**Employees' Retirement System
of the State of Hawaii**

ACTUARIAL EXPERIENCE STUDY
For the five-year period ending June 30, 2015

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Gabriel Roeder Smith & Company

July 5, 2016

Board of Trustees
Employees' Retirement System of
   The State of Hawaii
City Financial Tower
201 Merchant St., Ste. 1400
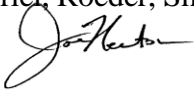Honolulu, HI 96813-2980

Subject: **Results of 2016 Experience Study**

We are pleased to present our report on the results of the 2016 Experience Study for the Employees' Retirement System of the State of Hawaii (ERS). It includes our recommendations for new actuarial assumptions to be effective for the June 30, 2016 actuarial valuation, and it describes the actuarial impact produced by these recommendations as though they had been effective for the June 30, 2015 actuarial valuation.
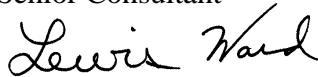
With the Board's approval of the recommendations in this report, we believe the actuarial condition of the System will be more accurately portrayed. The Board's decisions should be based on the appropriateness of each recommendation, not on their effect on the funding period or the unfunded liability.

We wish to thank the ERS staff for their assistance in providing data for this study.
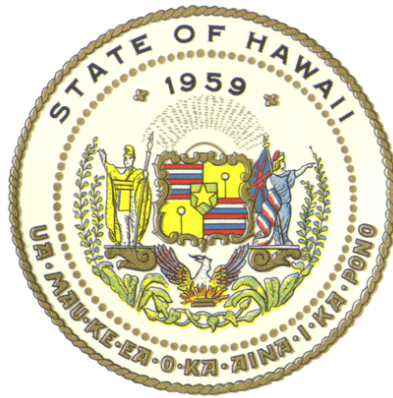
Sincerely,
Gabriel, Roeder, Smith & Company

Joseph P. Newton, FSA
Senior Consultant

Lewis Ward
Consultant

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Gabriel Roeder Smith & Company

SECTION I

EXECUTIVE SUMMARY

Executive Summary

Our recommended changes to the current actuarial assumptions may be summarized as follows:

Economic Assumptions

- We recommend no change to the current nominal investment return assumption of 7.50%. Based on a blending of the current capital market assumptions from twenty three independent sources and the System's target asset allocation, a 7.50% investment return is very close to the median expected geometric return over a 20 year time horizon. Even though lowering the inflation assumption (see below) actually increases the assumed real rate of return assumption, there have been adjustments to the asset allocation as inflation has continued to decrease in order to increase the real return of the portfolio.

- The current 7.50% assumption is based on earning the 7.50%, net of all investment *and* administrative expenses. This actually equates to a gross assumption in excess of 7.50%. We recommend adding an explicit charge of 0.35% of covered payroll for administrative expenses to the required contribution rate instead of implicitly netting the expenses against the investment return assumption. This will mimic the approach used in determining the investment return assumption under the accounting rules so that one investment return assumption can be used for both purposes.

- We recommend decreasing the inflation assumption from 3.00% to 2.50%. This will have an impact on projected wage growth which will have an impact on anticipated individual salary increases and projected contribution growth.

- We recommend no change to the 1.00% general productivity component of the general wage inflation assumption. However, consistent with the decrease in inflation, the nominal general wage inflation assumption will decrease from 4.00% to 3.50%. This assumption represents the average increase in wages in the general economy and is used to index salaries for each cohort of new entrants in projections. This will decrease the projected amount of overall payroll that will be made available to collect contributions on over the time horizon.

- The assumed salary increase schedules include an ultimate component for general wage inflation that may add on additional increases for individual merit (which would include promotions) and then an additional component for step rates based on service.

  - For General Employees, we are recommending no change to the current 1.00% above inflation assumption for the ultimate component. We are recommending extending the step-rate component to 25 years based on experience. The net change is an approximate 0.18% decrease in the average annual salary increase received by the

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member over their career (4.59% to 4.41%).

- o For Teachers, we are recommending a 0.25% decrease from 1.50% to 1.25% above inflation for the ultimate component. We are also recommending extending the step-rate component to 25 years based on experience. The net change is an approximate 0.94% decrease in the average annual salary increase received by the member over their career (5.31% to 4.37%).

- o For Police and Fire Employees, we are recommending an increase from 2.00% above inflation to 2.50% above inflation for the ultimate component. For Police and Fire Employees, the step rate portion is much shorter (only 2 years compared to 25 for State Employees and Teachers), and thus there are more across the board increases and less portioning by service. The net change is an approximate 0.82% decrease in the average annual salary increase received by the member over their career (5.98% to 5.16%). However, almost all of the decrease is due to the substantial decrease in the first two step rates from 14%/12% to 2%/2%. The ultimate component of 5.00% remained unchanged.

Mortality Assumptions

- • We recommend replacing the base mortality tables with client-specific mortality tables developed using the actual mortality experience of non-disabled retirees in ERS. We also recommend assuming mortality rates will continue to improve in the future using a fully generational approach and Scale BB. We will apply further adjustments to this set of base tables based on occupation (General Employees, Teachers, and Public Safety).

- • We recommend updating post-retirement mortality tables for disabled retirees to be a version of the new non-disabled base tables, adjusted with a 5-year setback to reflect impaired morality. We will also apply a minimum morality probability of 3.5% for males and 2.5% for females. Mortality rates will continue to improve in the future using a fully generational approach and Scale BB.

- • We recommend updating the pre-retirement mortality tables for active employees to use multiples of the recently published RP-2014 mortality table for active employees. We also recommend assuming mortality rates will continue to improve in the future using a fully generational approach and Scale BB.

Other Demographic Assumptions

- • We recommend minor adjustments to the retirement, termination, and disability patterns for members consistent with experience and future expectations.

- • For members that become disabled in the future, we will assume 50% of them will choose a

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- 100% joint and survivor annuity option.

- We recommend no change to the current assumption for the amount of sick leave converted to service at retirement.

Actuarial Methods and Policies

- We recommend no change to the current process of estimating the valuation payroll for the upcoming fiscal year.

- We recommend no change to the use of a 4-year smoothing technique to determine the actuarial value of assets, used for determining the funding period. However, we do recommend adding in a provision to ensure that the gain or loss from an individual year is fully recognized within 4 years.

- We recommend no change to the current funding method. The Entry Age Normal cost method (EAN) is the current funding method being used to allocate the actuarial costs of the System. The Entry Age Normal method will generally produce relatively level contribution amounts as a percentage of payroll from year to year, and allocates costs among various generations of taxpayers in a reasonable manner. It is by far the most commonly used actuarial cost method for large public retirement systems.

- *Impact of all recommended changes:*

  All values are based on the projected valuation as of June 30, 2017, assuming 7.5% investment returns for FY 2016 and FY2017 and no change to current employer contribution rates until FY2018.

| Item | Current Assumptions | Change Due to | | | |
| | | Mortality | All Other Demographic | Wage Growth | Admin Expense |
(1)	(2)	(3)	(4)	(5)	(5)
Total System					
Unfunded Actuarial Accrued Liability ($ in Millions)	$9,511	$10,974	$10,988	$10,656	$10,656
Funded Ratio	62.7%	59.3%	59.3%	60.0%	60.0%
Police and Fire Only					
Total Normal Cost %	20.76%	21.73%	22.53%	22.24%	22.59%
Funding Period based on current 25% employer contribution rate (years)	27	44	48	46	48
Employer Contribution for FY2018 and beyond to keep 27 year funding period	25.0%	30.4%	31.0%	30.6%	31.0%
Employer Contribution for FY2018 and beyond to produce a 30 year funding period	23.5%	29.0%	29.6%	29.2%	29.6%
All Other Employees					
Total Normal Cost %	10.77%	11.34%	11.22%	10.67%	11.02%
Funding Period based on current 17% employer contribution rate (years)	25	34	36	32	34
Employer Contribution for FY2018 and beyond to keep 25 year funding period	17.0%	19.6%	19.9%	19.1%	19.5%
Employer Contribution for FY2018 and beyond to produce a 30 year funding period	15.4%	18.0%	18.2%	17.6%	17.9%

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SECTION II

INTRODUCTION

Introduction

A periodic review and selection of the actuarial assumptions is one of many important components of understanding and managing the financial aspects of ERS. Use of outdated or inappropriate assumptions can result in understated costs which will lead to higher future contribution requirements or perhaps an inability to pay benefits when due; or, on the other hand, produce overstated costs which place an unnecessarily large burden on the current generation of members, employers, and taxpayers.

A single set of assumptions is typically not expected to be suitable forever. As the actual experience of the retirement changes, the assumptions should be reviewed and adjusted accordingly.

It is important to recognize that the impact from various outcomes and the ability to adjust from experience deviating from the assumption are not symmetric. Due to compounding economic forces, legal limitations, and moral obligations, outcomes from underestimating future liabilities are much more difficult to manage than outcomes of overestimates, and that un-symmetric risk should be considered when the assumption set, investment policy and funding policy are created. As such, the assumption set used in the valuation process needs to represent the best estimate of the future experience of the System and be at least as likely, if not more than likely, to overestimate the future liabilities versus underestimate them.

Changes in certain assumptions and methods are suggested upon this comparison to remove any bias that may exist and to perhaps add in a slight margin for future adverse experience where appropriate. Next, the assumption set as a whole was analyzed for consistency and to ensure that the projection of liabilities was reasonable and consistent with historical trends.

The following report provides our recommended changes to the current actuarial assumptions.

SUMMARY OF PROCESS

In determining liabilities, contribution rates, and funding periods for retirement plans, actuaries must make assumptions about the future. Among the assumptions that must be made are:

- Retirement rates
- Mortality rates
- Turnover rates
- Disability rates
- Investment return rate
- Salary increase rates
- Inflation rate

For some of these assumptions, such as the mortality rates, recent past experience provides important evidence about the future. For other assumptions, such as the investment return rate, the link between past and future results is much weaker. In either case, though, actuaries should review their assumptions periodically and determine whether these assumptions are consistent with actual past experience and with anticipated future experience.

For this purpose we have reviewed and analyzed ERS's data for the five-year period from June 30, 2010 through June 30, 2015. (In examining certain assumptions, however, we used a longer period, ten years, in order to smooth some of the year-to-year fluctuations and increase the soundness of our conclusions.) In our view, a period this long is reasonable. Sufficient data can usually be gathered so that the results have statistical significance. Legislation, such as plan improvements or changes in statewide salary schedules, can sometimes affect the results. Using a 3-5 year period prevents giving too much weight to such short-term effects. Finally, using a much longer period would water down real changes that may be occurring, such as mortality improvement or a change in the ages at which members retire.

In an experience study, we first determine the number of deaths, retirements, etc. that occurred during the period. Then we determine the number expected to occur, based on the current actuarial assumptions. Finally we calculate the A/E ratio, where "A" is the <u>actual</u> number (of retirements, for example) and "E" is the <u>expected</u> number. If the current assumptions were "perfect", the A/E ratio would be 100%. When it varies much from this figure, it is a sign that new assumptions may be needed. Of course we not only look at the assumptions as a whole, but we also review how well they fit the actual results by sex, by age, and by service.

Finally, if the data leads the actuary to conclude that new tables are needed, the actuary "graduates" or smoothes the results, since the raw results can be quite uneven from age to age or from service to service.

Please bear in mind that, while the recommended assumption set represents our best estimate, there are other reasonable assumption sets that could be supported. Some reasonable assumption sets would show higher or lower liabilities or costs.

ORGANIZATION OF REPORT

Section I of this report summarizes our recommended changes. Section III contains our findings and a more detailed analysis of our recommendation for each actuarial assumption. The impact of adopting our recommendations on liabilities and contribution rates is shown in Section IV. Sections V and VI show a summary of the recommended assumptions for each System. Finally, Section VII presents detailed summaries of the data and comparisons of the A/E ratios.

SECTION X EXHIBITS

The exhibits in Section VII should generally be self-explanatory. For example, on page 102, we show the exhibit analyzing the police service-based termination rates (salary weighted). The second column shows the total salary of members who terminated during the study period. This excludes members who died, became disabled or retired. Column (3) shows the total exposures. This is the salary of members who could have terminated during any of the years. In this exhibit, the exposures exclude anyone eligible for retirement. A member is counted in each year they could have terminated, so the total shown is the total exposures for the study period. Column (4) shows the probability of termination based on the raw data. That is, it is the result of dividing the actual salary of terminations (col. 2) by the salary exposed (col. 3). Column (5) shows the current termination rate and column (6) shows the new recommended termination rate. Columns (7) and (8) show the expected salary of terminations based on the current and proposed termination assumptions. Columns (9) and (10) show the Actual-to-Expected ratios under the current and proposed termination assumptions.

SECTION III

ANALYSIS OF EXPERIENCE
AND RECOMMENDATIONS

Analysis of Experience and Recommendations

We will begin by discussing the economic assumptions: inflation, the investment return rate, the general wage increase assumption, and the salary increase assumption. Then we will discuss the demographic assumptions: mortality, disability, termination and retirement. Finally we will discuss the actuarial methods used.

ECONOMIC ASSUMPTIONS

Actuaries are guided by the Actuarial Standards of Practice (ASOP) adopted by the Actuarial Standards Board (ASB). One of these standards is ASOP No. 27, Selection of Economic Assumptions for Measuring Pension Obligations. This standard provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations under defined benefit plans. The ASB adopted a revised standard in September 2013 and is applicable for measurement dates on or after September 30, 2014.

As no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The economic assumptions are much more subjective in nature than the demographic assumptions. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period. Nevertheless, the economic assumptions are much more subjective in nature than the demographic assumptions, which in itself can still create a difference in opinion among individuals in the actuarial profession and possibly stakeholders of the Retirement Systems.

INFLATION ASSUMPTION

By "inflation," we mean price inflation as measured by annual increases in the Consumer Price Index (CPI). This inflation assumption underlies most of the other economic assumptions. It impacts investment return, salary increases, and the rate of payroll growth for amortizing the unfunded actuarial accrued liability. The current annual inflation assumption is 3.00%.

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However, because Hawaii's economy is separated from the Mainland and may not trend at the same rate, there could be a need for separate inflation assumptions: one underlying the investment return and one underlying the wage increases. We compared the CPI-U over the last fifty years for Honolulu to All-US. The data showed that while for given periods of time of the economic cycle the two rates may differ, over the long term, the two rates trend very closely. The following graph shows the annual rates of inflation for both sets of data.
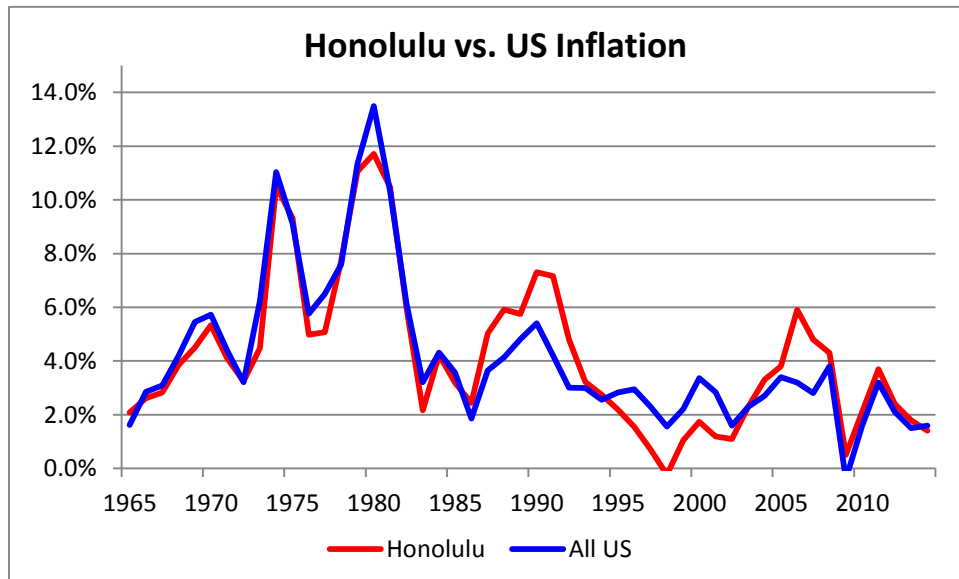
Over the long term, when the state economy booms relative to the Mainland, Hawaii's inflation is usually higher and when it is depressed relative to the Mainland, the inflation is usually lower. However, the average Hawaii inflation over the past fifty years has been 4.15%, and the average all-US inflation has been 4.15%. We believe the two inflation measurements will track closely over time and we have developed and recommend one inflation assumption.

Actual Change in CPI-U

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

Employees' Retirement System of the State of Hawaii
Section III
Analysis of Experience and Recommendations

Average Annual Inflation
CPI-U, Five-Year Averages Ending June 30
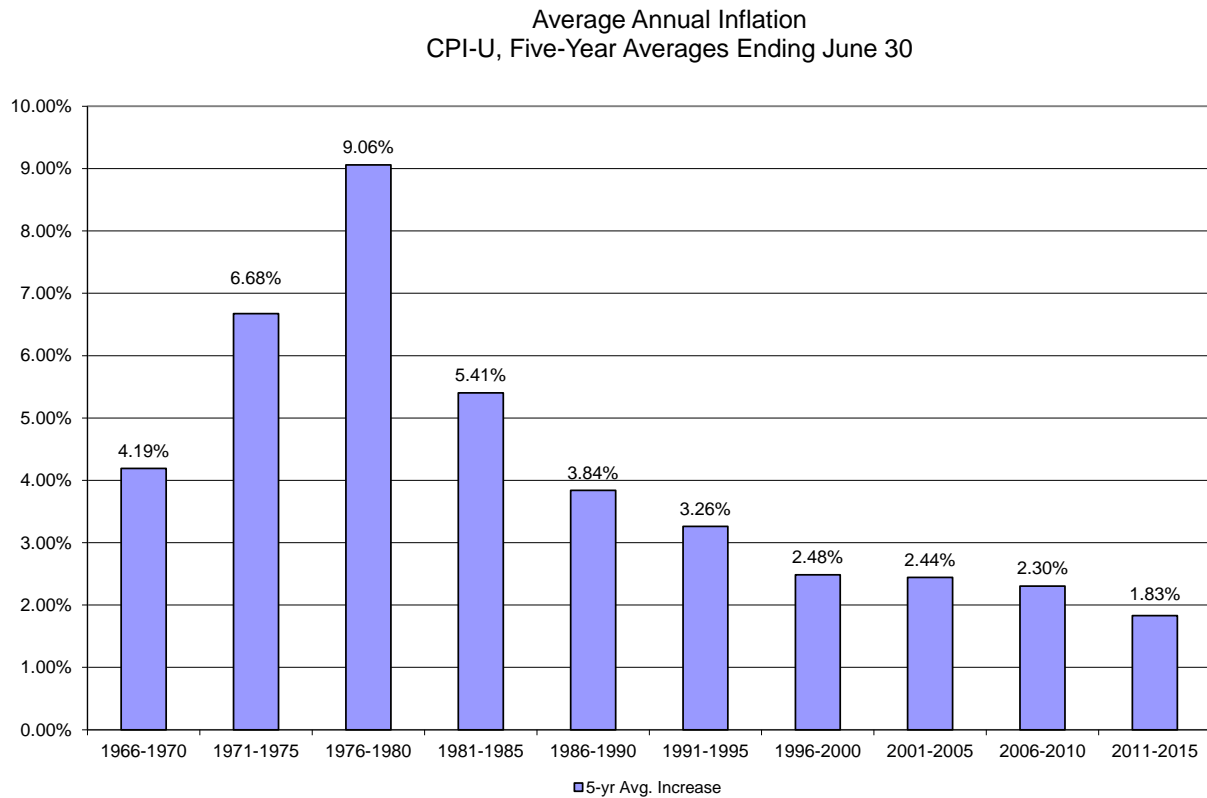
The following table shows the average inflation over various periods, ending June 30, 2015:

Periods Ending June 30, 2015	Average Annual Increase in CPI-U
Last five (5) years	1.83%
Last ten (10) years	2.07%
Last fifteen (15) years	2.19%
Last twenty (20) years	2.26%
Last twenty-five (25) years	2.46%
Last thirty (30) years	2.69%
Since 1913 (first available year)	3.16%

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

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

Forecasts from Investment Consulting Firms

Most investment consulting firms, in setting their capital market assumptions, assume that inflation will be less than 3.00%. Based on a 2015 survey of capital market assumptions of ten

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investment consulting firms who develop longer-term assumptions (20 years or more) performed by Horizon Actuarial Services, LLC, shows that the expected rate of inflation, as measured by CPI-U, for the next 20 years ranged from 2.0% to 2.8% with a median expectation of 2.3%. PCA, ERS' investment consultant, assumes that inflation will increase at the rate of 2.25% per year over the next ten years.

