experience for all OCERS General members covered under various formulas and all OCERS Safety members covered under various formulas. For General members, the actual retirement experience shows relatively higher retirement rates for members immediately upon reaching the minimum age or service requirement for a retirement benefit (i.e., attaining age 70 regardless of service or attaining age 50 with 10 or more years of retirement service credit) whereas from 10 years of service to 25 years of service, the retirement rates are very flat. For Safety members, the retirement rates are very volatile with no discernable pattern for members with less than 25 years of service.

The above analyses can be improved if we introduce age as additional variable to use in summarizing the experience. This is exactly the case for CalPERS as their retirement assumptions are developed and applied based on both a member’s age and service. We believe CalPERS is able to develop retirement assumptions based on both age and service because it is a significantly larger entity with more exposures and decrements, allowing them to break down the experience into smaller groups. If we were to split the experience for OCERS by age and service, we do not believe we would have as much reliable experience to make credible recommended retirement assumptions.

Years of Service	Rate of Retirement (%)	
	Actual Rate - General Members	Actual Rate - Safety Members
0 - 4	0.00	0.00
5 - 9	47.59	100.00
10 – 14	6.64	8.11
15 – 19	6.75	8.54
20 – 14	8.63	4.29
25 – 19	11.87	15.59
30 – 14	18.57	31.77
35 – 39	29.17	20.59
40 & over	29.17	0.00

Deferred Vested Members

In prior valuations, deferred vested General and Safety members were assumed to retire at age 58 and 53, respectively. The average age at retirement over the current three years period in this experience study was 58.8 for General and 53.1 for Safety. We recommend increasing the assumption for General members from age 58 to age 59 and maintaining the current assumption for Safety members at age 53.

For members who terminate with less than five years of service after January 1, 2003 and are not vested, we assume they would retire at age 70 for both General and Safety if they decide to leave their contributions on deposit as permitted by §31629.5.

Reciprocity

It is currently assumed that 20% of future General and 30% of future Safety deferred vested members would go on to work for a reciprocal system and receive 4.25% compensation increases for General and 5.00% for Safety per annum from termination until their date of retirement. Based on the actual experience that 13% of General and 23% of Safety members went on to work for a reciprocal system as of December 31, 2016, we recommend decreasing the reciprocity assumption for General members from 20% to 15% and decreasing the reciprocity assumption for Safety members from 30% to 25%. Based on our ultimate recommended merit and promotional salary increase assumption of 1.00% for General and 1.50% for Safety (and our recommended economic assumptions), we propose that a 4.50% (i.e., 3.00% inflation plus 0.50% “across the board” plus 1.00% merit and promotional) for General and 5.00% (i.e., 3.00% inflation plus 0.50% “across the board” plus 1.50% merit and promotional) salary increase assumption be utilized to anticipate salary increases (under the reciprocal system) from termination from OCERS to the expected date of retirement.

Survivor Continuance Under Unmodified Option

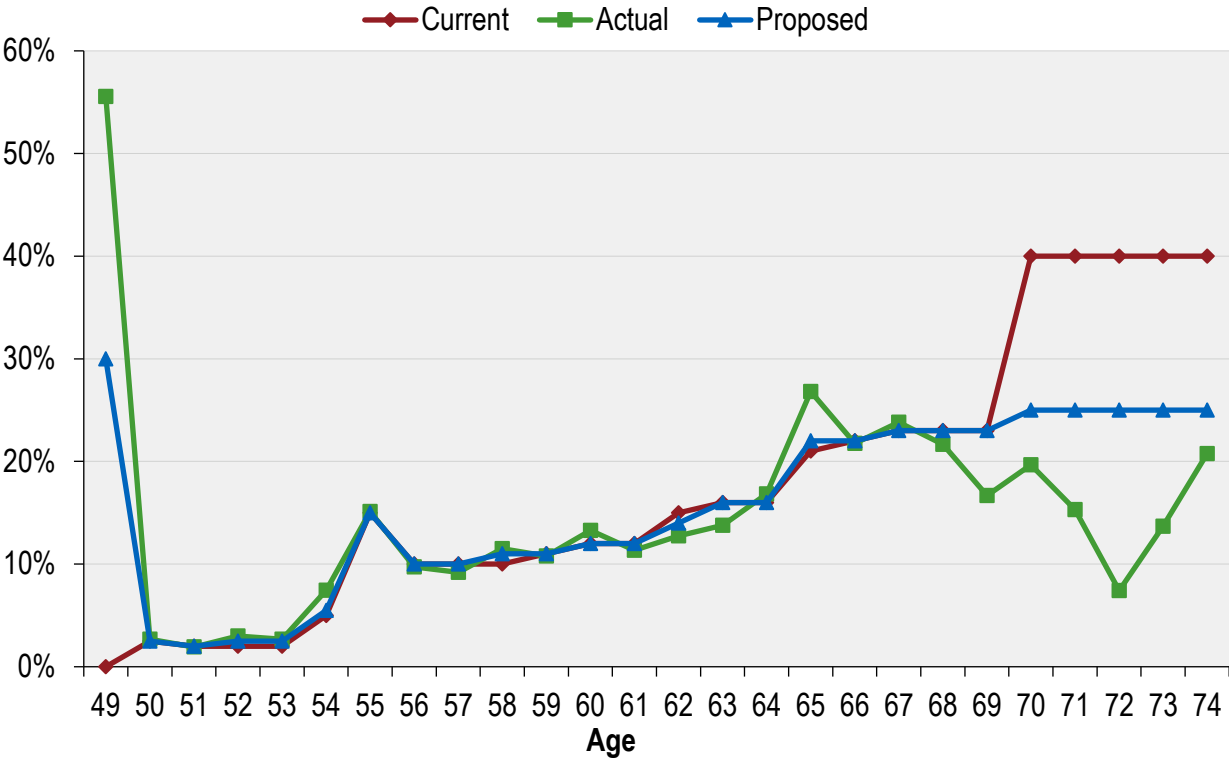
In prior valuations, it was assumed that 75% of all active male members and 50% of all active female members who selected the unmodified option would be married or have an eligible domestic partner when they retired. According to the experience of members who retired during the last three years, about 72% of all male members and 55% of all female members were married or had a domestic partner at retirement. We recommend continuing the assumptions that 75% of active male members will be married or have a domestic partner when they retire and increasing the assumption that 50% of active female members will be married or have a domestic partner when they retire to 55%.

Since the value of the survivor’s continuance benefit is dependent on the survivor’s age and sex, we must also have assumptions for the age and sex of the survivor. Based on the experience during the three-year period, we believe that it is reasonable to continue to assume a three-year age difference for the survivors age as compared to the member’s age. Since the majority of survivors are expected to be of the opposite sex, even with the inclusion of domestic partners, we will continue to assume that the survivor’s sex is the opposite of the member.

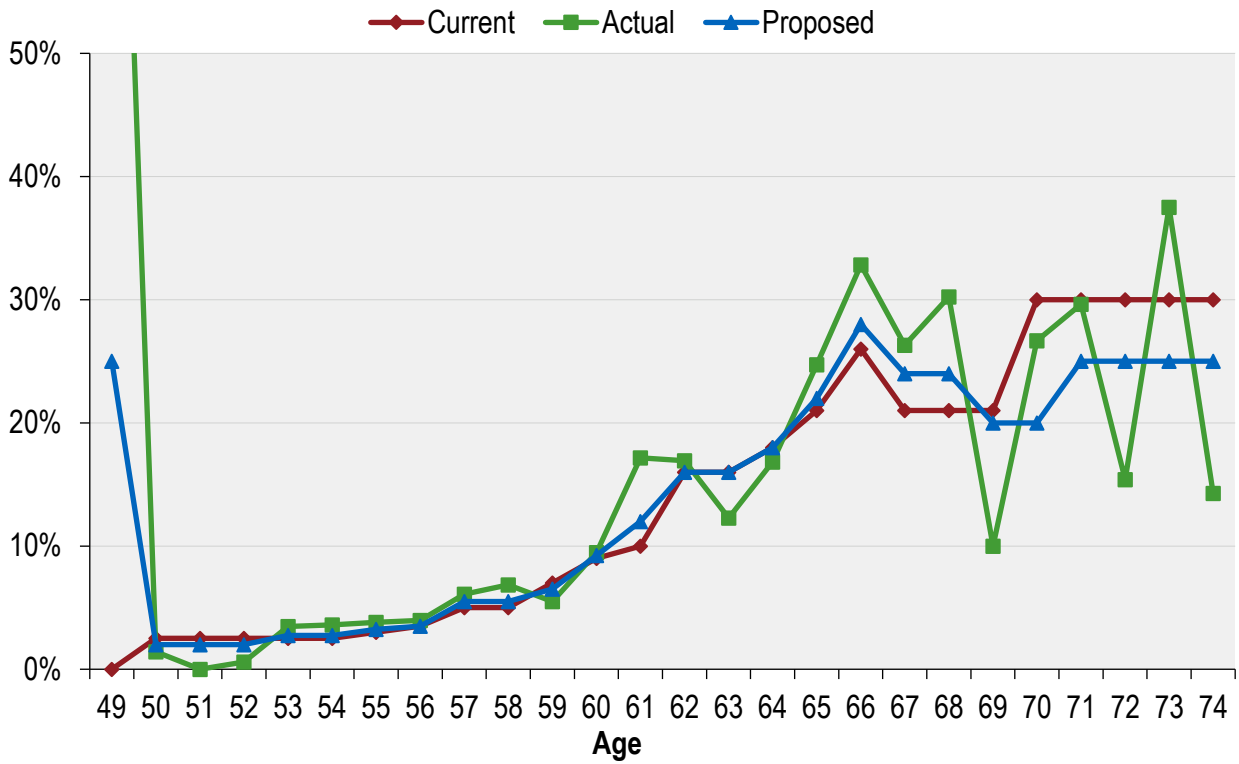
The proposed assumption for the age of the survivor and recommended assumption are shown below. These assumptions will continue to be monitored in future experience studies.

Survivor Ages – Current Assumptions			
Beneficiary Sex	Survivor's Age as Compared to Member's Age		
	Current Assumption	Actual Age Difference	Recommended Assumption
Male	3 years older	2.8 years older	No change
Female	3 years younger	2.5 years younger	No change

