

**GENERAL EMPLOYEES RETIREMENT PLAN OF MINNESOTA
6-YEAR EXPERIENCE STUDY
JULY 1, 2008 THROUGH JUNE 30, 2014**

June 30, 2015

Public Employees Retirement Association of Minnesota
General Employees Retirement Plan
St. Paul, Minnesota

Dear Trustees of the General Employees Retirement Plan:

The results of the six-year *actuarial experience study* of the General Employees Retirement Plan (GERP) are presented in this report. The investigation was conducted for the purpose of updating the actuarial assumptions used in valuing the actuarial liabilities of the General Employees Retirement Plan.

The investigation was based upon the statistical data furnished for annual active member and retired life actuarial valuations concerning members who died, withdrew, became disabled or retired during the six-year period of the study by the Public Employees Retirement Association of Minnesota (PERA). We checked for internal and year-to-year consistency, but did not otherwise audit the data. We are not responsible for the accuracy or completeness of the information provided by PERA.

The investigation covered the six-year period from *July 1, 2008 to June 30, 2014*, and was carried out using generally accepted actuarial principles and techniques.

We believe that the actuarial assumptions recommended in this experience study report represent individually and in the aggregate reasonable estimates of future experience of the General Employees Retirement Plan.

This report should not be relied on for any purpose other than that described above. It was prepared at the request of PERA and is intended for use by the Retirement Association and those designated or approved by the Trustees. This report may be provided to parties other than the Association only in its entirety and only with the permission of the Trustees.

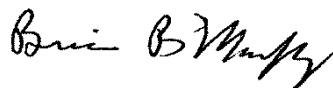
This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge and belief, the information contained in this report was performed in accordance with Minnesota Statutes Section 356.215 and the requirements of the Standards for Actuarial Work established by the Legislative Commission on Pensions and Retirement. We certify that, to the best of our knowledge, this report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board.

Brian B. Murphy and Bonnie Wurst are independent of the plan sponsor and are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. In addition, Mr. Murphy meets the requirements of "approved actuary" under Minnesota Statutes Section 356.215, Subdivision 1, Paragraph (c).

Respectfully submitted,



Bonita J. Wurst, ASA, EA, MAAA



Brian B. Murphy, FSA, EA, FCA, MAAA

ACTUARIAL EXPERIENCE STUDY 2008-2014

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SECTION A

OVERVIEW AND SUMMARY OF RESULTS

SUMMARY OF FINDINGS

The six-year period (July 1, 2008 to June 30, 2014) covered by this experience study provided sufficient data to form a basis for recommending changes in some of the assumptions and/or methods used in actuarial valuations of the General Employees Retirement Plan. The recommended changes in actuarial assumptions and methods resulting from this experience study are summarized below:

Recommendations:

- Decrease the current 8.0% select / 8.5% ultimate investment return assumption (8.0% for all years effective July 1, 2015) to an investment return assumption in the range of 7.00% to 8.00%.
- Decrease the price inflation assumption from 3.00% to 2.75%.
- Decrease the wage inflation (i.e., payroll growth) assumption from 3.75% to 3.50%.
- Adjust rates of merit and seniority, resulting in a minor overall increase:
 - Average proposed rate averages approximately 0.2% higher than current rate.
 - When combined with the proposed reduction in wage inflation, proposed salary increase rates average approximately 0.1% lower than the current average rate.
- Adjust assumed retirement rates:
 - Lower the assumed unreduced retirements (i.e., Normal Retirement) at ages 65, 68, 69 and 70.
 - Lower the assumed Rule of 90 retirements at ages 56 through 61.
 - Proposed distinct early retirement rates for Tier 1 and Tier 2 members:
 - Slight adjustments to rates for Tier 1 members, resulting in fewer expected retirements.
 - Lower the rates for Tier 2 members at all ages.
- Change the assumed rates of withdrawal (termination of membership before eligible to retire):
 - Proposed rates are service-based for all years.
 - Generally, proposed rates are higher than current rates for years 2 to 11 for males and years 2 to 15 for females.
- Change rates of disability to approximately 60% to 75% of current rates.
- Change the base mortality table to the RP-2014 mortality table, white collar adjustment, with rates adjusted to better fit observed plan experience and with future improvement projected using scale MP-2014. Generally results in a decrease in assumed mortality rates at most ages.
- No change in the actuarial funding method.
- No change in amortization policy.
- A minor change to the post-retirement benefit increase funding policy.
- Change Minnesota Standards for Actuarial Work requirements related to projected payroll.
- Change the assumed married percentage for male members from 75% to 80%.
- Minor changes to the form of payment assumptions.

The recommendations are summarized on the following pages.

INTRODUCTION

Each year as of June 30, the actuarial liabilities of the Association are valued. In order to perform the valuation, assumptions must be made regarding the future experience of the System with regard to the following risk areas:

- Rates of **withdrawal** of active members (leaving before eligible to retire).
- Rates of **disability** among active members.
- Patterns of **pay increases** to active members.
- Rates of **retirement** among active members.
- Rates of **mortality** among active members, retirees, and beneficiaries.
- Long-term rates of **investment return** to be generated by the assets of the System.

Assumptions should be carefully chosen and continually monitored. An unrealistic set of assumptions can lead to:

- Understated costs resulting in either an inability to pay benefits when due, or gradual increases in required contributions as time progresses;
- Overstated costs resulting in an unnecessarily large burden on the current generation of employers and taxpayers.

All actuarial assumptions are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement or the PERA Trustees.

A single set of assumptions will not be suitable indefinitely. Things change, and our understanding of things (whether or not they are changing) also changes. The package of assumptions is then adjusted to reflect basic experience trends -- but not random year to year fluctuations. Actuarial assumptions were last revised for the June 30, 2010, 2011 and 2012 actuarial valuations based on the results of the most recent experience study. Assumptions in effect prior to June 30, 2014 are ignored for purposes of this report.

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

We are recommending certain changes in assumptions and methods. The various assumption changes and their impact on the required contribution are described on the following pages.