Expectations Implied in the Bond Market

Another source of information about future inflation is the market for US Treasury bonds. For example, the July 1, 2015 yield for 20-year inflation indexed Treasury bonds was 0.94% plus actual inflation. The yield for 20-year non-indexed US Treasury bonds was 2.92%. Simplistically, this means that on that day the bond market was predicting that inflation over the next twenty years would average 1.96% [(1 + 2.92%) / (1 + 0.94%) - 1] per year. The difference in yield for 30 year bonds implies 2.00% inflation over the next 30 years. This is consistent with most forecasts of inflation and overall economic growth being lower over the next decade. The chart on the following page shows the historical market implied inflation from January 1, 2010 through December 31, 2015.
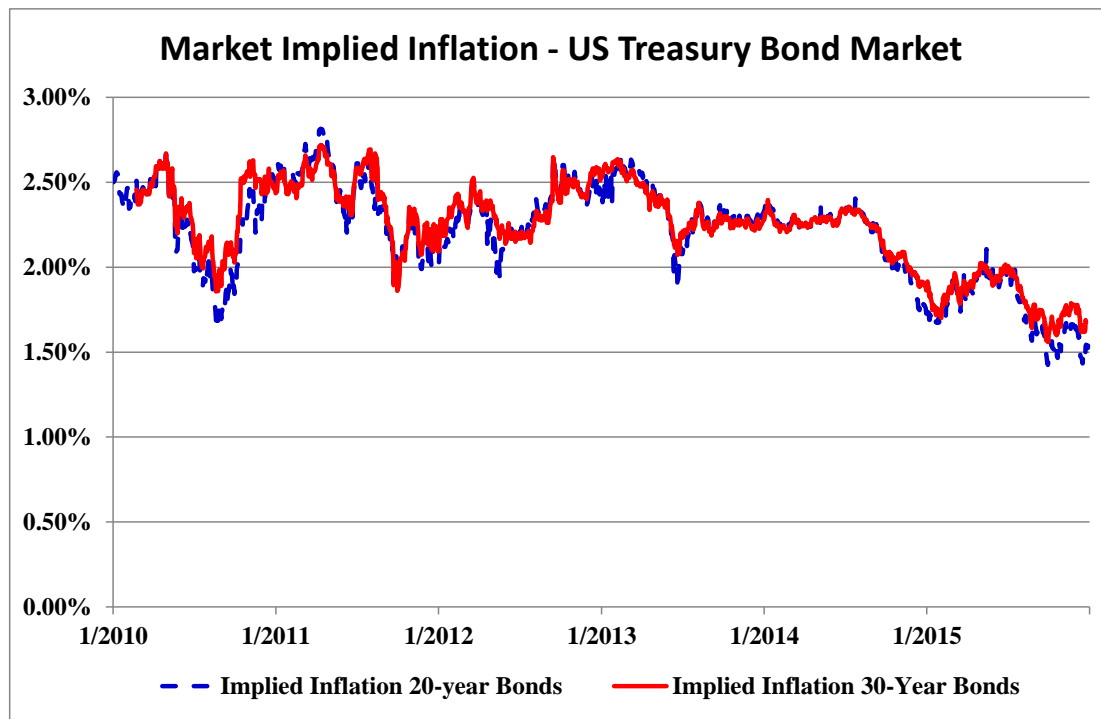
However, this analysis is known to be imperfect as it ignores the inflation risk premium that buyers of US Treasury bonds often demand as well as possible differences in liquidity between US Treasury bonds and TIPS.

Forecasts from Social Security Administration

In the Social Security Administration's 2016 Trustees Report, the Office of the Chief Actuary is projecting a long-term average annual inflation rate of 2.6% under the intermediate cost assumption. For the 2nd year in a row, the Chief Actuary for the Social Security Administration reduced this assumption by 0.10% from the prior year and also narrowed the low cost and high cost scenarios to 2.0% and 3.2%, respectively.

Survey of Professional Forecasters and Fed Policy

The Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters. Their most recent forecast (third quarter of 2015) was for inflation over the next ten years (2015 to 2024) to average 2.15%. Most observers expect inflation to continue to be low as the economy works out of the recession. However, the Society of Professional Forecasters is implicitly assuming a 2.00% inflation rate from 2015-2019, so it is not just the next 5-7 years that is depressing inflation forecasts.

Additionally, the Fed has openly stated that they have a target 2.00% inflation rate.

Comparison of Inflation Expectations from 2011 to 2016

Finally, the table below provides a comparison of the inflation expectations documented in the 2011 experience study report and the current inflation expectations.

| | **Inflation Expectations** | | |
Source	2011	2016	Change
(1)	(2)	(3)	(4)
ERS' Investment Consultant	3.00%	2.25%	-0.75%
Implied Inflation 20-Year Treasuries	2.09%	1.96%	-0.13%
SSA Trustees Report	2.80%	2.70%	-0.10%
Survey of Professional Forecasters	2.20%	2.15%	-0.05%

Recommendation

Using these sources, we recommend reducing the current 3.00% assumption to 2.50%, placing it closer to recent inflation levels and closer to the levels expected in the financial markets. As you will see, this change also affects other economic assumptions, including the payroll growth rate assumption for amortizing the unfunded actuarial accrued liability.

INVESTMENT AND ADMINISTRATIVE EXPENSES

The trust fund pays expenses in addition to member benefits and refunds so we must make some assumption about these. Almost all actuaries treat investment expenses as an offset to the investment return assumption. That is, the investment return assumption represents expected return after payment of investment expenses.

In regards to investment expenses, anticipated returns developed by investment consulting firms and discussed in more detail later in this section are net of investment related fees (including alternative asset classes such as real estate, private equity, and hedge funds). Therefore, we will not make any adjustments to account for investment related expenses.

On the other hand, the GASB Accounting Standard Nos. 67 and 68 specify that the investment return assumption is net of investment expenses, but not administrative expenses. For ERS, the practice has been to set the investment return assumption as the net return after payment of both investment and administrative expenses. To be consistent with the new accounting standard, we recommend that the valuation has an explicit administrative expense assumption that is a percentage of payroll and include it in the normal cost rate. Based on plan administrative expenses

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reported in the 2015 CAFR, we are recommend including a 0.35% of payroll adjustment to the normal cost rate to reflect administrative expenses paid with plan assets.

This change in method for recognizing administrative expenses will also lessen the burden on the investment portfolio as investment returns are no longer assumed to also cover administrative expenses, which are approximately 0.10% of assets (based on the 2015 CAFR).

INVESTMENT RETURN

As of the last valuation, ERS assumes an investment return rate of 7.65%, net of investment and administrative expenses. However, the Board has already adopted a policy to trend down to 7.50% over the next two valuation cycles, and thus the rest of the analysis is going to be based on the ultimate 7.50% assumption. This is the rate used in discounting future payments in calculating the actuarial present value of those payments. Even a small change to this assumption can produce significant changes to the liabilities and contribution rates.

The chart on the following page shows a history of ERS' market returns through FY 2015.

7.50%
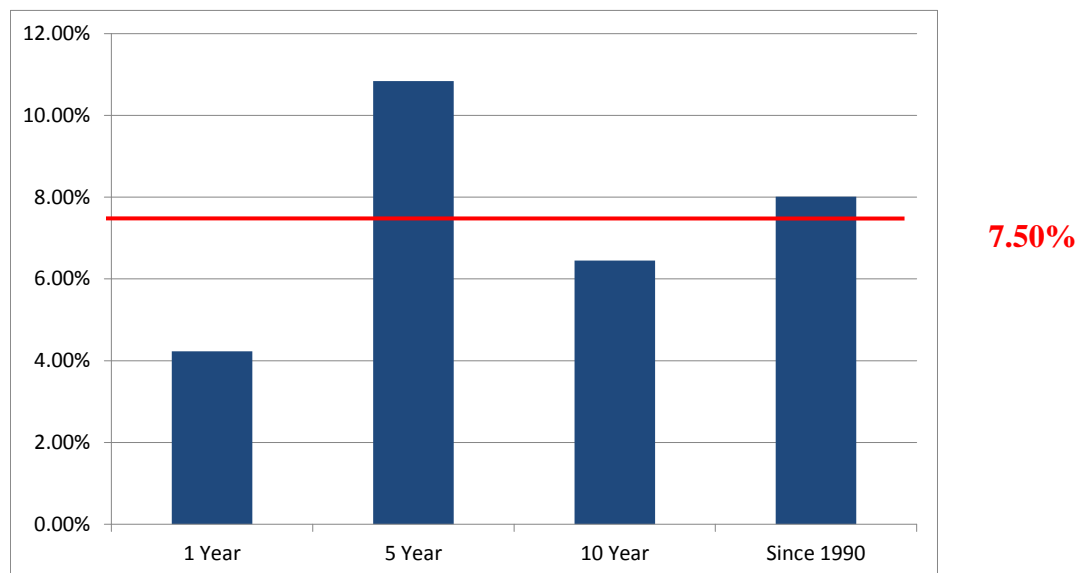
The returns in the chart above are market returns as reporting in the performance report as of June 30, 2015. While ERS did exceed the expected 8.00% return assumption over a five or 20 year time horizon, they have not if measured on a one or 10 year basis.

Because of this, past performance, even averaged over a twenty-year period, is not a reliable indicator of future performance for this assumption. The actual asset allocation of the trust fund will significantly impact the overall performance, so returns achieved under a different allocation are not meaningful. More importantly, the real rates of return for many asset classes, especially equities, vary so dramatically from year to year that even a twenty-year period is not long

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enough to provide reasonable guidance. There are strong reasons to believe the next twenty years will be different than the last twenty, in part because we are starting from higher price-earnings ratios on equities, and in part because the current bond returns are so low.

Comparison to Peers

We do not recommend the selection of an investment return assumption based on prevalence information. However, it is still informative to identify where the investment return assumption for ERS is compared to its peers. The chart on the following page shows the distribution of the investment return assumptions in the Public Plans Data as of December 2015 updated to reflect known changes to return assumptions that other retirement systems have made, but not yet included in the downloaded survey data.
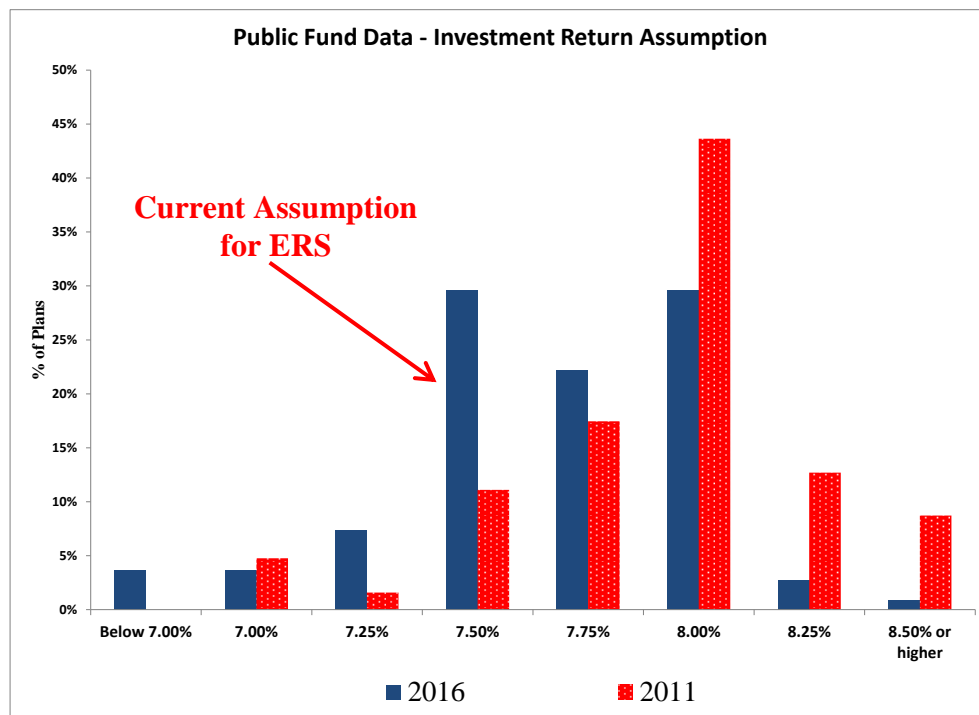
Source: Public Plans Database (n=108). Median investment return assumption: 7.75% nominal return.

We have included the same information from the 2011 survey to show the national trends in this assumption. The median rate of return is 7.75% and the average is 7.67%.

Forecasts Developed by ERS' Investment Consultant

We believe a more appropriate approach to selecting an investment return assumption is to identify expected returns developed by mapping the investment policy to forward-looking capital market assumptions that are developed by investment consulting firms.

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Because GRS is a benefits consulting firm and does not provide investment consulting advice, we do not develop or maintain our own forecasts of capital market expectations. Instead, we utilized the forward-looking return expectations developed by the PCA (ERS' investment consultant). PCA regularly updates their capital market expectations (i.e. estimates of expected returns, volatility, and correlations) as the economy and financial markets evolve.

To do this, we first will examine the results of applying the current set of capital market assumptions from PCA to the plan's target asset allocation.

Strategic Class	Long-Term Target Asset Allocation	Expected Total Return	Expected Portfolio Return (2) x (3)
(1)	(2)	(3)	(4)
Broad Growth	63.0%	9.41%	5.93%
Principal Protection	7.0%	2.90%	0.20%
Crisis Risk Offset	20.0%	6.59%	1.32%
Real Return	10.0%	6.47%	0.65%
Gross Arithmetic Return			8.10%
Adjustment for Compounding			(0.30%)
Gross Compound Return			7.80%

As you can see, the 2015 capital market assumptions developed by PCA would result in a ten-year expected compound return of 7.80%, which is slightly higher than the current 7.50% return assumption.

Comparison of PCA's Return Expectations to Other Investment Consultants

As we previously mentioned, most investment consulting firms develop forecasts regarding future investment returns. PCA's return expectations are one opinion among many different opinions in the profession investment community. To understand how PCA's expectations compare to expectations developed by other investment consulting firms, we have utilized a report issued by Horizon Actuarial Services, LLC (2015 Edition), which compiles and averages the return and risk forecasts of 29 major investment consulting firms (including PCA). This survey provides expectations on a short term (7-10 years) basis and a long term (20 year) basis.

We believe Horizon's survey provides stakeholders important information in understanding whether ERS' investment consultant is relatively optimistic or pessimistic compared to the professional investment community, as well as quantify differences in those expectations.

We have mapped ERS' asset allocation to the average survey assumptions and calculated the expected real rates of return. Based on this information, the survey produces expected compound returns of 7.16%, 7.55%, and 8.04% over the 10, 15, and 20 year time horizons.

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Recommendation

We believe the compilation of these sources of data support the current 7.50% long term investment return assumption. Based on PCA's analysis, the likelihood of attaining a 7.50% investment return is slightly more than 50% over the next decade. However, many sources believe the probabilities over the shorter term are much lower. It should be noted that if the returns over the short term do in fact underperform, it would lead to actuarial losses and extend the funding period.

We believe this recommendation satisfies the reasonable assumption requirement under ASOP No. 27 as revised and adopted in September 2013. Also, this recommendation is consistent with the recommendations regarding the use of an investment return assumption that is estimated to be realizable at least 50% of the time from a report released by the Society of Actuaries Blue Ribbon Panel on public pension plan funding in February 2014.

General Wage Inflation

The valuation currently assumes that General Wage Inflation (GWI) will be 1.00% above price inflation. The 1.00% represents the real wage growth over time in the general economy, or, is the assumption on how much the pay scales themselves will change year to year, not necessarily how much the pay increases received by individuals are. This assumption is used primarily to index each cohort of new entrants used in the projections to determine the funding period.

Historically, General Wage Inflation almost always exceeds price inflation. This is because wage inflation is in theory the result of (a) price inflation, and (b) productivity gains being passed through to wages. For the last 10 years, for the national economy as a whole, wage inflation has outpaced price inflation by about 0.45%, and for the last 20 years, wage inflation has exceeded price inflation by about 0.85%. Since 1951, wage inflation has been about 1.00% larger than price inflation each year.

The current assumption is consistent with national trends and we recommend no change to the spread above inflation. However, the 0.50% decrease in the inflation assumption decreases the nominal GWI assumption from 4.00% to 3.50%. This change will lower projected total covered payroll in the projection and thus lower the projected contribution revenue expected to be received over the amortization period.

Salary increase rates

In order to project future benefits, the actuary must project future salary increases. Salaries may increase for a variety of reasons:

- Across-the-board increases for all employees;
- Across-the-board increases for a given group of employees;

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- Increases to a minimum salary schedule;
- Additional pay for additional duties;
- Step or service-related increases;
- Increases for acquisition of advanced degrees or specialized training;
- Promotions;
- Overtime;
- Bonuses, if available; or
- Merit increases, if available.

Our salary increase assumption is meant to reflect all of these kinds of increases to the extent that they are included in the pay used to determine contributions or plan benefits.

The actuary should not look at the overall increases in payroll in setting this assumption, because payroll can grow at a rate different from the average pay increase for individual members. There are two reasons for this. First, when older, longer-service employees terminate, retire or die, they are generally replaced with new employees who have a lower salary. Because of this, in most populations that are not growing in size, the growth in total payroll is smaller than the average pay increase for members. Second, payroll can change due to an increase or decrease in the size of the group. Therefore, to analyze salary increases, we examine the actual increase in salary for each member who is active in two consecutive fiscal years. We focused on the base pay rate provided in the raw data as it appeared to be the most consistent from year to year and would not be impacted by furloughs.

Salary increases for employees of state government tend to vary significantly from year to year. In particular, when the state's tax revenues stall or increase slowly, salary increases often are small or nonexistent. Also, increases may be granted through biennial legislative sessions or through labor negotiations that do not occur every year. Therefore, a longer period for measuring salary increase rates usually provides a more accurate picture, by allowing us to smooth out short-term effects.

For this assumption, we looked at the salaries provided for all members who were active in the start and the end of an experience year, for the ten year study period, beginning July 1, 2005 and ending June 30, 2015. Therefore, we have used the combined period from the prior experience study and this year's experience study to produce our analysis.

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The following table shows the average increase over the last 10 years.

Average Salary Increase			
Year Ending June 30,	General Employees	Teachers	Public Safety
2006	7.25%	5.44%	7.34%
2007	5.30%	6.11%	6.55%
2008	6.54%	8.41%	8.41%
2009	8.04%	7.30%	7.66%
2010	-0.87%	-0.75%	5.59%
2011	0.94%	0.96%	7.90%
2012	0.36%	-1.73%	1.57%
2013	3.05%	4.59%	0.52%
2014	5.51%	4.77%	4.66%
2015	7.00%	4.64%	15.14%
Average	**4.27%**	**3.92%**	**6.47%**

Most actuaries recommend salary increase assumptions that include an element that depends on the member's age or service, especially for large, state-wide retirement systems. They assume larger pay increases for younger or shorter-service employees. This is done in order to reflect pay increases that accompany changes in job responsibility, promotions, demonstrated merit, etc. The experience shows salaries continue to be more closely correlated to service (rather than age), as promotions and productivity increases tend to be greater in the first few years of a career, even if the new employee is older than the average new hire. For this reason, we will continue to use salary scales based on service.

The data also shows differences in salary increases for Teachers, Police & Fire, and General Employees. Therefore, the salary scales have been derived separately for these three groups.

The current salary increase assumption varies based on years of service, with an ultimate salary increase assumption used for all employees who have attained a specified amount of service (4.00% for General Employees with 16 or more years of service, 4.50% for Teachers with 16 or more years of service, and 5.00% for Police and Fire employees with 3 or more years of service). The table below shows the actual average long-service increases for each year of the study. Note that these actual average rates of increase include average actual inflation, not our inflation assumption.

Average "Long-Service" Increase				
Actual Experience				
Year Ending	Inflation	Police & Fire	Teachers	General Employees
2006	4.32%	7.26%	6.08%	5.71%
2007	2.69%	6.41%	5.19%	5.06%
2008	5.02%	8.21%	8.17%	5.39%
2009	-1.43%	7.65%	6.28%	6.14%
2010	1.05%	5.52%	-1.32%	-1.26%
2011	3.56%	7.90%	0.63%	0.49%
2012	1.66%	1.50%	-3.26%	-1.23%
2013	1.75%	0.43%	4.82%	3.24%
2014	2.07%	4.61%	4.25%	5.15%
2015	0.12%	15.07%	4.00%	5.98%
Average	2.07%	6.39%	3.42%	3.43%

The following describes the building block methodology used to construct the current and proposed salary assumptions for Teachers. The same methodology was used to construct the current and proposed salary assumptions for Police & Fire as well as General Employees.