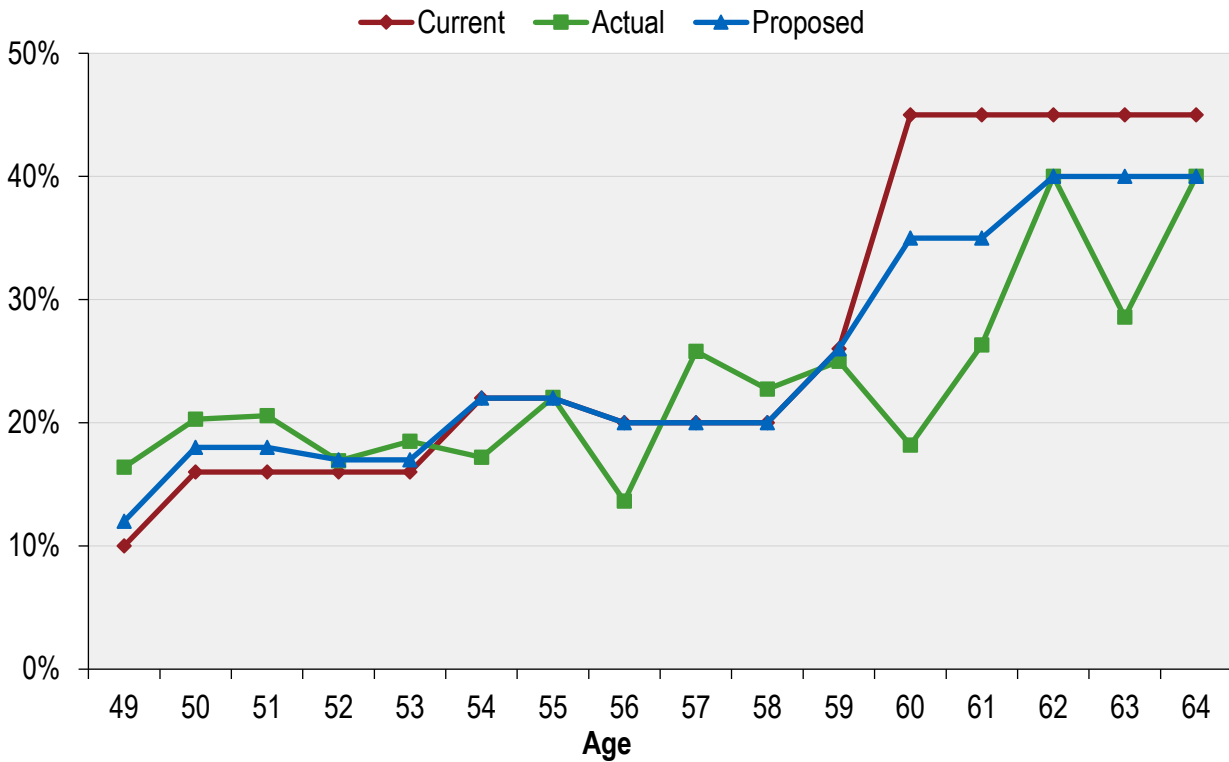
**CHART 3: RETIREMENT RATES
GENERAL ENHANCED MEMBERS**



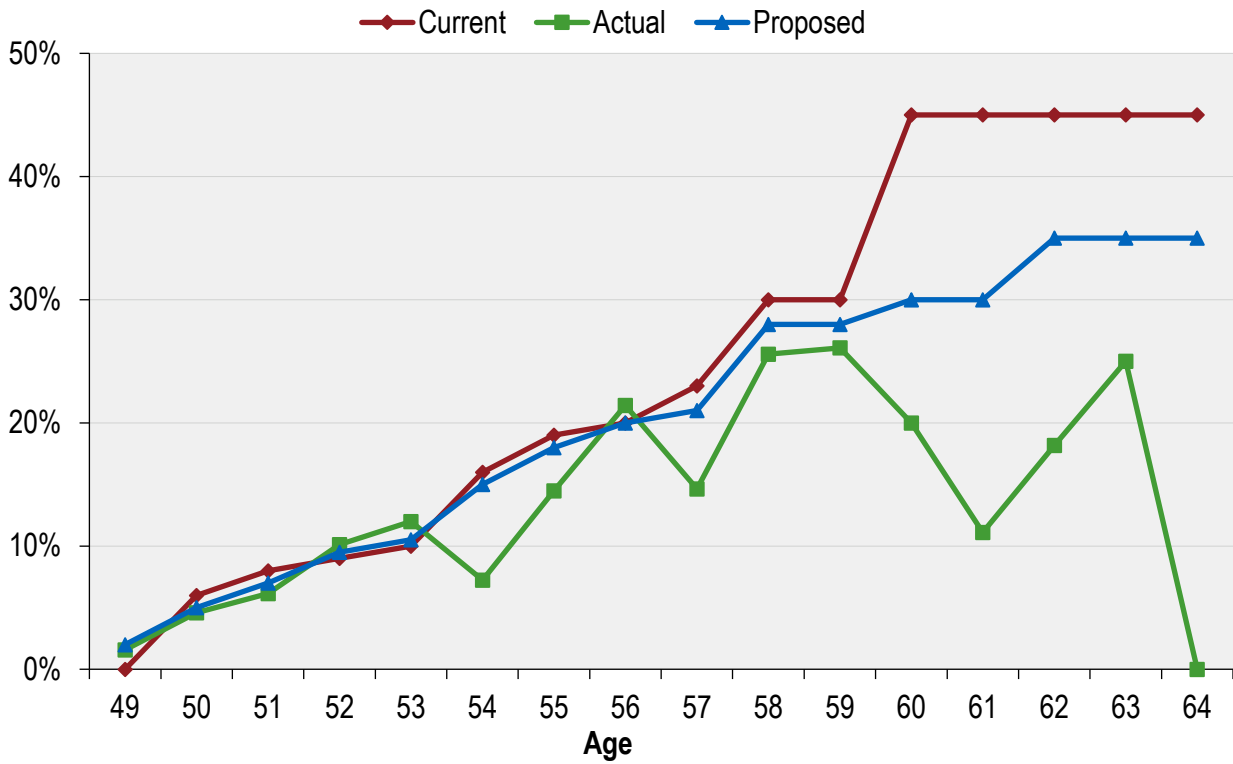
**CHART 4: RETIREMENT RATES
GENERAL NON-ENHANCED MEMBERS**



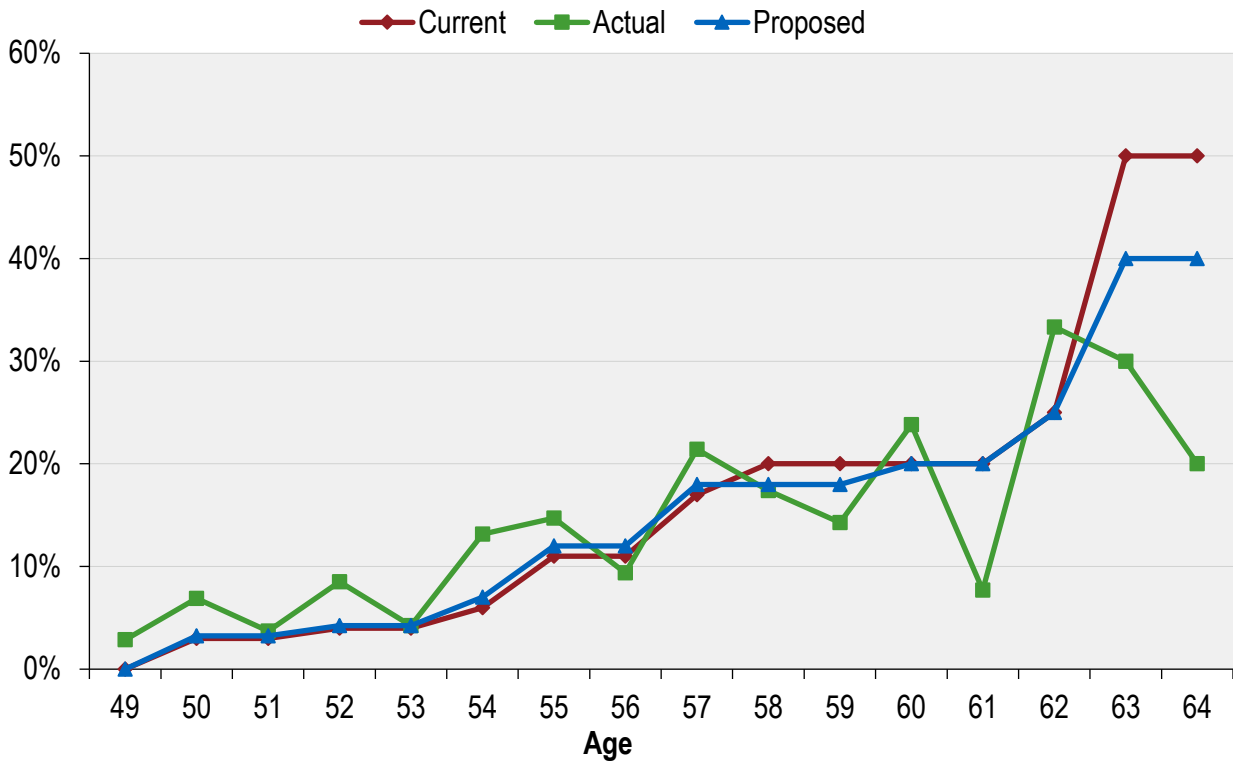
**CHART 5: RETIREMENT RATES
SAFETY LAW ENFORCEMENT MEMBERS (31664.1)**



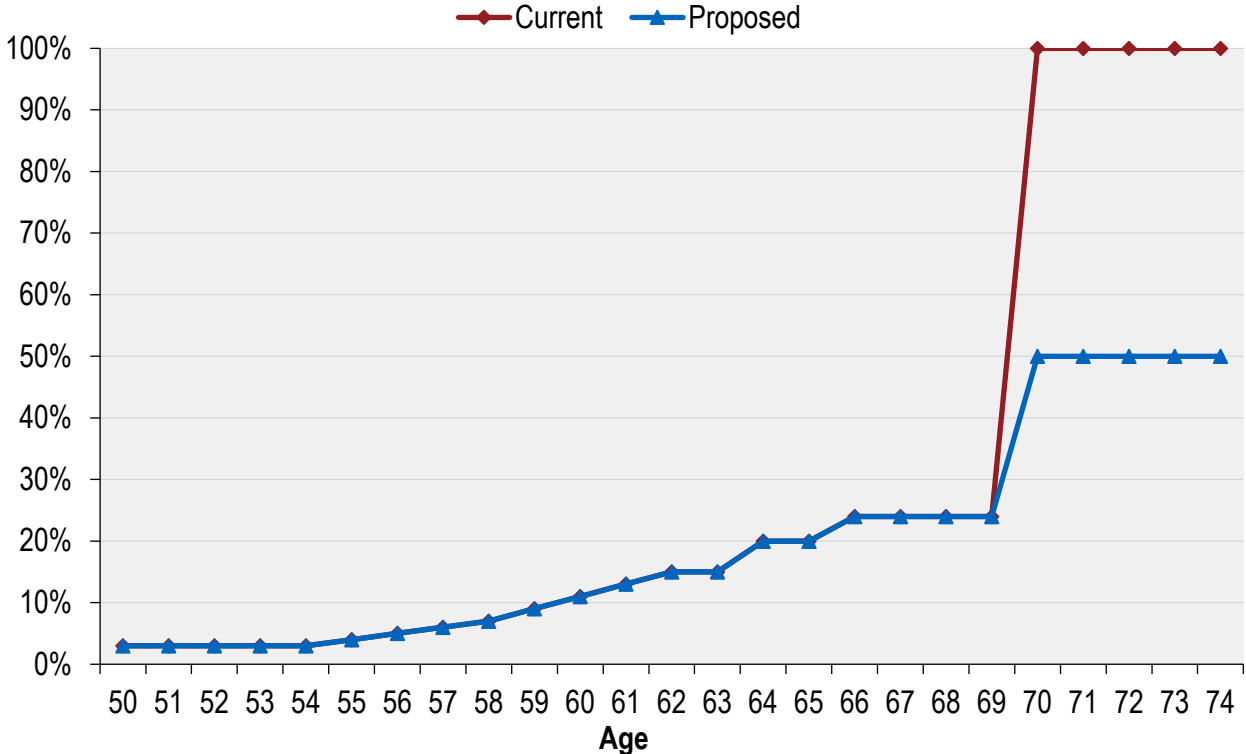
**CHART 6: RETIREMENT RATES
SAFETY FIRE AUTHORITY MEMBERS (31664.1)**



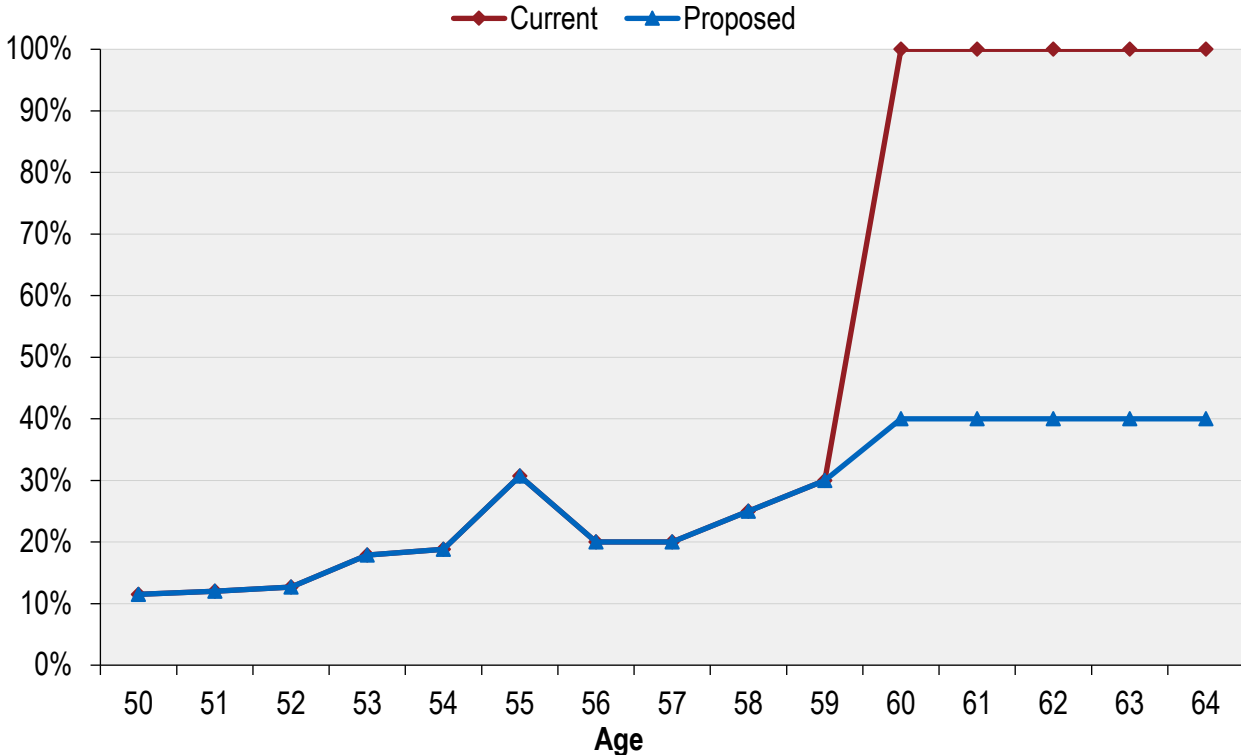
**CHART 7: RETIREMENT RATES
SAFETY PROBATION MEMBERS (31664.1)**



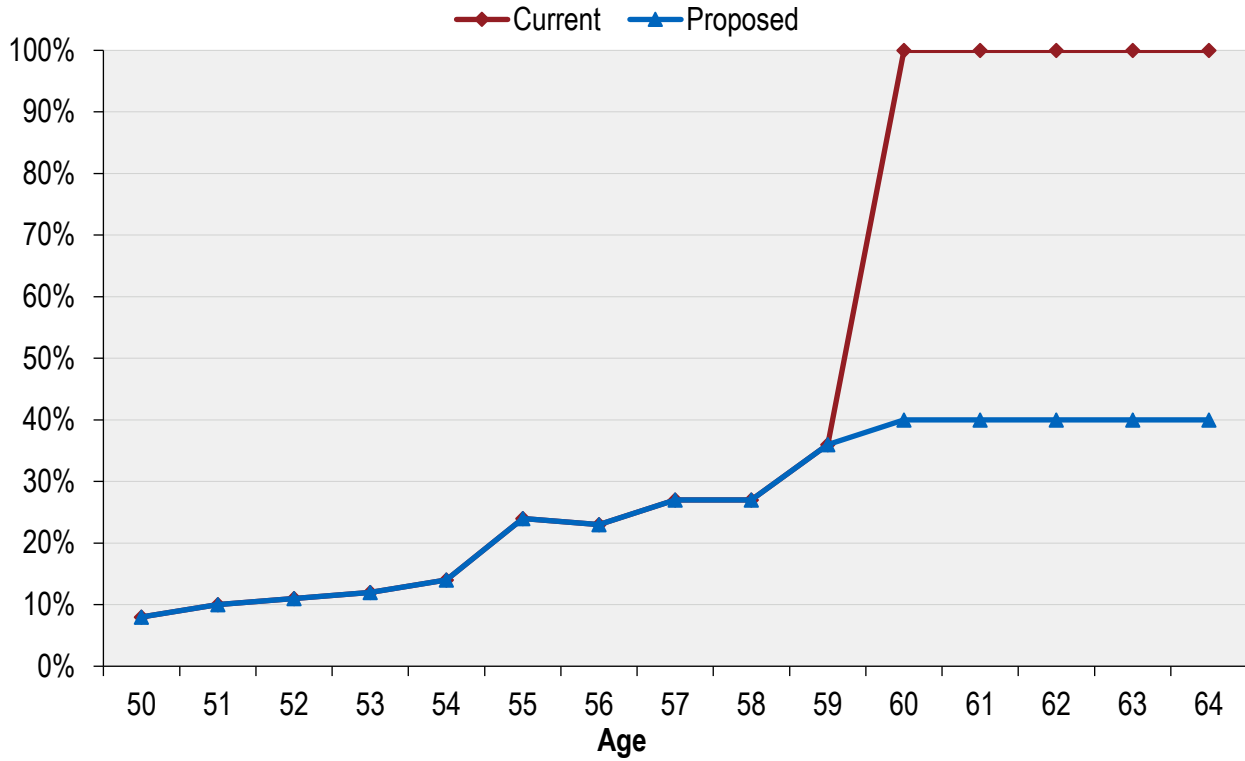
**CHART 8: RETIREMENT RATES
GENERAL SJC MEMBERS (31676.12)**



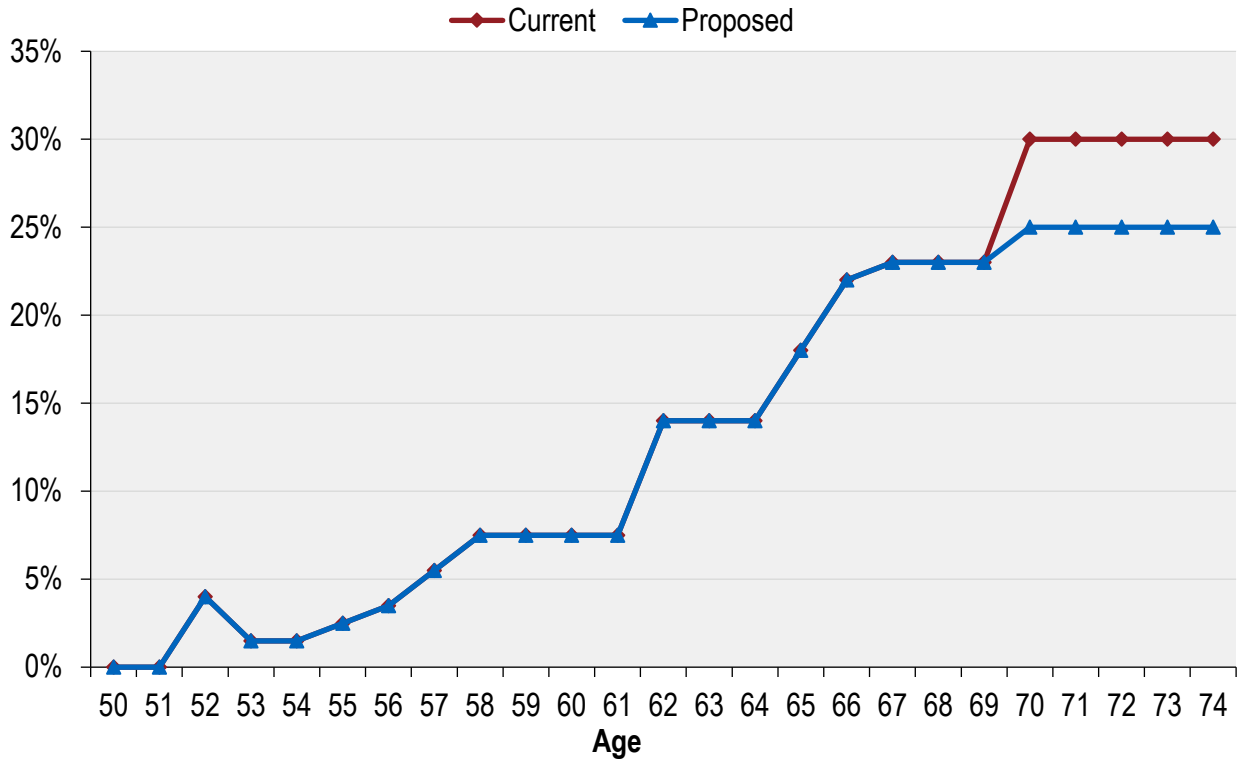
**CHART 9: RETIREMENT RATES
SAFETY LAW ENFORCEMENT MEMBERS (31664.2)**



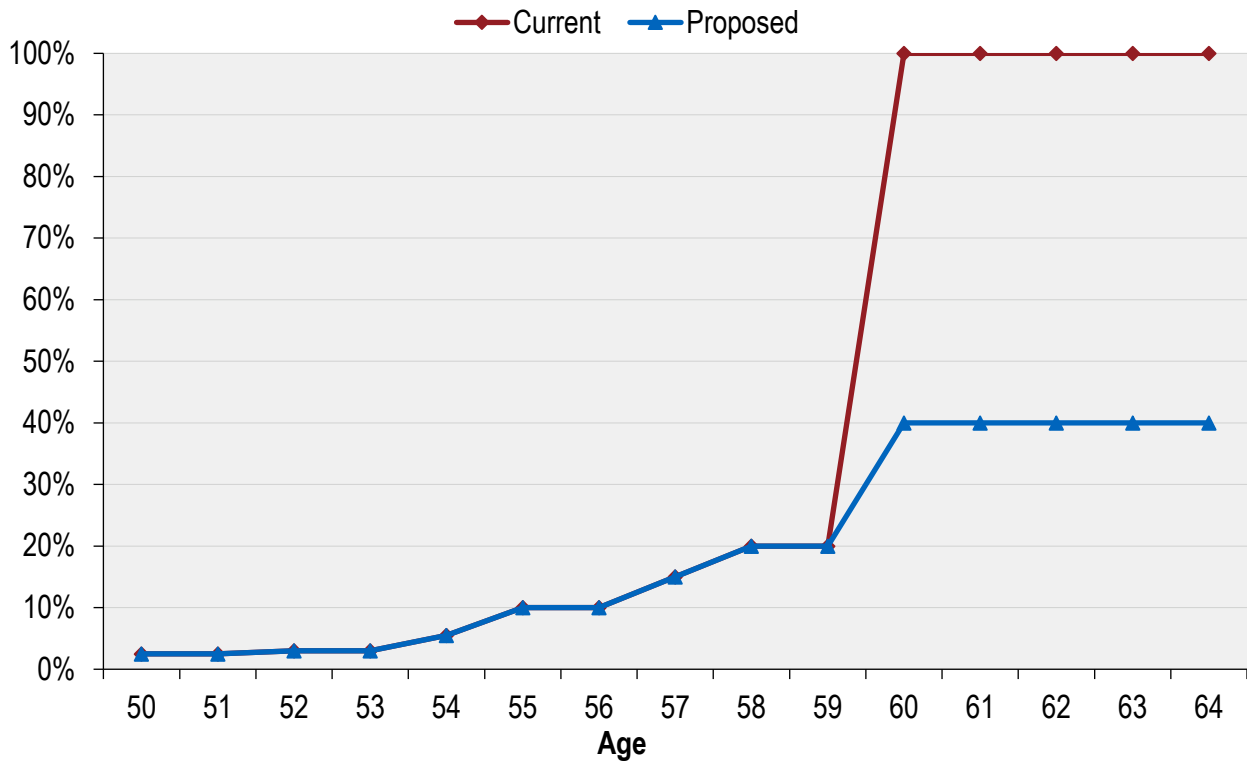
**CHART 10: RETIREMENT RATES
SAFETY FIRE AUTHORITY MEMBERS (31664.2)**



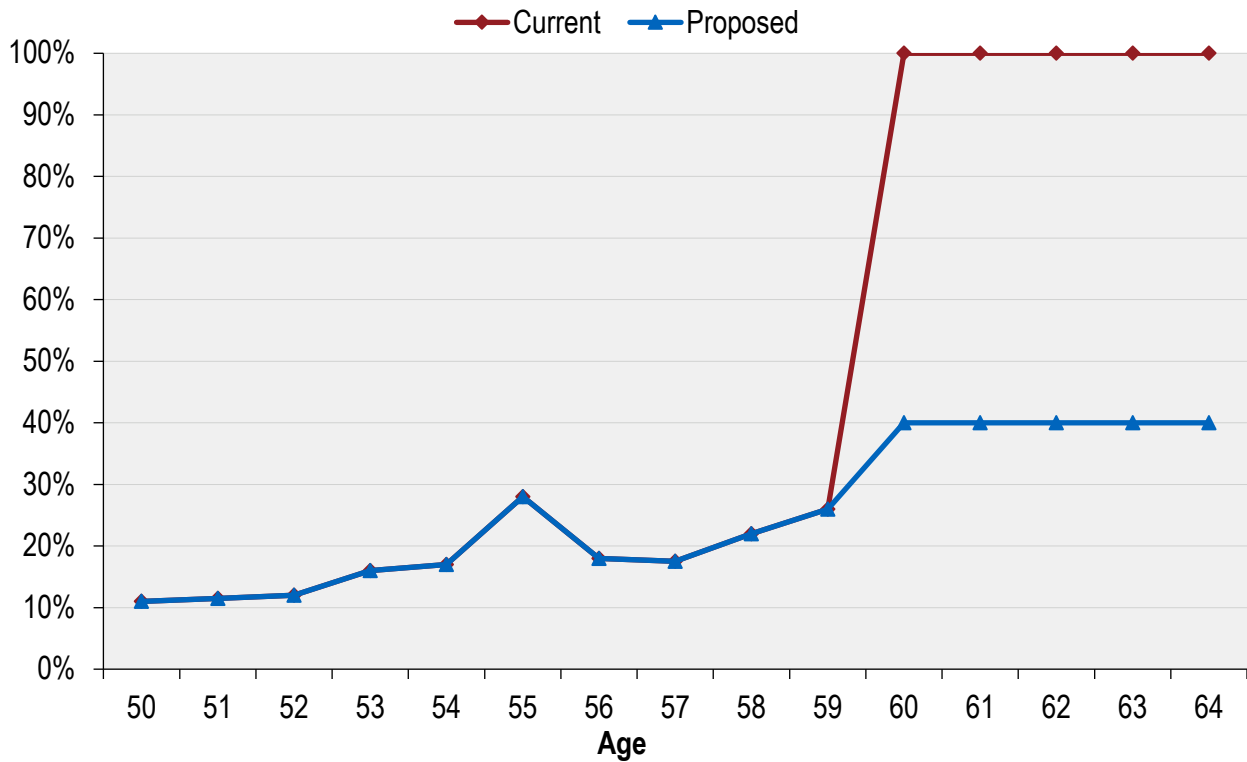
**CHART 11: RETIREMENT RATES
CALPEPRA GENERAL MEMBERS**