**SUMMARY OF DECREMENT EXPERIENCE
2008 - 2014**

Decrement Risk Area	Actual Number	Expected		
		Present Assumptions	Proposed Assumptions	Change
<i>Unreduced Retirement</i>				
Normal Retirement	4,389	5,196.8	4,847.6	(349.2)
Rule of 90	4,672	6,526.7	5,583.8	(942.9)
<i>Reduced Retirement</i>				
Tier 1 Early Retirement	5,395	6,188.9	5,935.4	(253.5)
Tier 2 Early Retirement	8,131	12,370.8	9,827.0	(2,543.8)
<i>Withdrawal</i>				
Males	17,726	13,826.1	16,031.9	2,205.8
Females	45,448	31,367.5	40,070.7	8,703.2
<i>Disability</i>				
Males	414	811.8	531.1	(280.7)
Females	490	1,017.3	612.5	(404.8)
<i>Mortality</i>				
Healthy Retired Lives - Male	4,471	4,472.4	4,410.5	(61.9)
- Female	5,656	5,593.9	5,247.8	(346.1)
Disabled Retired Lives - Male	247	289.7	243.4	(46.3)
- Female	320	384.3	310.7	(73.6)
Active Lives - Male	418	642.9	418.6	(224.3)
- Female	509	643.0	500.6	(142.5)

SECTION B

ECONOMIC ASSUMPTIONS

ECONOMIC ASSUMPTIONS – INTRODUCTION

Economic assumptions include **long-term rates of investment return** (net of administrative and investment expenses), **inflation** (the across-the-board portion of salary increases), **payroll growth**, and pay increases due to **merit and seniority**. Unlike demographic activities, economic activities do not lend themselves to analysis solely on the basis of internal historical patterns because both salary increases and investment return are affected more by external forces; namely inflation (both wage and price), general productivity changes and the local economic environment which defy accurate long-term prediction. Estimates of economic activities are generally selected on the basis of the expectations in an inflation-free environment and then both long-term rates of investment return and wage inflation are increased by some provision for long-term inflation.

Current economic assumptions for PERA are as follows:

Investment Return

- **current** 8.00% through June 30, 2017; 8.50% thereafter
- **effective July 1, 2015** 8.00% for all years

Inflation 3.00%

Payroll Growth 3.75%

The remainder of this section addresses the economic assumptions other than pay increases due to merit and seniority. Pay increases due to merit and seniority are addressed in Section C.

Sources considered in the analysis of the economic assumptions included:

- Future expectations of the State Board of Investment (SBI) for the State of Minnesota, including information in SBI memos dated July 22 and August 28, 2014
- Future expectations of other investment consultants
- 2014 Social Security Trustees Report
- Historical observations of inflation statistics and investment returns
- U.S. Department of the Treasury yield curve rates (www.treasury.gov)
- National Average Wage Index

ECONOMIC ASSUMPTIONS – ASOP No. 27

Guidance regarding the selection of economic assumptions for measuring pension obligations is provided by Actuarial Standards of Practice (ASOP) No. 27. The standard requires that the selected economic assumptions be consistent with each other. That is, the selection of the investment return assumption should be consistent with the selection of the payroll growth and inflation assumptions.

The recently adopted revision of ASOP No. 27 (applicable to valuation dates on or after September 30, 2014) defines a reasonable economic assumption as an assumption that has the following characteristics:

- (a) It is appropriate for the purpose of the measurement;
- (b) It reflects the actuary's professional judgment;
- (c) It takes into account historical and current economic data that is relevant as of the valuation date;
- (d) It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and
- (e) It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included and disclosed under section 3.5.1, or when alternative assumptions are used for the assessment of risk.

ECONOMIC ASSUMPTIONS – INFLATION

Inflation. Over the past 60 years, price inflation has averaged 3.7%. This result is heavily affected by the high inflationary period of the 1970s and early 1980s. During the past decade, price inflation averaged 2.1%.

Calendar Year Period	Inflation (CPI)
1950-1959	2.2%
1960-1969	2.5%
1970-1979	7.4%
1980-1989	5.1%
1990-1999	2.9%
2000-2009	2.5%
2010	1.5%
2011	3.0%
2012	1.7%
2013	1.5%
2014	0.8%
Last 5 Years	1.7%
Last 10 Years	2.1%
Last 20 Years	2.3%
Last 30 Years	2.7%
Last 40 Years	3.8%
Last 50 Years	4.1%
Last 60 Years	3.7%

The SBI currently uses a 3.0% price inflation assumption in the development of its capital market assumptions.

Most of the investment consulting firms, in setting their capital market assumptions, currently assume that inflation will be less than 3.00%. We examined the capital market assumption sets for eight investment consulting firms. The average assumption for inflation was 2.36%, with a range of 2.11% to 3.00%. However, the investment consulting firms typically set their assumptions based on a shorter time horizon, while actuaries must make much longer projections.

ECONOMIC ASSUMPTIONS – INFLATION

The 2014 Social Security Trustees report uses 2.7% as the long-range intermediate price inflation assumption. The low-cost assumption is 3.4%, and the high-cost assumption is 2.0%. (The Social Security program benefits from high inflation through faster earnings and revenue growth). The long-term intermediate assumption decreased slightly since 2013, from 2.8% to 2.7%.

Treasury Inflation Protected Securities (TIPS) are government bonds which are adjusted upward or downward for actual changes in inflation. Real yields on TIPS at "constant maturity" are interpolated by the U.S. Treasury from the Treasury's daily real yield curve. The spread between yield curve rates and real yield curve rates gives insight into market expectations for inflation. As of June 30, 2014, the spread on a 30-year basis was 2.35%.

It is difficult to ignore the steady march downwards in inflation statistics over the last 25 years. We believe that it is appropriate to recognize this trend in future inflation assumptions. **Based upon the reviewed data, we recommend the inflation assumption be reduced from 3.00% to 2.75%.** (Remember that the selected payroll growth and investment return assumptions should be consistent with the final selected inflation assumption.)