The following table shows the average increase over the ten-year period parsed out in five-year service groups for Teachers:

Teacher Experience	
Service	Average Pay Increase
1 to 5 Years	4.99%
6 to 10 Years	4.16%
11 to 15 Years	3.87%
16 to 20 Years	3.69%
21 to 24 Years	3.52%
25 Years or More	3.42%

The table shows that members with less than 6 years of service had an average increase of 4.99%, which is 1.31% higher than that of members with 16 to 20 years of service and 1.57% higher than that of members with more than 25 years of service. Therefore, we continue to recommend the adoption of assumed salary increase rates which vary by service.

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The salary scale is composed of three pieces: general wage inflation, an individual productivity/merit component, and a service based step-rate or promotional piece. Our recommended general wage inflation assumption is 3.50%, as discussed earlier. The individual productivity component would include the general productivity included in the GWI and any additional salary increase of the longer-service employees that is above the GWI (which could come from individual merit and promotions). The service-based or step-rate component is the expected salary increase of the shorter-service members that is above this level. All three pieces are determined independently and then added together to develop the ultimate salary schedule.

To determine the new salary scale, we first calculated the average increase over the ten-year period for members grouped by service. Members with 25 or more years of service were selected to be the longer-service employees to be used in determining the individual productivity component. They were grouped together because their salary increase did not vary significantly with additional service.

Using this group, we backed out actual inflation during the study period (2.31%) to get the real rates of increase. There is a lag between inflation and its impact on wages as budgets are typically set 6-12 months before the beginning of a fiscal year.   Using a one year lag (using the period 2004-2014), inflation averaged 2.31%. The average increase for the longer-service employees over the ten-year period was 3.42%; therefore, the actual individual productivity component for the period was 1.11% (3.42% less the actual inflation rate of 2.31%).

Therefore, we are recommending a decrease in our individual productivity component for Teachers from 1.50% to 1.25% above inflation.

The salary increase assumption for longer-service employees is the sum of the inflation (2.50%) and the individual productivity component (1.25%) for a total of 3.75%. This creates the salary increase assumption of 3.75% for longer-service Teachers.

Next, we developed the step-rate component. The following table shows the actual increases for members with less than 26 years of service and how we calculated the actual step-rates from the experience. Notice how the step rates decrease as the service increases.

Teachers Step-rate/Promotional Experience			
Years of Service	Average Pay Increase	Less Actual Inflation and Productivity Components	Actual Step-Rate Component
1	5.42%	- 3.42%	2.00%
2	5.12%	- 3.42%	1.70%
3	5.10%	- 3.42%	1.68%
4	4.97%	- 3.42%	1.55%
5	4.35%	- 3.42%	0.93%
6	4.58%	- 3.42%	1.15%
7	3.75%	- 3.42%	0.33%
8	4.35%	- 3.42%	0.92%
9	4.03%	- 3.42%	0.60%
10	4.08%	- 3.42%	0.65%
11-15	3.87%	- 3.42%	0.45%
16-20	3.69%	- 3.42%	0.27%
21-24	3.52%	- 3.42%	0.10%
25+	3.42%	- 3.42%	0.00%

The next step is to smooth these actual step-rates in order to develop a schedule that will produce a salary history consistent with the experience.

To obtain the recommended rates, we add the smoothed step-rate component, the 2.50% inflation component, and the 1.25% individual productivity component. These rates include an increase of 5.75% for new members after their first year of service and grade down to an annual 3.75% increase for teachers with 25 or more years of service. The average salary increase under the schedule is 4.37%. The full schedule is shown in Section VI of this report.

Similar methodologies produced an individual productivity component of 1.00% for General Employees (same as current assumption) for an overall ultimate salary increase assumption of 3.50% for long service employees and an average career increase of 4.41%.

For Police and Fire employees, the salary increases, when compared to inflation, have been much larger than expected based on the previous assumption, and thus we are increasing the individual productivity component by 0.50% from 2.00% to 2.50% which when combined with the 0.50% decrease in inflation produces no change to the nominal 5.00% ultimate assumption. The average salary increase under the proposed schedule of Police & Fire employees is 5.16%, beginning at

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7.00% for members with 1 or 2 years of service and then 5.00% for each year thereafter. Section VII of this report shows more detail on the experience.

DEMOGRAPHIC ASSUMPTIONS
ANALYSIS OF POST-RETIREMENT MORTALITY

ERS' actuarial liabilities and retirement contribution rates depend in part on how long retirees live. If members live longer, benefits will be paid for a longer period of time and the liability and ultimate employer contribution rates will be larger.

The issue of future mortality improvement is one that the governing bodies of our profession have increasingly become more focused on studying and ensuring that the actuarial profession remains on the forefront of this issue. This has resulted in recent changes to the relevant Actuarial Standard of Practice, ASOP 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations, and published practice notes. This ASOP now requires pension actuaries to make and disclose an assumption as to the expected mortality improvement after the valuation date. The following are excerpts directly from the commentary provided in conjunction with the Standard:

> *"As mortality rates have continued to decline over time, concern has increased about the impact of potential future mortality improvements on the magnitude of pension commitments. Section 3.5.3 of current ASOP No. 35 lists "the likelihood and extent of mortality improvement in the future" as a factor for the actuary to consider in selecting a mortality assumption. In the view of many actuaries, the guidance regarding mortality assumptions should more explicitly recognize estimated future mortality improvement as a fundamental and necessary assumption, and the actuary's provision for such improvement should be disclosed explicitly and transparently."*

> *"**The resources reviewed by the Pension Committee showed that demographers generally expect that mortality will continue to improve**. These resources noted that some scientists argue that human life has biological limits, and that the rate of mortality improvement could slow as a result of obesity or other emerging health issues, but that such limits and countervailing factors do not alter the scientific consensus of likely continuing improvements in mortality."*

> *"The actuary should consider the effect of mortality improvement both prior to and subsequent to the measurement date. With regard to mortality improvement, the actuary should do the following:*
>
> > i.   ***adjust mortality rates to reflect mortality improvement prior to the measurement date***. *For example, if the actuary starts with a published mortality table, the mortality rates may need to be adjusted to reflect mortality improvement from the effective date of the table to the measurement date. Such an adjustment is not necessary if, in the*

actuary's professional judgment, the published mortality table reflects expected mortality rates as of the measurement date.

ii.   **include an assumption as to expected mortality improvement after the measurement date**. *This assumption should be disclosed in accordance with Section 4.1.1, even if the actuary concludes that an assumption of zero future improvement is reasonable as described in Section 3.1. **Note that the existence of uncertainty about the occurrence or magnitude of future mortality improvement does not by itself mean that an assumption of zero future improvement is a reasonable assumption.**"*

As you will note, we have highlighted the above sentences we feel need to be emphasized. To meet this standard, a recent trend in actuarial models is to use mortality tables that explicitly incorporate projected mortality improvements over time. This type of table (or series of tables) is called "generational mortality." Historically, actuarial models have been constrained to static mortality tables due to two primary reasons: (1) a general belief that there was a limit on the ultimate longevity and (2) the added complexity of a generational mortality type model and limitations in computational power. These static mortality tables would be used and updated with each experience study to reflect the most recent mortality and limited expectation for future mortality improvements. Historically, this would almost always result in adoption of lower mortality rates creating losses for plans and unfunded past service liabilities.

With advances in computing power, it has become an emerging best practice to incorporate generational mortality models. The idea behind adopting a generational mortality model is to avoid the experience study "correction" factor resulting from the use of static mortality tables. While minor adjustments may need to be made in the future, the constant bias towards needing to reduce mortality rates is avoided.

The expectation of continued increases in longevity is supported by national trends. The following graph provides the expected remaining lifetime in years for a 65-year old retiree measured beginning in 1960. Notice the recent uptrend in female longevity after almost two decades of relatively minimal improvement. This significant change in pattern (most of which has occurred since 2004) has led most of the actuarial profession to agree that future improvements will likely continue.

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Life Expectancy in Years, Current Age 65
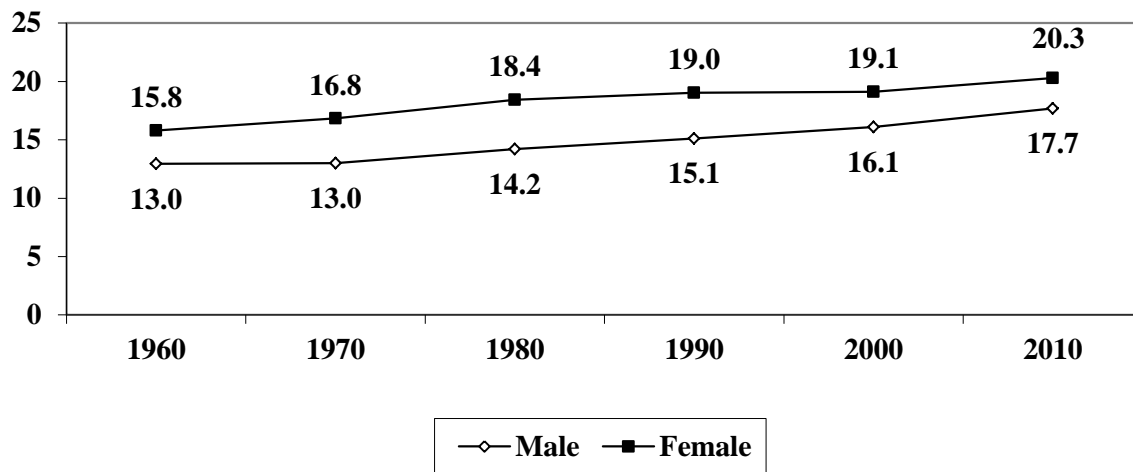
National Vital Statistics Reports, Vol 58, No 21, June 2010

National Vital Statistics Reports, Vol 60, No 4, January 2011

The most current mortality tables and improvement assumptions have recently been published in a report by the Society of Actuaries' Retirement Plans Experience Committee's (RPEC) in October of 2014. The following are excerpts from the Society of Actuaries Report on their mortality improvement scale, referred to as MP-2014:

> *"In late 2009, RPEC initiated a comprehensive analysis of pension plan mortality experience in the United States. At an early stage of its analysis, the Mortality Improvement subcommittee of RPEC noticed that mortality improvement experience in the United States since 2000 was clearly different from that anticipated by Scale AA. In particular, there was a noticeable degree of mismatch between the Scale AA rates and actual mortality experience for ages under 50, and the Scale AA rates were lower than the actual mortality improvement rates for most ages over 55. Given that the full Pension Mortality Study was still many months from completion at that time, the SOA decided to publish interim mortality improvement Scale BB, which provided pension actuaries with a more up-to-date alternative to Scale AA for the projection of base mortality rates beyond calendar year 2000."*

RPEC recognizes that there is a wide range of opinion with respect to future levels of mortality and that the assumptions underlying mortality improvement reflect some degree of subjectivity. RPEC characterized the assumptions that underpin Generational Scale BB (including a 1.0% long-term rate of mortality improvement and limited cohort effects) as a temporary projection scale to overcome perceived short-comings of Scale AA (noted above) until RPEC could finalize an updated generational mortality assumption, which they now refer to as MP-2014.

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Based on the recent strengthening of the Standards of Practice, GRS has been increasingly recommending our clients use a fully generational approach for mortality assumptions, and almost all of them have accepted the new projection method. By doing this, future mortality rates will be projected to continually decrease each year. Therefore, the life expectancy at age 60 for someone reaching 60 now will not be as long as the life expectancy for someone reaching 60 in 2020, and their life expectancy will not be as long as someone reaching 60 in 2040, etc. For illustrative purposes, the following table provides the life expectancy for individuals retiring in future years, based on the recently published Retirement Pensioners 2014 (RP-2014) healthy annuitant mortality tables, with full generational projection using the Society of Actuaries mortality improvement scale MP-2014.

Proposed Life Expectancy for an Age 60 Retiree (in Years)					
Gender	**Year of Retirement**				
	2010	2015	2020	2025	2030
Male	25.6	26.1	26.5	27.0	27.4
Female	28.1	28.5	29.0	29.4	29.8

Because of this assumption of continuous improvement, life expectancies for today's younger active members are expected to be materially longer than those of today's retirees. The improvement over time is built into the projections for individual members.

It is important to note that the liabilities and costs for the current valuation would be equal under a static or generational approach to mortality improvement if the static tables are set properly. It is the systematic inclusion of continuous improvement that will impact future valuations and experience studies.

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ERS Specific Analysis

Based on experience observed in prior experience studies, we currently have separate mortality tables for the three groups of members (Teachers, Public Safety, and General Employees). This is a fairly common practice and is appropriate because individual employee groups may have measurably different rates of mortality.

The following graphic provides the life expectancy, in years, from a given age for each classification of retiree. These values are based on the actual data, not on the current assumption.

Life Expectancy in Years from Current Age (Males)
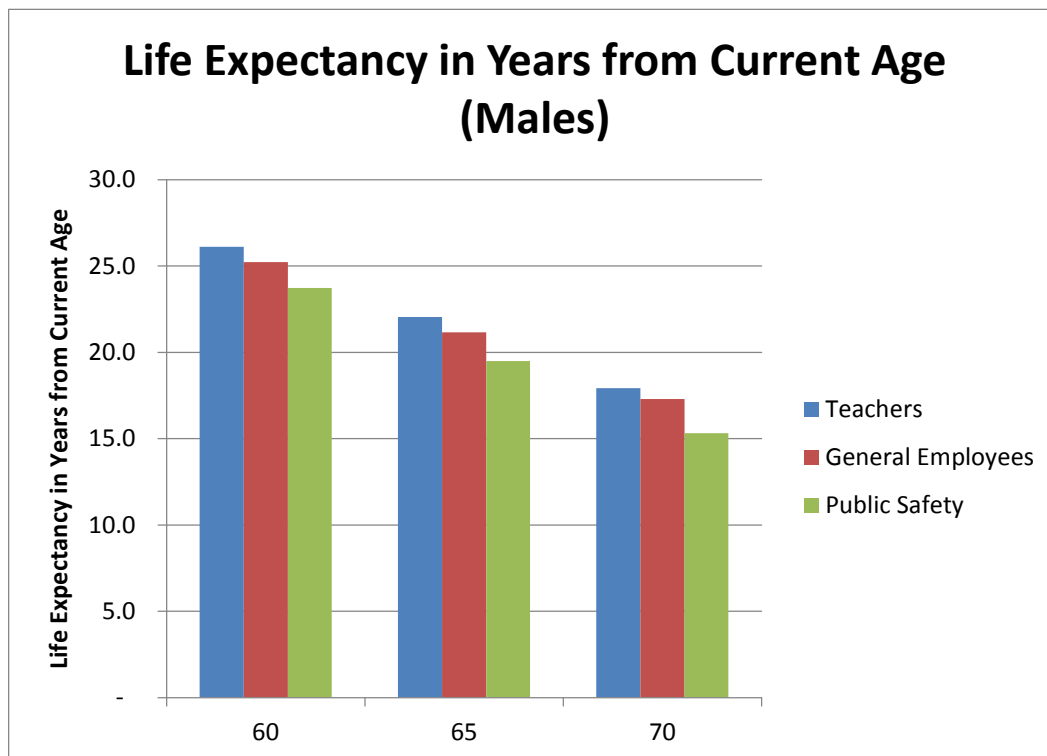
As shown, the life expectancy for male teacher retirees is larger than the life expectancy of the retirees in the other groups. Public Safety retirees have the lowest of the three groups. This experience supports the use of slightly different mortality assumptions (e.g., different multipliers, age set-backs, or different versions of base tables).

Credibility

When choosing an appropriate mortality assumption, actuaries typically use standard mortality tables, unlike when choosing other demographic assumptions. They may choose to adjust these standard mortality tables, however, to reflect various characteristics of the covered group, and to provide for expectations of future mortality improvement (both up to and after the measurement date). If the plan population has sufficient credibility to justify its own mortality table, then the use

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of such a table also could be appropriate. Factors that may be considered in selecting and/or adjusting a mortality table include the demographics of the covered group, the size of the group, the statistical credibility of its experience, and the anticipated rate of future mortality improvement.

We first measured the credibility of the dataset to determine whether standard, unadjusted tables should be used or if statistical analysis of ERS specific data was warranted. Based on a practice note issued by the American Academy of Actuaries in the Fall of 2011, a dataset needs 96 expected deaths for each gender to be within +/- 20% of the actual pattern with 95% confidence. We believe +/- 20% is a rather large range to be considered fully credible. Other sources state higher requirements, such as 1,000 deaths per gender. The following table gives the number of deaths needed by gender to have a given level of confidence that the data is +/- X% of the actual pattern.

Standard Score	Confidence	99% – 101%	97% – 103%	95% – 105%	90% – 110%	80% – 120%
0.674	75%	4,543	505	182	45	11
1.282	80%	16,435	1,826	657	164	41
1.645	90%	27,060	3,007	1,082	271	68
1.96	95%	38,416	4,268	1,537	384	96
2.576	99%	66,358	7,373	2,654	664	166

Using this information, 1,082 deaths are needed by gender to have 90% confidence that the data is within +/- 5% of the actual pattern. ERS had 2,710 male deaths during the 5-year period and 2,197 female deaths, clearly indicating they are a fully credible group.

For this analysis, we have weighted the analysis by the amount of the member's monthly annuity. This is consistent with the development of all national tables as data shows a clear correlation between income and longevity. By weighting the data by annuity amounts, we are giving more weight to members who have larger annuities (and thus have larger liabilities).

We begin by determining the expected number of deaths in each year at each age for males and females and the benefit amounts associated with these retirees. Then we compare the actual number to the expected number. The ratio of the actual deaths to the expected deaths (the A/E ratio) tells us whether the assumptions are reasonable. When using a static mortality table, an A/E ratio between 110% and 120% has traditionally been desired for conservatism and includes a margin for continued future improvements in mortality rates. However, when using a generational approach for mortality improvement, an A/E of 100% is targeted. We will discuss this in two parts, the recommended base mortality assumption, and the recommended mortality improvement assumption.

Recommended Base Mortality Assumption

Since ERS has enough experience to credibly model post-retirement mortality, we have developed and recommended base mortality assumptions that are specific to ERS. We started by deciding whether we would use standard industry tables, and possibly adjust these for ERS experience, or create client-specific tables based on ERS data.   The following table shows the life expectancy in years for female retirees ages 60, 65, & 70 based on occupation compared to the life expectancies created by the three versions of the recently published RP-2014 mortality tables.

	Life Expectancy in Years				
Current Age	HI Teachers	HI General Employees	RP-2014 Blue Collar	RP-2014 Standard	RP-2014 White Collar
60	30.5	29.3	25.7	26.3	27.4
65	25.7	24.9	21.5	22.0	23.0
70	20.9	20.8	17.5	18.0	18.8

As shown, even compared to the white-collar version of the RP-2014 table, the life expectancy of ERS female retirees far exceeds the expectation from the industry table. It would take material adjustments to the industry tables to mimic ERS experience. Based on this information and the level of credibility discussed above, we conclude it is appropriate for ERS to use non-standard, System specific mortality tables.

The proposed base mortality assumptions are based on ERS's experience for the five-year period ending June 30, 2015.   We intentionally used a five-year period for developing a morality assumption because this is the most recent experience and reflects the most recent improvements in longevity. Using a larger experience period would temper real changes that have occurred in the mortality assumption due to real changes, or improvements, observed in this assumption.

To develop the recommended mortality assumptions, mortality rates for ages after 60 are based on the System's experience, using an exponential model to provide a smooth fit to the experience. Mortality rates for ages under 50, are equal to the most recently published RP-2014 combined healthy annuitant mortality assumptions (adjusted back to the central point of the experience period). Finally, the mortality rates for the transitional age ranges, ages 50 to 59, were developed using a cubic spine method to orderly transition between the mortality rates between the core and outlier age ranges.

The final step in the creation of the base mortality assumption was to project the preliminary table from the center point of the analysis period (i.e., 2012) to the year 2016 using the recommended projection scale below.