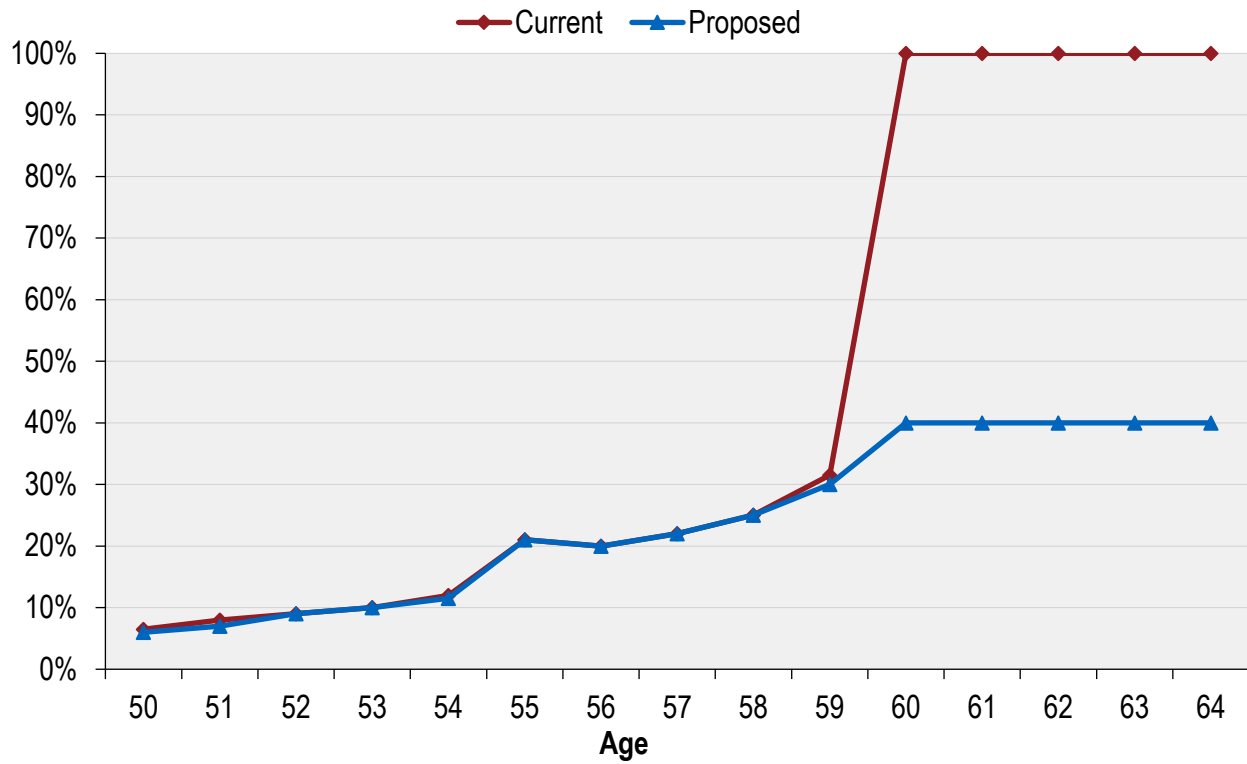
**CHART 12: RETIREMENT RATES
CALPEPRA SAFETY PROBATION MEMBERS**



**CHART 13: RETIREMENT RATES
CALPEPRA SAFETY LAW ENFORCEMENT MEMBERS**



**CHART 14: RETIREMENT RATES
CALPEPRA SAFETY FIRE AUTHORITY MEMBERS**



B. Mortality Rates - Healthy

The “healthy” mortality rates project the life expectancy of a member who retires from service (i.e., who did not retire on a disability pension). Also, the “healthy” pre-retirement mortality rates project what proportion of members will die before retirement. For General members, the table currently being used for post-service retirement mortality rates is the RP-2000 Combined Healthy Mortality Table (separate tables for males and females) projected with Scale BB to 2020 with no age adjustments. For Safety members, the table currently being used for post-service retirement mortality rates is the RP-2000 Combined Healthy Mortality Table (separate tables for males and females) projected with Scale BB to 2020 with ages set back two years. All General and Safety beneficiaries are assumed to have the same mortality of a General member of the opposite sex who has taken a service (non-disabled) retirement.

The Society of Actuaries (SOA) has published the RP-2014 family of mortality tables and associated mortality improvement scales. Within that family of mortality tables, there are mortality rates developed for annuitants on a “headcount” weighted basis that weight all retirees at the same age the same way without regard to the level of benefits those annuitants are receiving from a retirement plan. Mortality rates are also developed for annuitants on a “benefit” weighted basis, with higher credibility assigned to experience from annuitants receiving larger benefits. The headcount-weighted basis is the more common practice currently and is the approach used by Segal in the past for its California public system clients (including OCERS) and by other public sector actuaries in California.

As for the mortality improvement scales, they can be applied in one of two ways. Historically, the more common application is to use a “static” approach to anticipate a fixed level of mortality improvement for all annuitants receiving benefits from a retirement plan. This is in contrast to a “generational” approach where each future year has its own mortality table that reflects the forecasted improvements, using the published improvement scales. While the static approach is still used by some of Segal’s California public system clients, as well as CalPERS, the “generational” approach is the emerging practice within the actuarial profession.

A generational mortality table provides dynamic projections of mortality experience for each cohort of retirees. For example, the mortality rate for someone who is 65 next year will be slightly less than for someone who is 65 this year. In general, using generational mortality anticipates increases in the cost of the Plan over time as participants’ life expectancies are projected to increase. This is in contrast to updating a static mortality assumption with each experience study as we have proposed in prior experience studies.

The SOA is in the process of collecting data from public sector plans so that they can develop mortality tables based on public sector experience comparable to the RP-2014 mortality tables developed using data collected from private and multi-employer plans. Furthermore, after publishing the two-dimensional MP-2014 life expectancy improvement scale, the SOA replaced it with the two-dimensional MP-2015 life expectancy improvement scales to remove some of the conservatism built into the MP-2014 scale and to better reflect the most recent data of mortality improvement from the Social Security Administration. We understand that the Retirement Plans Experience Committee of the Society of Actuaries (RPEC) intends to publish annual updates to their mortality improvement scales. Improvement scale MP-2016 is the latest improvement scale available.

We recommend that given the trend in the retirement industry to move towards generational mortality, it would be reasonable for the Board to adopt the Headcount-Weighted RP-2014 mortality table (adjusted for OCERS experience), and project the mortality improvement generationally using the MP-2016 mortality improvement scale. Once the SOA has included data from public sector plans in developing the new tables, we will also include a discussion with the Board on whether to consider the benefit weighted mortality rates in a future experience study.

As an illustration of the relative effect of these approaches, we have provided in the table below the approximate change in the total employer and member contribution rates based on the different approaches to build in margin for future mortality improvements.

	Employer and Member Contribution Rate Impact Combined
Headcount Weighted RP-2014 Family of Tables – Static Approach with Increased Margin*	3.5% of payroll
Benefit Weighted RP-2014 Family of Tables – Static Approach without Increased Margin	5.1% of payroll
Headcount Weighted RP-2014 Family of Tables – Generational Approach	4.3% of payroll

* Includes an increased margin of 20% to anticipate the move towards a “generational” approach.

In order to use more actual OCERS experience in our analysis, we have used experience for a nine-year period by using data from the current (from January 1, 2014 to December 31, 2016) and the last two (from January 1, 2011 to December 31, 2013 and January 1, 2008 to December 31, 2010) experience study periods to study this assumption. We have continued to examine the mortality experience with all beneficiaries included since combining General healthy retirees and all General and Safety beneficiaries would provide more exposures and would increase the credibility of the results.

Pre-Retirement Mortality

In prior experience studies, the pre-retirement mortality rates for active members were set equal to the post-retirement mortality rates for retirees since the actual number of deaths among active members was not large enough to provide a statistically credible analysis. However, this approach is not compatible with our current proposal because the post-retirement RP-2014 Healthy Annuitant table does not include rates for ages below 50.

From the RP-2014 family of tables, we recommend that pre-retirement mortality follow the Headcount-Weighted RP-2014 Employee Mortality Table (separate tables for males and females) times 80%, projected generationally with the two-dimensional scale MP-2016. The 80% scaling factor is to account for the lower incidences of observed pre-retirement death on the combined General and Safety workforce relative to the standard table.

Currently, our assumption is that all General member pre-retirement deaths are non-service connected. For Safety, 90% of pre-retirement deaths are assumed to be non-service connected and the other 10% are assumed to be service connected. Based on actual experience during the last three years (with 100% non-service connected deaths for General and 90% non-service connected deaths for Safety), we recommended maintaining the current assumption for both General and Safety members.

Post-Retirement Mortality (Service Retirements)

Among all retired members, the actual deaths compared to the expected deaths under the current assumptions for the last nine years is shown in the table below. We also show the deaths under proposed assumptions. In prior years we have generally set the mortality assumption using a static mortality projection so that actual deaths will be at least 10% greater than those assumed. As noted above, we are recommending the use of a generational mortality table rather than static mortality. A generational mortality table incorporates a more explicit assumption for future mortality improvement. Accordingly, the goal is to start with a mortality table that closely matches the current experience (without a margin for future mortality improvement), and then reflect mortality improvement by projecting lower mortality rates in future years. That is why the current actual to expected ratios shown in the table below for General (including all beneficiaries) and Safety are 98% and 97%, respectively. In future years these ratios should remain around 100%, as long as actual mortality improved at the same rates as anticipated in the generational mortality tables. The actual deaths compared to the expected deaths under the current and proposed assumptions for the last nine years are as follows:

Gender	General Members – Healthy			Safety Members - Healthy		
	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	913	921	1,000	115	126	130
Female	1,029	1,081	1,098	10	11	11
Total	1,942	2,002	2,098	125	137	141
Actual / Expected	103%		95%	110%		97%

Gender	All Beneficiaries – Healthy		
	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	135	179	139
Female	440	475	468
Total	575	654	607
Actual / Expected	114%		108%

Gender	General Members and All Beneficiaries – Healthy			Safety Members - Healthy		
	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	1,048	1,100	1,139	115	126	130
Female	1,469	1,556	1,566	10	11	11
Total	2,517	2,656	2,705	125	137	141
Actual / Expected	106%		98%	110%		97%

For General service retirees and all beneficiaries, the ratio of actual to expected deaths was 106% during the nine-year period. We recommend updating the current table to the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) with no age adjustments. This will bring the current actual to expected ratio to 98%. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016.

For Safety service retirees, the ratio of actual to expected deaths was 110% during the nine-year period. We recommend updating the current table to the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) with ages set back four years. This will bring the current actual to expected ratio to 97%. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016.

All of this is consistent with ASOP 35 as we anticipate expected future improvement in life expectancy using the generational approach.

Chart 15 compares actual to expected deaths for General members and all beneficiaries under the current and proposed assumptions over the last nine years. Experience shows that there were more deaths than predicted by the current table.

Chart 16 has the same comparison for Safety members. Experience shows that there were more deaths than predicted by the current table.

Chart 17 shows the life expectancies (i.e. expected future lifetime) under the current and the proposed tables for General members and all beneficiaries.

Chart 18 shows the same information for Safety members.

The expected deaths (Charts 15 and 16) and life expectancies (Charts 17 and 18) under the proposed generational mortality table are based on mortality rates from 2014 which is the base year of the table. In practice, life expectancies will be assumed to increase based on applying the mortality improvement scale.

Comparison to CalPERS' Mortality Table

Following prior practice, we have continued to use the mortality tables published by the SOA but adjusted to reflect OCERS' mortality experience in recommending the post-retirement mortality tables. Subsequent to our last experience study, we were asked whether or not it could have been appropriate to start with the mortality tables used by CalPERS for their participating employers and members and modify them for use at OCERS. We have addressed that question in this section.

When comparing OCERS' mortality experience over the past nine years against the CalPERS mortality table with no age adjustment, the actual to expected ratios are 115% for General members (including beneficiaries), 96% for Safety members and 114% when combining both General and Safety members. The reason why the actual and expected ratios differed significantly between General and Safety members is that CalPERS does not develop separate mortality tables between different membership classes (i.e., General and Safety) for members who retired from service retirement.

It is our understanding from conversations with CalPERS staff that CalPERS is considering moving towards using different mortality tables for General and Safety members in their valuations at some future time. In addition, they are also considering moving to a generational approach to anticipate future mortality improvements which is our understanding of the reason why they are currently considering about a 20% margin in selecting their mortality assumptions. After taking the above factors into account, we believe that the tables we have proposed (using the SOA mortality tables as a starting point) provide a better predictor for mortality experience for OCERS.

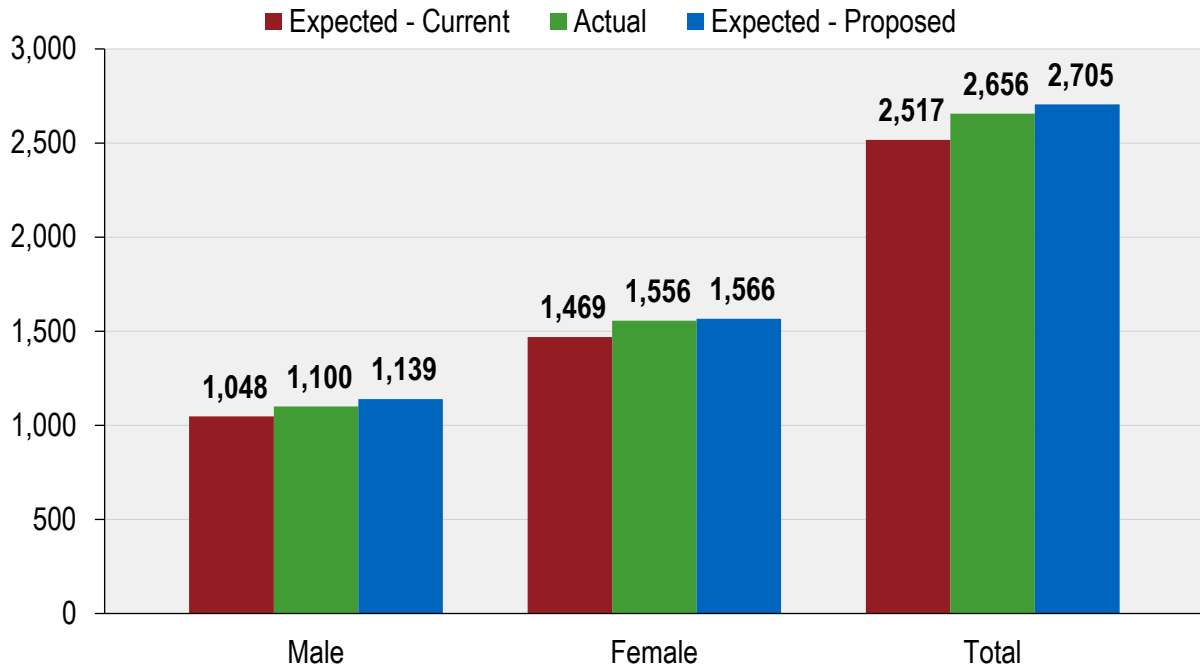
Mortality Table for Member Contributions, Optional Forms of Payment and Reserves

There are administrative reasons why a generational mortality table is more difficult to implement for determining age-based member contribution rates, optional forms of payment and reserves. One emerging practice is to approximate the use of a generational mortality table by the use of a static table with projection of the mortality improvement over a period that is close to the duration of the benefit payments for active members. We would recommend the use of this approximation.

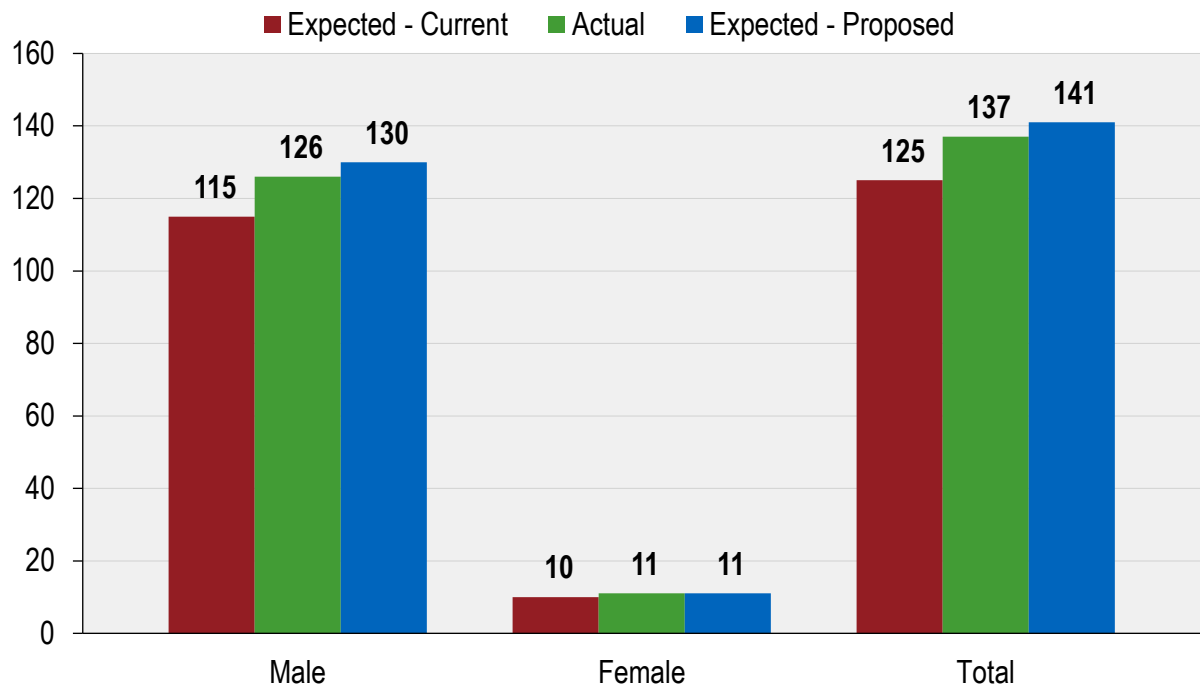
We recommend that the mortality table used for determining contributions for General members be updated to a blended table based on the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females), projected 20 years with the two-dimensional mortality improvement scale MP-2016, weighted 40% male and 60% female. This is based on the proposed valuation mortality table for General members and the actual gender distribution of General members. For all beneficiaries, we recommend the same tables as General members but weighted 60% male and 40% female.

We also recommend an update to the mortality table for Safety members to be the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females), projected 20 years with the two-dimensional mortality improvement scale MP-2016 set back four years, weighted 80% male and 20% female. This is based on the proposed mortality table for Safety members and the actual gender distribution for the current Safety members.