ECONOMIC ASSUMPTIONS – PAYROLL GROWTH

Payroll growth (wage inflation) represents the expected growth in total payroll for a stable population. Increases or decreases in covered population that lead to a change in total payroll are not reflected in this assumption. Wage inflation consists of two components, 1) a portion due to pure price inflation (i.e., increases due to changes in the CPI), and 2) increases in average salary levels in excess of pure price inflation (i.e., increases due to changes in productivity levels, supply and demand in the labor market and other macroeconomic factors).

The current payroll growth assumption is 3.75%, which is comprised of a 3.00% price inflation assumption plus a real wage growth assumption of 0.75%. The payroll growth assumption is used to develop the amount necessary to amortize the unfunded actuarial accrued liability using the level percent of pay methodology.

Over the past 50 years, wage inflation (as measured by increases in the National Average Earnings) has averaged 4.8%. This would imply a real growth rate of 0.7% over the last 50 years (i.e., 4.8% wage inflation - 4.1% price inflation). In the past five decades, we have experienced real growth rate of wages ranging from (0.9%) to 1.6%. The past decade saw a real growth rate of wages of 0.4%. The 2014 Social Security Trustees report uses 1.1% as the long-range intermediate real-wage differential assumption. The low-cost assumption is 1.8% and the high-cost assumption is 0.5%.

Based upon the data reviewed, we recommend maintaining the current real wage growth assumption of 0.75%. When combined with the recommended 2.75% price inflation, the recommended payroll growth assumption is 3.50%.

ECONOMIC ASSUMPTIONS – INVESTMENT RETURN

Investment Return. The investment return assumption is the actuarial assumption that has the largest impact on actuarial valuation results. Since one of PERA’s objectives is the receipt of level contributions over time, the discount rate assumption is set equal to the investment return assumption.

It is our understanding that the SBI’s most recent asset allocation study resulted in an expected net rate of return of 8.25%, comprised of an inflation assumption of 3.00%, a real rate of return assumption of 5.36%, and an investment expense assumption of 0.11%. SBI’s expectations are based on capital market assumptions provided by a variety of investment professionals.

PERA’s Comprehensive Annual Financial Report for the fiscal year ending June 30, 2014 includes the following investment return statistics:

- SBI retirement funds returned 6.6 percentage points above the CPI over the last 20 years.
- The average return over the ten-year period ending June 30, 2014 was 8.4%.

The following chart shows the estimated annual investment return on an actuarial and market value basis for each year in the six-year period under consideration:

Estimated Annual Investment Return

Fiscal Year Ending	Actuarial Value of Assets	Market Value of Assets
June 30, 2009	2.9%	-18.9%
June 30, 2010	2.1%	15.7%
June 30, 2011	5.0%	23.0%
June 30, 2012	4.2%	2.3%
June 30, 2013	6.2%	14.2%
June 30, 2014	14.1%	18.5%
Average annual investment return July 1, 2008 to June 30, 2014	5.7%	8.1%

ECONOMIC ASSUMPTIONS – INVESTMENT RETURN

Presented below is the current target asset allocation, provided to GRS by the SBI for use in this study:

Asset Class	Asset Allocation
Domestic Equity	45%
International Equity	15
U.S. Fixed Income	18
Alternative Investments	20
Cash	2

Additionally, the SBI provided the following clarifications:

- Domestic equities are currently managed to the Russell 3000 benchmark which is comprised of 92% large cap and 8% small cap stocks.
- International equities are currently managed to the MSCI ACWI ex U.S. benchmark which is comprised of 79% developed markets and 21% emerging market equities.
- The percentage weightings for SBI’s alternative investment portfolio (market value and unfunded commitments) as of June 30, 2014 are 12.4% private equity, 1.4% real estate, 3.7% resources, and 2.5% yield-oriented investments.
- The “sub-asset classes” shown above are not “targets.” Managers have discretion to actively manage their portfolios within the target asset allocation shown on the prior page.

Based upon the target asset allocation, we made the following assumptions about detailed asset classes within the broad target asset classes:

Asset Classes	Final
Cash	2.00%
US Stock - Large Cap	22.50%
US Stock - Small Cap	22.50%
Int'l Equity	7.50%
Emerging Mkts Eq	7.50%
US Corporate Bonds	12.00%
Government Bonds	6.00%
Real Estate	1.50%
Private Equity	12.50%
Other Alternatives	6.00%
	100.00%

ECONOMIC ASSUMPTIONS – INVESTMENT RETURN

Because GRS is a benefits consulting firm and does not provide investment advice, we reviewed capital market assumptions of eight independent investment consulting firms. We excluded assumptions for two of the firms because they applied to time horizons of less than 10 years.

These investment consulting firms periodically issue reports that describe their capital market assumptions, that is, their estimates of expected returns, volatility, and correlations. Our analysis is based on the GRS Capital Market Assumption Modeler released May 22, 2015. For confidentiality purposes, the exhibits are shown in order by expected return with the names of the firms omitted. While these assumptions are developed based upon historical analysis, many of these firms also incorporate forward looking adjustments to better reflect near-term expectations. The estimates for core investments (i.e., fixed income, equities, and real estate) are generally based on anticipated returns produced by passive index funds.

Given the Plan’s long-term policy target asset allocation and the capital market assumptions from the investment consultants, the development of the average nominal return, net of investment expenses, is provided in the table below:

Investment Consultant	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Investment Expenses	Nominal Return Net of Expenses (6)-(7)	Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	6.26%	2.12%	4.14%	2.75%	6.89%	0.10%	6.79%	13.70%
2	7.00%	2.26%	4.74%	2.75%	7.49%	0.10%	7.39%	12.70%
3	7.58%	2.50%	5.08%	2.75%	7.83%	0.10%	7.73%	14.20%
4	7.66%	2.11%	5.55%	2.75%	8.30%	0.10%	8.20%	14.60%
5	8.02%	2.20%	5.82%	2.75%	8.57%	0.10%	8.47%	14.10%
6	8.40%	2.20%	6.20%	2.75%	8.95%	0.10%	8.85%	15.40%
Average	7.49%	2.23%	5.26%	2.75%	8.01%	0.10%	7.91%	14.12%

ECONOMIC ASSUMPTIONS – INVESTMENT RETURN

We have determined for each firm the expected nominal return rate, then subtracted that firm’s expected inflation to arrive at their expected real return in column (4). Then we have added back our suggested 2.75% inflation assumption and subtracted the expense assumption to get a net nominal return shown in column (8). The results are based upon an investment expense assumption for active management of equity and fixed income securities of 10 basis points. Because the asset classes that the investment firms use are not identical to those contained in SBI’s target asset allocation, there is a certain amount of subjectivity involved in developing the figures in the chart. The figures should be considered as approximate guides to judgment, rather than exact scientific numbers.