There are then multipliers applied to this base table based on the occupation. Higher multipliers mean higher rates of mortality and thus shorter life expectancies. The following table provides the

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multipliers for each gender and occupation combination. Please note that for Public Safety females, we have used the same multiplier as the General Employee females. This is because (1) there is not enough data to analysis the female Public Safety members on their own and (2) most of the female mortality liability in the valuation of Public Safety is in the beneficiary liability, which will look more like the general population.

	General Employee	Teacher	Public Safety
Male	100%	90%	120%
Female	107%	95%	107%

Recommended Mortality Improvement Assumption

There are currently three commonly discussed mortality improvement assumptions used by pension actuaries for valuating pension plan liabilities, each released by the Society of Actuaries. These mortality improvement assumptions include: Scale AA, Scale BB, and Scale MP-2014. One way to look at the three scales is low, medium, and high anticipated improvement, meaning if we used Scale AA we would be assuming low continued improvement, etc.

Scale AA is based upon a blend of mortality improvement trends among Civil Service Retirement System (CSRS) and Social Security Administration participants between 1977 and 1993. Since its official release in 1995, it has become the most widely adopted improvement scale for use by both public and private institutions within the United States.

The Society of Actuaries' Retirement Plans Experience Committee (RPEC) initiated a pension mortality study in 2010. At an early stage of its analysis, RPEC noticed that mortality experience since 2000 has improved at a faster rate than anticipated by Scale AA. As a result, RPEC issued another mortality improvement scale, Scale BB, in the year 2012 as an alternative mortality improvement assumption for pension actuaries to use.

In October 2014, RPEC issued final reports of the mortality study that was originally initiated in 2010. These final reports included the release of another mortality improvement assumption, Scale MP-2014, which represents the Committee's current best estimate of future mortality improvement in the United States overall.

In our opinion, mortality improvement assumptions Scale BB and Scale MP-2014 are preferable over Scale AA since they are based on more current data (Scale BB and MP-2014 are based on the same historical data) and more consistently model recent historical experience. A significant difference between improvement Scale MP-2014 and Scale BB is Scale MP-2014 is a two-dimensional improvement assumption that is a function of the age and calendar year, whereas Scale BB is only a function of age. Also, in 2015 the SOA issued a new projection scale named MP-2015 that included updates for actual improvement experience through 2011. This new scale

shows that the rate of increase during the 2010 and 2011 was slower than the previous MP-2014 anticipated.

Based on recent analysis for several of our large clients, we are finding that the actual improvement in our data sets over the last 10 years has produced a better match to the Scale BB than MP-2014. In addition, an argument can be made that life expectancies for ERS members are already so far ahead of other populations, there might be less room for further improvement over time.

For these reasons, we recommend use of the mortality improvement Scale BB. This change will increase the UAAL, decrease the funded ratio, and increase the funding period of ERS and is the most material change recommended in this analysis. That said, this change should reduce the impact of the "correction factor" in future experience studies as continuous future improvement is now included in the liability projections.

Disabled mortality rates

This is a minor assumption, and it has little impact on the liabilities of ERS. We are recommending a change to assume members that live past normal retirement age will use the same table as healthy retirees, with a 5-year set-forward, meaning a disabled member age 70 will use the same mortality rate as a healthy member age 75. For ages prior to normal retirement age, we will assume the same 5-year set forward, but we are applying a minimum mortality rate of 3.5% for males and 2.5% for females to reflect impaired mortality during those ages.

Active mortality rates

A separate mortality table is used for active members. It is typical for active mortality to be much lower than the retiree mortality. The current mortality rates assume lower mortality than the retiree mortality table but clearly still higher mortality than is actually occurring. We are recommending updating this assumption to the new RP-2014 mortality table for active employees, and applying a multiplier based on ERS experience, including the proportion of members with duty related or non-duty related deaths and the prevalence of beneficiaries. This assumption has basically no impact.

Disability rates

Disability is also a minor assumption, with little effect on the liabilities. However, the experience appears to be higher than expected from the current assumptions. To determine the actual experience, we counted the actual number of new disability records in the retiree data over the five year period 2010-2014. This allows the experience to account for the normal delay in processing disability claims. Based on this information, we are recommending changing the percentages of the client table to match the experience of the groups.

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	Ordinary Disability			Duty Related Disability		
	Expected	Actual	Proposed	Expected	Actual	Proposed
General Employees	137	269	272	32	57	60
Teachers	20	33	34	2	2	2
Police and Fire	5	2	5	3	7	7

For future members who become disabled, we currently assume they will choose a life only benefit option. We recommend changing this to assume 50% will choose a 100% Joint and Survivor option to reflect any subsidy that exists in the option factors.

Retirement rates

For this assumption, an A/E ratio between 90% and 100% is desirable for conservatism. We currently use retirement rates that vary by group, age, and sex. The retirement tables also vary by contributory vs. noncontributory. The analysis was completed weighted by liability instead of count as individuals with higher benefits are more likely to retire earlier. The analysis studied all of the groups separately. Data from the prior experience study was taken into consideration when changes were recommended to the assumptions.

The following sections give a brief description of the findings for unreduced retirement for each group for the "core ages" of 55-69. Section VII has more detail on the experience.

Hybrid ($ in 000s of liability)					
		Old Assumptions		Proposed Assumptions	
Group	Actual Retirements	Expected Retirements	Actual/ Expected	Expected Retirements	Actual/ Expected
General Male	$3,367	$4,037	83.4%	$3,530	95.4%
General Female	4,539	5,234	86.4%	4,677	97.0%
Teacher Male	1,282	1,264	101.4%	1,326	96.7%
Teacher Female	2,910	3,100	93.9%	3,137	92.8%

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Non-Contributory ($ in 000s of liability)					
		Old Assumptions		Proposed Assumptions	
Group	Actual Retirements	Expected Retirements	Actual/ Expected	Expected Retirements	Actual/ Expected
General Male	$2,125	$2,771	76.7%	$2,188	97.1%
General Female	2,285	2,715	84.2%	2,403	95.1%
Teacher Male	689	721	95.6%	721	95.6%
Teacher Female	1,558	1,757	88.7%	1,628	95.7%

Contributory ($ in 000s of liability)					
		Old Assumptions		Proposed Assumptions	
Group	Actual Retirements	Expected Retirements	Actual/ Expected	Expected Retirements	Actual/ Expected
General Male	$1,613	$1,433	112.6%	$1,563	103.2%
General Female	1,889	1,923	98.2%	1,980	95.4%
Teacher Male	423	448	94.4%	448	94.4%
Teacher Female	1,727	1,614	107.0%	1,614	107.0%

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Police & Fire Employees:

The retirement rates were very slightly modified to give a closer match to experience, as shown below. The following table gives more detail.

Police & Fire Employees – Males and Females ($ in 000s of liability)					
		Old Assumptions		Proposed Assumptions	
Age Range	Actual Retirements	Expected Retirements	Actual/ Expected	Expected Retirements	Actual/ Expected
45-49	926	965	96.0%	965	96.0%
50-54	2,600	2,360	110.2%	2,360	110.2%
55-59	2,715	2,640	102.9%	2,765	98.2%
60-61	584	573	101.9%	573	101.9%
Sub-Total	6,825	6,537	104.4%	6,662	102.4%
62-64	329	390	84.3%	390	84.3%
Total (including ages 62-64)	7,154	6,927	103.3%	7,052	101.4%

Termination rates

Termination rates reflect members who leave for any reason other than death, disability or service retirement. They apply whether the termination is voluntary or involuntary, whether the member is vested or non-vested, and whether the member takes a refund or keeps his/her account balance on deposit and takes a deferred benefit. For this analysis, we utilized 10 years of data to capture a longer economic cycle and have based the analysis weighted by salary instead of count.

The current tables have different rates for members within their first six years of service than the rest of the population. This is a typical pattern as termination and turnover are higher earlier in a member's career than once the member is established. The period based on the first few years of a member's career is called the select period, and the period after the select period is called the ultimate period. The rates during the ultimate period are age based and unrelated to service. There are also separate rate for males and females.

We found that in general the current assumptions do a reasonable job of estimating the number of terminations. However, we have also noticed that the application of the assumption could be simplified. We found very little difference in patterns between males and females and that a

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service only pattern was preferred to the more complicated service and age based schedule currently used. Thus, we have created unisex tables solely based on service.

The following tables show selected information. The first table only includes data from employees with six years of service or less, while the second table uses data from employees with more than six years of service. Section VII gives more detail on the data.

Members with Six Years of Service or Less					
		Old Assumptions		Proposed Assumptions	
	Actual Terminations	Expected Terminations	A/E	Expected Terminations	A/E
Teachers	361,870	361,236	100%	360,257	100%
General Employees	599,539	552,457	109%	605,601	99%
Police & Fire	26,666	29,304	91%	25,955	103%

Members with More than Six Years of Service					
		Old Assumptions		Proposed Assumptions	
	Actual Terminations	Expected Terminations	A/E	Expected Terminations	A/E
Teachers	168,445	179,155	94%	170,244	99%
General Employees	323,816	321,764	101%	319,335	101%
Police & Fire	27,196	38,323	71%	27,640	98%

Sick Leave

We currently assume that each member has their service increased at retirement for unused sick leave. The current assumption varies the percentage increase by employee group. Data shows the amount of sick leave is proportional to the amount of service at retirement. Data also shows the amount differs by General Employees, Teachers, and Police and Fire. We are recommending no changes to the assumptions at this time. However, the experience for Police and Fire Employees has outpaced the current assumption over the last five years. If this trend continues, we will increase that assumption in the next experience study. The following is the experience from 2010-2015 based on actual retirements showing the average months of service.

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	Credited Service at Retirement	Credited Sick Leave	% Increase	Current Assumption
Teachers	309.30	12.58	4.07%	4.25%
General Employees	282.88	10.23	3.62%	3.75%
Police & Fire	337.41	18.91	5.60%	5.00%

Other assumptions

There are other assumptions made in the course of a valuation, such as the age difference between husbands and wives, the likelihood that a terminating employee will take a refund, timing of decrements, etc. We reviewed these, and decided to recommend no changes to these other assumptions.

Actuarial methods

We have reviewed the actuarial cost method being used—the Entry Age Normal cost method (EAN)—and we continue to believe that this is the method of choice for this plan, since this method usually does the best job of keeping costs level as a percentage of payroll.

Actuarial Value of Assets

Actuaries generally recommend using a smoothed actuarial value of assets (AVA), rather than market value (MVA), in order to dampen the fluctuations in measurements such as the required contribution amount and the funded status of the Plan. Currently, the actuarial value of assets is based on the market value of assets with an approximate four-year smoothing applied. This is accomplished by recognizing each year 25% of the difference between the market value of assets and the expected actuarial value of assets, based upon the assumed valuation rate of return. We continue to believe this method is appropriate. It does not distinguish between types of return (interest, dividends, realized gains/losses, and unrealized gains/losses), like some other methods. It treats different asset classes and different investment styles the same. We do not believe the method has a bias relative to market. In other words, we expect the ratio of the AVA to MVA to average about 100% over the very long term. We believe this method does a good job of smoothing asset gains and losses, and reduces fluctuations in the contribution rates. However, this specific method can take longer than 4 years to completely recognize a large event such as the 2008 financial crisis. We are recommending a small change to the method that would keep track of individual gains or losses in the past and ensure that they are recognized within the 4 year period if they are not offset by a gain or loss in a future valuation. This change would be added prospectively in conjunction with the next valuation and will have no material impact on this or any future valuation.

SECTION IV

ACTUARIAL IMPACT OF RECOMMENDATIONS

Actuarial Impact of Recommendations

All values are based on the projected valuation as of June 30, 2017, assuming 7.5% investment returns for FY 2016 and FY2017 and no change to current employer contribution rates until FY2018.

		Change Due to			
Item	**Current Assumptions**	**Mortality**	**All Other Demographic**	**Wage Growth**	**Admin Expense**
(1)	(2)	(3)	(4)	(5)	(5)
Total System					
Unfunded Actuarial Accrued Liability ($ in Millions)	$9,511	$10,974	$10,988	$10,625	$10,656
Funded Ratio	62.7%	59.3%	59.3%	60.1%	60.0%
Police and Fire Only					
Total Normal Cost %	20.76%	21.73%	22.53%	22.24%	22.59%
Funding Period based on current 25% employer contribution rate (years)	27	44	48	46	48
Employer Contribution for FY2018 and beyond to keep 27 year funding period	25.0%	30.4%	31.0%	30.6%	31.0%
Employer Contribution for FY2018 and beyond to produce a 30 year funding period	23.5%	29.0%	29.6%	29.2%	29.6%
All Other Employees					
Total Normal Cost %	10.77%	11.34%	11.22%	10.67%	11.02%
Funding Period based on current 17% employer contribution rate (years)	25	34	36	32	34
Employer Contribution for FY2018 and beyond to keep 25 year funding period	17.0%	19.6%	19.9%	19.1%	19.5%
Employer Contribution for FY2018 and beyond to produce a 30 year funding period	15.4%	18.0%	18.2%	17.6%	17.9%

Shown above is a table that compares key statistics from the June 30, 2015 actuarial valuation before and after taking into account the recommended new assumptions, projected forward to June 30, 2017. The net result of making all the recommended changes makes a significant change in the picture of ERS's actuarial status, especially for the Police and Fire group.

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The normal cost is the average cost of accruing new benefits. The figures shown include both the expected contribution paid by members and the balance to be paid by the employers. The difference between the total contribution paid by the employers, and the portion devoted to the normal cost, is used to amortize the unfunded actuarial accrued liability (UAAL). The UAAL is the portion of the total present value of future benefits that is assigned to past years and is in excess of the actuarial value of assets. The funding period is the number of years that will be required to amortize the UAAL, assuming that the employer contribution rate is unchanged at 25.00% for Police & Firefighters and 17.00% for All Other Employees. The amortization calculations are made assuming payments increase annually as payroll increases.

As you can see, especially for Police and Fire, the changes are significant. The change in the mortality assumption has the largest effect on the actuarial status.

The Board's decisions should be based on the appropriateness of each recommendation not on their effect on the funding period or the unfunded liability.

SECTION V

SUMMARY OF RECOMMENDATIONS

Summary of Recommendations

Our recommendations may be summarized as follows:

Economic Assumptions

1.   We recommend no change to the current nominal investment return assumption of 7.50%.

2.   We recommend adding an explicit charge for administrative expenses of 0.35% of covered payroll, instead of netting the expenses against the investment return assumption, and adding this expense to the required contribution rate.

3.   We recommend decreasing the inflation assumption from 3.00% to 2.50%.

4.   We recommend no change to the 1.00% general productivity component of the general wage inflation assumption. However, consistent with the decrease in inflation, the nominal general wage inflation assumption will decrease from 4.00% to 3.50%.

5.   For General Employees, we are recommending no change to the current 1.00% above inflation assumption for the ultimate component. We are recommending extending the step-rate component to 25 years of service based on experience.

6.   For Teachers, we are recommending a 0.25% decrease from 1.50% to 1.25% above inflation for the ultimate component. We are recommending extending the step-rate component to 25 years of service based on experience.

7.   For Police and Fire Employees, we are recommending an increase from 2.00% above inflation to 2.50% above inflation for the ultimate component. For Police and Fire Employees, the step rate portion is much shorter (only 2 years compared to 25 for State Employees and Teachers), and thus there are more across the board increases and less portioning by service.

8.   We recommend replacing the base mortality tables with client-specific mortality tables developed using the actual mortality experience of non-disabled retirees in ERS. We also recommend assuming mortality rates will continue to improve in the future using a fully generational approach and Scale BB. We will apply further adjustments to this set of base tables based on occupation (General Employees, Teachers, and Public Safety).

9.   We recommend updating post-retirement mortality tables for disabled retirees to be a version of the new non-disabled base tables, adjusted with a 5-year setback to reflect impaired morality. We will all apply a minimum morality probability of 3.5% for males

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and 2.5% for females. Mortality rates will continue to improve in the future using a fully generational approach and Scale BB.

10.   We recommend updating the pre-retirement mortality tables for active employees to use multiples of the recently published RP-2014 mortality table for active employees.

11.   We recommend minor adjustments to the retirement, termination, and disability patterns for members consistent with experience and future expectations.

12.   For members that become disabled in the future, we will assume 50% of them will choose a 100% joint and survivor annuity option.

13.   We recommend no change to the current assumption for the amount of sick leave converted to service at retirement.

14.   We recommend no change to the current process of estimating the valuation payroll for the upcoming fiscal year.

15.   Recommend no change to the use of a 4-year smoothing technique to determine the actuarial value of assets, used for determining the funding period. However, add in a provision to ensure that the gain or loss from an individual year is fully recognized within 4 years.

16.   We recommend no change to the current funding method.

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SECTION VI

SUMMARY OF ASSUMPTIONS
AND METHODS INCORPORATING
THE RECOMMENDED ASSUMPTIONS

Summary of Assumptions and Methods
Incorporating the Recommended Assumptions

The following assumptions were developed and recommended based on an experience study performed in 2016. All of the assumptions are based on a combination of anticipated future experience and market observations. We believe all of the assumptions are reasonable and appropriate for this measurement. Please see our report dated June 1, 2016 for more discussion about the selection of these assumptions.

I.   *Valuation Date*

The valuation date is June 30th of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

II.   *Actuarial Cost Method*

The normal cost and actuarial accrued liability are determined using the Entry Age Actuarial Cost Method. The actuarial accrued liability is assigned to years prior to the valuation, and the normal cost is assigned to the year following the valuation. The remaining costs are assigned to future years. The normal cost and accrued liability are determined on an individual basis.

The normal cost is the level percentage of payroll contribution required to accumulate the needed funds to pay all expected benefits. This percentage of payroll is then applied to the total compensation for the prior year for all active members, and is then adjusted for the payroll growth assumption.

The actuarial accrued liability is the difference between the total present value of future benefits and the actuarial present value of future normal costs. The unfunded actuarial accrued liability (UAAL) is the excess of the actuarial accrued liability over the actuarial value of assets.

III. *Funding of Unfunded Actuarial Accrued Liability*

Since the State statutes governing the System establish the employee and employer contribution rates, the actuarial valuation determines the number of years required to amortize (or fund) the UAAL. Because of the legislated increases in future employer contribution rates and the new tier of benefits for employees hired after June 30, 2012, an open group projection of liabilities and assets was used to determine the length of time until the UAAL is eliminated. The open group projection assumed that the number of active members would remain static (i.e. each active employee who leaves employment due to termination, retirement, death or disability, would be replaced by exactly one new employee).

Because of this methodology for determining the funding period, any change in the unfunded actuarial accrued liability due to (i) actuarial gains and losses, (ii) changes in actuarial assumptions, or (iii) amendments, affects the funding period.

Please see Section V of this table for a description of the new entrant profile used in the open group projection.

IV.   *Actuarial Value of Assets*

The actuarial value of assets is based on the market value of assets with a four-year phase-in of actual investment return in excess of (less than) expected investment income. Offsetting unrecognized gains and losses are immediately recognized, with the shortest remaining bases recognized first and the net remaining bases continue to be recognized on their original timeframe. The expected actuarial value of assets is calculated net of investment expenses, and the expected investment return is equal to the assumed investment return rate multiplied by the prior year's actuarial value of assets, adjusted for contributions, benefits paid, and refunds.

V.   New Entrant Profile

For the purposes of determining the funding period, an open group projection is used which replaces on a one-to-one basis each active member who leaves employment with an average new hire. The average new hire is determined based on a new entrant profile, which is created from the valuation data by determining the entry age and entry pay for anyone with seven or less years of service as of the valuation date. Each group of new hires' salaries is assumed to grow at the General Wage Inflation of 3.50% over the salaries of the previous year's group.

The new entrant profile for members assumed to be hired during the year following the valuation date for the Police and Fire Employees and the All Other Employees are shown in the table below.

New Entrant Profile for Police & Fire Employees		
Entry Age	# of Employees	Average Salary
20-24	199	$42,080
25-29	421	41,841
30-34	286	41,807
35-39	136	42,273
40-44	47	42,310
45-49	17	43,503
50-54	6	45,708
55-59	1	40,632
Total	1,113	41,993

It is assumed that 92.7% of new hires will be male.

New Entrant Profile for All Other Employees		
Entry Age	# of Employees	Average Salary
15-19	19	$26,410
20-24	1,433	37,250
25-29	3,459	40,108
30-34	2,759	42,208
35-39	2,388	43,097
40-44	1,954	41,537
45-49	1,785	40,980
50-54	1,449	42,278
55-59	1,169	45,146
60-64	484	46,511
65-69	52	47,971
Total	16,951	41,610

It is assumed that 40.0% of new hires will be male.