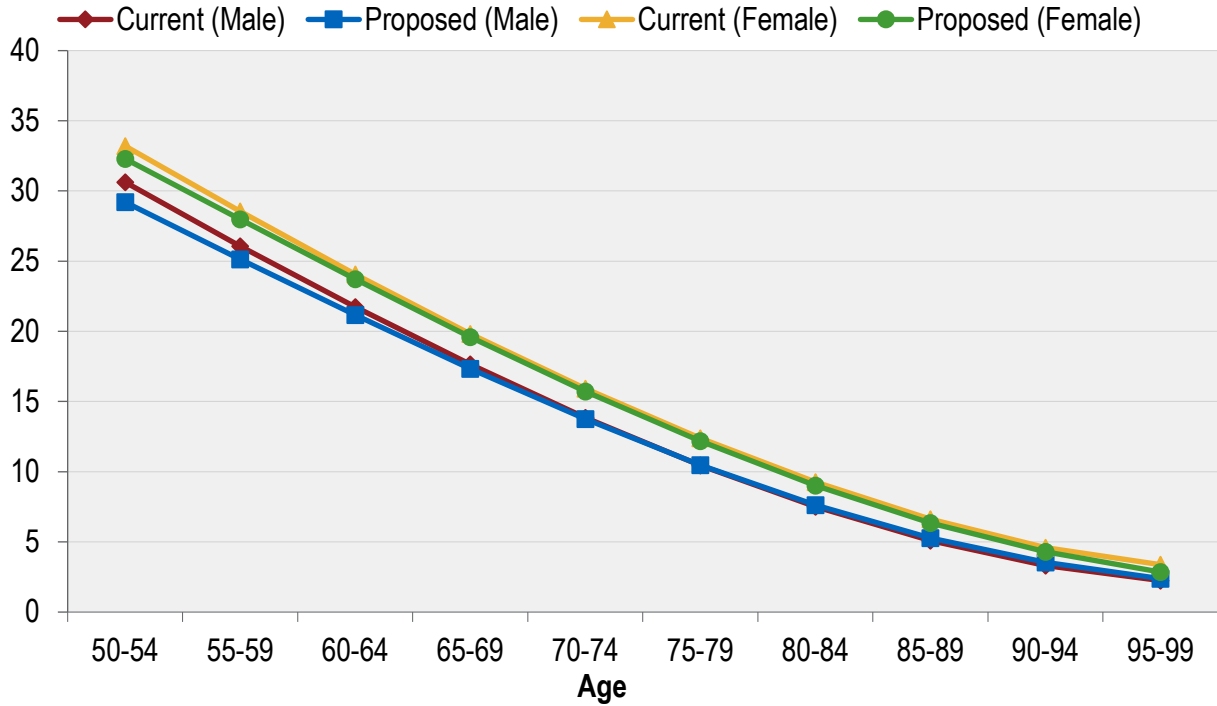
**CHART 15: POST-RETIREMENT DEATHS
NON – DISABLED GENERAL MEMBERS AND ALL BENEFICIARIES
(JANUARY 1, 2008 THROUGH DECEMBER 31, 2016)**



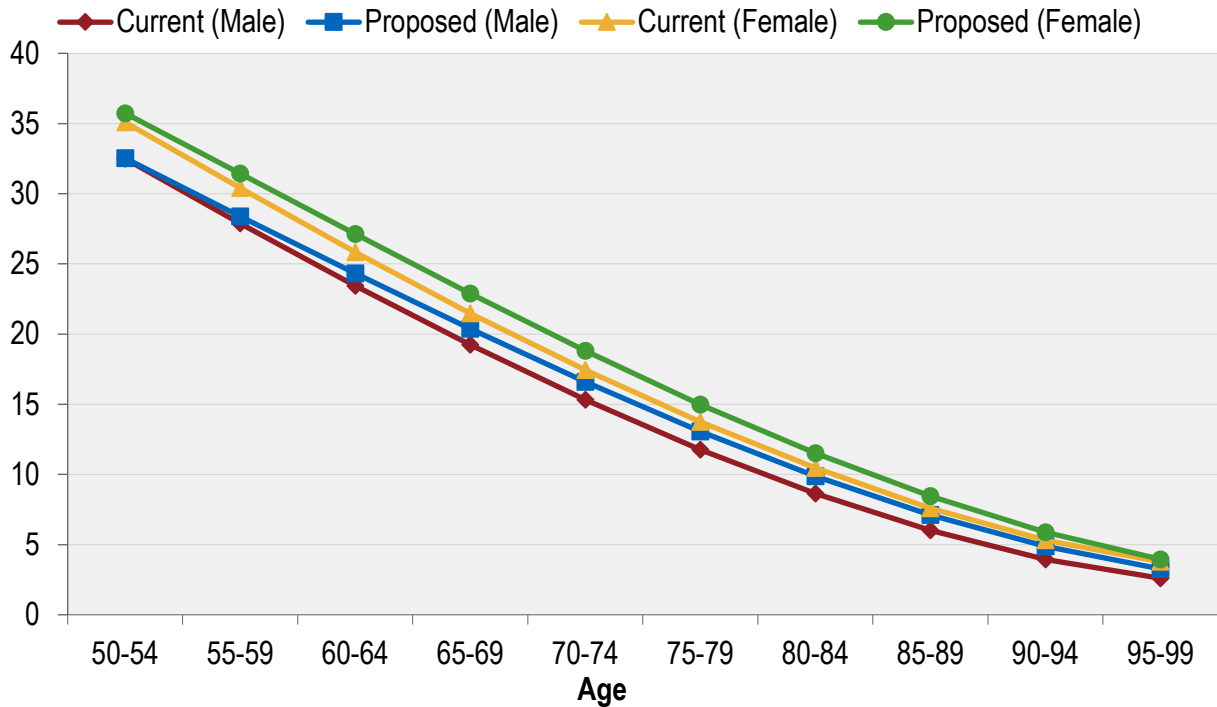
**CHART 16: POST-RETIREMENT DEATHS
NON – DISABLED SAFETY MEMBERS
(JANUARY 1, 2008 THROUGH DECEMBER 31, 2016)**



**CHART 17: LIFE EXPECTANCIES
NON – DISABLED GENERAL MEMBERS AND BENEFICIARIES**



**CHART 18: LIFE EXPECTANCIES
NON – DISABLED SAFETY MEMBERS**



C. Mortality Rates - Disabled

Since mortality rates for disabled members can vary from those of healthy members, a different mortality assumption is often used. For General members, the table currently being used is the RP-2000 Combined Healthy Mortality Table, projected with scale BB to 2020, set forward six years for males and set forward three years for females. For Safety members, the table currently being used is the RP-2000 Combined Healthy Mortality Table, projected with scale BB to 2020.

The number of actual deaths compared to the number expected under the current and proposed assumption for the last nine years are as provided in the table below.

Gender	General - Disabled			Safety - Disabled		
	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	124	122	121	37	52	48
Female	73	93	97	3	1	5
Total	197	215	218	40	53	53
Actual / Expected	109%		99%	132%		100%

Based on the actual experience from the last nine years, we recommend changing the mortality table for General disabled members to the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) set forward five years. This will bring the current actual to expected ratio to 99%. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016.

Likewise, based on the actual experience, we recommend changing the mortality table for Safety disabled members to the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females). This will bring the current actual to expected ratio to 100%. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016.

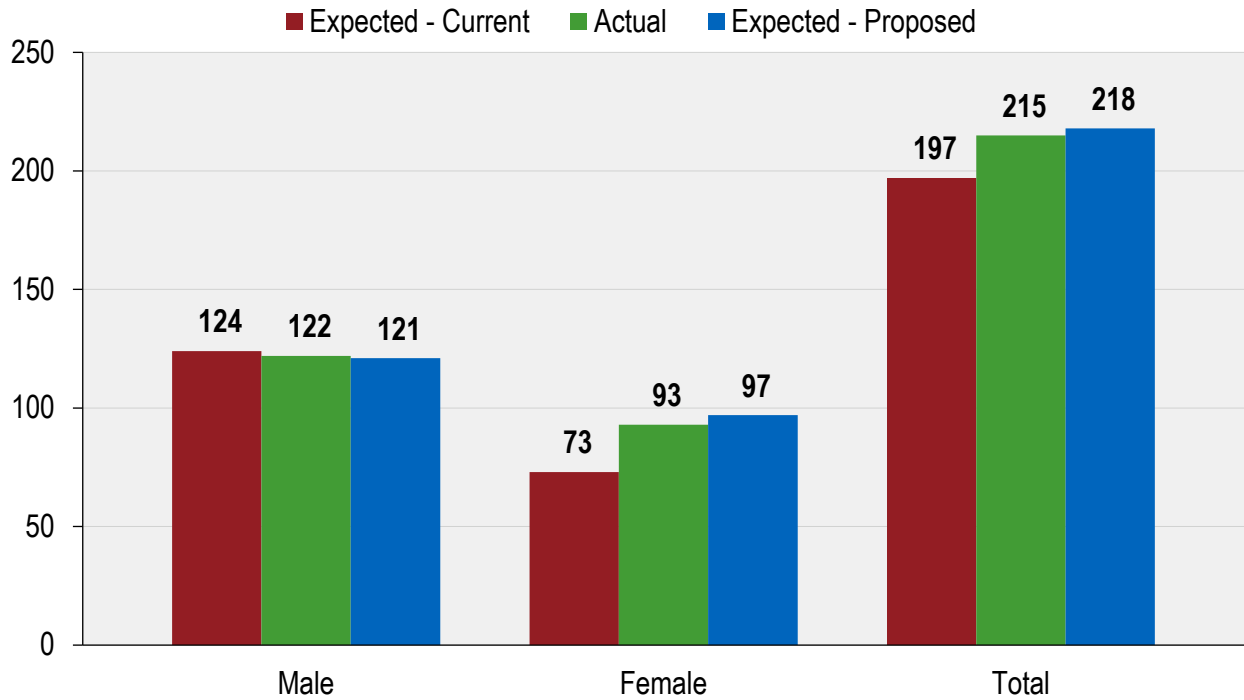
Chart 19 compares actual to expected deaths under both the current and proposed assumptions for disabled General members over the last nine years. Experience shows that there were more deaths than predicted by the current table.

Chart 20 has the same comparison for Safety members. Experience shows that there were more deaths than predicted by the current table.

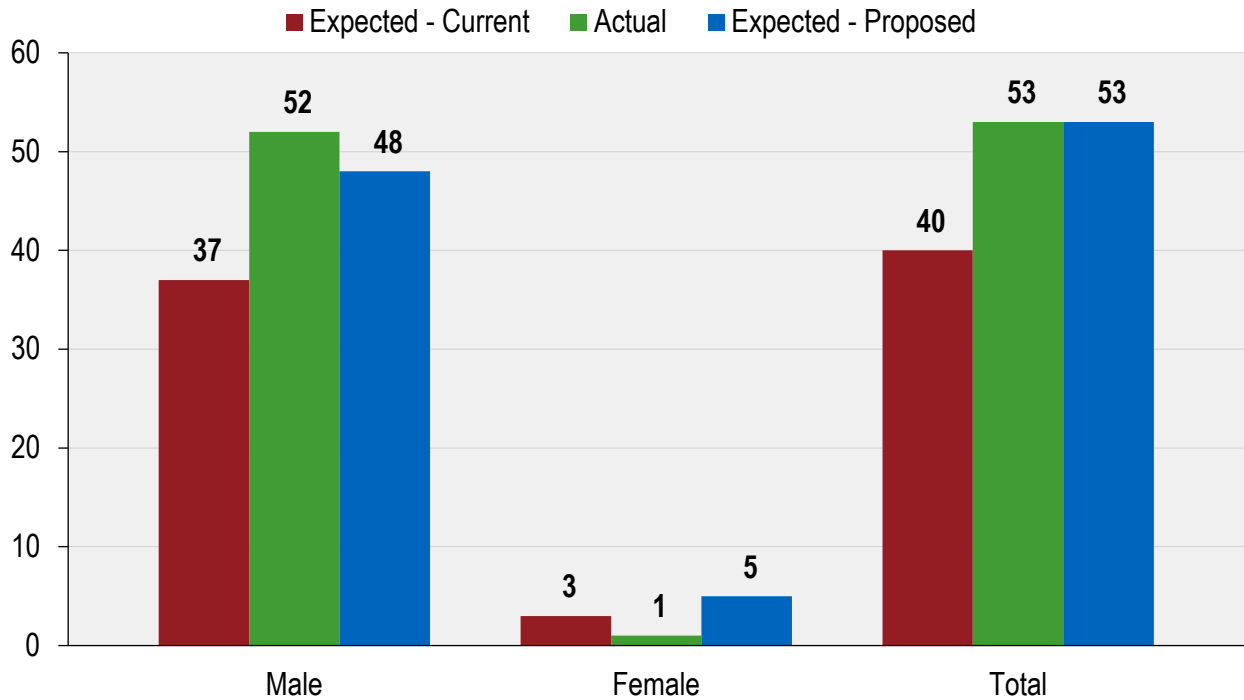
Chart 21 shows the life expectancies under both the current and proposed tables for General members.

Chart 22 shows the same information for Safety members.

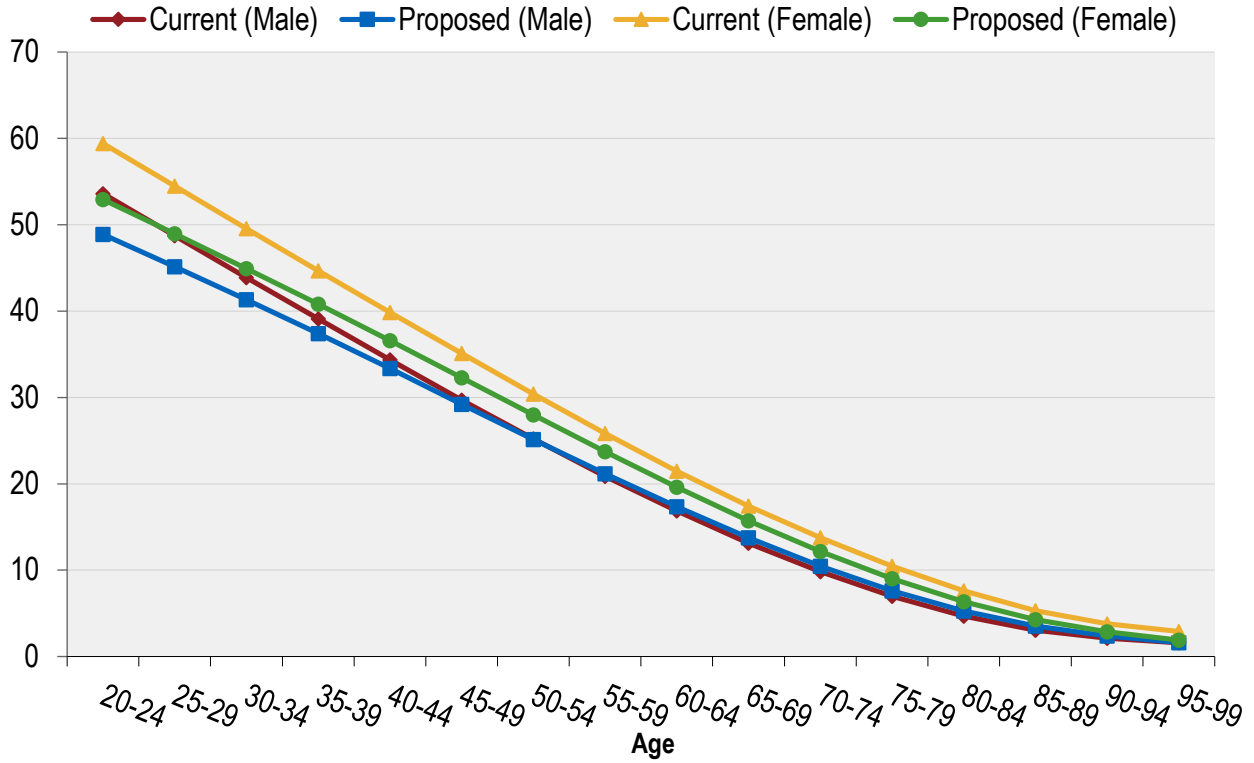
**CHART 19: POST-RETIREMENT DEATHS
DISABLED GENERAL MEMBERS
(JANUARY 1, 2008 THROUGH DECEMBER 31, 2016)**



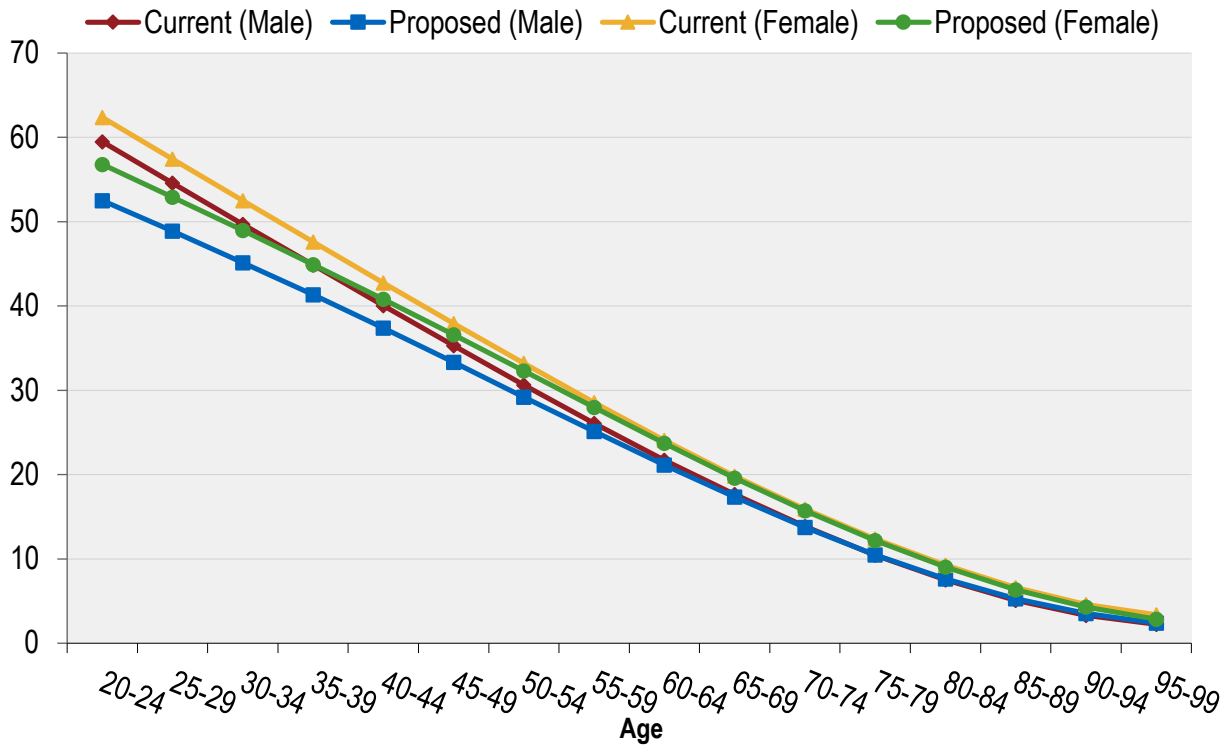
**CHART 20: POST-RETIREMENT DEATHS
DISABLED SAFETY MEMBERS
(JANUARY 1, 2008 THROUGH DECEMBER 31, 2016)**



**CHART 21: LIFE EXPECTANCIES
DISABLED GENERAL MEMBERS**



**CHART 22: LIFE EXPECTANCIES
DISABLED SAFETY MEMBERS**



D. Termination Rates

Termination rates include all terminations for reasons other than death, disability, or retirement. Under the current assumptions there is an overall incidence of termination assumed, combined with assumptions, based on the plan membership and years of service. There is also another set of assumptions to anticipate the percentage of members who will withdraw their contributions and members who will leave their contributions on deposit and receive a deferred vested benefit.

We have developed rates for the following four groups: (1) General All Other, (2) General OCTA, (3) Safety Law Enforcement and Fire and (4) Safety Probation. The termination experience over the last three years is shown by years of service in the following tables. We also show the current and proposed assumptions.