In a volatile investment environment, gains and losses do not offset each other. For example if an investor enters Period 1 with a \$1 Million portfolio and experiences a 50% loss, the investor has \$500,000 at the end of Period 1. If, then in Period 2, the investor experiences a 50% gain, the investor has \$750,00 at the end of Period 2, and has still not recovered from the loss. The same thing would happen if the gains and losses occurred in the reverse order. This effect is called “volatility drag.” Therefore, it is important to consider both the expected return and the anticipated volatility of the investment portfolio in order to estimate the long-term net return that could be expected to be produced by the investment portfolio. The following table provides the 25th, 50th, and 75th percentiles of the 20-year geometric average of the expected nominal return, net of investment expenses. The table also shows the probability of exceeding the current ultimate 8.50% assumption, as well as alternate possible assumptions of 8.00% or 7.00%.

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of Exceeding 8.50 %	Probability of Exceeding 8.00 %	Probability of Exceeding 7.00 %
	25th	50th	75th			
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	3.88%	5.90%	7.96%	20%	25%	36%
2	4.75%	6.63%	8.54%	25%	31%	45%
3	4.69%	6.78%	8.92%	29%	35%	47%
4	5.06%	7.21%	9.40%	34%	40%	53%
5	5.46%	7.54%	9.66%	38%	44%	57%
6	5.48%	7.74%	10.06%	41%	47%	59%
Average	4.89 %	6.97 %	9.09 %	31 %	37 %	50 %

ECONOMIC ASSUMPTIONS – INVESTMENT RETURN

Another point of view comes from the *Report of the Blue Ribbon Panel on Public Pension Plan Funding* dated February 2014. The independent Panel was commissioned by the Society of Actuaries to develop recommendations for strengthening public plan funding. Page 28 of the report states “The Panel believes the assumed rate of return should be set at the median expected return, which should be based on the geometric mean return. A simple arithmetic mean return, which has a less than 50 percent chance of being realized in future years, should not be used. Plans should be using rates of return that they believe can be achieved over the next 20 to 30-year period with a 50 percent probability. The Panel does not believe the rate should be aggressively conservative, as doing so may lead to a surplus.”

Given that using the expected arithmetic return is expected to result in gains and losses that offset each other over the long term, but recognizing that a level of conservatism may be desirable (which would suggest using the expected geometric return), **we suggest that PERA consider an investment return assumption in the range of 7.00% to 8.00%.** Based upon an earlier draft of this study, the assumption will be lowered to 8.00% for all years effective July 1, 2015. If capital markets do not improve measurably over the next several years, the next experience study will likely include a recommendation to lower the investment return assumption further.

PERA should note that the selection of an investment return assumption at the upper end of this range results in a higher risk of increased actuarial contributions in the future. The recent statutory change in discount rate improved the odds of achieving the assumed rate in the long run from 31% to 37%. Since the probability of achieving the 8% return in the long run is only 37%, there is a 63% chance that calculated contributions based on an 8% return would be insufficient. The probabilities of achieving the assumed rate of return would be improved to 40% for a 7.75% assumed rate and to 43% for a 7.50% assumed rate. It would be appropriate to continue reducing the assumed investment return below 8.00% so that the odds of achieving the assumed return in the long run are improved. The investment return assumption would have to be lowered to 7% in order to have a 50% probability of being realized. On the surface, it would appear that the assumption should be lowered all the way to 7% to achieve 50% probability. But a change that large might result in contribution levels that in the future might prove to be overstated. In reviewing these results, readers should be aware that an analysis done at a different time could produce quite different recommendations.

SECTION C
PAY INCREASES

PAY INCREASES DUE TO MERIT AND SENIORITY

Pay increases granted to active members typically consist of two pieces:

- An across-the-board, economic type of increase granted to most or all members of the group. This increase is typically tied to inflation or cost of living changes, and
- An increase as a result of merit and seniority. This increase is typically related to the performance of an individual and includes promotions and increased years of experience.

The assumption for across-the-board increases is the pay inflation assumption discussed in Section B. The merit and seniority portion of pay increases is discussed on this page.

We reviewed the merit and seniority pay increases during the six-year period. For each year, we excluded individual pay increases that were more than 30% and also excluded individual pay increases that were less than -30%. While this was a relatively small number of records, the experience distorted the experience of the overall group.

In order to study the merit and seniority portion of the salary increase assumption, it is necessary to separate out the portion attributable to wage inflation. General inflation, as measured by the change in the Consumer Price Index, has averaged about 1.3% over the six-year period ending June 30, 2014. During the six-year period ending December 31, 2013, the increase in the national average earnings has been about 1.7%, or 0.4% higher than inflation. Based on our review of salary experience for GERP members for the period July 1, 2008 through June 30, 2014, we observed that members with longer service averaged about a 2.0% annual increase for this period. For our analysis of the merit and seniority portion of total salary increase, we assumed that the salary increase amount in excess of the total salary increase for the longer-service members (i.e., those with 20 or more years of service) was attributable to wage inflation only. This assumes that once members reach a certain length of service, merit and seniority increases are no longer provided.

PAY INCREASES DUE TO MERIT AND SENIORITY

Findings

The assumed wage inflation was 3.75% for the period of the study. However, due to low price inflation and real wage growth during the same period (as discussed in Section B), we estimated that during the six years of the study, the average actual wage inflation component of pay increases was around 2.0% for members of the General Employees Retirement Plan. This estimated actual increase was subtracted from the actual pay increases to obtain the estimated merit/seniority portion of the pay increases. It should be noted that the results of the analysis are very sensitive to the estimated wage inflation component.