VI.   *Actuarial Assumptions*

    A.   Economic Assumptions

        1.   Investment return: 7.5% per year, compounded annually, composed of an assumed 2.50% inflation rate and a 5.00% net real rate of return.

        2.   General Wage Inflation: 3.50% per annum.

3.   Salary increase rates: As shown below

Years of Service	General Employees		Teachers	
	Service-related Component	Total Rate Including 2.50% Inflation Component and 1.00% Productivity Component	Service-related Component	Total Rate Including 2.50% Inflation Component and 1.25% Productivity Component
1	3.00%	6.50%	2.00%	5.75%
2	3.00%	6.50%	1.75%	5.50%
3	2.00%	5.50%	1.75%	5.50%
4	1.50%	5.00%	1.50%	5.25%
5	1.50%	5.00%	1.00%	4.75%
6	1.25%	4.75%	1.00%	4.75%
7	1.25%	4.75%	0.75%	4.50%
8	1.00%	4.50%	0.75%	4.50%
9	1.00%	4.50%	0.50%	4.25%
10	1.00%	4.50%	0.50%	4.25%
11	0.75%	4.25%	0.50%	4.25%
12	0.75%	4.25%	0.50%	4.25%
13	0.50%	4.00%	0.25%	4.00%
14	0.50%	4.00%	0.25%	4.00%
15	0.50%	4.00%	0.25%	4.00%
16	0.50%	4.00%	0.25%	4.00%
17	0.50%	4.00%	0.25%	4.00%
18	0.50%	4.00%	0.25%	4.00%
19	0.50%	4.00%	0.25%	4.00%
20	0.25%	3.75%	0.25%	4.00%
21	0.25%	3.75%	0.25%	4.00%
22	0.25%	3.75%	0.25%	4.00%
23	0.25%	3.75%	0.25%	4.00%
24	0.25%	3.75%	0.25%	4.00%
25 or more	0.00%	3.50%	0.00%	3.75%

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3.   Salary increase rates (continued):

Years of Service	Police & Firefighters	
	Service-related Component	Total Annual Rate of Increase Including 2.50% Inflation Component and 2.5% General Increase Rate
1	2.00%	7.00%
2	2.00%	7.00%
3 or more	0.00%	5.00%

Salary increases are assumed to occur once a year, on July 1. Therefore the pay used for the period between the valuation date and the first anniversary of the valuation date is equal to the reported pay for the prior year, annualized if necessary, and then increased by the salary increase assumption. To adjust the pays received as of March 31st to the June 30th valaution date, the reported pay for each member is increased by 1%.

B.   Demographic Assumptions

1.   Mortality rates:

Active Members: Multiples of the RP 2014 mortality table for active employees based on the occupation of the member as follows:

Type	General Employees Male & Female	Teachers Male & Female	Police and Fire Male & Female
Ordinary	75%	55%	58%
% of Ordinary Choosing Annuity	41%	52%	24%
Duty Related	5%	5%	12%

Healthy Retirees: The 2016 Public Retirees of Hawaii mortality table, generational projection using the BB projection table from the year 2016 and with multipliers based on plan and group experience. The following are sample rates of the base table as of 2016 with the corresponding multipliers:

Healthy Annuitant Mortality Rates Before Projection (Multiplier Applied)

Age	General Employees		Teachers		Police and Fire	
	Male	Female	Male	Female	Male	Female
50	0.1626%	0.1140%	0.1463%	0.1012%	0.1951%	0.1140%
55	0.3963%	0.1937%	0.3567%	0.1720%	0.4756%	0.1937%
60	0.6301%	0.2735%	0.5671%	0.2428%	0.7561%	0.2735%
65	0.9489%	0.3532%	0.8540%	0.3136%	1.1387%	0.3532%
70	1.3733%	0.7404%	1.2360%	0.6574%	1.6480%	0.7404%
75	2.1071%	1.3116%	1.8964%	1.1645%	2.5285%	1.3116%
80	3.6268%	2.2573%	3.2641%	2.0041%	4.3522%	2.2573%
85	6.6210%	4.1830%	5.9589%	3.7138%	7.9452%	4.1830%
90	12.1005%	8.2371%	10.8905%	7.3133%	14.5206%	8.2371%
Multiplier	100%	107%	90%	95%	120%	107%
Setback	0	0	0	0	0	0

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The following table provides the life expectancy for individuals retiring in future years based on the assumption with full generational projection:

Life Expectancy for an Age 65 Retiree in Years

Gender	Year of Retirement			
	2020	2025	2030	2035
General Retirees				
Male	23.2	23.7	24.2	24.7
Female	26.4	26.8	27.2	27.5
Teachers				
Male	24.0	24.5	25.0	25.5
Female	27.3	27.7	28.0	28.3
Police and Fire				
Male	21.8	22.3	22.8	23.3
Female	26.4	26.8	27.2	27.5

Disabled retirees: Base Table for healthy retirees occupation, set forward 5 years, generational projection using the BB projection table from the year 2016. Minimum mortality rate of 3.5% for males and 2.5% for females.

2.   Disability rates – The assumed total disability rates at select ages are multiples of the client specific table that follows:

Age	Male & Female
25	0.000%
30	0.001%
35	0.008%
40	0.026%
45	0.064%
50	0.146%
55	0.198%
60	0.217%

Note: The disability rates project the percentage of employees at each age that is assumed to become disabled before retiring. Multiples of the rates above are assumed to be ordinary disability or accidental disability, and varies by employee group as follows:

Type	General Employees Male & Female	Teachers Male & Female	Police and Fire Male & Female
Ordinary	210%	75%	70%
Accidental	30%	5%	75%

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3. Termination Rates - Same male and female rates, based solely on the member's service. Rates reflect terminations for causes other than death, disability or retirement. Employees eligible for retirement are assumed to have no probability of termination. Sample rates are shown below:

Years of Service	Expected Terminations per 1000 Lives (Male & Female)		
	General Employees	Teachers	Police & Fire
0	185.9	243.6	110.0
1	152.5	200.8	95.0
2	124.6	164.7	37.0
3	101.6	134.4	30.1
4	82.9	109.4	26.1
5	67.9	89.0	23.3
6	56.1	72.5	21.0
7	47.0	59.5	19.2
8	40.1	49.4	17.7
9	35.1	41.7	16.4
10	31.5	36.0	15.2
11	29.1	31.9	14.1
12	27.6	29.0	13.2
13	26.6	27.0	12.3
14	25.9	25.7	11.5
15	25.5	24.8	10.8
16	25.1	24.0	10.1
17	24.5	23.2	9.5
18	23.9	22.4	8.9
19	23.0	21.4	8.3
20	22.0	20.2	7.7
21	20.8	18.7	7.2
22	19.5	17.1	6.8
23	18.3	15.4	6.3
24	17.4	13.6	5.8
25	16.8	12.1	0.0
26	16.8	10.9	0.0
27	16.8	10.4	0.0
28	16.8	10.7	0.0
29	16.8	10.0	0.0
30 and more	0.0	0.0	0.0

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4.   Retirement rates - Separate male and female rates, based on age. Sample rates are shown below:

Contributory Members

Expected Retirements per 100 Lives

| | General Employees | | | | Teachers | | | | Police/Fire |
| | Unreduced Retirement | | Reduced Retirement | | Unreduced Retirement | | Reduced Retirement | | Unreduced Retirement |
Age	Male	Female	Male	Female	Male	Female	Male	Female	Male & Female
45	0	0	0.0001	0.0001	0	0	0	0	12.5
46	0	0	0.0001	0.0001	0	0	0	0	12.5
47	0	0	0.0001	0.0001	0	0	0	0	12.5
48	0	0	0.0001	0.0001	0	0	0	0	12.5
49	0	0	0.0001	0.0001	0	0	0	0	12.5
50	0	0	0.0001	0.0001	0	0	1	0	15.0
51	0	0	2	1	0	0	1	1	15.0
52	0	0	2	1	0	0	1	1	15.0
53	0	0	2	1	0	0	2	2	15.0
54	0	0	3	2	0	0	3	3	15.0
55	25	20	3	2	20	18			20.0
56	25	20			15	16			20.0
57	16	13			15	16			20.0
58	16	13			15	16			22.0
59	13	13			15	16			25.0
60	13	15			14	18			30.0
61	13	15			14	18			30.0
62	28	25			14	25			30.0
63	20	20			14	20			30.0
64	20	20			14	15			30.0
65	20	20			20	25			100.0
66	18	20			15	25			
67	18	20			15	20			
68	18	20			15	20			
69	18	20			15	20			
70	20	20			15	20			
71	20	20			15	20			
72	20	20			15	20			
73	20	20			15	20			
74	20	20			15	20			
75	100	100			100	100			

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Noncontributory Members

| | General Employees | | | | Teachers | | | |
| | Unreduced | | Reduced | | Unreduced | | Reduced | |
Age	Male	Female	Male	Female	Male	Female	Male	Female
55	20	11	1	1	10	13	1	2
56	18	11	1	1	10	7	1	2
57	13	11	1	1	10	8	1	2
58	10	11	1	1	10	10	2	2
59	10	11	2	2	10	20	3	3
60	10	14	3	3	10	11	5	5
61	11	18	4	4	10	16	7	5
62	20	20			16	25		
63	20	20			12	20		
64	12	20			10	15		
65	14	20			20	25		
66	20	20			15	25		
67	20	20			15	25		
68	20	20			15	25		
69	20	20			15	25		
70	20	20			15	25		
71	20	20			15	25		
72	20	20			15	25		
73	20	20			15	25		
74	20	20			15	25		
75	100	100			100	100		

Expected Retirements per 100 Lives

Note: Retirement rates for the 25&out group age 50-54 are 10% for male and 11% for female.

Hybrid Members

| | General Employees | | | | Teachers | | | |
| | Unreduced | | Reduced | | Unreduced | | Reduced | |
Age	Male	Female	Male	Female	Male	Female	Male	Female
55	16	18	1	1	20	16	2	2
56	10	13	1	1	13	10	2	2
57	10	13	1	1	13	10	2	2
58	14	13	1	2	13	12	2	2
59	14	13	2	2	13	12	3	3
60	14	13	2	4	14	14	3	5
61	14	15	3	4	14	18	3	10
62	21	20			22	30		
63	18	20			14	20		
64	18	20			14	20		
65	21	20			20	25		
66	18	18			15	25		
67	18	18			15	25		
68	18	18			15	25		
69	18	18			15	25		
70	20	20			15	25		
71	20	20			15	25		
72	20	20			15	25		
73	20	20			15	25		
74	20	20			15	25		
75	100	100			100	100		

Expected Retirements per 100 Lives

Note: Retirement rates for the 25&out group age 50-54 are 6% for both male and female.

For members hired after June 30, 2012 the retirement rates for members once they reach unreduced retirement eligibility are increased 10% (multiplicative) for each year the member is beyond the age the member would have been eligible under the Hybrid provisions for members hired prior to June 30, 2012.

C.   Other Assumptions

1. Projected payroll for contributions: The aggregate projected payroll for the fiscal year following the valuation date is calculated by increasing the actual payroll paid during the previous fiscal year by the payroll growth rate and multiplying by the ratio of current active members to the average number of active members during the previous fiscal year.

2. Age difference: Male members are assumed to be four years older than their spouses, and female members are assumed to be four years younger than their spouses.

3. Marriage Assumption: While not implicitly used in the valuation, 100% of active members are assumed to be married when setting other benefit election and eligibility assumptions.

4. Percent electing annuity on death for contributory participants (when eligible): All of the spouses of married participants who die after becoming eligible for a retirement benefit are assumed to elect an annuity or a refund, whichever is more valuable at time of participant's death.

5. Payment Option: Future healthy retirees are assumed to choose the life only payment option. 50% of future disabled retirees are assumed to choose the 100% Joint and Survivor option.

6. Percent electing deferred termination benefit: vested terminating members are assumed to elect a refund or a deferred benefit, whichever is more valuable at the time of termination.

7. Assumed age for commencement of deferred benefits: Members electing to receive a deferred benefit are assumed to commence receipt when eligible for early retirement.

8. Administrative expenses: Administrative expenses are assumed to be 0.35% of active member payroll.

9. Reemployment, purchase of service, transfers: No recognition is made of (i) future member reimbursements upon reemployment, (ii) future purchase of additional service, or (iii) special transfer provisions.

10. Sick Leave: It is assumed that all members will have their benefit service increased by sick leave and the following loads will be applied by group:

General Employees	3.75%
Teachers	4.25%
Police and Fire	5.00%

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11. COLA delay: It is assumed that the first COLA will be received 9 months after retirement. Teachers are assumed to receive COLA 12 months after retirement,

12. There will be no recoveries once disabled.

13. No surviving spouse will remarry and there will be no children's benefit.

14. Pay increase timing: Beginning of (fiscal) year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.

15. Decrement timing: Retirements and terminations of Teachers are assumed to occur at the beginning of the year. All other decrements are assumed to occur mid-year.

16. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.

17. Decrement relativity: Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.

18. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.

19. Benefit Service: All members are assumed to accrue 1 year of service each year. Exact fractional service is used to determine the amount of benefit payable.

20. Police officers, firefighters, investigators of the Department of the Prosecuting Attorney and the Attorney General, narcotic enforcement investigators, and public safety investigators hired prior to June 30, 2012 are not assumed to retire at age 55 unless they have 10 years of service.

VI.   Participant Data

Participant data was supplied on CD-ROM for (i) active members, (ii) inactive vested members, who are entitled to a future deferred benefit, (iii) members and beneficiaries receiving benefits.

Salary supplied for the current year was based on the actual pensionable earnings for the 12-month period ending the March preceding the valuation date. This pay was increased by 1% to reflect the three month difference from March to June. For members with less than one year of service, the base pay rate provided in the data was used.

SECTION VII

SUMMARY OF DATA AND EXPERIENCE

GENERAL EMPLOYEES - CONTRIBUTORY
MALE NORMAL RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate Current	Assumed Rate Proposed	Expected Liabilities Current (3) * (5)	Expected Liabilities Proposed (3) * (6)	Actual/Expected Current (2) / (7)	Actual/Expected Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	174,821	819,476	0.213	0.160	0.250	131,116	204,869	133%	85%
56	205,664	822,782	0.250	0.140	0.250	115,189	205,695	179%	100%
57	121,374	766,533	0.158	0.140	0.160	107,315	122,645	113%	99%
58	148,855	839,706	0.177	0.140	0.160	117,559	134,353	127%	111%
59	131,429	829,740	0.158	0.140	0.130	116,164	107,866	113%	122%
60	88,835	756,882	0.117	0.140	0.130	105,963	98,395	84%	90%
61	98,262	699,869	0.140	0.150	0.130	104,980	90,983	94%	108%
62	174,339	615,691	0.283	0.250	0.280	153,923	172,394	113%	101%
63	126,151	495,052	0.255	0.200	0.200	99,010	99,010	127%	127%
64	74,931	425,186	0.176	0.200	0.200	85,037	85,037	88%	88%
65	48,853	384,090	0.127	0.250	0.200	96,022	76,818	51%	64%
66	101,661	354,343	0.287	0.250	0.180	88,586	63,782	115%	159%
67	70,896	233,195	0.304	0.200	0.180	46,639	41,975	152%	169%
68	30,605	184,894	0.166	0.200	0.180	36,979	33,281	83%	92%
69	16,460	143,690	0.115	0.200	0.180	28,738	25,864	57%	64%
Subtotal	1,613,136	8,371,126	0.193			1,433,220	1,562,967	113%	103%
70-74	27,360	332,397	0.082	25.000	0.200	66,479	66,479	41%	41%
Subtotal	1,640,496	8,703,523	0.188			1,499,700	1,629,446	109%	101%
75 & Over	32,215	278,560	0.116	1.000	1.000	278,560	278,560	12%	12%
Total	1,672,711	8,982,083	0.186			1,778,260	1,908,006	94%	88%

Note: The proposed retirement rates of the 25& out group from age 50 to 54 are 10%.

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Section VII
Employees' Retirement System of the State of Hawaii
Summary of Data and Experience

GENERAL EMPLOYEES - CONTRIBUTORY
FEMALE NORMAL RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	191,346	963,987	0.198	0.130	0.200	125,318	192,797	153%	99%
56	217,083	1,059,423	0.205	0.130	0.200	137,725	211,885	158%	102%
57	88,621	986,974	0.090	0.130	0.130	128,307	128,307	69%	69%
58	151,717	1,051,408	0.144	0.130	0.130	136,683	136,683	111%	111%
59	109,909	1,060,178	0.104	0.130	0.130	137,823	137,823	80%	80%
60	150,911	1,106,882	0.136	0.150	0.150	166,032	166,032	91%	91%
61	174,549	1,010,887	0.173	0.150	0.150	151,633	151,633	115%	115%
62	208,914	911,673	0.229	0.250	0.250	227,918	227,918	92%	92%
63	146,027	762,087	0.192	0.250	0.200	190,522	152,417	77%	96%
64	161,081	663,650	0.243	0.200	0.200	132,730	132,730	121%	121%
65	62,678	522,737	0.120	0.250	0.200	130,684	104,547	48%	60%
66	86,056	413,152	0.208	0.250	0.200	103,288	82,630	83%	104%
67	91,735	329,140	0.279	0.200	0.200	65,828	65,828	139%	139%
68	31,807	247,346	0.129	0.200	0.200	49,469	49,469	64%	64%
69	16,916	196,327	0.086	0.200	0.200	39,265	39,265	43%	43%
Subtotal	1,889,350	11,285,853	0.167			1,923,227	1,979,967	98%	95%
70-74	128,756	588,250	0.219	25.000	0.200	117,650	117,650	109%	109%
Subtotal	2,018,106	11,874,102	0.170			2,040,877	2,097,617	99%	96%
75 & Over	37,888	198,284	0.191	1.000	1.000	198,284	198,284	19%	19%
Total	2,055,993	12,072,386	0.170			2,239,160	2,295,900	92%	90%

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Employees' Retirement System of the State of Hawaii

GENERAL EMPLOYEES - CONTRIBUTORY
MALE EARLY RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 45	-	-	N\A	0.000	0.000	-	-	N\A	N\A
45	-	2,833	0.000	0.020	0.000	57	-	0%	
46	-	6,938	0.000	0.020	0.000	139	-	0%	
47	-	30,618	0.000	0.020	0.000	612	-	0%	
48	-	81,843	0.000	0.020	0.000	1,637	-	0%	
49	-	149,340	0.000	0.020	0.000	2,987	-	0%	
50	-	229,041	0.000	0.020	0.000	4,581	-	0%	
51	9,542	298,489	0.032	0.020	0.020	5,970	5,970	160%	160%
52	18,055	357,215	0.051	0.020	0.020	7,144	7,144	253%	253%
53	17,546	505,760	0.035	0.020	0.020	10,115	10,115	173%	173%
54	37,528	600,130	0.063	0.030	0.030	18,004	18,004	208%	208%
Total	82,671	2,262,207	0.037			51,245	41,233	161%	200%

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GENERAL EMPLOYEES - CONTRIBUTORY
FEMALE EARLY RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 45	-	-	N\A	0.000	0.000	-	-	N\A	N\A
45	-	-	N\A	0.000	0.000	-	-	N\A	
46	-	4,731	0.000	0.010	0.000	47	-	0%	
47	-	5,310	0.000	0.010	0.000	53	-	0%	
48	-	10,945	0.000	0.010	0.000	109	-	0%	
49	-	44,579	0.000	0.010	0.000	446	-	0%	
50	-	96,164	0.000	0.010	0.000	962	-	0%	
51	-	196,742	0.000	0.010	0.010	1,967	1,967	0%	0%
52	3,139	321,575	0.010	0.010	0.010	3,216	3,216	98%	98%
53	4,782	481,836	0.010	0.020	0.010	9,637	4,818	50%	99%
54	5,354	694,967	0.008	0.030	0.020	20,849	13,899	26%	39%
Total	13,276	1,856,850	0.007			37,286	23,901	36%	56%

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GENERAL EMPLOYEES - NONCONTRIBUTORY
MALE NORMAL RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