Years of Service	Termination Rate (%)					
	General All Other			General OCTA		
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
Less than 1	11.00	11.13	11.00	17.50	18.29	17.50
1	8.00	6.93	7.50	13.50	7.73	11.00
2	7.00	6.17	6.50	10.50	6.63	9.00
3	5.00	5.05	5.00	10.00	3.96	8.50
4	4.00	6.26	4.50	9.00	1.69	7.50
5	3.75	5.70	4.25	7.00	10.00	7.00
6	3.50	4.25	3.75	5.00	2.33	4.50
7	3.00	3.62	3.25	5.00	2.48	4.00
8	2.75	3.51	3.00	4.00	2.91	3.50
9	2.50	2.87	2.75	3.50	2.50	3.00
10	2.25	2.56	2.50	3.50	2.83	3.00
11	2.00	2.00	2.00	3.50	1.37	3.00
12	2.00	1.79	2.00	3.00	3.57	3.00
13	1.75	1.94	1.75	3.00	0.76	2.50
14	1.75	1.01	1.50	3.00	2.42	2.50
15	1.75	1.27	1.40	3.00	2.82	2.50
16	1.50	0.95	1.30	3.00	0.00	2.00
17	1.50	1.00	1.20	2.75	1.04	1.80
18	1.50	0.67	1.10	2.75	2.86	1.60
19	1.50	0.75	1.00	2.75	1.79	1.40
20 or more	1.25	0.41	0.90	1.75	0.63	1.20

	Termination Rate (%)					
	Safety Law and Fire			Safety Probation		
Years of Service	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
Less than 1	4.00	6.28	4.50	16.00	10.00	14.00
1	3.00	1.06	2.50	13.00	15.15	13.00
2	2.00	1.83	2.00	10.00	10.00	10.00
3	1.00	2.67	1.50	6.00	0.00	5.00
4	1.00	1.52	1.25	4.00	0.00	4.00
5	1.00	0.00	1.00	3.50	10.00	3.50
6	0.95	1.83	0.95	3.00	0.00	2.75
7	0.90	0.24	0.90	2.50	0.91	2.00
8	0.85	0.23	0.85	2.25	1.83	2.00
9	0.80	0.86	0.80	2.00	0.00	1.75
10	0.75	1.20	0.75	1.75	2.83	1.75
11	0.65	1.36	0.65	1.75	0.00	1.50
12	0.60	0.88	0.60	1.50	0.54	1.25
13	0.50	0.00	0.55	1.25	0.50	1.00
14	0.50	0.32	0.50	1.00	0.56	0.75
15	0.50	0.00	0.45	1.00	1.26	0.75
16	0.50	0.00	0.40	1.00	0.00	0.75
17	0.50	0.67	0.35	0.50	0.00	0.25
18	0.50	0.00	0.30	0.50	0.00	0.25
19	0.50	0.00	0.25	0.50	0.00	0.25
20 or more	0.25	0.08	0.20	0.50	0.00	0.25

Chart 23 compares actual to expected terminations over the past three years for both the current and proposed assumptions for General All Other, General OCTA, Safety Law Enforcement and Fire and Safety Probation members.

Chart 24 shows the actual termination rates over the past three years compared to the current and proposed assumptions for General All Other members.

Chart 25-27 shows the same information as Chart 24, but for General OCTA, Safety Law and Fire and Safety Probation members.

Based upon the recent experience, we have decreased the termination rates overall for General All Other members, General OCTA members, Safety Law and Fire members and Safety Probation members.

The following table shows the currently assumed, actual and proposed assumed percentages for members who withdraw their contributions. In the past, for the four membership categories just discussed, there was a separate assumption for members with fewer than five years of service versus those with five or more years of service. Based on the experience observed during the past three years, we are recommending a more detailed assumption for members with five or more years of service. The assumed percentages for members who leave their contributions on deposit and receive a deferred vested benefit is equal to 100% minus the percentage of those assumed to withdraw.

Election for Withdrawal of Contributions						
General All Other				General OCTA		
Years of Service	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
0-4	40%	25%	35%	45%	33%	40%
5-9	25%	31%	30%	35%	33%	35%
10-14	25%	27%	25%	35%	28%	30%
15 or more	25%	18%	20%	35%	13%	20%

Election for Withdrawal of Contributions						
Safety Law and Fire				Safety Probation		
Years of Service	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
0-4	20%	12%	20%	40%	20%	25%
5-9	20%	55%	20%	30%	0%	25%
10-14	20%	11%	20%	30%	0%	25%
15 or more	20%	25%	20%	30%	50%	25%

CHART 23: ACTUAL NUMBER OF TERMINATIONS COMPARED TO EXPECTED
(JANUARY 1, 2014 THROUGH DECEMBER 31, 2016)

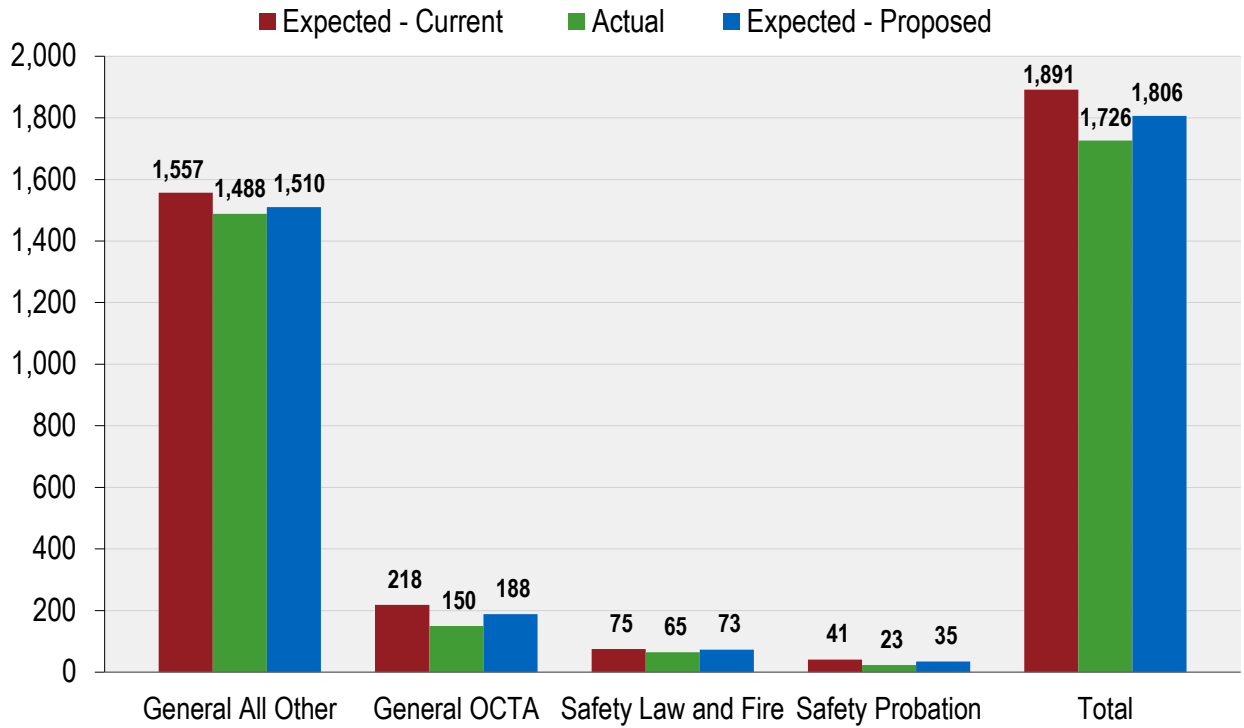
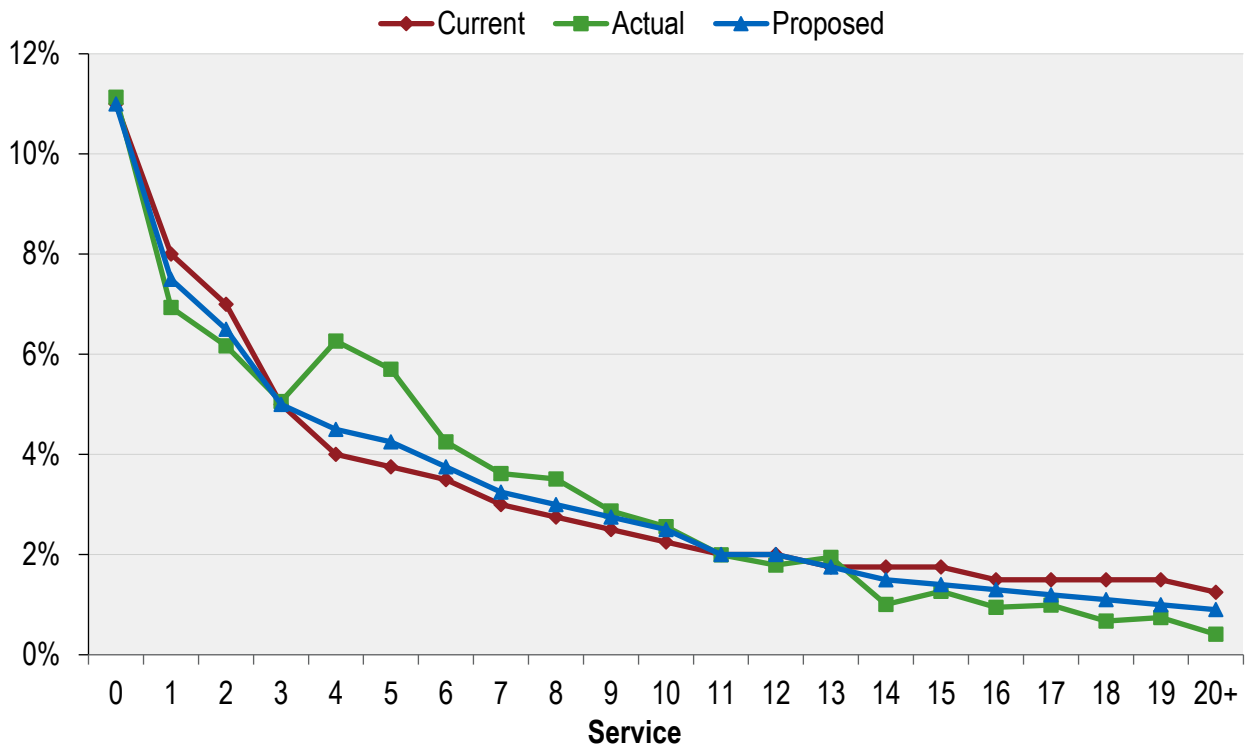
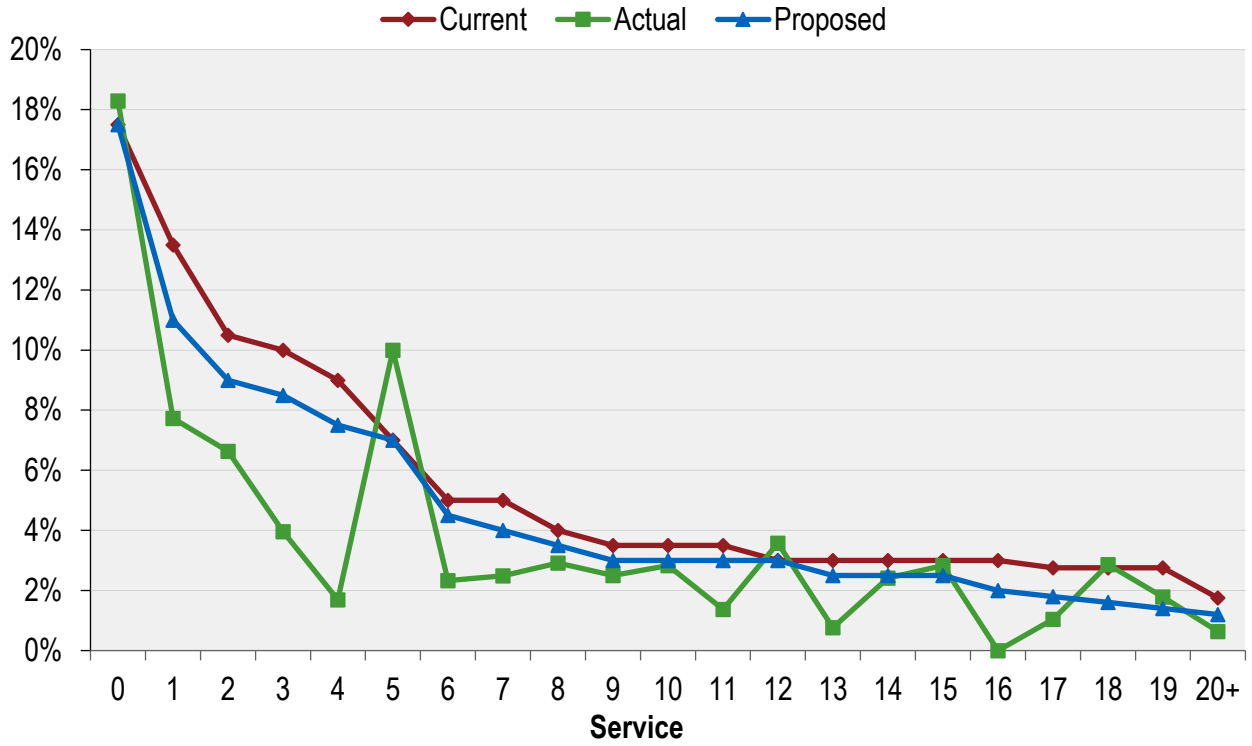


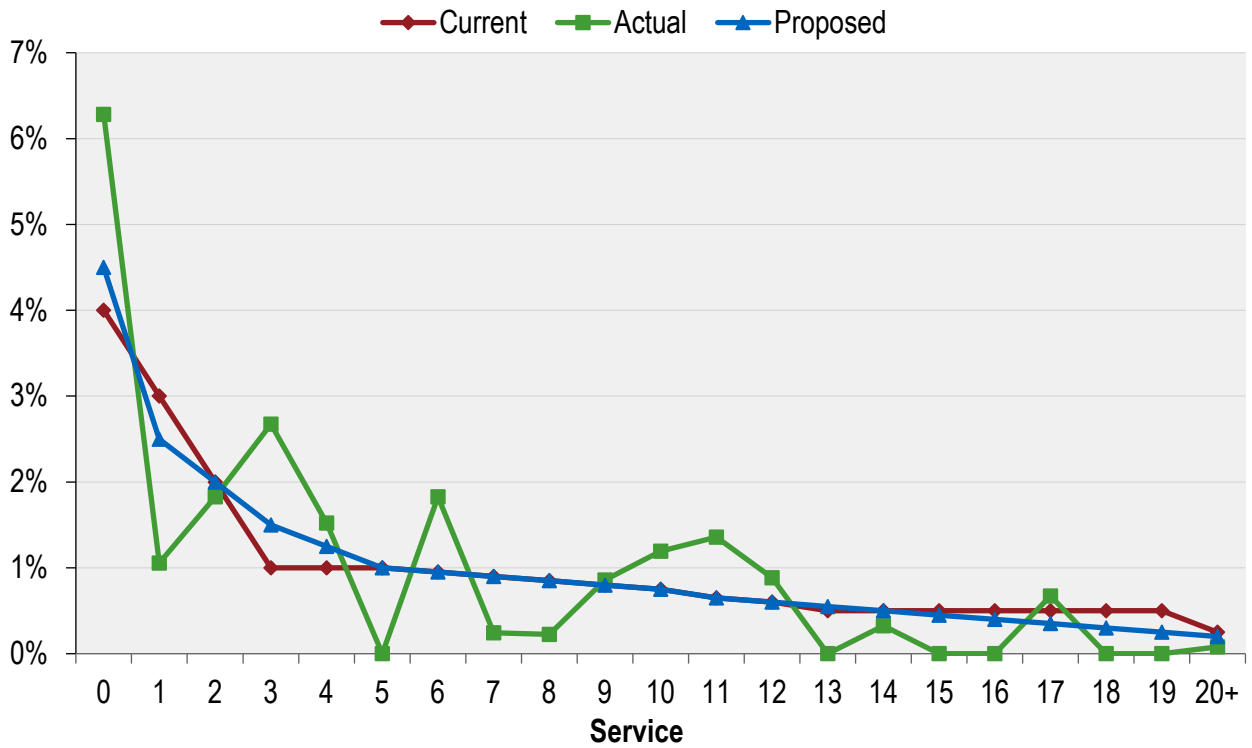
CHART 24: TERMINATION RATES GENERAL ALL OTHER MEMBERS



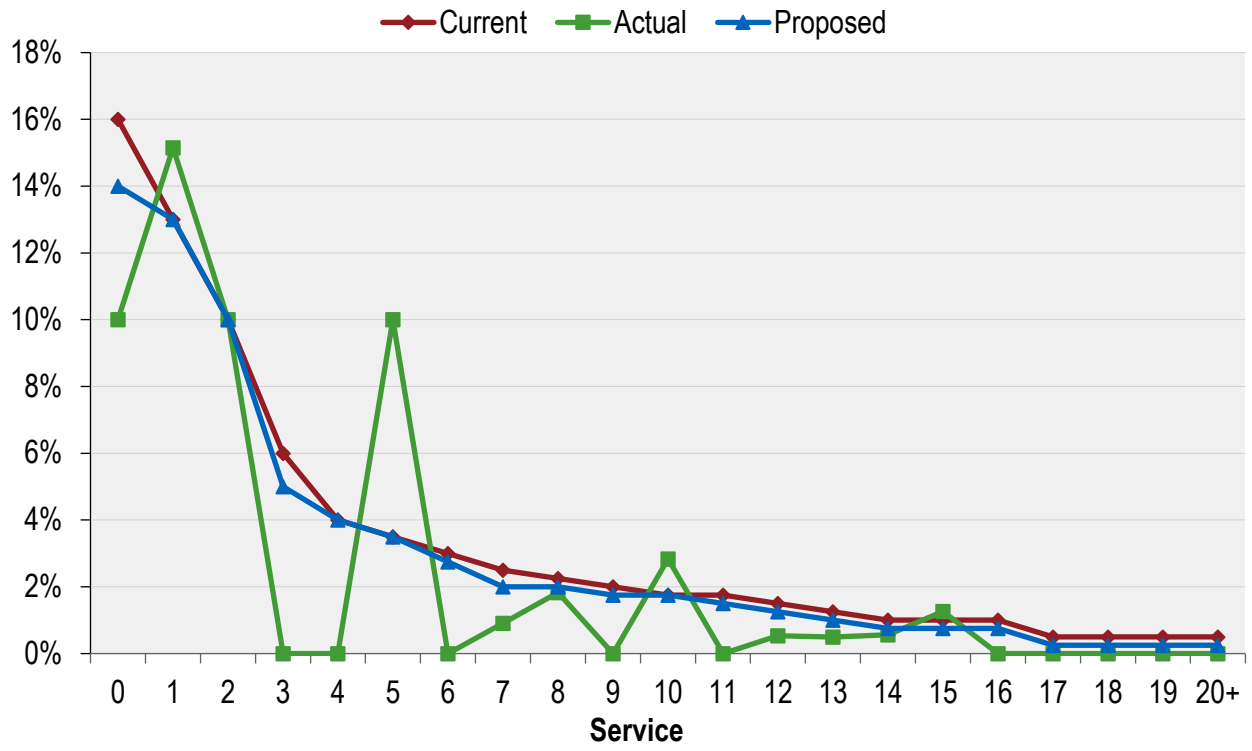
**CHART 25: TERMINATION RATES
GENERAL OCTA MEMBERS**



**CHART 26: TERMINATION RATES
SAFETY LAW AND FIRE MEMBERS**



**CHART 27: TERMINATION RATES
SAFETY PROBATION MEMBERS**



E. Disability Incidence Rates

When a member becomes disabled, he or she may be entitled to at least a 50% pension (service connected disability), or a pension that depends upon the member's years of service (non-service connected disability). The following summarizes the actual incidence of combined service and non-service connected disabilities over the past three years compared to the current and proposed assumptions for both service connected and non-service connected disability incidence:

Age	Disability Incidence Rate (%)					
	General All Other			General OCTA		
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
20 – 24	0.00	0.00	0.00	0.00	0.00	0.00
25 – 29	0.00	0.03	0.00	0.00	0.00	0.00
30 – 34	0.01	0.00	0.01	0.05	0.00	0.05
35 – 39	0.05	0.05	0.05	0.30	0.00	0.30
40 – 44	0.10	0.09	0.10	0.40	0.00	0.40
45 – 49	0.12	0.16	0.15	0.45	0.91	0.45
50 – 54	0.15	0.19	0.20	0.50	0.24	0.50
55 – 59	0.20	0.37	0.25	0.90	0.72	0.75
60 – 64	0.35	0.28	0.35	1.75	1.54	1.60
65 – 69	0.35	0.24	0.35	1.75	0.53	1.60

Age	Disability Incidence Rate (%)					
	Safety Law and Fire			Safety Probation		
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
20 – 24	0.00	0.00	0.00	0.00	0.00	0.00
25 – 29	0.02	0.00	0.02	0.05	0.00	0.05
30 – 34	0.05	0.00	0.05	0.10	0.00	0.10
35 – 39	0.20	0.15	0.20	0.10	0.16	0.10
40 – 44	0.30	0.07	0.25	0.10	0.48	0.15
45 – 49	0.50	0.49	0.50	0.20	0.65	0.25
50 – 54	1.20	1.98	1.50	0.20	0.40	0.30
55 – 59	2.50	3.70	3.00	0.25	0.67	0.50
60 – 64	7.00	5.45	6.00	0.00	0.00	0.00
65 – 69	0.00	7.32	7.00	0.00	0.00	0.00

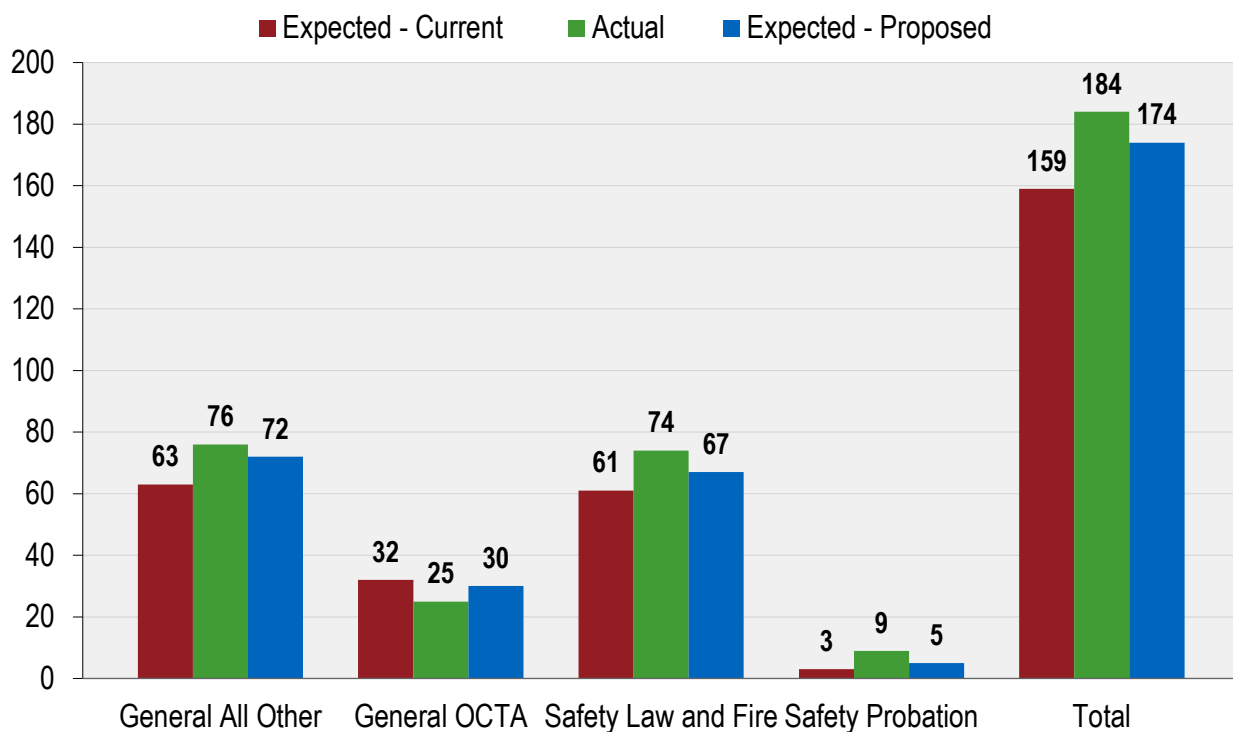
Chart 28 compares the actual number of service connected and non-service connected disabilities over the past three years to that expected under both the current and proposed assumptions. The proposed disability rates were adjusted to reflect the past three years experience.

Chart 29 shows actual disablement rates, compared to the assumed and proposed rates for General All Other members. Charts 30-32 graph the same information as Chart 29, but for General OCTA, Safety Law and Fire and Safety Probation members.

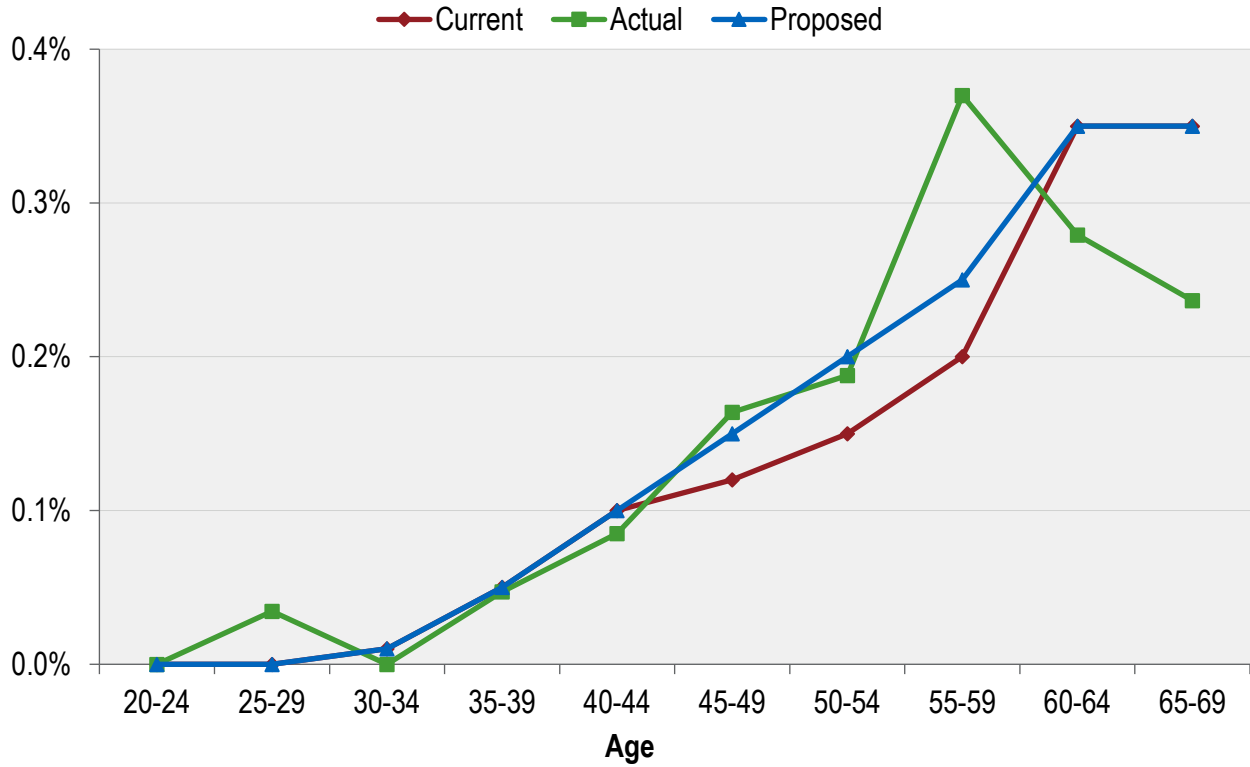
The following table shows the currently assumed, actual and proposed assumed percentages for service versus non-service connected disability for the groups.

Service vs. Non-Service Connected Disability				
	Disablements Receiving Service Connected Disability			Disablements Receiving Non-Service Connected Disability
	Current Assumption	Actual Percentage	Proposed Assumption	Proposed Assumption
General All Other	55%	61%	60%	40%
General OCTA	65%	68%	65%	35%
Safety Law and Fire	100%	100%	100%	0%
Safety Probation	100%	67%	75%	25%

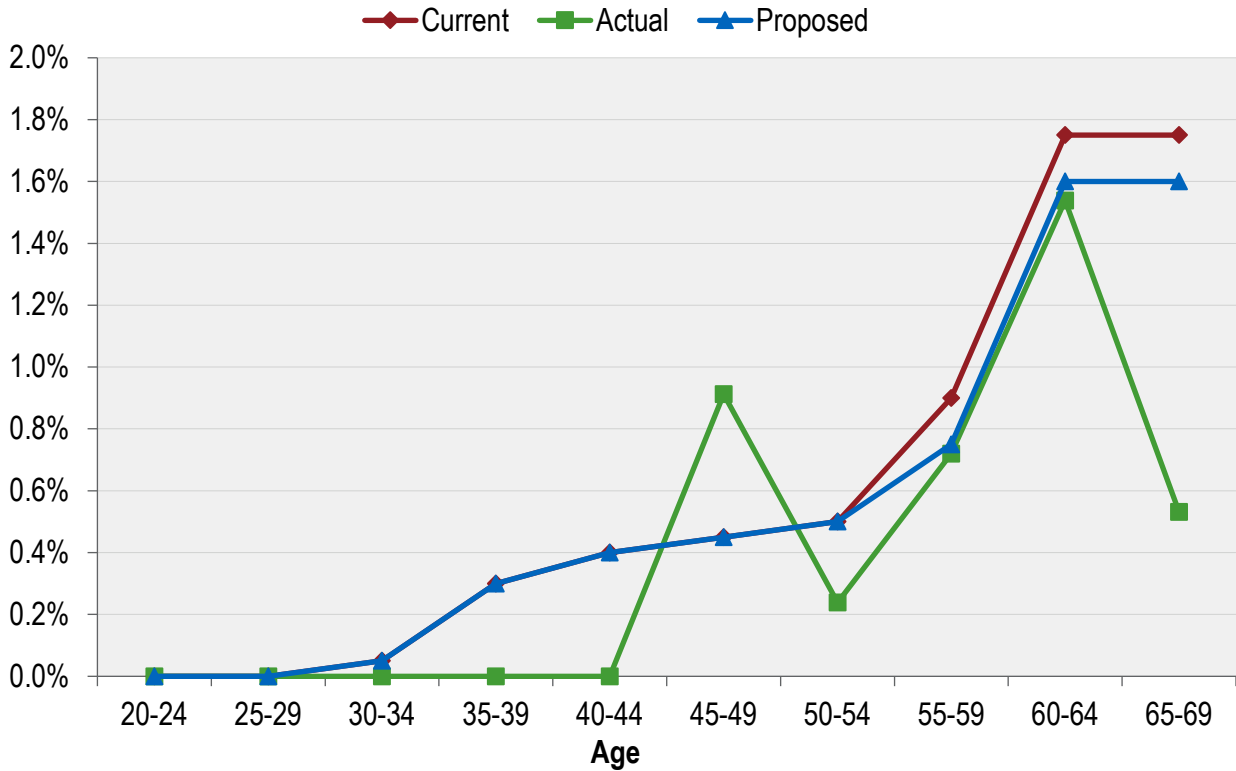
**CHART 28: ACTUAL NUMBER OF DISABILITIES COMPARED TO EXPECTED
(JANUARY 1, 2014 THROUGH DECEMBER 31, 2016)**



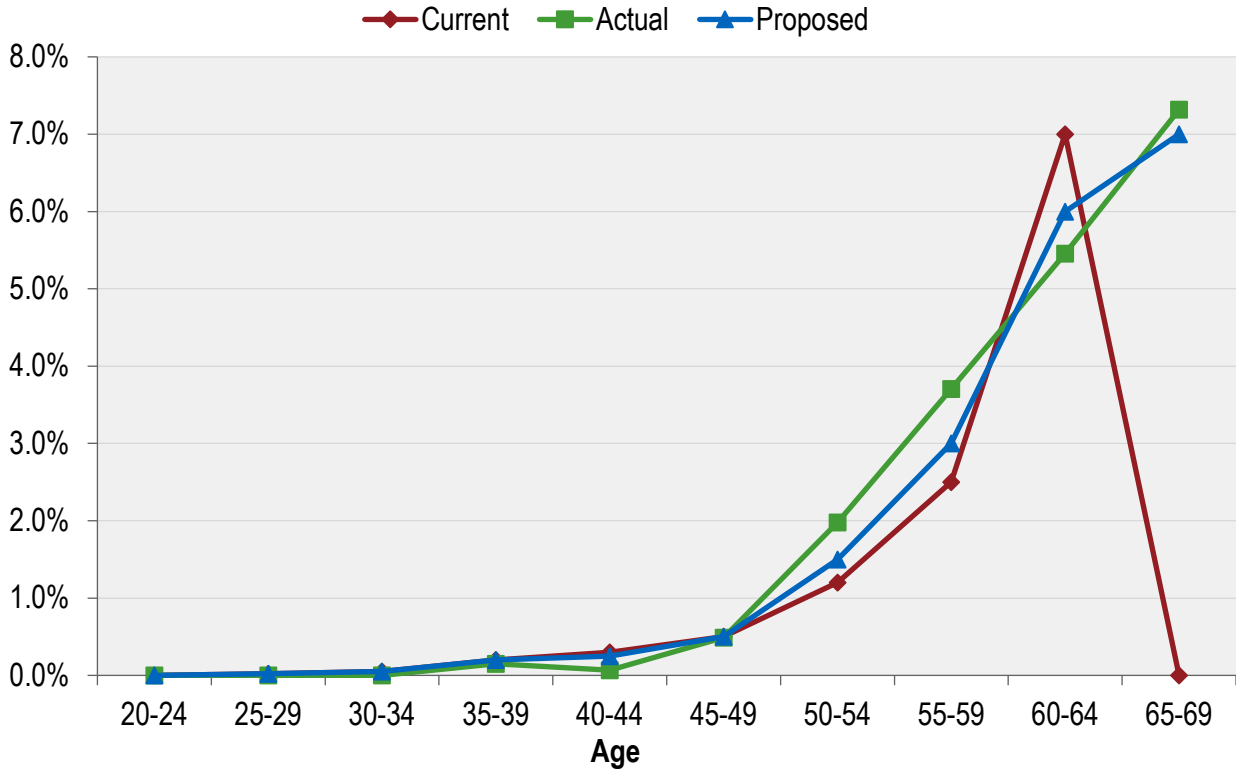
**CHART 29: DISABILITY INCIDENCE RATES
GENERAL ALL OTHER MEMBERS**



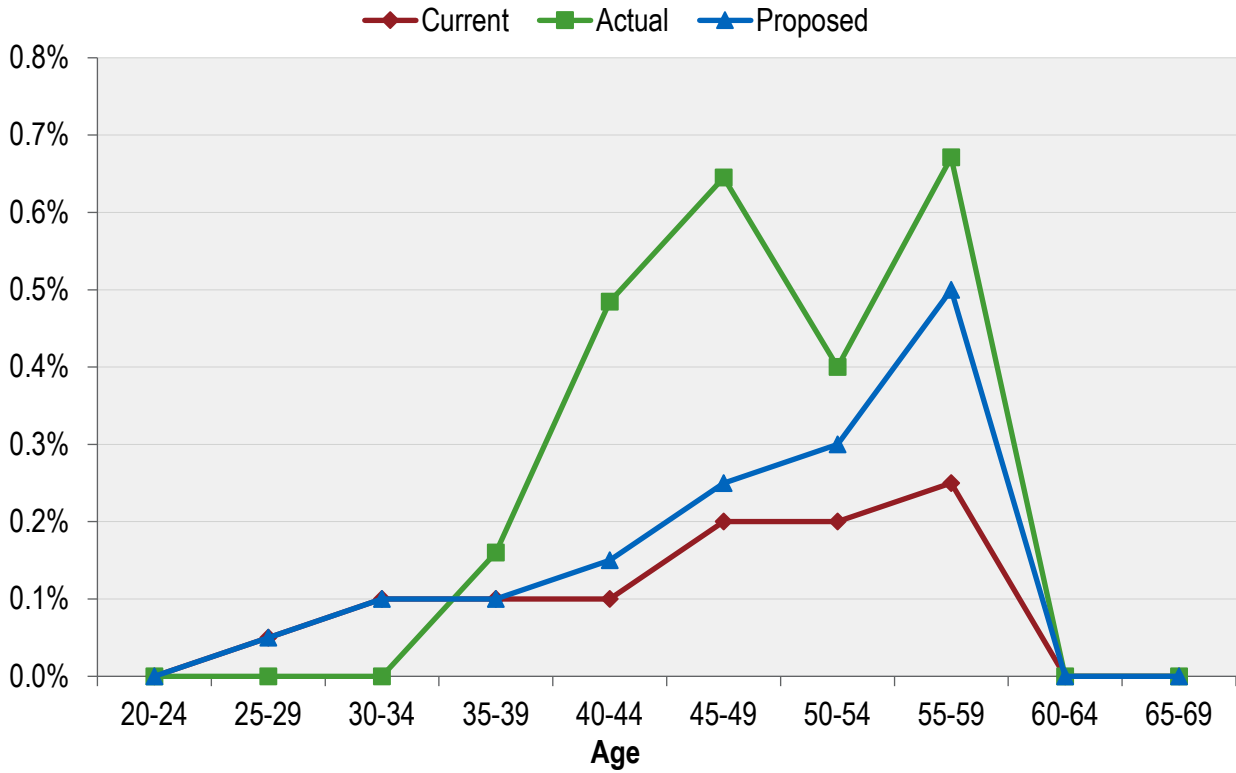
**CHART 30: DISABILITY INCIDENCE RATES
GENERAL OCTA MEMBERS**



**CHART 31: DISABILITY INCIDENCE RATES
SAFETY LAW AND FIRE MEMBERS**



**CHART 32: DISABILITY INCIDENCE RATES
SAFETY PROBATION MEMBERS**



F. Additional Cashouts

In response to the California Court ruling in the Ventura cases, several additional pay elements were included as Earnable Compensation.²² These additional pay elements fall into two categories:

- Ongoing Pay Elements – Those that are expected to be received relatively uniformly over a member’s employment years; and
- Terminal Pay Elements – Those that are expected to be received only during the member’s final average earnings pay period.

The first category is recognized in the actuarial calculations by virtue of being included in the current pay of active members. The second category requires a separate actuarial assumption to anticipate its impact on a member’s retirement benefit.

In this study, we have been provided with final average salaries determined by OCERS before (“FAS – Base”)²³ as well as after (“FAS – Final”)²⁴ including the terminal pay elements for members who retired during the last three years. We have studied the impact of including these pay elements by taking the ratio of “FAS – Final” to “FAS – Base”. Members covered under CalPEPRA plans are not eligible to receive leave cashouts.