Gross actual salary increases averaged 3.33% over the six-year period, ranging from 2.57% in 2013 to 5.22% in 2009. After adjusting for the 2.0% average wage inflation for this period, the average net salary increase (i.e., merit and seniority) averaged 1.33%, ranging from 0.57% to 3.22%. Salaries for local government employees during this period were impacted by tough economic conditions.

Fiscal Year Ending	Count	Gross		Net*	
		Expected	Actual	Expected	Actual
2009	113,346	4.99%	5.22%	1.24%	3.22%
2010	115,450	4.94%	3.26%	1.19%	1.26%
2011	112,926	4.84%	2.89%	1.09%	0.89%
2012	109,550	4.78%	2.73%	1.03%	0.73%
2013	107,788	4.78%	2.57%	1.03%	0.57%
2014	108,168	4.87%	3.23%	1.12%	1.23%
Total	667,228	4.87%	3.33%	1.12%	1.33%

* Net Expected increases are equal to Gross Expected increases minus assumed wage inflation of 3.75%. Net Actual increases are equal to Gross Actual increases minus the estimated actual wage inflation for the period of 2.0%.

The results of our analysis are shown on the following page. Using the techniques described above, observed merit and seniority pay increases were generally slightly higher than the presently assumed increases. However, when combined with the recommended decrease in payroll growth assumption, the result is a modest decrease in proposed gross salary increases.

Recommendation

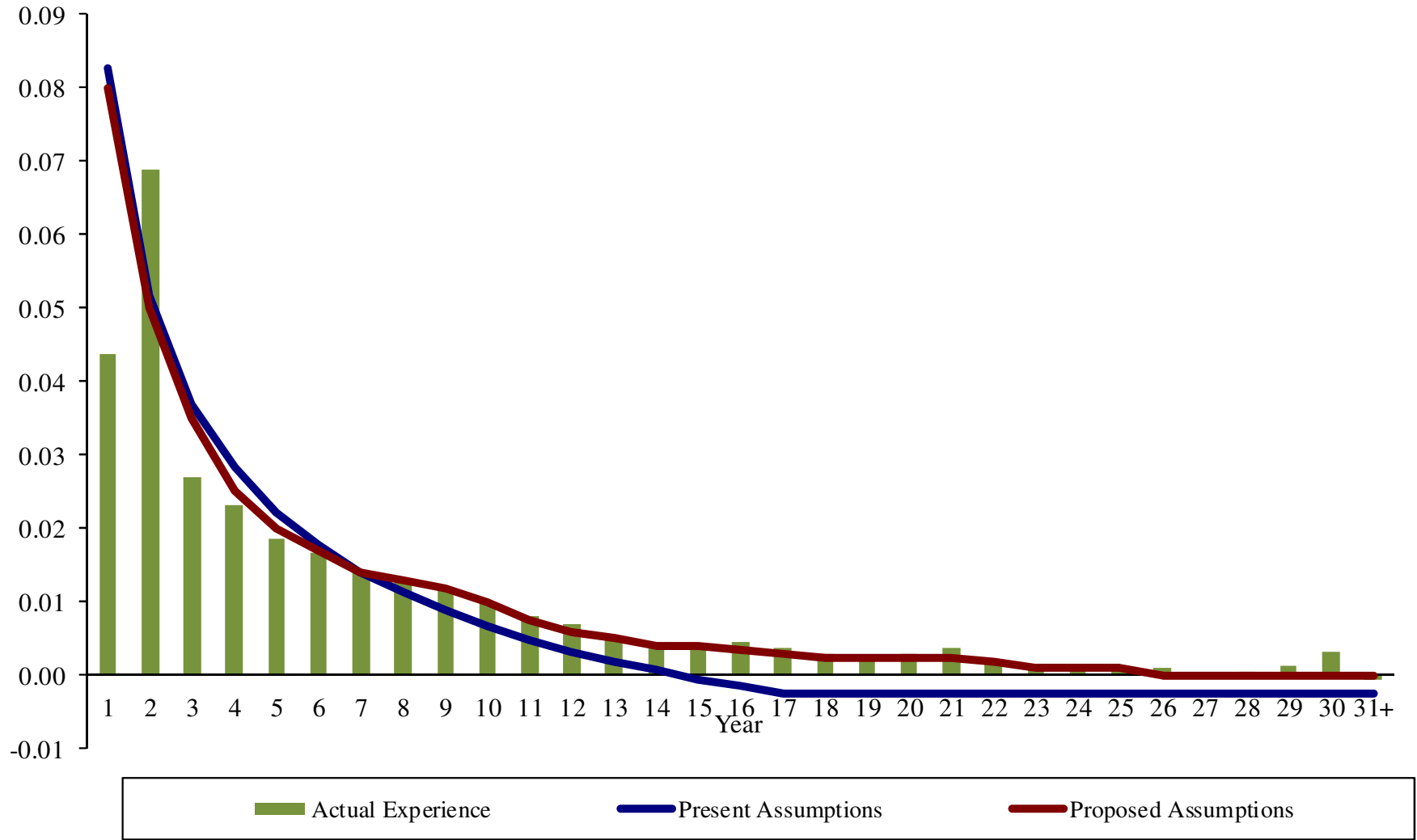
We recommend adjustments to the current merit/seniority pay increase assumption as shown on the following page. The proposed rates take into account the economic conditions of the prior six years.