				Assumed Rate		Expected Retirement		Actual/Expected	
Age	Actual Liabilities	Total Liabilities	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	101,500	466,045	0.218	0.130	0.200	60,586	93,209	168%	109%
56	105,855	577,445	0.183	0.130	0.180	75,068	103,940	141%	102%
57	86,529	680,410	0.127	0.130	0.130	88,453	88,453	98%	98%
58	76,570	768,603	0.100	0.130	0.100	99,918	76,860	77%	100%
59	92,581	856,483	0.108	0.130	0.100	111,343	85,648	83%	108%
60	88,017	916,849	0.096	0.140	0.100	128,359	91,685	69%	96%
61	93,663	892,869	0.105	0.140	0.110	125,002	98,216	75%	95%
62	377,545	1,939,030	0.195	0.250	0.200	484,758	387,806	78%	97%
63	279,513	1,511,944	0.185	0.250	0.200	377,986	302,389	74%	92%
64	139,912	1,262,881	0.111	0.200	0.120	252,576	151,546	55%	92%
65	132,094	1,091,584	0.121	0.250	0.140	272,896	152,822	48%	86%
66	198,725	946,744	0.210	0.250	0.200	236,686	189,349	84%	105%
67	185,054	781,020	0.237	0.250	0.200	195,255	156,204	95%	118%
68	92,574	598,500	0.155	0.250	0.200	149,625	119,700	62%	77%
69	75,324	451,262	0.167	0.250	0.200	112,815	90,252	67%	83%
Subtotal	2,125,454	13,741,670	0.155			2,771,326	2,188,079	77%	97%
70-74	236,821	1,249,385	0.190	0.200	0.200	249,877	249,877	95%	95%
Subtotal	2,362,275	14,991,055	0.158			3,021,203	2,437,956	78%	97%
75 & Over	84,947	392,615	0.216	1.000	1.000	392,615	392,615	22%	22%
Total	2,447,222	15,383,669	0.159			3,413,818	2,830,571	72%	86%

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GENERAL EMPLOYEES - NONCONTRIBUTORY
FEMALE NORMAL RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	42,819	428,283	0.100	0.120	0.110	51,394	47,111	83%	91%
56	61,032	462,061	0.132	0.120	0.110	55,447	50,827	110%	120%
57	60,255	587,431	0.103	0.120	0.110	70,492	64,617	85%	93%
58	89,807	662,919	0.135	0.120	0.110	79,550	72,921	113%	123%
59	48,474	679,791	0.071	0.120	0.110	81,575	74,777	59%	65%
60	94,501	789,000	0.120	0.150	0.140	118,350	110,460	80%	86%
61	121,034	810,045	0.149	0.180	0.180	145,808	145,808	83%	83%
62	436,466	2,217,514	0.197	0.250	0.200	554,378	443,503	79%	98%
63	376,410	1,773,762	0.212	0.250	0.200	443,441	354,752	85%	106%
64	230,360	1,370,765	0.168	0.200	0.200	274,153	274,153	84%	84%
65	193,682	1,134,042	0.171	0.220	0.200	249,489	226,808	78%	85%
66	174,487	923,209	0.189	0.220	0.200	203,106	184,642	86%	95%
67	139,896	751,969	0.186	0.220	0.200	165,433	150,394	85%	93%
68	134,948	577,869	0.234	0.220	0.200	127,131	115,574	106%	117%
69	80,920	433,342	0.187	0.220	0.200	95,335	86,668	85%	93%
Subtotal	2,285,091	13,602,003	0.168			2,715,083	2,403,016	84%	95%
70-74	136,829	991,121	0.138	0.250	0.200	198,224	198,224	69%	69%
Subtotal	2,421,919	14,593,123	0.166			2,913,307	2,601,240	83%	93%
75 & Over	37,690	291,924	0.129	1.000	1.000	291,924	291,924	13%	13%
Total	2,459,610	14,885,048	0.165			3,205,232	2,893,165	77%	85%

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GENERAL EMPLOYEES - NONCONTRIBUTORY
MALE EARLY RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate Current	Assumed Rate Proposed	Expected Retirement Current (3) * (5)	Expected Retirement Proposed (3) * (6)	Actual/Expected Current (2) / (7)	Actual/Expected Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 55	-	-	N\A	0.000	0.000	-	-	N\A	N\A
55	1,188	801,140	0.001	0.020	0.010	16,023	8,011	7%	15%
56	6,601	862,028	0.008	0.020	0.010	17,241	8,620	38%	77%
57	5,534	878,736	0.006	0.020	0.010	17,575	8,787	31%	63%
58	11,850	880,362	0.013	0.020	0.010	17,607	8,804	67%	135%
59	10,689	813,493	0.013	0.030	0.020	24,405	16,270	44%	66%
60	40,177	846,017	0.047	0.040	0.030	33,841	25,381	119%	158%
61	26,649	819,267	0.033	0.050	0.040	40,963	32,771	65%	81%
Total	102,689	5,901,043	0.017			167,654	108,644	61%	95%

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Employees' Retirement System of the State of Hawaii

GENERAL EMPLOYEES - NONCONTRIBUTORY
FEMALE EARLY RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 55	-	-	N\A	N\A	0.000	-	-	N\A	N\A
55	5,758	786,582	0.007	0.020	0.010	15,732	7,866	37%	73%
56	8,113	877,632	0.009	0.020	0.010	17,553	8,776	46%	92%
57	9,944	875,742	0.011	0.020	0.010	17,515	8,757	57%	114%
58	27,002	963,354	0.028	0.020	0.010	19,267	9,634	140%	280%
59	18,696	1,023,551	0.018	0.030	0.020	30,707	20,471	61%	91%
60	26,633	1,015,950	0.026	0.040	0.030	40,638	30,479	66%	87%
61	32,941	1,001,012	0.033	0.050	0.040	50,051	40,040	66%	82%
Total	129,087	6,543,824	0.020			191,461	126,023	67%	102%

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Section VII
Employees' Retirement System of the State of Hawaii
Summary of Data and Experience

GENERAL EMPLOYEES - HYBRID
MALE NORMAL RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	138,748	850,145	0.163	0.160	0.160	136,023	136,023	102%	102%
56	105,069	1,001,588	0.105	0.140	0.100	140,222	100,159	75%	105%
57	106,625	1,072,964	0.099	0.140	0.100	150,215	107,296	71%	99%
58	158,851	1,210,511	0.131	0.140	0.140	169,471	169,471	94%	94%
59	242,889	1,406,098	0.173	0.140	0.140	196,854	196,854	123%	123%
60	194,415	1,393,300	0.140	0.140	0.140	195,062	195,062	100%	100%
61	217,466	1,419,144	0.153	0.150	0.140	212,872	198,680	102%	109%
62	539,318	3,261,199	0.165	0.250	0.210	815,300	684,852	66%	79%
63	553,101	2,520,803	0.219	0.200	0.180	504,161	453,744	110%	122%
64	278,249	1,955,942	0.142	0.200	0.180	391,188	352,069	71%	79%
65	229,053	1,530,956	0.150	0.250	0.210	382,739	321,501	60%	71%
66	240,331	1,198,825	0.200	0.250	0.180	299,706	215,789	80%	111%
67	150,817	918,777	0.164	0.200	0.180	183,755	165,380	82%	91%
68	128,123	757,261	0.169	0.200	0.180	151,452	136,307	85%	94%
69	83,712	537,998	0.156	0.200	0.180	107,600	96,840	78%	86%
Subtotal	3,366,767	21,035,509	0.160			4,036,620	3,530,027	83%	95%
70-74	178,217	1,089,573	0.164	0.000	0.200	217,915	217,915	82%	82%
Subtotal	3,544,984	22,125,082	0.160			4,254,535	3,747,942	83%	95%
75 & Over	47,869	251,594	0.190	0.000	1.000	251,594	251,594	19%	19%
Total	3,592,853	22,376,676	0.161			4,506,129	3,999,536	80%	90%

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Section VII
Summary of Data and Experience
Employees' Retirement System of the State of Hawaii

GENERAL EMPLOYEES - HYBRID
FEMALE NORMAL RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	193,231	1,351,059	0.143	0.130	0.180	175,638	243,191	110%	79%
56	280,905	1,545,858	0.182	0.130	0.130	200,962	200,962	140%	140%
57	232,250	1,866,049	0.124	0.130	0.130	242,586	242,586	96%	96%
58	268,125	1,934,039	0.139	0.130	0.130	251,425	251,425	107%	107%
59	205,381	1,919,968	0.107	0.130	0.130	249,596	249,596	82%	82%
60	270,345	1,941,321	0.139	0.150	0.130	291,198	252,372	93%	107%
61	263,883	1,788,738	0.148	0.150	0.150	268,311	268,311	98%	98%
62	854,839	4,292,047	0.199	0.250	0.200	1,073,012	858,409	80%	100%
63	716,346	3,385,576	0.212	0.250	0.200	846,394	677,115	85%	106%
64	345,785	2,375,735	0.146	0.200	0.200	475,147	475,147	73%	73%
65	286,379	1,759,985	0.163	0.250	0.200	439,996	351,997	65%	81%
66	273,799	1,322,964	0.207	0.250	0.180	330,741	238,134	83%	115%
67	171,430	938,416	0.183	0.200	0.180	187,683	168,915	91%	101%
68	127,401	638,908	0.199	0.200	0.180	127,782	115,004	100%	111%
69	48,424	466,430	0.104	0.200	0.180	93,286	83,957	52%	58%
Subtotal	4,538,522	27,527,093	0.165			5,253,756	4,677,120	86%	97%
70-74	186,128	1,007,841	0.185	0.000	0.200	201,568	201,568	92%	92%
Subtotal	4,724,651	28,534,934	0.166			5,455,324	4,878,688	87%	97%
75 & Over	29,045	178,028	0.163	0.000	1.000	178,028	178,028	16%	16%
Total	4,753,696	28,712,962	0.166			5,633,353	5,056,716	84%	94%

GRS

GENERAL EMPLOYEES - HYBRID
MALE EARLY RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	6,212	1,280,450	0.005	0.048	0.010	61,462	12,805	10%	49%
56	12,542	1,303,298	0.010	0.056	0.010	72,985	13,033	17%	96%
57	10,798	1,362,827	0.008	0.070	0.010	95,398	13,628	11%	79%
58	20,725	1,494,668	0.014	0.084	0.010	125,552	14,947	17%	139%
59	16,726	1,359,395	0.012	0.098	0.020	133,221	27,188	13%	62%
60	34,415	1,255,926	0.027	0.112	0.020	140,664	25,119	24%	137%
61	31,232	1,185,098	0.026	0.135	0.030	159,988	35,553	20%	88%
62	-	-	N\A	0.000	0.000	-	-	0%	0%
63	-	-	N\A	0.000	0.000	-	-	0%	0%
64	-	-	N\A	0.000	0.000	-	-	0%	0%
Total	132,650	9,241,664	0.014			789,269	142,272	17%	93%

GRS

Section VII
Employees' Retirement System of the State of Hawaii
Summary of Data and Experience

GENERAL EMPLOYEES - HYBRID
FEMALE EARLY RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate Current	Assumed Rate Proposed	Expected Retirement Current (3) * (5)	Expected Retirement Proposed (3) * (6)	Actual/Expected Current (2) / (7)	Actual/Expected Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	11,680	1,696,786	0.007	0.039	0.010	66,136	16,968	18%	69%
56	29,693	1,804,479	0.016	0.052	0.010	93,833	18,045	32%	165%
57	20,074	1,694,754	0.012	0.065	0.010	110,159	16,948	18%	118%
58	27,591	1,700,833	0.016	0.078	0.020	132,665	34,017	21%	81%
59	33,871	1,769,569	0.019	0.091	0.020	161,031	35,391	21%	96%
60	67,361	1,710,541	0.039	0.120	0.040	205,265	68,422	33%	98%
61	59,353	1,663,134	0.036	0.135	0.040	224,523	66,525	26%	89%
62	-	-	N\A	0.000	0.000	-	-	0%	0%
63	-	-	N\A	0.000	0.000	-	-	0%	0%
64	-	-	N\A	0.000	0.000	-	-	0%	0%
Total	249,622	12,040,096	0.021			993,611	256,315	25%	97%

GRS

Section VII
Employees' Retirement System of the State of Hawaii
Summary of Data and Experience

TEACHERS - CONTRIBUTORY
MALE NORMAL RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	55,776	245,049	0.228	0.200	0.200	49,010	49,010	114%	114%
56	23,737	188,161	0.126	0.150	0.150	28,224	28,224	84%	84%
57	39,209	198,646	0.197	0.150	0.150	29,797	29,797	132%	132%
58	18,793	189,291	0.099	0.150	0.150	28,394	28,394	66%	66%
59	43,270	177,630	0.244	0.150	0.150	26,644	26,644	162%	162%
60	11,583	179,001	0.065	0.140	0.140	25,060	25,060	46%	46%
61	13,455	214,428	0.063	0.140	0.140	30,020	30,020	45%	45%
62	44,387	214,441	0.207	0.140	0.140	30,022	30,022	148%	148%
63	22,274	220,500	0.101	0.140	0.140	30,870	30,870	72%	72%
64	32,273	217,764	0.148	0.140	0.140	30,487	30,487	106%	106%
65	45,904	219,738	0.209	0.200	0.200	43,948	43,948	104%	104%
66	36,020	189,310	0.190	0.150	0.150	28,397	28,397	127%	127%
67	14,492	147,892	0.098	0.150	0.150	22,184	22,184	65%	65%
68	3,588	136,766	0.026	0.150	0.150	20,515	20,515	17%	17%
69	17,957	160,562	0.112	0.150	0.150	24,084	24,084	75%	75%
Subtotal	422,717	2,899,179	0.146			447,655	447,655	94%	94%
70-74	48,557	384,507	0.126	0.150	0.150	57,676	57,676	84%	84%
Subtotal	471,274	3,283,686	0.144			505,331	505,331	93%	93%
75 & Over	67,768	120,571	0.562	1.000	1.000	120,571	120,571	56%	56%
Total	539,042	3,404,257	0.158			625,902	625,902	86%	86%

GRS

TEACHERS - CONTRIBUTORY
FEMALE NORMAL RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

				Assumed Rate		Expected Retirement		Actual/Expected	
Age	Actual Liabilities	Total Liabilities	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	163,344	643,559	0.254	0.180	0.180	115,841	115,841	141%	141%
56	95,158	588,941	0.162	0.160	0.160	94,231	94,231	101%	101%
57	102,416	722,505	0.142	0.160	0.160	115,601	115,601	89%	89%
58	130,032	890,719	0.146	0.160	0.160	142,515	142,515	91%	91%
59	127,756	903,110	0.141	0.160	0.160	144,498	144,498	88%	88%
60	125,026	821,049	0.152	0.180	0.180	147,789	147,789	85%	85%
61	140,761	822,411	0.171	0.180	0.180	148,034	148,034	95%	95%
62	181,340	760,068	0.239	0.250	0.250	190,017	190,017	95%	95%
63	151,449	629,214	0.241	0.200	0.200	125,843	125,843	120%	120%
64	136,812	495,097	0.276	0.150	0.150	74,265	74,265	184%	184%
65	74,122	412,549	0.180	0.250	0.250	103,137	103,137	72%	72%
66	156,848	376,540	0.417	0.250	0.250	94,135	94,135	167%	167%
67	29,035	222,469	0.131	0.200	0.200	44,494	44,494	65%	65%
68	51,562	208,905	0.247	0.200	0.200	41,781	41,781	123%	123%
69	60,822	159,676	0.381	0.200	0.200	31,935	31,935	190%	190%
Subtotal	1,726,483	8,656,814	0.199			1,614,114	1,614,114	107%	107%
70-74	31,926	294,533	0.108	0.200	0.200	58,907	58,907	54%	54%
Subtotal	1,758,409	8,951,347	0.196			1,673,021	1,673,021	105%	105%
75 & Over	42,182	157,876	0.267	1.000	1.000	157,876	157,876	27%	27%
Total	1,800,591	9,109,223	0.198			1,830,897	1,830,897	98%	98%

GRS

Employees' Retirement System of the State of Hawaii

TEACHERS - CONTRIBUTORY
MALE EARLY RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 45	-	-	N\A	0.000	0.000	-	-	N\A	N\A
45	-	-	N\A	N\A	0.000	-	-	N\A	N\A
46	-	-	N\A	N\A	0.000	-	-	N\A	N\A
47	-	-	N\A	N\A	0.000	-	-	N\A	N\A
48	-	-	N\A	N\A	0.000	-	-	N\A	N\A
49	-	-	N\A	N\A	0.000	-	-	N\A	N\A
50	-	23,944	0.000	0.010	0.010	239	239	0%	0%
51	-	28,803	0.000	0.010	0.010	288	288	0%	0%
52	-	32,366	0.000	0.010	0.010	324	324	0%	0%
53	-	46,159	0.000	0.020	0.020	923	923	0%	0%
54	-	63,350	0.000	0.030	0.030	1,901	1,901	0%	0%
Total	-	194,621	0.000			3,675	3,675	0%	0%

GRS

TEACHERS - CONTRIBUTORY
FEMALE EARLY RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 45	-	-	N\A	0.000	0.000	-	-	N\A	N\A
45	-	-	N\A	N\A	0.000	-	-	N\A	N\A
46	-	-	N\A	N\A	0.000	-	-	N\A	N\A
47	-	-	N\A	N\A	0.000	-	-	N\A	N\A
48	-	-	N\A	N\A	0.000	-	-	N\A	N\A
49	-	23,679	0.000	0.000	0.000	0	-	0%	N\A
50	-	29,311	0.000	0.000	0.000	0	-	0%	N\A
51	-	72,947	0.000	0.010	0.010	729	729	0%	0%
52	-	106,372	0.000	0.010	0.010	1,064	1,064	0%	0%
53	-	104,658	0.000	0.020	0.020	2,093	2,093	0%	0%
54	-	164,287	0.000	0.030	0.030	4,929	4,929	0%	0%
Total	-	501,254	0.000			8,815	8,815	0%	0%

GRS

TEACHERS - NONCONTRIBUTORY
MALE NORMAL RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

				Assumed Rate		Expected Retirement		Actual/Expected	
	Actual	Total	Actual			Current (3)	Proposed	Current	Proposed
Age	Liabilities	Liabilities	Rate	Current	Proposed	* (5)	(3) * (6)	(2) / (7)	(2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	9,782	109,080	0.090	0.100	0.100	10,908	10,908	90%	90%
56	13,656	121,506	0.112	0.100	0.100	12,151	12,151	112%	112%
57	17,784	149,336	0.119	0.100	0.100	14,934	14,934	119%	119%
58	7,804	164,594	0.047	0.100	0.100	16,459	16,459	47%	47%
59	21,119	190,104	0.111	0.100	0.100	19,010	19,010	111%	111%
60	37,466	205,206	0.183	0.100	0.100	20,521	20,521	183%	183%
61	45,481	224,094	0.203	0.100	0.100	22,409	22,409	203%	203%
62	117,880	666,487	0.177	0.160	0.160	106,638	106,638	111%	111%
63	59,978	549,328	0.109	0.120	0.120	65,919	65,919	91%	91%
64	63,460	612,739	0.104	0.100	0.100	61,274	61,274	104%	104%
65	66,297	579,836	0.114	0.200	0.200	115,967	115,967	57%	57%
66	68,767	513,637	0.134	0.150	0.150	77,046	77,046	89%	89%
67	53,513	445,076	0.120	0.150	0.150	66,761	66,761	80%	80%
68	62,771	434,196	0.145	0.150	0.150	65,129	65,129	96%	96%
69	43,506	306,278	0.142	0.150	0.150	45,942	45,942	95%	95%
Subtotal	689,265	5,271,497	0.131			721,068	721,068	96%	96%
70-74	179,048	851,307	0.210	0.150	0.150	127,696	127,696	140%	140%
Subtotal	868,313	6,122,804	0.142			848,765	848,765	102%	102%
75 & Over	81,799	368,718	0.222	1.000	1.000	368,718	368,718	22%	22%
Total	950,112	6,491,522	0.146			1,217,482	1,217,482	78%	78%