The current and recommended additional cashout assumptions are provided in the following table:

Membership	Final One Year Salary			Final Three Year Salary		
	Current Assumption	Actual Rate	Proposed Assumption	Current Assumption	Actual Rate	Proposed Assumption
General Members	3.50%	2.46%	3.00%	2.80%	2.85%	2.80%
Safety Probation	3.80%	5.98%	3.80%	2.80%	3.43%	3.40%
Safety Law Enforcement	5.20%	6.63%	5.20%	4.70%	4.59%	4.60%
Safety Fire	2.00%	0.00%	2.00%	2.00%	1.65%	1.70%

Note that we have maintained the current cashout assumptions for Safety members from “Final One Year Salary” plans due to the low level of actual experience that we observed during the last three years.

²² We understand that these amounts would only be applicable for legacy members enrolled in the non-CalPEPRA plans.

²³ Per OCERS, this is calculated by the System using base earnable salary plus those reported pensionable pay items (regularly included in the annual actuarial valuation) based on the highest system-calculated FAS period.

²⁴ Per OCERS, this is equal to “FAS – Base” plus all eligible pensionable pay items that had not been formerly transmitted to OCERS from the employer.

V. Cost Impact

The tables below show the changes in the average employer and member contribution rates due to the recommended and alternative assumption changes as if they were applied to the December 31, 2016 actuarial valuation.

Cost Impact of Recommended Assumptions		
<u>Change in Costs</u>	Contribution Rate	Estimated Annual Dollar Amount in Thousands*
Total Normal Cost	3.68%	\$65,260
Member Normal Cost	1.61%	\$28,559
Employer Normal Cost	2.07%	\$36,701
Employer UAAL Payments	<u>5.87%</u>	<u>\$103,710</u>
Total for Employer	7.94%	\$140,411

* Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.

Cost Impact of Alternative 1 Assumptions (7.00% Investment Return Assumption & 2.75% Inflation)		
<u>Change in Costs</u>	Contribution Rate	Estimated Annual Dollar Amount in Thousands*
Total Normal Cost	1.88%	\$32,321
Member Normal Cost	0.77%	\$13,232
Employer Normal Cost	1.11%	\$19,089
Employer UAAL Payments	<u>3.53%</u>	<u>\$61,450</u>
Total for Employer	4.64%	\$80,539

* Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.

Cost Impact of Alternative 2 Assumptions (6.75% Investment Return Assumption & 2.75% Inflation)		
<u>Change in Costs</u>	Contribution Rate	Estimated Annual Dollar Amount in Thousands*
Total Normal Cost	3.77%	\$65,566
Member Normal Cost	1.59%	\$27,567
Employer Normal Cost	2.18%	\$37,999
Employer UAAL Payments	<u>5.84%</u>	<u>\$102,078</u>
Total for Employer	8.02%	\$140,077

* Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.

The breakdown of the contribution impacts due only to the recommended demographic assumption changes (as recommended in Section IV of this report) and the contribution rate impacts (after implementing the demographic assumption changes) due to the recommended and alternative economic assumption changes (as recommended in Section III of this report), as well as the changes in funded status, are summarized in the following table.

Cost Impact			
	Recommended (7.00% Return & 3.00% Inflation)	Alternative 1 (7.00% Return & 2.75% Inflation)	Alternative 2 (6.75% Return & 2.75% Inflation)
<u>Impact on Employer</u>			
Change due to demographic assumptions	3.94%	3.94%	3.94%
Change due to economic assumptions	<u>4.00%</u>	<u>0.70%</u>	<u>4.08%</u>
Total change in employer rate	7.94%	4.64%	8.02%
Total estimated change in annual dollar amount (\$000s)	\$140,411	\$80,539	\$140,077
<u>Impact on Member</u>			
Change due to demographic assumptions	0.57%	0.57%	0.57%
Change due to economic assumptions	<u>1.04%</u>	<u>0.20%</u>	<u>1.02%</u>
Total change in member rate	1.61%	0.77%	1.59%
Total estimated change in annual dollar amount (\$000s)	\$28,559	\$13,232	\$27,567
<u>Impact on UAAL and Funded Percentage</u>			
Change in UAAL	\$1,404 million	\$763 million	\$1,385 million
Change in funded percentage	From 73.1% to 67.7%	From 73.1% to 70.1%	From 73.1% to 67.9%

Considered separately, the changes in economic assumptions accounted for about one-half of the overall cost impact to the plan. Of the various economic assumption changes, the most significant cost impact is from the investment return assumption change. Of the various demographic assumption changes, the most significant cost impact is from the mortality assumption change.

We have also analyzed in the tables below the average employer and member contribution rate impacts by rate groups due to the recommended assumption changes as if they were applied to the December 31, 2016 actuarial valuation.

Increases in Employer Contribution Rates (% of Payroll) under Recommended Assumptions

Rate Group	Normal Cost	UAAL	Total	Estimated Dollar Amounts ⁽¹⁾ (in 000s)
Rate Group #1 (non-OCTA, non-OCSD)	1.87%	3.49% ⁽²⁾	5.36%	\$4,462
Rate Group #2 (County et al.)	1.92%	5.50%	7.42%	\$79,640
Rate Group #3 (OCSD)	1.77%	1.06% ⁽³⁾	2.83%	\$1,865
Rate Group #5 (OCTA)	2.02%	5.03%	7.05%	\$7,393
Rate Group #9 (TCA)	1.53%	3.22%	4.75%	\$325
Rate Group #10 (OCFA)	1.90%	4.42%	6.32%	\$1,698
Rate Group #11 (Cemetery)	1.77%	2.71% ⁽⁴⁾	4.48%	\$63
Rate Group #12 (Law Library)	1.60%	4.39%	5.99%	\$71
Rate Group #6 (Probation)	3.20%	9.16%	12.36%	\$8,054
Rate Group #7 (Law Enforcement)	2.67%	9.45%	12.12%	\$26,599
Rate Group #8 (Fire Authority)	2.09%	6.31%	8.40%	\$10,241
Total All Rate Groups Combined	2.07%	5.87%	7.94%	\$140,411

⁽¹⁾ Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.

⁽²⁾ Before adjusting for UAAL allotted to U.C.I and Department of Education.

⁽³⁾ The UAAL for Rate Group #3 after reflecting the recommended assumptions has been partially offset by the OCSD UAAL Deferred Account of \$34,067,000 as of December 31, 2016. If Rate Group #3 had not been overfunded prior to the changes in assumptions and if the OCSD UAAL Account was not available to offset the change in UAAL due to the changes in assumptions, the UAAL Contribution rate impact due to the changes in assumptions would have been 5.36% of payroll.

⁽⁴⁾ If Rate Group #11 had not been overfunded prior to the changes in assumptions, the UAAL contribution rate impact due to the changes in assumptions would have been 4.36% of payroll.

Increases in Average Member Contribution Rates (% of Payroll) under Recommended Assumptions

Rate Group	Current	Proposed	Difference	Estimated Dollar Amounts ⁽¹⁾ (in 000s)
Rate Group #1 (non-OCTA, non-OCSD)	8.62%	10.19%	1.57%	\$1,310
Rate Group #2 (County et al.)	11.10%	12.58%	1.48%	\$15,943
Rate Group #3 (OCSD)	11.52%	12.98%	1.46%	\$967
Rate Group #5 (OCTA)	9.35%	10.71%	1.36%	\$1,434
Rate Group #9 (TCA)	10.08%	11.43%	1.35%	\$93
Rate Group #10 (OCFA)	11.03%	12.59%	1.56%	\$420
Rate Group #11 (Cemetery)	8.87%	10.26%	1.39%	\$20
Rate Group #12 (Law Library)	13.06%	14.49%	1.43%	\$17
Rate Group #6 (Probation)	15.53%	17.81%	2.28%	\$1,486
Rate Group #7 (Law Enforcement)	16.39%	18.46%	2.07%	\$4,540
Rate Group #8 (Fire Authority)	15.44%	17.35%	1.91%	\$2,329
Total All Rate Groups Combined	12.01%	13.62%	1.61%	\$28,559

⁽¹⁾ Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.

We have also analyzed in the tables below the average employer and member contribution rate impacts by rate groups due to the Alternative 1 (7.00% investment return and 2.75% inflation) assumption changes as if they were applied to the December 31, 2016 actuarial valuation.

Increases in Employer Contribution Rates (% of Payroll) under Alternative 1 Assumptions				
Rate Group	Normal Cost	UAAL	Total	Estimated Dollar Amounts ⁽¹⁾ (in 000s)
Rate Group #1 (non-OCTA, non-OCSD)	1.18%	2.30% ⁽²⁾	3.48%	\$2,866
Rate Group #2 (County et al.)	1.08%	3.41%	4.49%	\$47,504
Rate Group #3 (OCSD)	0.97%	0.00% ⁽³⁾	0.97%	\$628
Rate Group #5 (OCTA)	1.37%	3.22%	4.59%	\$4,756
Rate Group #9 (TCA)	0.88%	1.96%	2.84%	\$191
Rate Group #10 (OCFA)	1.08%	2.62%	3.70%	\$973
Rate Group #11 (Cemetery)	1.01%	0.99% ⁽⁴⁾	2.00%	\$28
Rate Group #12 (Law Library)	0.86%	2.83%	3.69%	\$44
Rate Group #6 (Probation)	1.93%	5.84%	7.77%	\$4,980
Rate Group #7 (Law Enforcement)	1.12%	5.50%	6.62%	\$14,169
Rate Group #8 (Fire Authority)	0.63%	3.10%	3.73%	\$4,400
Total All Rate Groups Combined	1.11%	3.53%	4.64%	\$80,539

⁽¹⁾ Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.

⁽²⁾ Before adjusting for UAAL allotted to U.C.I and Department of Education.

⁽³⁾ The UAAL for Rate Group #3 after reflecting the recommended assumptions has been offset by the OCSD UAAL Deferred Account of \$34,067,000 as of December 31, 2016. If Rate Group #3 had not been overfunded prior to the changes in assumptions and if the OCSD UAAL Account was not available to offset the change in UAAL due to the changes in assumptions, the UAAL Contribution rate impact due to the changes in assumptions would have been 2.81% of payroll.

⁽⁴⁾ If Rate Group #11 had not been overfunded prior to the changes in assumptions, the UAAL contribution rate impact due to the changes in assumptions would have been 2.56% of payroll.

Increases in Average Member Contribution Rates (% of Payroll) under Alternative 1 Assumptions				
Rate Group	Current	Proposed	Difference	Estimated Dollar Amounts ⁽¹⁾ (in 000s)
Rate Group #1 (non-OCTA, non-OCSD)	8.62%	9.56%	0.94%	\$767
Rate Group #2 (County et al.)	11.10%	11.85%	0.75%	\$7,864
Rate Group #3 (OCSD)	11.52%	12.26%	0.74%	\$477
Rate Group #5 (OCTA)	9.35%	10.11%	0.76%	\$784
Rate Group #9 (TCA)	10.08%	10.79%	0.71%	\$48
Rate Group #10 (OCFA)	11.03%	11.86%	0.83%	\$216
Rate Group #11 (Cemetery)	8.87%	9.59%	0.72%	\$10
Rate Group #12 (Law Library)	13.06%	13.79%	0.73%	\$9
Rate Group #6 (Probation)	15.53%	16.53%	1.00%	\$627
Rate Group #7 (Law Enforcement)	16.39%	17.16%	0.77%	\$1,598
Rate Group #8 (Fire Authority)	15.44%	16.16%	0.72%	\$832
Total All Rate Groups Combined	12.01%	12.78%	0.77%	\$13,232

⁽¹⁾ Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.

We have also analyzed in the tables below the average employer and member contribution rate impacts by rate groups due to the Alternative 2 (6.75% investment return and 2.75% inflation) assumption changes as if they were applied to the December 31, 2016 actuarial valuation.

Increases in Employer Contribution Rates (% of Payroll) under Alternative 2 Assumptions				
Rate Group	Normal Cost	UAAL	Total	Estimated Dollar Amounts ⁽¹⁾ (in 000s)
Rate Group #1 (non-OCTA, non-OCSD)	1.92%	3.48% ⁽²⁾	5.40%	\$4,460
Rate Group #2 (County et al.)	2.01%	5.48%	7.49%	\$79,313
Rate Group #3 (OCSD)	1.84%	1.00% ⁽³⁾	2.84%	\$1,851
Rate Group #5 (OCTA)	2.12%	4.99%	7.11%	\$7,372
Rate Group #9 (TCA)	1.65%	3.26%	4.91%	\$332
Rate Group #10 (OCFA)	1.99%	4.39%	6.38%	\$1,691
Rate Group #11 (Cemetery)	1.87%	2.72% ⁽⁴⁾	4.59%	\$64
Rate Group #12 (Law Library)	1.71%	4.43%	6.14%	\$72
Rate Group #6 (Probation)	3.40%	9.17%	12.57%	\$8,102
Rate Group #7 (Law Enforcement)	2.87%	9.39%	12.26%	\$26,520
Rate Group #8 (Fire Authority)	2.32%	6.27%	8.59%	\$10,300
Total All Rate Groups Combined	2.18%	5.84%	8.02%	\$140,077

⁽¹⁾ Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.

⁽²⁾ Before adjusting for UAAL allotted to U.C.I and Department of Education.

⁽³⁾ The UAAL for Rate Group #3 after reflecting the recommended assumptions has been partially offset by the OCSD UAAL Deferred Account of \$34,067,000 as of December 31, 2016. If Rate Group #3 had not been overfunded prior to the changes in assumptions and if the OCSD UAAL Account was not available to offset the change in UAAL due to the changes in assumptions, the UAAL Contribution rate impact due to the changes in assumptions would have been 5.31% of payroll.

⁽⁴⁾ If Rate Group #11 had not been overfunded prior to the changes in assumptions, the UAAL contribution rate impact due to the changes in assumptions would have been 4.38% of payroll.

Increases in Average Member Contribution Rates (% of Payroll) under Alternative 2 Assumptions				
Rate Group	Current	Proposed	Difference	Estimated Dollar Amounts ⁽¹⁾ (in 000s)
Rate Group #1 (non-OCTA, non-OCSD)	8.62%	10.20%	1.58%	\$1,298
Rate Group #2 (County et al.)	11.10%	12.59%	1.49%	\$15,733
Rate Group #3 (OCSD)	11.52%	13.00%	1.48%	\$960
Rate Group #5 (OCTA)	9.35%	10.71%	1.36%	\$1,408
Rate Group #9 (TCA)	10.08%	11.41%	1.33%	\$90
Rate Group #10 (OCFA)	11.03%	12.59%	1.56%	\$412
Rate Group #11 (Cemetery)	8.87%	10.24%	1.37%	\$19
Rate Group #12 (Law Library)	13.06%	14.50%	1.44%	\$17
Rate Group #6 (Probation)	15.53%	17.66%	2.13%	\$1,361
Rate Group #7 (Law Enforcement)	16.39%	18.33%	1.94%	\$4,160
Rate Group #8 (Fire Authority)	15.44%	17.21%	1.77%	\$2,109
Total All Rate Groups Combined	12.01%	13.60%	1.59%	\$27,567

⁽¹⁾ Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.

Appendix A: Current Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.25%, net of investment expenses and administration expenses.
Member Contribution Crediting Rate:	5.00%, compounded semi-annually.
Consumer Price Index:	Increase of 3.00% per year, retiree COLA increases due to CPI subject to a 3.0% maximum change per year.
Payroll Growth:	Inflation of 3.00% per year plus “across the board” real salary increases of 0.50% per year.
Increase in Section 7522.10 Compensation Limit:	Increase of 3.00% per year from the valuation date.

Individual Salary Increases¹

Annual Rate of Compensation Increase (%)		
Inflation: 3.00% per year; plus “across the board” salary increases of 0.50% per year; plus the following merit and promotional increases:		
Years of Service	General	Safety
Less than 1	10.00	14.00
1	7.25	10.00
2	6.00	8.50
3	4.75	6.75
4	4.00	5.25
5	3.25	4.50
6	2.25	3.50
7	2.00	3.25
8	1.50	2.25
9	1.25	2.25
10	1.25	1.75
11	1.25	1.75
12	1.25	1.75
13	1.25	1.75
14	1.25	1.75
15	1.25	1.75
16	0.75	1.50
17	0.75	1.50
18	0.75	1.50
19	0.75	1.50
20 and Over	0.75	1.50

¹ In addition to the individual salary increase assumptions, we have applied an average two hours of additional salary annually for leap-year salary adjustment.

Demographic Assumptions

Mortality Rates – Healthy

- **General Members:** RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2020
- **Safety Members:** RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2020 with ages set back two years

Mortality Rates – Disabled

- **General Members:** RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2020 with ages set forward six years for males and set forward three years for females
- **Safety Members:** RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2020

Mortality Rates – Beneficiaries

- Beneficiaries are assumed to have the same mortality as a General Member of the opposite sex who is receiving a service (non-disability) retirement

The mortality tables shown above were determined to contain about a 10% margin to reflect future mortality improvement, based on a review of the mortality experience as of the measurement date.

Member Contribution Rates

- **General Members:** RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2020 weighted, 40% male and 60% female
- **Safety Members:** RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2020 with ages set back two years, weighted 80% male and 20% female

Mortality Rates Before Retirement

Age	Rate (%)			
	General		Safety	
	Male	Female	Male	Female
25	0.04	0.02	0.04	0.02
30	0.04	0.02	0.04	0.02
35	0.07	0.04	0.06	0.04
40	0.10	0.07	0.09	0.06
45	0.14	0.11	0.12	0.09
50	0.20	0.16	0.18	0.14
55	0.34	0.25	0.27	0.21
60	0.59	0.41	0.48	0.33
65	1.00	0.76	0.82	0.60

All General pre-retirement deaths are assumed to be non-service connected. For Safety, 90% of pre-retirement deaths are assumed to be non-service connected. The other 10% are assumed to be service connected

Disability Incidence Rates

Age	Rate (%)			
	General All Other ¹	General OCTA ²	Safety Law & Fire ³	Safety Probation ³
20	0.00	0.00	0.00	0.00
25	0.00	0.00	0.01	0.03
30	0.01	0.03	0.04	0.08
35	0.03	0.20	0.14	0.10
40	0.08	0.36	0.26	0.10
45	0.11	0.43	0.42	0.16
50	0.14	0.48	0.92	0.20
55	0.18	0.74	1.98	0.23
60	0.29	1.41	5.20	0.10

¹ 55% of General All Other disabilities are assumed to be service connected disabilities. The other 45% are assumed to be non-service connected.

² 65% of General OCTA disabilities are assumed to be service connected disabilities. The other 35% are assumed to be non-service connected.

³ 100% of Safety Law Enforcement, Fire and Probation disabilities are assumed to be service connected disabilities.

Termination Rates

Years of Service	Rate (%)			
	General All Other ¹	General OCTA ²	Safety Law & Fire ³	Safety Probation ⁴
0	11.00	17.50	4.00	16.00
1	8.00	13.50	3.00	13.00
2	7.00	10.50	2.00	10.00
3	5.00	10.00	1.00	6.00
4	4.00	9.00	1.00	4.00
5	3.75	7.00	1.00	3.50
6	3.50	5.00	0.95	3.00
7	3.00	5.00	0.90	2.50
8	2.75	4.00	0.85	2.25
9	2.50	3.50	0.80	2.00
10	2.25	3.50	0.75	1.75
11	2.00	3.50	0.65	1.75
12	2.00	3.00	0.60	1.50
13	1.75	3.00	0.50	1.25
14	1.75	3.00	0.50	1.00
15	1.75	3.00	0.50	1.00
16	1.50	3.00	0.50	1.00
17	1.50	2.75	0.50	0.50
18	1.50	2.75	0.50	0.50
19	1.50	2.75	0.50	0.50
20 +	1.25	1.75	0.25	0.50

¹ 40% of all terminated members with less than 5 years of service and 25% of all terminated members with 5 or more years of service will choose a refund of contributions.