PAY INCREASES DUE TO MERIT AND SENIORITY

Year	Exposures	Total Salary % Increase			Merit & Seniority % Increase		
		Actual	Current	Proposed	Actual	Current	Proposed
1	5,555	6.39%	12.03%	11.50%	4.39%	8.28%	8.00%
2	40,419	8.90%	8.90%	8.50%	6.90%	5.15%	5.00%
3	40,402	4.71%	7.46%	7.00%	2.71%	3.71%	3.50%
4	37,775	4.32%	6.58%	6.00%	2.32%	2.83%	2.50%
5	36,061	3.87%	5.97%	5.50%	1.87%	2.22%	2.00%
6	33,895	3.67%	5.52%	5.20%	1.67%	1.77%	1.70%
7	32,121	3.42%	5.16%	4.90%	1.42%	1.41%	1.40%
8	30,490	3.27%	4.87%	4.80%	1.27%	1.12%	1.30%
9	29,123	3.16%	4.63%	4.70%	1.16%	0.88%	1.20%
10	27,830	3.00%	4.42%	4.50%	1.00%	0.67%	1.00%
11	27,165	2.81%	4.24%	4.25%	0.81%	0.49%	0.75%
12	26,924	2.70%	4.08%	4.10%	0.70%	0.33%	0.60%
13	25,196	2.48%	3.94%	4.00%	0.48%	0.19%	0.50%
14	23,113	2.39%	3.82%	3.90%	0.39%	0.07%	0.40%
15	21,457	2.43%	3.70%	3.90%	0.43%	-0.05%	0.40%
16	19,750	2.45%	3.60%	3.85%	0.45%	-0.15%	0.35%
17	18,007	2.38%	3.51%	3.80%	0.38%	-0.24%	0.30%
18	16,788	2.28%	3.50%	3.75%	0.28%	-0.25%	0.25%
19	16,258	2.23%	3.50%	3.75%	0.23%	-0.25%	0.25%
20	15,724	2.29%	3.50%	3.75%	0.29%	-0.25%	0.25%
21	14,749	2.37%	3.50%	3.75%	0.37%	-0.25%	0.25%
22	14,062	2.21%	3.50%	3.70%	0.21%	-0.25%	0.20%
23	13,381	2.08%	3.50%	3.60%	0.08%	-0.25%	0.10%
24	12,804	2.11%	3.50%	3.60%	0.11%	-0.25%	0.10%
25	11,846	2.14%	3.50%	3.60%	0.14%	-0.25%	0.10%
26	10,343	2.10%	3.50%	3.50%	0.10%	-0.25%	0.00%
27	8,862	2.01%	3.50%	3.50%	0.01%	-0.25%	0.00%
28	7,776	2.06%	3.50%	3.50%	0.06%	-0.25%	0.00%
29	7,238	2.14%	3.50%	3.50%	0.14%	-0.25%	0.00%
30	6,892	2.31%	3.50%	3.50%	0.31%	-0.25%	0.00%
31+	35,222	1.95%	3.50%	3.50%	-0.05%	-0.25%	0.00%
Total	667,228	3.33%	4.87%	4.79%	1.33%	1.12%	1.29%

First year pay increases were impacted by the methods used to annualize salary in the first year of employment.

PAY INCREASES DUE TO MERIT AND SENIORITY



SECTION D

RETIREMENT EXPERIENCE

AGE AND SERVICE UNREDUCED (NORMAL) RETIREMENT

Findings

The benefit provisions of the General Employees Retirement Plan (GERP) establish the minimum age and service requirements for unreduced or normal retirement. However, the actual cost of retirement is determined by when members actually retire. The assumption about timing of retirements is a major ingredient in cost calculations. Note that higher rates of retirement with full benefits generally results in higher computed contributions, and vice-versa. Eligible Tier 2 members retiring at age 65 with an unreduced benefit were included with the Tier 2 members retiring at age 65 with a reduced benefit, for purposes of determining proposed retirement rates.

Some members are eligible for retirement but elect to defer the benefit. We included these terminations as retirements for the purposes of this study.

The current assumption ends at age 71; in other words, we assume all members currently under the age of 71 will retire by the age of 71. However, for members currently age 71 or older, we assume retirement one year after the valuation date (effectively 18 months due to mid-year decrementing), as required by the Minnesota Standards for Actuarial Work. As such, there are no Exposures for ages over 71 since the valuation assumption is all of these members work for an additional year and then retire. During the six-year period, there were 1,200 actual retirements at ages 71 and older including 231 actual retirements at age 71. We believe assuming 100% retirement at age 71 is an appropriately conservative approach.

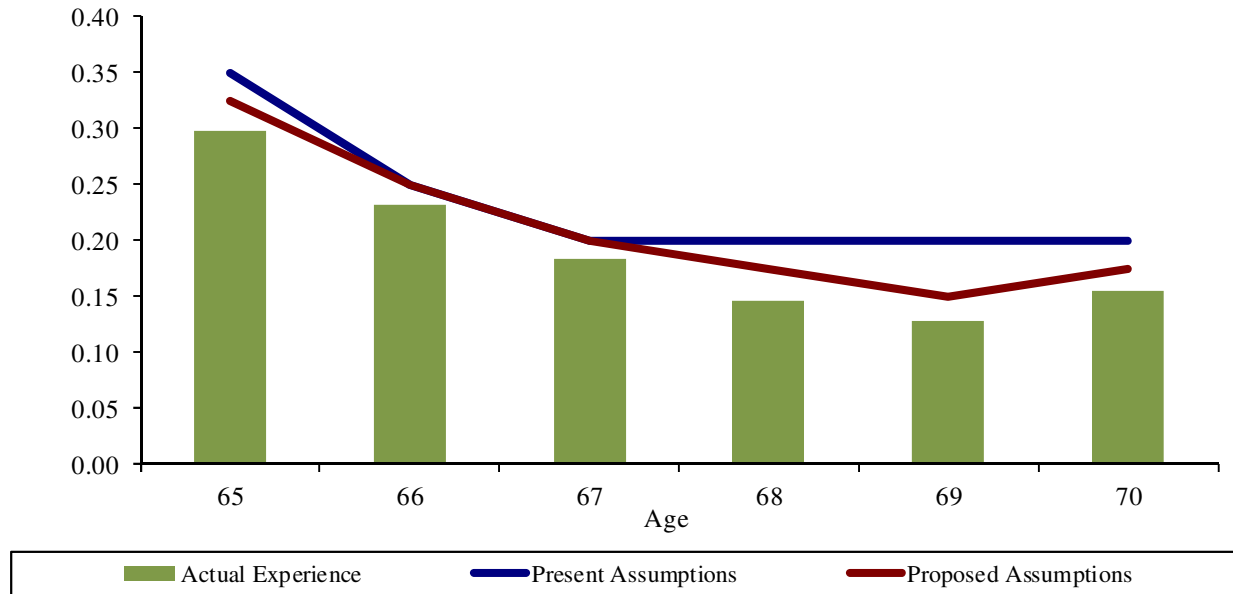
AGE AND SERVICE UNREDUCED (NORMAL) RETIREMENT

Recommendations

We recommend minor changes to the retirement rates as indicated below. In addition, we recommend the Minnesota Standards for Actuarial Work be modified to remove the requirement that members currently over age 70 delay retirement one year and instead assume these members retire mid-year, the same as members younger than age 71.