GRS

TEACHERS - NONCONTRIBUTORY
FEMALE NORMAL RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

				Assumed Rate		Expected Retirement		Actual/Expected	
	Actual	Total	Actual			Current (3)	Proposed (3)	Current	Proposed
Age	Liabilities	Liabilities	Rate	Current	Proposed	* (5)	* (6)	(2) / (7)	(2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	20,637	160,709	0.128	0.130	0.130	20,892	20,892	99%	99%
56	12,029	202,585	0.059	0.130	0.070	26,336	14,181	46%	85%
57	17,382	234,722	0.074	0.140	0.080	32,861	18,778	53%	93%
58	31,849	303,158	0.105	0.150	0.100	45,474	30,316	70%	105%
59	78,405	362,820	0.216	0.160	0.200	58,051	72,564	135%	108%
60	40,254	392,147	0.103	0.170	0.110	66,665	43,136	60%	93%
61	56,738	466,285	0.122	0.180	0.160	83,931	74,606	68%	76%
62	345,837	1,371,289	0.252	0.250	0.250	342,822	342,822	101%	101%
63	217,065	1,163,521	0.187	0.200	0.200	232,704	232,704	93%	93%
64	150,020	981,567	0.153	0.180	0.150	176,682	147,235	85%	102%
65	148,847	805,893	0.185	0.300	0.250	241,768	201,473	62%	74%
66	193,701	650,784	0.298	0.250	0.250	162,696	162,696	119%	119%
67	105,206	473,959	0.222	0.250	0.250	118,490	118,490	89%	89%
68	64,316	335,925	0.191	0.250	0.250	83,981	83,981	77%	77%
69	75,980	255,907	0.297	0.250	0.250	63,977	63,977	119%	119%
Subtotal	1,558,267	8,161,270	0.191			1,757,330	1,627,851	89%	96%
70-74	83,014	467,527	0.178	25.000	0.250	116,882	116,882	71%	71%
Subtotal	1,641,281	8,628,798	0.190			1,874,212	1,744,733	88%	94%
75 & Over	12,808	100,648	0.127	1.000	1.000	100,648	100,648	13%	13%
Total	1,654,089	8,729,446	0.189			1,974,860	1,845,381	84%	90%

GRS

TEACHERS - NONCONTRIBUTORY
MALE EARLY RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 55	-	-	N\A	N\A	0.000	-	-	N\A	N\A
55	1	89	0.011	0.020	0.010	2	1	56%	112%
56	-	95	0.000	0.020	0.010	2	1	0%	0%
57	1	92	0.011	0.020	0.010	2	1	54%	109%
58	4	91	0.044	0.020	0.020	2	2	220%	220%
59	5	96	0.052	0.030	0.030	3	3	174%	174%
60	2	102	0.020	0.050	0.050	5	5	39%	39%
61	6	91	0.066	0.100	0.070	9	6	66%	94%
Total	19	656	0.029			24	19	78%	100%

GRS

TEACHERS - NONCONTRIBUTORY
FEMALE EARLY RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 55	-	-	N\A	N\A	0.000	-	-	N\A	N\A
55	-	181	0.000	0.030	0.020	5	4	0%	0%
56	6	164	0.037	0.030	0.020	5	3	122%	183%
57	1	156	0.006	0.030	0.020	5	3	21%	32%
58	3	167	0.018	0.030	0.020	5	3	60%	90%
59	6	196	0.031	0.030	0.030	6	6	102%	102%
60	7	195	0.036	0.050	0.050	10	10	72%	72%
61	11	188	0.059	0.050	0.050	9	9	117%	117%
Total	34	1,247	0.027			45	38	75%	89%

GRS

Section VII
Employees' Retirement System of the State of Hawaii
Summary of Data and Experience

TEACHERS - HYBRID
MALE NORMAL RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	43,060	247,211	0.174	0.200	0.200	49,442	49,442	87%	87%
56	7,894	222,722	0.035	0.150	0.130	33,408	28,954	24%	27%
57	50,807	352,997	0.144	0.150	0.130	52,950	45,890	96%	111%
58	30,511	360,902	0.085	0.150	0.130	54,135	46,917	56%	65%
59	53,784	393,332	0.137	0.150	0.130	59,000	51,133	91%	105%
60	58,548	429,720	0.136	0.140	0.140	60,161	60,161	97%	97%
61	88,146	455,004	0.194	0.140	0.140	63,701	63,701	138%	138%
62	252,835	1,109,500	0.228	0.140	0.220	155,330	244,090	163%	104%
63	116,126	917,891	0.127	0.140	0.140	128,505	128,505	90%	90%
64	145,054	917,248	0.158	0.140	0.140	128,415	128,415	113%	113%
65	118,068	810,428	0.146	0.200	0.200	162,086	162,086	73%	73%
66	104,434	673,515	0.155	0.150	0.150	101,027	101,027	103%	103%
67	95,452	590,238	0.162	0.150	0.150	88,536	88,536	108%	108%
68	88,717	474,618	0.187	0.150	0.150	71,193	71,193	125%	125%
69	28,789	376,087	0.077	0.150	0.150	56,413	56,413	51%	51%
Subtotal	1,282,225	8,331,413	0.154			1,264,300	1,326,461	101%	97%
70-74	169,220	1,103,709	0.153	25.000	0.150	165,605	165,556	102%	102%
Subtotal	1,451,445	9,435,122	0.154			1,429,905	1,492,017	102%	97%
75 & Over	68,120	302,603	0.225	1.000	1.000	302,603	302,603	23%	23%
Total	1,519,565	9,737,725	0.156			1,732,508	1,794,621	88%	85%

GRS

TEACHERS - HYBRID
FEMALE NORMAL RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

| Age | Actual Liabilities | Total Liabilities | Actual Rate | Assumed Rate | | Expected Retirement | | Actual/Expected | |
| | | | | Current | Proposed | Current (3) * (5) | Proposed (3) * (6) | Current (2) / (7) | Proposed (2) / (8) |
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	78,013	532,687	0.146	0.180	0.160	95,884	85,230	81%	92%
56	51,043	672,858	0.076	0.160	0.100	107,657	67,286	47%	76%
57	81,937	922,815	0.089	0.160	0.100	147,650	92,282	55%	89%
58	147,960	1,073,025	0.138	0.160	0.120	171,684	128,763	86%	115%
59	115,972	1,033,749	0.112	0.160	0.120	165,400	124,050	70%	93%
60	127,120	1,072,483	0.119	0.180	0.140	193,047	150,148	66%	85%
61	178,168	1,018,750	0.175	0.180	0.180	183,375	183,375	97%	97%
62	738,949	2,562,956	0.288	0.250	0.300	640,739	768,887	115%	96%
63	377,549	1,927,297	0.196	0.200	0.200	385,459	385,459	98%	98%
64	243,873	1,514,402	0.161	0.150	0.200	227,160	302,880	107%	81%
65	276,055	1,196,362	0.231	0.250	0.250	299,090	299,090	92%	92%
66	195,525	873,563	0.224	0.250	0.250	218,391	218,391	90%	90%
67	148,683	627,881	0.237	0.200	0.250	125,576	156,970	118%	95%
68	98,435	391,966	0.251	0.200	0.250	78,393	97,992	126%	100%
69	50,654	303,250	0.167	0.200	0.250	60,650	75,813	84%	67%
Subtotal	2,909,938	15,724,045	0.185			3,100,157	3,136,615	94%	93%
70-74	149,609	547,902	0.273	25.000	0.250	109,580	136,975	137%	109%
Subtotal	3,059,547	16,271,947	0.188			3,209,737	3,273,590	95%	93%
75 & Over	10,031	103,969	0.096	1.000	1.000	103,969	103,969	10%	10%
Total	3,069,579	16,375,915	0.187			3,313,705	3,377,559	93%	91%

GRS

TEACHERS - HYBRID
MALE EARLY RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	7,299	399,324	0.018	0.060	0.020	23,959	7,986	30%	91%
56	2,122	414,264	0.005	0.060	0.020	24,856	8,285	9%	26%
57	8,151	396,512	0.021	0.075	0.020	29,738	7,930	27%	103%
58	2,737	442,856	0.006	0.090	0.020	39,857	8,857	7%	31%
59	15,949	511,165	0.031	0.105	0.030	53,672	15,335	30%	104%
60	12,976	505,107	0.026	0.112	0.030	56,572	15,153	23%	86%
61	11,399	464,414	0.025	0.126	0.030	58,516	13,932	19%	82%
62	-	-	N\A	0.000	0.000	-	-	0%	0%
63	-	-	N\A	0.000	0.000	-	-	0%	0%
64	-	-	N\A	0.000	0.000	-	-	0%	0%
Total	60,633	3,133,642	0.019			287,171	77,480	21%	78%

GRS

Section VII
Employees' Retirement System of the State of Hawaii
Summary of Data and Experience

TEACHERS - HYBRID
FEMALE EARLY RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	15,387	832,275	0.018	0.054	0.020	44,943	16,645	34%	92%
56	8,207	843,343	0.010	0.064	0.020	53,974	16,867	15%	49%
57	6,328	923,927	0.007	0.080	0.020	73,914	18,479	9%	34%
58	19,825	990,231	0.020	0.096	0.020	95,062	19,805	21%	100%
59	34,913	1,134,620	0.031	0.112	0.030	127,077	34,039	27%	103%
60	63,267	1,222,750	0.052	0.144	0.050	176,076	61,138	36%	103%
61	105,878	1,224,329	0.086	0.162	0.100	198,341	122,433	53%	86%
62	-	-	N\A	0.000	0.000	-	-	0%	0%
63	-	-	N\A	0.000	0.000	-	-	0%	0%
64	-	-	N\A	0.000	0.000	-	-	0%	0%
Total	253,804	7,171,476	0.035			769,388	289,405	33%	88%

GRS

POLICE & FIRE EMPLOYEES
RETIREMENT EXPERIENCE - AGE BASED LIABILITY WEIGHTED

Age	Actual Liabilities	Total Liabilities	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
45	9,762	410,380	0.024	0.125	0.125	51,297	51,297	19%	105%
46	138,214	1,057,814	0.131	0.125	0.125	132,227	132,227	105%	100%
47	195,958	1,569,006	0.125	0.125	0.125	196,126	196,126	100%	95%
48	257,074	2,163,482	0.119	0.125	0.125	270,435	270,435	95%	103%
49	325,238	2,520,405	0.129	0.125	0.125	315,051	315,051	103%	84%
50	360,941	2,880,959	0.125	0.150	0.150	432,144	432,144	84%	91%
51	413,898	3,048,185	0.136	0.150	0.150	457,228	457,228	91%	106%
52	535,938	3,381,809	0.158	0.150	0.150	507,271	507,271	106%	117%
53	582,662	3,325,335	0.175	0.150	0.150	498,800	498,800	117%	152%
54	706,092	3,094,356	0.228	0.150	0.150	464,153	464,153	152%	95%
55	706,148	3,713,903	0.190	0.200	0.200	742,781	742,781	95%	100%
56	634,817	3,182,565	0.199	0.200	0.200	636,513	636,513	100%	90%
57	460,246	2,556,309	0.180	0.200	0.200	511,262	511,262	90%	102%
58	467,842	2,083,854	0.225	0.200	0.220	416,771	458,448	112%	107%
59	446,073	1,662,397	0.268	0.200	0.250	332,479	415,599	134%	101%
60	357,502	1,177,381	0.304	0.300	0.300	353,214	353,214	101%	103%
61	226,539	732,343	0.309	0.300	0.300	219,703	219,703	103%	63%
Subtotal	6,824,942	38,560,483	0.177			6,537,455	6,662,252	104%	102%
62-64	328,688	1,299,348	0.253	0.300	0.300	389,804	389,804	84%	84%
Subtotal	7,153,630	39,859,831	0.179			6,927,260	7,052,057	103%	101%
65 & Over	92,427	444,078	0.208	1.000	1.000	444,078	444,078	21%	21%
Total	7,246,057	40,303,909	0.180			7,371,338	7,496,135	98%	97%

GRS

SALARY SCALE ASSUMPTION
GENERAL EMPLOYEES

Year	Average Long Service Increase	CPI	Productivity
2006	5.71%	4.32%	1.39%
2007	5.06%	2.69%	2.37%
2008	5.39%	5.02%	0.37%
2009	6.14%	-1.43%	7.57%
2010	-1.26%	1.05%	-2.31%
2011	0.49%	3.56%	-3.06%
2012	-1.23%	1.66%	-2.89%
2013	3.24%	1.75%	1.48%
2014	5.15%	2.07%	3.08%
Average	3.43%	2.31%	1.12%
Proposed	3.50%	2.50%	1.00%

SALARY SCALE ASSUMPTION
GENERAL EMPLOYEES

Years of Service	Average Pay Increase	Less Actual Inflation and Productivity Components	Actual Step-Rate/Promotional Component	Proposed Step-Rate/Promotional Component
1	6.43%	-3.43%	3.01%	3.00%
2	6.47%	-3.43%	3.05%	3.00%
3	5.74%	-3.43%	2.32%	2.00%
4	5.12%	-3.43%	1.69%	1.50%
5	4.85%	-3.43%	1.42%	1.50%
6	4.55%	-3.43%	1.12%	1.25%
7	4.63%	-3.43%	1.20%	1.25%
8	4.48%	-3.43%	1.06%	1.00%
9	4.21%	-3.43%	0.78%	1.00%
10	4.35%	-3.43%	0.93%	1.00%
11	4.35%	-3.43%	0.93%	0.75%
12	4.18%	-3.43%	0.75%	0.75%
13	4.07%	-3.43%	0.64%	0.50%
14	4.08%	-3.43%	0.66%	0.50%
15	3.95%	-3.43%	0.52%	0.50%
16	3.92%	-3.43%	0.49%	0.50%
17	4.09%	-3.43%	0.66%	0.50%
18	3.99%	-3.43%	0.56%	0.50%
19	4.09%	-3.43%	0.66%	0.50%
20	3.71%	-3.43%	0.28%	0.25%
21	3.76%	-3.43%	0.33%	0.25%
22	3.73%	-3.43%	0.30%	0.25%
23	3.75%	-3.43%	0.32%	0.25%
24	3.70%	-3.43%	0.27%	0.25%
25	3.43%	-3.43%	0.00%	0.00%

GRS

SALARY SCALE ASSUMPTION
TEACHERS

Year	Average Long Service Increase	CPI	Productivity
2006	6.08%	4.32%	1.76%
2007	5.19%	2.69%	2.50%
2008	8.17%	5.02%	3.15%
2009	6.28%	-1.43%	7.71%
2010	-1.32%	1.05%	-2.38%
2011	0.63%	3.56%	-2.93%
2012	-3.26%	1.66%	-4.92%
2013	4.82%	1.75%	3.07%
2014	4.25%	2.07%	2.18%
Average	3.42%	2.31%	1.11%
Proposed	3.75%	2.50%	1.25%

GRS

SALARY SCALE ASSUMPTION
TEACHERS

Years of Service	Average Pay Increase	Less Actual Inflation and Productivity Components	Actual Step-Rate/Promotional Component	Proposed Step-Rate/Promotional Component
1	5.42%	-3.42%	2.00%	2.00%
2	5.12%	-3.42%	1.70%	1.75%
3	5.10%	-3.42%	1.68%	1.75%
4	4.97%	-3.42%	1.55%	1.50%
5	4.35%	-3.42%	0.93%	1.00%
6	4.58%	-3.42%	1.15%	1.00%
7	3.75%	-3.42%	0.33%	0.75%
8	4.35%	-3.42%	0.92%	0.75%
9	4.03%	-3.42%	0.60%	0.50%
10	4.08%	-3.42%	0.65%	0.50%
11	4.02%	-3.42%	0.59%	0.50%
12	3.98%	-3.42%	0.56%	0.50%
13	3.83%	-3.42%	0.40%	0.25%
14	3.69%	-3.42%	0.27%	0.25%
15	3.86%	-3.42%	0.43%	0.25%
16	3.73%	-3.42%	0.30%	0.25%
17	3.89%	-3.42%	0.46%	0.25%
18	3.63%	-3.42%	0.21%	0.25%
19	3.44%	-3.42%	0.01%	0.25%
20	3.75%	-3.42%	0.32%	0.25%
21	3.41%	-3.42%	-0.01%	0.25%
22	3.45%	-3.42%	0.02%	0.25%
23	3.55%	-3.42%	0.12%	0.25%
24	3.67%	-3.42%	0.24%	0.25%
25	3.42%	-3.42%	0.00%	0.00%

GRS

SALARY SCALE ASSUMPTION
POLICE & FIRE EMPLOYEES

Year	Average Long Service Increase	CPI	Productivity
2006	7.26%	3.81%	3.46%
2007	6.41%	2.59%	3.82%
2008	8.21%	3.71%	4.50%
2009	7.65%	1.40%	6.26%
2010	5.52%	0.97%	4.55%
2011	7.90%	2.01%	5.90%
2012	1.50%	2.93%	-1.43%
2013	0.43%	1.66%	-1.24%
2014	4.61%	1.56%	3.05%
Average	6.39%	2.13%	4.26%
Proposed	5.00%	2.50%	2.50%

Years of Service	Average Pay Increase	Less Actual Inflation and Productivity Components	Actual Step-Rate/Promotional Component	Proposed Step-Rate/Promotional Component
1	7.79%	-6.39%	1.40%	2.00%
2	8.95%	-6.39%	2.56%	2.00%
3	6.39%	-6.39%	0.00%	0.00%

GRS

Employees' Retirement System of the State of Hawaii

ALL EMPLOYEES
POST-RETIREMENT MORTALITY - HEALTHY MALE

Age	Actual Benefits	Total Benefits	Actual Rate	Assumed Rate		Expected Benefits		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
40-44	0	161	0.0000	0.0010	0.0011	0	0	0%	0%
45-49	0	7,276	0.0000	0.0018	0.0018	13	13	0%	0%
50-54	133	46,486	0.0029	0.0032	0.0032	148	148	90%	90%
55-59	591	176,411	0.0034	0.0068	0.0066	1,206	1,160	49%	51%
60-64	2,984	387,844	0.0077	0.0103	0.0082	4,012	3,172	74%	94%
65-69	6,398	531,040	0.0120	0.0135	0.0117	7,182	6,208	89%	103%
70-74	6,998	409,181	0.0171	0.0204	0.0171	8,328	6,993	84%	100%
75-79	8,801	324,707	0.0271	0.0309	0.0274	10,049	8,900	88%	99%
80-84	11,070	240,741	0.0460	0.0504	0.0472	12,124	11,369	91%	97%
85-89	11,677	130,328	0.0896	0.0886	0.0846	11,544	11,028	101%	106%
90-94	7,172	47,089	0.1523	0.1421	0.1467	6,690	6,910	107%	104%
95-99	2,328	8,780	0.2651	0.1972	0.2483	1,731	2,181	134%	107%
100-104	365	939	0.3883	0.2899	0.3843	272	361	134%	101%
Other	0	14	0.0000	0.0000	0.0000	0	0	0%	0%
Totals	58,522	2,311,003				63,302	58,446	92%	100%

GRS

Employees' Retirement System of the State of Hawaii

ALL EMPLOYEES
POST-RETIREMENT MORTALITY - HEALTHY FEMALE

Age	Actual Benefits	Total Benefits	Actual Rate	Assumed Rate		Expected Benefits		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
45-49	0	810	0.0000	0.0009	0.0000	1	0	0%	0%
50-54	0	6,111	0.0000	0.0015	0.0024	10	15	0%	0%
55-59	352	79,482	0.0044	0.0030	0.0026	440	211	80%	167%
60-64	997	344,754	0.0029	0.0054	0.0029	2,017	1,002	49%	100%
65-69	2,917	606,720	0.0048	0.0098	0.0046	3,517	2,808	83%	104%
70-74	4,357	455,063	0.0096	0.0166	0.0090	3,863	4,084	113%	107%
75-79	4,821	327,218	0.0147	0.0275	0.0156	4,895	5,116	98%	94%
80-84	6,347	241,281	0.0263	0.0466	0.0275	7,324	6,628	87%	96%
85-89	7,731	139,784	0.0553	0.0837	0.0509	8,624	7,117	90%	109%
90-94	5,074	51,087	0.0993	0.1384	0.0976	6,047	4,987	84%	102%
95-99	2,599	13,480	0.1928	0.2020	0.1773	2,284	2,390	114%	109%
100-104	708	2,320	0.3053	0.2418	0.3280	516	761	137%	93%
105-109	57	109	0.5269	0.3066	0.4818	30	52	188%	109%
Totals	35,961	2,268,219				39,568	35,171	91%	102%

GRS

ALL EMPLOYEES
POST-RETIREMENT MORTALITY - DISABLED MALE

Age	Actual Benefits	Total Benefits	Actual Rate	Assumed Rate		Expected Benefits		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
50-54	125	4,465	0.0279	0.0253	0.0350	37	156	334%	80%
55-59	293	9,181	0.0319	0.0304	0.0350	136	321	216%	91%
60-64	601	13,986	0.0430	0.0360	0.0350	321	490	187%	123%
65-69	436	10,921	0.0399	0.0436	0.0350	388	382	112%	114%
70-74	265	6,664	0.0398	0.0555	0.0350	389	233	68%	114%
75-79	181	3,261	0.0554	0.0737	0.0466	298	152	61%	119%
80-84	294	2,270	0.1297	0.0975	0.0856	341	194	86%	151%
85-89	191	1,969	0.0972	0.1242	0.1579	467	311	41%	62%
90-94	202	813	0.2486	0.1733	0.2523	232	205	87%	99%
95-99	21	252	0.0837	0.2399	0.3574	95	90	22%	23%
Other	28	2,066	0.0136	0.0000	0.0000	0	0	0%	0%
Totals	2,662	55,873				2,715	2,544	98%	105%