² 45% of all terminated members with less than 5 years of service and 35% of all terminated members with 5 or more years of service will choose a refund of contributions.

³ 20% of all terminated members with less than 5 years of service and 20% of all terminated members with 5 or more years of service will choose a refund of contributions.

⁴ 40% of all terminated members with less than 5 years of service and 30% of all terminated members with 5 or more years of service will choose a refund of contributions.

Retirement Rates

Age	Rate (%)							
	General			Safety				
	Enhanced	Non-Enhanced ¹	SJC (31676.12)	Law (31664.1) ²	Law (31664.2) ²	Fire (31664.1) ²	Fire (31664.2) ²	Probation ²
49	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
50	2.5	2.5	3.0	16.0	11.5	6.0	8.0	3.0
51	2.0	2.5	3.0	16.0	12.0	8.0	10.0	3.0
52	2.0	2.5	3.0	16.0	12.7	9.0	11.0	4.0
53	2.0	2.5	3.0	16.0	17.9	10.0	12.0	4.0
54	5.0	2.5	3.0	22.0	18.8	16.0	14.0	6.0
55	15.0	3.0	4.0	22.0	30.7	19.0	24.0	11.0
56	10.0	3.5	5.0	20.0	20.0	20.0	23.0	11.0
57	10.0	5.0	6.0	20.0	20.0	23.0	27.0	17.0
58	10.0	5.0	7.0	20.0	25.0	30.0	27.0	20.0
59	11.0	7.0	9.0	26.0	30.0	30.0	36.0	20.0
60	12.0	9.0	11.0	45.0	100.0	45.0	100.0	20.0
61	12.0	10.0	13.0	45.0	100.0	45.0	100.0	20.0
62	15.0	16.0	15.0	45.0	100.0	45.0	100.0	25.0
63	16.0	16.0	15.0	45.0	100.0	45.0	100.0	50.0
64	16.0	18.0	20.0	45.0	100.0	45.0	100.0	50.0
65	21.0	21.0	20.0	100.0	100.0	100.0	100.0	100.0
66	22.0	26.0	24.0	100.0	100.0	100.0	100.0	100.0
67	23.0	21.0	24.0	100.0	100.0	100.0	100.0	100.0
68	23.0	21.0	24.0	100.0	100.0	100.0	100.0	100.0
69	23.0	21.0	24.0	100.0	100.0	100.0	100.0	100.0
70	40.0	30.0	100.0	100.0	100.0	100.0	100.0	100.0
71	40.0	30.0	100.0	100.0	100.0	100.0	100.0	100.0
72	40.0	30.0	100.0	100.0	100.0	100.0	100.0	100.0
73	40.0	30.0	100.0	100.0	100.0	100.0	100.0	100.0
74	40.0	30.0	100.0	100.0	100.0	100.0	100.0	100.0
75	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

¹ These assumptions are also used for the CalPEPRA 1.62% @ 65 formula (Plan T and Plan W).

² Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings.

Retirement Rates (continued)

Age	Rate (%)			
	General	Safety		
	CalPEPRA 2.5% @ 67	CalPEPRA Probation Formula ¹	CalPEPRA Law Formula ¹	CalPEPRA Fire Formula ¹
50	0.0	2.5	11.0	6.5
51	0.0	2.5	11.5	8.0
52	4.0	3.0	12.0	9.0
53	1.5	3.0	16.0	10.0
54	1.5	5.5	17.0	12.0
55	2.5	10.0	28.0	21.0
56	3.5	10.0	18.0	20.0
57	5.5	15.0	17.5	22.0
58	7.5	20.0	22.0	25.0
59	7.5	20.0	26.0	31.5
60	7.5	100.0	100.0	100.0
61	7.5	100.0	100.0	100.0
62	14.0	100.0	100.0	100.0
63	14.0	100.0	100.0	100.0
64	14.0	100.0	100.0	100.0
65	18.0	100.0	100.0	100.0
66	22.0	100.0	100.0	100.0
67	23.0	100.0	100.0	100.0
68	23.0	100.0	100.0	100.0
69	23.0	100.0	100.0	100.0
70	30.0	100.0	100.0	100.0
71	30.0	100.0	100.0	100.0
72	30.0	100.0	100.0	100.0
73	30.0	100.0	100.0	100.0
74	30.0	100.0	100.0	100.0
75	100.0	100.0	100.0	100.0

¹ Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings

Retirement Age and Benefit for Deferred Vested Members:	<p>For deferred vested members, we make the following retirement assumption:</p> <p style="padding-left: 40px;">General Age: 58</p> <p style="padding-left: 40px;">Safety Age: 53</p> <p>We assume that 20% of future General and 30% of future Safety deferred vested members are reciprocal. For reciprocals, we assume 4.25% compensation increases for General and 5.00% for Safety per annum.</p>															
Liability Calculation for Current Deferred Vested Members:	<p>Liability for a current deferred vested member is calculated based on salary, service, and eligibility for reciprocal benefit as provided by the Retirement System. For those members without salary information that have 3 or more years of service, we used an average salary. For those members without salary information that have less than 3 years of service or for those members without service information, we assumed a refund of account balance.</p>															
Future Benefit Accruals:	<p>1.0 year of service per year of employment. There is no assumption to anticipate conversion of unused sick leave at retirement.</p>															
Unknown Data for Members:	<p>Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.</p>															
Definition of Active Member:	<p>All active members of OCERS as of the valuation date.</p>															
Form of Payment:	<p>All members are assumed to elect the unmodified option at retirement.</p>															
Percent Married:	<p>75% of male members and 50% of female members are assumed to be married at retirement or time of pre-retirement death.</p>															
Age of Spouse:	<p>Female (or male) three years younger (or older) than spouse.</p>															
Additional Cashout Assumptions:	<p><u>Non-CalPEPRA Formulas</u></p> <p>Additional compensation amounts are expected to be received during a member's final average earnings period. The percentages used in this valuation are:</p> <table border="0" style="margin-left: 40px;"> <thead> <tr> <th></th> <th style="text-align: center;">Final One Year Salary</th> <th style="text-align: center;">Final Three Year Salary</th> </tr> </thead> <tbody> <tr> <td>General Members</td> <td style="text-align: center;">3.50%</td> <td style="text-align: center;">2.80%</td> </tr> <tr> <td>Safety Probation</td> <td style="text-align: center;">3.80%</td> <td style="text-align: center;">2.80%</td> </tr> <tr> <td>Safety Law Enforcement</td> <td style="text-align: center;">5.20%</td> <td style="text-align: center;">4.70%</td> </tr> <tr> <td>Safety Fire</td> <td style="text-align: center;">2.00%</td> <td style="text-align: center;">2.00%</td> </tr> </tbody> </table> <p>The additional cashout assumptions are the same for service and disability retirements.</p> <p><u>CalPEPRA Formulas</u></p> <p>None</p>		Final One Year Salary	Final Three Year Salary	General Members	3.50%	2.80%	Safety Probation	3.80%	2.80%	Safety Law Enforcement	5.20%	4.70%	Safety Fire	2.00%	2.00%
	Final One Year Salary	Final Three Year Salary														
General Members	3.50%	2.80%														
Safety Probation	3.80%	2.80%														
Safety Law Enforcement	5.20%	4.70%														
Safety Fire	2.00%	2.00%														

Appendix B: Proposed Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.00%, net of investment expenses and administration expenses.
Member Contribution Crediting Rate:	5.00%, compounded semi-annually.
Consumer Price Index:	Increase of 3.00% per year, retiree COLA increases due to CPI subject to a 3.0% maximum change per year.
Payroll Growth:	Inflation of 3.00% per year plus “across the board” real salary increases of 0.50% per year.
Increase in Section 7522.10 Compensation Limit:	Increase of 3.00% per year from the valuation date.

Individual Salary Increases¹

Annual Rate of Compensation Increase (%)		
Inflation: 3.00% per year; plus “across the board” salary increases of 0.50% per year; plus the following merit and promotional increases:		
Years of Service	General	Safety
Less than 1	9.00	14.00
1	7.25	10.00
2	6.00	7.75
3	5.00	6.00
4	4.00	5.50
5	3.50	4.50
6	2.50	3.75
7	2.25	3.25
8	1.75	2.50
9	1.50	2.25
10	1.50	1.75
11	1.50	1.75
12	1.50	1.75
13	1.50	1.75
14	1.50	1.75
15	1.50	1.75
16	1.00	1.50
17	1.00	1.50
18	1.00	1.50
19	1.00	1.50
20 and Over	1.00	1.50

¹ In addition to the individual salary increase assumptions, we have applied an average two hours of additional salary annually for leap-year salary adjustment.

Demographic Assumptions

Mortality Rates – Healthy

- **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table, projected generationally with the two-dimensional MP-2016 projection scale
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set back four years, projected generationally with the two-dimensional MP-2016 projection scale

Mortality Rates – Disabled

- **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set forward five years, projected generationally with the two-dimensional MP-2016 projection scale
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table, projected generationally with the two-dimensional MP-2016 projection scale

Mortality Rates – Beneficiaries

- Beneficiaries are assumed to have the same mortality as a General Member of the opposite sex who is receiving a service (non-disability) retirement

Pre-Retirement Mortality Rates

- **General and Safety Members:** Headcount-Weighted RP-2014 Employee Mortality Table times 80%, projected generationally with the two-dimensional MP-2016 projection scale

Member Contribution Rates

- **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females), projected 20 years with the two-dimensional mortality improvement scale MP-2016, weighted 40% male and 60% female
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females), projected 20 years with the two-dimensional mortality improvement scale MP-2016 set back four years, weighted 80% male and 20% female

The RP-2014 mortality tables and adjustments as shown above reflect the mortality experience as of the measurement date. The generational projection is a provision for future mortality improvement.

Mortality Rates Before Retirement

Age	Rate (%)	
	Male	Female
25	0.05	0.02
30	0.05	0.02
35	0.05	0.03
40	0.06	0.04
45	0.10	0.07
50	0.17	0.11
55	0.27	0.17
60	0.45	0.24
65	0.78	0.36
70	1.27	0.59

Note that generational projections beyond the base year (2014) are not reflected in the above mortality rates.

All General pre-retirement deaths are assumed to be non-service connected. For Safety, 90% of pre-retirement deaths are assumed to be non-service connected. The other 10% are assumed to be service connected.

Disability Incidence Rates

Age	Rate (%)			
	General All Other ¹	General OCTA ²	Safety Law & Fire ³	Safety Probation ⁴
20	0.00	0.00	0.00	0.00
25	0.00	0.00	0.01	0.03
30	0.01	0.03	0.04	0.08
35	0.03	0.20	0.14	0.10
40	0.08	0.36	0.23	0.13
45	0.13	0.43	0.40	0.21
50	0.18	0.48	1.10	0.28
55	0.23	0.65	2.40	0.42
60	0.31	1.26	4.80	0.20

¹ 60% of General All Other disabilities are assumed to be service connected disabilities. The other 40% are assumed to be non-service connected.

² 65% of General OCTA disabilities are assumed to be service connected disabilities. The other 35% are assumed to be non-service connected.

³ 100% of Safety Law Enforcement and Fire disabilities are assumed to be service connected disabilities.

⁴ 75% of Safety Probation disabilities are assumed to be service connected disabilities. The other 25% are assumed to be non-service connected.

Termination Rates

Years of Service	Rate (%)			
	General All Other	General OCTA	Safety Law & Fire	Safety Probation
0	11.00	17.50	4.50	14.00
1	7.50	11.00	2.50	13.00
2	6.50	9.00	2.00	10.00
3	5.00	8.50	1.50	5.00
4	4.50	7.50	1.25	4.00
5	4.25	7.00	1.00	3.50
6	3.75	4.50	0.95	2.75
7	3.25	4.00	0.90	2.00
8	3.00	3.50	0.85	2.00
9	2.75	3.00	0.80	1.75
10	2.50	3.00	0.75	1.75
11	2.00	3.00	0.65	1.50
12	2.00	3.00	0.60	1.25
13	1.75	2.50	0.55	1.00
14	1.50	2.50	0.50	0.75
15	1.40	2.50	0.45	0.75
16	1.30	2.00	0.40	0.75
17	1.20	1.80	0.35	0.25
18	1.10	1.60	0.30	0.25
19	1.00	1.40	0.25	0.25
20 +	0.90	1.20	0.20	0.25

Proportion of Total Termination Assumed to Withdraw Contributions

Years of Service	Election for Withdrawal of Contributions (%)			
	General All Other	General OCTA	Safety Law and Fire	Safety Probation
0 – 4	35.0	40.0	20.0	25.0
5 – 9	30.0	35.0	20.0	25.0
10 – 14	25.0	30.0	20.0	25.0
15 or more	20.0	20.0	20.0	25.0

Retirement Rates

Age	Rate (%)							
	General			Safety				
	Enhanced	Non-Enhanced ¹	SJC (31676.12)	Law (31664.1) ²	Law (31664.2) ²	Fire (31664.1)	Fire (31664.2)	Probation ²
48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	30.00	25.00	0.00	12.00	0.00	2.00	0.00	0.00
50	2.50	2.00	3.00	18.00	11.50	5.00	8.00	3.25
51	2.00	2.00	3.00	18.00	12.00	7.00	10.00	3.25
52	2.50	2.00	3.00	17.00	12.70	9.50	11.00	4.25
53	2.50	2.75	3.00	17.00	17.90	10.50	12.00	4.25
54	5.50	2.75	3.00	22.00	18.80	15.00	14.00	7.00
55	15.00	3.25	4.00	22.00	30.70	18.00	24.00	12.00
56	10.00	3.50	5.00	20.00	20.00	20.00	23.00	12.00
57	10.00	5.50	6.00	20.00	20.00	21.00	27.00	18.00
58	11.00	5.50	7.00	20.00	25.00	28.00	27.00	18.00
59	11.00	6.50	9.00	26.00	30.00	28.00	36.00	18.00
60	12.00	9.25	11.00	35.00	40.00	30.00	40.00	20.00
61	12.00	12.00	13.00	35.00	40.00	30.00	40.00	20.00
62	14.00	16.00	15.00	40.00	40.00	35.00	40.00	25.00
63	16.00	16.00	15.00	40.00	40.00	35.00	40.00	40.00
64	16.00	18.00	20.00	40.00	40.00	35.00	40.00	40.00
65	22.00	22.00	20.00	100.00	100.00	100.00	100.00	100.00
66	22.00	28.00	24.00	100.00	100.00	100.00	100.00	100.00
67	23.00	24.00	24.00	100.00	100.00	100.00	100.00	100.00
68	23.00	24.00	24.00	100.00	100.00	100.00	100.00	100.00
69	23.00	20.00	24.00	100.00	100.00	100.00	100.00	100.00
70	25.00	20.00	50.00	100.00	100.00	100.00	100.00	100.00
71	25.00	25.00	50.00	100.00	100.00	100.00	100.00	100.00
72	25.00	25.00	50.00	100.00	100.00	100.00	100.00	100.00
73	25.00	25.00	50.00	100.00	100.00	100.00	100.00	100.00
74	25.00	25.00	50.00	100.00	100.00	100.00	100.00	100.00
75	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

¹ These assumptions are also used for the CalPEPRA 1.62% @ 65 formula (Plan T and Plan W).

² Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings.

Retirement Rates (continued)

Age	Rate (%)			
	General	Safety		
	CalPEPRA 2.5% @ 67	CalPEPRA Probation Formula ¹	CalPEPRA Law Formula ¹	CalPEPRA Fire Formula
50	0.00	2.50	11.00	6.00
51	0.00	2.50	11.50	7.00
52	4.00	3.00	12.00	9.00
53	1.50	3.00	16.00	10.00
54	1.50	5.50	17.00	11.50
55	2.50	10.00	28.00	21.00
56	3.50	10.00	18.00	20.00
57	5.50	15.00	17.50	22.00
58	7.50	20.00	22.00	25.00
59	7.50	20.00	26.00	30.00
60	7.50	40.00	40.00	40.00
61	7.50	40.00	40.00	40.00
62	14.00	40.00	40.00	40.00
63	14.00	40.00	40.00	40.00
64	14.00	40.00	40.00	40.00
65	18.00	100.00	100.00	100.00
66	22.00	100.00	100.00	100.00
67	23.00	100.00	100.00	100.00
68	23.00	100.00	100.00	100.00
69	23.00	100.00	100.00	100.00
70	25.00	100.00	100.00	100.00
71	25.00	100.00	100.00	100.00
72	25.00	100.00	100.00	100.00
73	25.00	100.00	100.00	100.00
74	25.00	100.00	100.00	100.00
75	100.00	100.00	100.00	100.00

¹ Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings

Retirement Age and Benefit for Deferred Vested Members:	<p>For deferred vested members, we make the following retirement assumption:</p> <p style="padding-left: 40px;">General Age: 59</p> <p style="padding-left: 40px;">Safety Age: 53</p> <p>We assume that 15% of future General and 25% of future Safety deferred vested members are reciprocal. For reciprocals, we assume 4.50% compensation increases for General and 5.00% for Safety per annum.</p>															
Liability Calculation for Current Deferred Vested Members:	<p>Liability for a current deferred vested member is calculated based on salary, service, and eligibility for reciprocal benefit as provided by the Retirement System. For those members without salary information that have 3 or more years of service, we used an average salary. For those members without salary information that have less than 3 years of service or for those members without service information, we assumed a refund of account balance.</p>															
Future Benefit Accruals:	<p>1.0 year of service per year of employment. There is no assumption to anticipate conversion of unused sick leave at retirement.</p>															
Unknown Data for Members:	<p>Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.</p>															
Definition of Active Member:	<p>All active members of OCERS as of the valuation date.</p>															
Form of Payment:	<p>All members are assumed to elect the unmodified option at retirement.</p>															
Percent Married:	<p>75% of male members and 55% of female members are assumed to be married at retirement or time of pre-retirement death.</p>															
Age of Spouse:	<p>Female (or male) three years younger (or older) than spouse.</p>															
Additional Cashout Assumptions:	<p><u>Non-CalPEPRA Formulas</u></p> <p>Additional compensation amounts are expected to be received during a member's final average earnings period. The percentages used in this valuation are:</p> <table border="0" style="margin-left: 40px;"> <thead> <tr> <th></th> <th style="text-align: center;">Final One Year Salary</th> <th style="text-align: center;">Final Three Year Salary</th> </tr> </thead> <tbody> <tr> <td>General Members</td> <td style="text-align: center;">3.00%</td> <td style="text-align: center;">2.80%</td> </tr> <tr> <td>Safety Probation</td> <td style="text-align: center;">3.80%</td> <td style="text-align: center;">3.40%</td> </tr> <tr> <td>Safety Law Enforcement</td> <td style="text-align: center;">5.20%</td> <td style="text-align: center;">4.60%</td> </tr> <tr> <td>Safety Fire</td> <td style="text-align: center;">2.00%</td> <td style="text-align: center;">1.70%</td> </tr> </tbody> </table> <p>The additional cashout assumptions are the same for service and disability retirements.</p> <p><u>CalPEPRA Formulas</u></p> <p>None</p>		Final One Year Salary	Final Three Year Salary	General Members	3.00%	2.80%	Safety Probation	3.80%	3.40%	Safety Law Enforcement	5.20%	4.60%	Safety Fire	2.00%	1.70%
	Final One Year Salary	Final Three Year Salary														
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