Age	Actual Retirements	Exposure	Crude Rates	Rates		Expected Retirements		Actual / Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
65	1,152	3,867	29.8%	35.0%	32.5%	1,353.45	1,256.78	85.1%	91.7%
66	1,392	5,998	23.2%	25.0%	25.0%	1,499.50	1,499.50	92.8%	92.8%
67	757	4,110	18.4%	20.0%	20.0%	822.00	822.00	92.1%	92.1%
68	446	3,052	14.6%	20.0%	17.5%	610.40	534.10	73.1%	83.5%
69	322	2,490	12.9%	20.0%	15.0%	498.00	373.50	64.7%	86.2%
70	320	2,067	15.5%	20.0%	17.5%	413.40	361.73	77.4%	88.5%
71+	*	*	N/A	100.0%	*	0.00	0.00	N/A	N/A
Totals	4,389	21,584				5,196.75	4,847.60	84.5%	90.5%

* The current assumption prescribed by the Minnesota Standards for Actuarial Work is that members who have reached 100% retirement eligibility will delay retirement for one year. Therefore, even though there are members that are over age 70, these members are not included in the Exposures since retirement is assumed to be delayed one year. There were 1,200 actual retirements over age 70.



RULE OF 90 (UNREDUCED) EARLY RETIREMENT

Findings

GERP members who were hired prior to July 1, 1989 may retire with an unreduced benefit when age plus service is at least 90 years. We refer to these cases as Rule of 90 early retirements.

Generally, because of the subsidized early retirement benefit, these members are expected to retire at a higher rate than those members that don't qualify for Rule of 90. Generally, higher rates of early retirement generally result in higher computed contributions due to the enhanced benefit, and vice-versa.

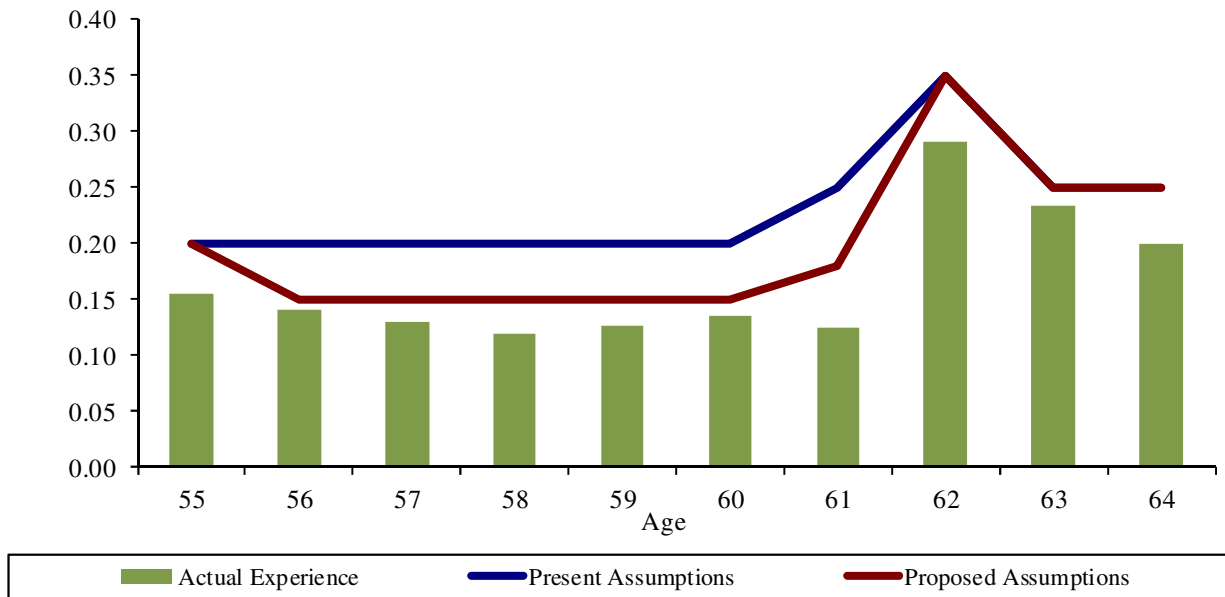
We reviewed the experience during the study period. Overall, the plan experienced fewer Rule of 90 early retirements than projected by the present assumptions (6,527 expected versus 4,672 actual – see totals on the following page). Similar experience was observed in the 2004 – 2008 period.

Recommendation

We recommend lowering the assumed Rule of 90 retirement rates to reflect the lower utilization observed over the last 10 years.

RULE OF 90 (UNREDUCED) EARLY RETIREMENT

Age	Actual Retirements	Exposure	Crude Rates	Rates		Expected Retirements		Actual / Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
55	123	794	15.5%	20.0%	20.0%	158.80	158.80	77.5%	77.5%
56	213	1,515	14.1%	20.0%	15.0%	303.00	227.25	70.3%	93.7%
57	296	2,272	13.0%	20.0%	15.0%	454.40	340.80	65.1%	86.9%
58	349	2,919	12.0%	20.0%	15.0%	583.80	437.85	59.8%	79.7%
59	434	3,393	12.8%	20.0%	15.0%	678.60	508.95	64.0%	85.3%
60	490	3,605	13.6%	20.0%	15.0%	721.00	540.75	68.0%	90.6%
61	463	3,681	12.6%	25.0%	18.0%	920.25	662.58	50.3%	69.9%
62	1,089	3,751	29.0%	35.0%	35.0%	1,312.85	1,312.85	82.9%	82.9%
63	691	2,961	23.3%	25.0%	25.0%	740.25	740.25	93.3%	93.3%
64	524	2,615	20.0%	25.0%	25.0%	653.75	653.75	80.2%	80.2%
Totals	4,672	27,506				6,526.70	5,583.83	71.6%	83.7%



TIER 1 REDUCED EARLY RETIREMENT

Findings

GERP members who were hired prior to July 1, 1989 (Tier 1 members) may also retire with a reduced benefit prior to the attainment of Normal Retirement. We refer to these cases as Tier 1 early retirements.