GRS

Employees' Retirement System of the State of Hawaii

ALL EMPLOYEES
POST-RETIREMENT MORTALITY - DISABLED FEMALE

Age	Actual Benefits	Total Benefits	Actual Rate	Assumed Rate		Expected Benefits		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
50-54	103	1,464	0.0705	0.0044	0.0250	6	37	1600%	282%
55-59	151	4,486	0.0336	0.0090	0.0250	40	112	373%	134%
60-64	171	8,993	0.0190	0.0144	0.0250	129	225	132%	76%
65-69	231	7,921	0.0291	0.0238	0.0250	188	198	123%	116%
70-74	114	4,246	0.0270	0.0402	0.0250	170	106	67%	108%
75-79	136	2,000	0.0680	0.0724	0.0279	145	56	94%	244%
80-84	48	2,179	0.0221	0.1244	0.0545	271	119	18%	41%
85-89	69	1,395	0.0493	0.1848	0.0949	258	132	27%	52%
90-94	86	601	0.1436	0.2852	0.1922	171	115	50%	75%
95-99	50	110	0.4510	0.3719	0.2747	41	30	121%	164%
Other	19	763	0.0252	0.0000	0.0000	0	0	0%	0%
Totals	1,183	34,163				1,423	1,132	83%	105%

GRS

Employees' Retirement System of the State of Hawaii

GENERAL EMPLOYEES
POST-RETIREMENT MORTALITY - HEALTHY MALE

Age	Actual Benefits	Total Benefits	Actual Rate	Assumed Rate		Expected Benefits		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	224	53,556	0.0042	0.0114	0.0068	611	365	37%	62%
60-64	1,301	162,007	0.0080	0.0142	0.0082	2,296	1,336	57%	97%
65-69	2,936	263,576	0.0111	0.0161	0.0117	4,236	3,091	69%	95%
70-74	3,858	211,870	0.0182	0.0225	0.0171	4,768	3,624	81%	106%
75-79	5,187	179,607	0.0289	0.0346	0.0275	6,220	4,943	83%	105%
80-84	6,719	143,976	0.0467	0.0532	0.0474	7,659	6,823	88%	98%
85-89	7,528	83,962	0.0897	0.0920	0.0850	7,727	7,138	97%	105%
90-94	4,785	33,217	0.1441	0.1456	0.1469	4,835	4,881	99%	98%
95-99	1,533	6,540	0.2344	0.1993	0.2504	1,303	1,638	118%	94%
100-104	288	701	0.4112	0.3079	0.3786	216	265	134%	109%
Other	0	14	0.0000	0.0000	0.0000	0	0	0%	0%
Totals	34,359	1,139,026				39,870	34,102	86%	101%

GRS

GENERAL EMPLOYEES
POST-RETIREMENT MORTALITY - HEALTHY FEMALE

Age	Actual Benefits	Total Benefits	Actual Rate	Assumed Rate		Expected Benefits		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	256	52,061	0.0049	0.0068	0.0028	355	148	72%	174%
60-64	737	185,266	0.0040	0.0084	0.0031	1,563	575	47%	128%
65-69	1,714	270,538	0.0063	0.0082	0.0049	2,208	1,337	78%	128%
70-74	2,069	199,891	0.0104	0.0099	0.0096	1,973	1,919	105%	108%
75-79	2,665	153,653	0.0173	0.0175	0.0168	2,685	2,587	99%	103%
80-84	3,285	129,527	0.0254	0.0306	0.0297	3,964	3,846	83%	85%
85-89	4,903	90,390	0.0542	0.0611	0.0546	5,526	4,938	89%	99%
90-94	3,472	33,710	0.1030	0.1237	0.1043	4,171	3,515	83%	99%
95-99	1,404	7,638	0.1838	0.1780	0.1878	1,360	1,434	103%	98%
100-104	246	695	0.3549	0.2195	0.3365	152	234	162%	105%
105-109	0	9	0.0000	0.2658	0.5091	2	4	0%	0%
Totals	20,752	1,123,379				23,961	20,535	87%	101%

GRS

TEACHERS
POST-RETIREMENT MORTALITY - HEALTHY MALE

Age	Actual Benefits	Total Benefits	Actual Rate	Assumed Rate		Expected Benefits		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	13	7,608	0.0017	0.0032	0.0062	24	47	53%	27%
60-64	364	51,747	0.0070	0.0034	0.0076	175	391	208%	93%
65-69	1,229	113,075	0.0109	0.0054	0.0106	616	1,198	200%	103%
70-74	1,409	102,636	0.0137	0.0126	0.0154	1,296	1,585	109%	89%
75-79	2,172	98,076	0.0221	0.0210	0.0249	2,063	2,439	105%	89%
80-84	3,175	78,665	0.0404	0.0423	0.0423	3,327	3,326	95%	95%
85-89	2,572	35,114	0.0732	0.0774	0.0752	2,719	2,642	95%	97%
90-94	1,642	9,916	0.1656	0.1270	0.1307	1,259	1,296	130%	127%
95-99	570	1,599	0.3567	0.1833	0.2210	293	353	195%	161%
100-104	77	238	0.3210	0.2370	0.3610	56	86	135%	89%
Other	0	0	N\A	0.0000	0.0000	0	0	0%	0%
Totals	13,228	498,681				11,832	13,367	112%	99%

GRS

Employees' Retirement System of the State of Hawaii

TEACHERS
POST-RETIREMENT MORTALITY - HEALTHY FEMALE

| Age | Actual Benefits | Total Benefits | Actual Rate | Assumed Rate | | Expected Benefits | | Actual/Expected | |
| | | | | Current | Proposed | Current (3) * (5) | Proposed (3) * (6) | Current (2) / (7) | Proposed (2) / (8) |
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	96	21,385	0.0045	0.0033	0.0025	70	54	136%	177%
60-64	260	155,449	0.0017	0.0028	0.0028	434	431	60%	60%
65-69	1,203	333,764	0.0036	0.0039	0.0044	1,287	1,471	93%	82%
70-74	2,288	254,599	0.0090	0.0074	0.0085	1,881	2,171	122%	105%
75-79	2,061	173,090	0.0119	0.0127	0.0148	2,197	2,556	94%	81%
80-84	3,017	111,118	0.0272	0.0300	0.0258	3,334	2,867	90%	105%
85-89	2,815	49,281	0.0571	0.0627	0.0481	3,090	2,372	91%	119%
90-94	1,602	17,377	0.0922	0.1079	0.0930	1,876	1,617	85%	99%
95-99	1,195	5,842	0.2046	0.1582	0.1707	924	997	129%	120%
100-104	462	1,626	0.2841	0.2237	0.3171	364	516	127%	90%
105-109	57	100	0.5725	0.2822	0.4582	28	46	203%	125%
Totals	15,056	1,123,630				15,487	15,097	97%	100%

GRS

POLICE/FIRE
POST-RETIREMENT MORTALITY - HEALTHY MALE

Age	Actual Benefits	Total Benefits	Actual Rate	Assumed Rate		Expected Benefits		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	354	115,247	0.0031	0.0050	0.0077	572	891	62%	40%
60-64	1,319	174,090	0.0076	0.0089	0.0097	1,541	1,683	86%	78%
65-69	2,233	154,389	0.0145	0.0151	0.0139	2,331	2,144	96%	104%
70-74	1,731	94,675	0.0183	0.0239	0.0204	2,264	1,929	76%	90%
75-79	1,443	47,024	0.0307	0.0376	0.0318	1,766	1,496	82%	96%
80-84	1,176	18,099	0.0650	0.0628	0.0564	1,137	1,021	103%	115%
85-89	1,577	11,251	0.1402	0.0975	0.1019	1,097	1,146	144%	138%
90-94	745	3,956	0.1882	0.1505	0.1787	595	707	125%	105%
95-99	225	642	0.3504	0.2105	0.2807	135	180	166%	125%
Other	0	0	N\A	0.0000	0.0000	0	0	0%	0%
Totals	10,802	619,374				11,439	11,197	94%	96%

POLICE/FIRE
POST-RETIREMENT MORTALITY - HEALTHY FEMALE

Age	Actual Benefits	Total Benefits	Actual Rate	Assumed Rate		Expected Benefits		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	0	6,036	0.0000	0.0025	0.0022	15	13	0%	0%
60-64	0	4,031	0.0000	0.0049	0.0030	20	12	0%	0%
65-69	0	2,418	0.0000	0.0088	0.0045	21	11	0%	0%
70-74	0	573	0.0000	0.0142	0.0093	8	5	0%	0%
75-79	17	396	0.0420	0.0256	0.0171	10	7	164%	246%
80-84	46	636	0.0717	0.0398	0.0269	25	17	180%	267%
85-89	13	113	0.1148	0.0700	0.0523	8	6	164%	219%
90-94	0	0	N\A			0	0	0%	0%
95-99	0	0	N\A			0	0	0%	0%
100-104	0	0	N\A			0	0	0%	0%
105-109	0	0	N\A			0	0	0%	0%
Totals	75	14,204				108	72	70%	105%

GRS

GENERAL EMPLOYEES
SERVICE BASED WITHDRAWAL EXPERIENCE - SALARY WEIGHTED

				Assumed Rate		Expected		Actual/Expected	
			Actual			Current (3) *	Proposed (3) *	Current	Proposed
Service	Actual	Total	Rate	Current	Proposed	(5)	(6)	(2) / (7)	(2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	66,140,859	356,141,794	0.1857	0.1668	0.1859	59,421,421	66,219,254	111%	100%
2	178,982,078	1,124,588,027	0.1592	0.1429	0.1525	160,691,061	171,535,940	111%	104%
3	133,099,477	1,057,784,785	0.1258	0.1144	0.1246	120,975,439	131,847,778	110%	101%
4	93,919,845	979,535,774	0.0959	0.0905	0.1016	88,628,859	99,556,419	106%	94%
5	69,915,730	924,421,194	0.0756	0.0717	0.0829	66,296,712	76,639,948	105%	91%
6	57,481,279	880,879,212	0.0653	0.0641	0.0679	56,443,928	59,804,447	102%	96%
7	48,339,738	839,585,921	0.0576	0.0352	0.0561	29,576,109	47,075,333	163%	103%
8	37,948,390	778,655,295	0.0487	0.0342	0.0470	26,643,120	36,560,302	142%	104%
9	27,532,447	730,284,830	0.0377	0.0332	0.0401	24,246,846	29,279,487	114%	94%
10	21,806,729	635,982,632	0.0343	0.0325	0.0351	20,668,114	22,309,635	106%	98%
11	20,225,090	576,161,331	0.0351	0.0319	0.0315	18,385,574	18,170,459	110%	111%
12	20,744,284	552,657,574	0.0375	0.0313	0.0291	17,288,527	16,100,025	120%	129%
13	16,909,730	537,827,186	0.0314	0.0307	0.0276	16,535,602	14,825,703	102%	114%
14	15,154,223	523,307,208	0.0290	0.0303	0.0266	15,855,263	13,908,882	96%	109%
15	13,123,212	518,263,783	0.0253	0.0300	0.0259	15,571,982	13,448,103	84%	98%
16	14,332,492	523,576,084	0.0274	0.0299	0.0255	15,665,559	13,346,000	91%	107%
17	12,022,324	519,872,121	0.0231	0.0296	0.0251	15,390,009	13,026,520	78%	92%
18	10,294,372	540,458,720	0.0190	0.0293	0.0245	15,843,305	13,263,164	65%	78%
19	9,237,139	548,743,017	0.0168	0.0289	0.0239	15,853,725	13,097,960	58%	71%
20	9,632,267	475,788,964	0.0202	0.0281	0.0230	13,391,838	10,947,428	72%	88%
21	8,484,558	385,180,815	0.0220	0.0271	0.0220	10,447,218	8,460,390	81%	100%
22	7,668,952	365,596,879	0.0210	0.0267	0.0208	9,750,341	7,596,433	79%	101%
23	6,302,190	331,751,751	0.0190	0.0263	0.0195	8,724,929	6,478,801	72%	97%
24	5,240,813	303,834,165	0.0172	0.0260	0.0183	7,899,881	5,570,765	66%	94%
25	5,205,570	252,199,888	0.0206	0.0258	0.0174	6,495,113	4,375,889	80%	119%
26	3,901,368	198,499,098	0.0197	0.0256	0.0168	5,072,758	3,328,831	77%	117%
27	3,052,902	166,940,577	0.0183	0.0255	0.0168	4,255,431	2,799,595	72%	109%
28	3,229,548	132,707,939	0.0243	0.0255	0.0168	3,389,562	2,225,513	95%	145%
29	1,879,433	106,465,667	0.0177	0.0256	0.0168	2,730,795	1,785,430	69%	105%
30	1,548,118	80,760,732	0.0192	0.0258	0.0168	2,082,776	1,354,358	74%	114%
Totals	923,355,157	15,948,452,963				874,221,798	924,938,794	106%	100%

GRS

TEACHERS
SERVICE BASED WITHDRAWAL EXPERIENCE - SALARY WEIGHTED

				Assumed Rate		Expected		Actual/Expected	
			Actual			Current (3) *	Proposed (3) *	Current	Proposed
Service	Actual	Total	Rate	Current	Proposed	(5)	(6)	(2) / (7)	(2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	32,968,483	135,592,993	0.2431	0.2994	0.2436	40,596,625	33,034,037	81%	100%
2	106,735,428	539,660,999	0.1978	0.2159	0.2008	116,486,767	108,388,178	92%	98%
3	84,212,725	485,155,823	0.1736	0.1504	0.1647	72,952,522	79,899,208	115%	105%
4	61,181,316	445,263,861	0.1374	0.1275	0.1344	56,769,167	59,859,435	108%	102%
5	44,979,403	409,782,468	0.1098	0.1060	0.1094	43,446,292	44,834,428	104%	100%
6	31,793,241	384,856,024	0.0826	0.0805	0.0890	30,984,366	34,241,351	103%	93%
7	24,174,993	375,151,470	0.0644	0.0422	0.0725	15,841,650	27,206,409	153%	89%
8	20,723,368	355,238,823	0.0583	0.0410	0.0595	14,577,750	21,136,243	142%	98%
9	14,807,261	344,612,247	0.0430	0.0397	0.0494	13,683,807	17,018,640	108%	87%
10	13,637,660	321,496,161	0.0424	0.0387	0.0417	12,456,232	13,406,390	109%	102%
11	13,345,346	307,799,670	0.0434	0.0380	0.0360	11,694,718	11,082,052	114%	120%
12	12,129,249	290,334,950	0.0418	0.0370	0.0319	10,743,101	9,260,867	113%	131%
13	8,784,221	279,239,708	0.0315	0.0359	0.0290	10,026,305	8,103,272	88%	108%
14	8,925,825	276,567,638	0.0323	0.0347	0.0270	9,584,006	7,480,993	93%	119%
15	6,997,807	268,724,782	0.0260	0.0337	0.0257	9,060,744	6,908,326	77%	101%
16	6,634,202	270,251,521	0.0245	0.0329	0.0248	8,883,073	6,689,715	75%	99%
17	5,493,945	268,919,162	0.0204	0.0323	0.0240	8,677,185	6,450,359	63%	85%
18	5,266,967	277,101,330	0.0190	0.0317	0.0232	8,781,661	6,441,131	60%	82%
19	4,886,763	279,758,192	0.0175	0.0310	0.0224	8,680,765	6,268,816	56%	78%
20	4,524,612	262,038,972	0.0173	0.0302	0.0214	7,906,988	5,606,324	57%	81%
21	3,879,634	193,096,104	0.0201	0.0278	0.0202	5,374,393	3,893,679	72%	100%
22	3,395,584	174,952,091	0.0194	0.0268	0.0187	4,682,404	3,274,220	73%	104%
23	2,657,086	153,531,888	0.0173	0.0260	0.0171	3,992,479	2,623,078	67%	101%
24	1,722,989	135,000,136	0.0128	0.0253	0.0154	3,420,917	2,072,608	50%	83%
25	2,180,956	124,555,712	0.0175	0.0247	0.0136	3,071,780	1,698,481	71%	128%
26	1,760,156	99,402,101	0.0177	0.0244	0.0121	2,422,635	1,202,165	73%	146%
27	1,053,013	80,432,770	0.0131	0.0242	0.0109	1,949,047	878,605	54%	120%
28	638,278	62,624,519	0.0102	0.0244	0.0104	1,526,055	648,952	42%	98%
29	434,716	48,706,043	0.0089	0.0244	0.0107	1,188,848	520,616	37%	84%
30	390,694	37,236,781	0.0105	0.0249	0.0100	928,801	372,368	42%	105%
Totals	530,315,921	7,687,084,939				540,391,084	530,500,946	98%	100%

GRS

Section VII
Employees' Retirement System of the State of Hawaii
Summary of Data and Experience

POLICE & FIRE EMPLOYEES
SERVICE BASED WITHDRAWAL EXPERIENCE - SALARY WEIGHTED

				Assumed Rate		Expected		Actual/Expected	
			Actual			Current (3) *	Proposed (3)	Current	Proposed
Service	Actual	Total	Rate	Current	Proposed	(5)	* (6)	(2) / (7)	(2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	3,192,078	29,104,481	0.1097	0.1132	0.1100	3,294,247	3,201,493	97%	100%
2	9,109,007	95,944,035	0.0949	0.0789	0.0950	7,567,687	9,114,683	120%	100%
3	4,179,916	112,468,858	0.0372	0.0397	0.0370	4,459,424	4,166,296	94%	100%
4	3,046,476	113,693,039	0.0268	0.0395	0.0301	4,491,260	3,427,604	68%	89%
5	3,383,100	118,912,669	0.0285	0.0388	0.0261	4,612,198	3,105,274	73%	109%
6	3,755,296	126,440,773	0.0297	0.0386	0.0233	4,879,387	2,939,970	77%	128%
7	2,544,356	131,990,742	0.0193	0.0239	0.0210	3,156,976	2,775,990	81%	92%
8	2,837,111	129,187,675	0.0220	0.0238	0.0192	3,068,317	2,482,701	92%	114%
9	1,625,777	130,614,614	0.0124	0.0232	0.0177	3,034,244	2,309,807	54%	70%
10	1,422,938	126,192,227	0.0113	0.0227	0.0164	2,865,102	2,063,954	50%	69%
11	1,697,972	124,436,361	0.0136	0.0217	0.0152	2,706,297	1,889,418	63%	90%
12	1,820,420	126,822,179	0.0144	0.0207	0.0141	2,628,175	1,792,705	69%	102%
13	1,703,401	123,193,333	0.0138	0.0196	0.0132	2,408,654	1,624,592	71%	105%
14	1,739,259	129,076,901	0.0135	0.0182	0.0123	2,353,837	1,590,442	74%	109%
15	1,554,861	127,422,398	0.0122	0.0170	0.0115	2,164,332	1,468,584	72%	106%
16	1,908,779	126,384,319	0.0151	0.0160	0.0108	2,018,999	1,363,436	95%	140%
17	1,422,630	121,188,355	0.0117	0.0150	0.0101	1,821,094	1,224,197	78%	116%
18	878,028	124,356,944	0.0071	0.0139	0.0095	1,731,758	1,176,356	51%	75%
19	1,196,033	125,550,437	0.0095	0.0130	0.0089	1,629,138	1,111,920	73%	108%
20	854,826	126,826,597	0.0067	0.0120	0.0083	1,515,877	1,051,100	56%	81%
21	1,247,624	124,824,998	0.0100	0.0110	0.0077	1,372,819	967,366	91%	129%
22	1,008,491	120,531,922	0.0084	0.0102	0.0072	1,227,463	872,586	82%	116%
23	681,069	119,453,699	0.0057	0.0094	0.0068	1,117,460	806,796	61%	84%
24	869,550	116,409,248	0.0075	0.0087	0.0063	1,014,239	732,356	86%	119%
25	183,147	57,404,827	0.0032	0.0085	0.0058	488,569	335,759	37%	55%
Totals	53,862,145	2,908,431,631				67,627,553	53,595,385	80%	100%

GRS