The early retirement benefit payable to Tier 1 members is the greater of (a) or (b):

- (a) 1.2% of average salary for each of the first ten years of service and 1.7% for each subsequent year with a reduction equal to 0.25% for each month the member is under age 65 (or age 62 if 30 or more years of service)
- (b) 1.7% of average salary for each year of service with actuarial reduction for each month the member is under age 65

Generally, because of the subsidized early retirement benefit, these members' are expected to retire at a higher rate than Tier 2 members who don't receive an early retirement subsidy, but not as high as Tier 1 members who have attained Rule of 90. Generally, higher rates of early retirement generally result in higher computed contributions due to the enhanced benefit, and vice-versa.

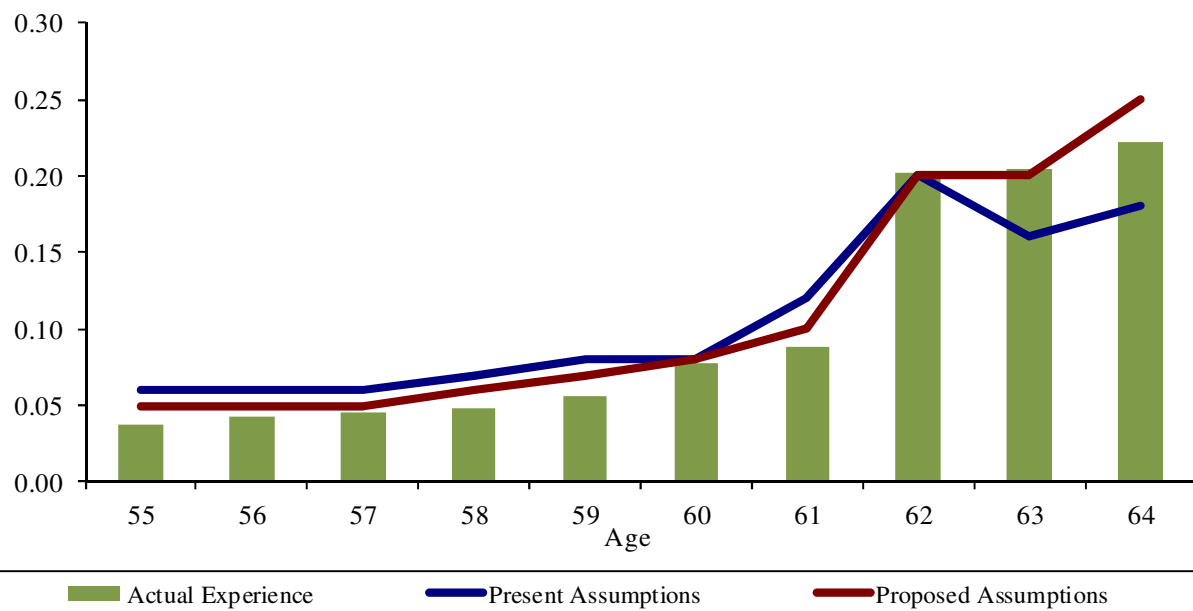
We reviewed the experience during the study period. Overall, the plan experienced fewer Tier 1 reduced early retirements than projected by the present assumptions (6,189 expected versus 5,395 actual – see totals on the following page).

Recommendation

We recommend slight adjustments to the Tier 1 Reduced early retirement rates, as indicated on the next page. Furthermore, given the variance in early retirement patterns for Tier 1 versus Tier 2 members, we recommend distinct early retirement rates for Tier 1 members.

TIER 1 REDUCED EARLY RETIREMENT

Age	Actual Retirements	Exposure	Crude Rates	Rates		Expected Retirements		Actual / Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
55	379	9,855	3.8%	6.0%	5.0%	591.30	492.75	64.1%	76.9%
56	418	9,645	4.3%	6.0%	5.0%	578.70	482.25	72.2%	86.7%
57	414	9,103	4.5%	6.0%	5.0%	546.18	455.15	75.8%	91.0%
58	407	8,297	4.9%	7.0%	6.0%	580.79	497.82	70.1%	81.8%
59	423	7,550	5.6%	8.0%	7.0%	604.00	528.50	70.0%	80.0%
60	536	6,923	7.7%	8.0%	8.0%	553.84	553.84	96.8%	96.8%
61	524	5,948	8.8%	12.0%	10.0%	713.76	594.80	73.4%	88.1%
62	1,030	5,104	20.2%	20.0%	20.0%	1,020.80	1,020.80	100.9%	100.9%
63	729	3,545	20.6%	16.0%	20.0%	567.20	709.00	128.5%	102.8%
64	535	2,402	22.3%	18.0%	25.0%	432.36	600.50	123.7%	89.1%
Totals	5,395	68,372				6,188.93	5,935.41	87.2%	90.9%



TIER 2 REDUCED EARLY RETIREMENT

Findings

GERP members who were hired after June 30, 1989 (Tier 2 members) may retire with a reduced benefit prior to the attainment of Normal Retirement. We refer to these cases as Tier 2 early retirements.

The Tier 2 early retirement benefit is the actuarial equivalent of the member's Normal Retirement benefit. In other words, there is no subsidy for early retirement. Generally, because of the actuarially equivalent early retirement reduction, these members' benefits have about the same value as the deferred benefit to which they would be eligible if they did not request early commencement of the benefit. Higher rates of early retirement generally result in slightly lower computed contributions, and vice-versa.

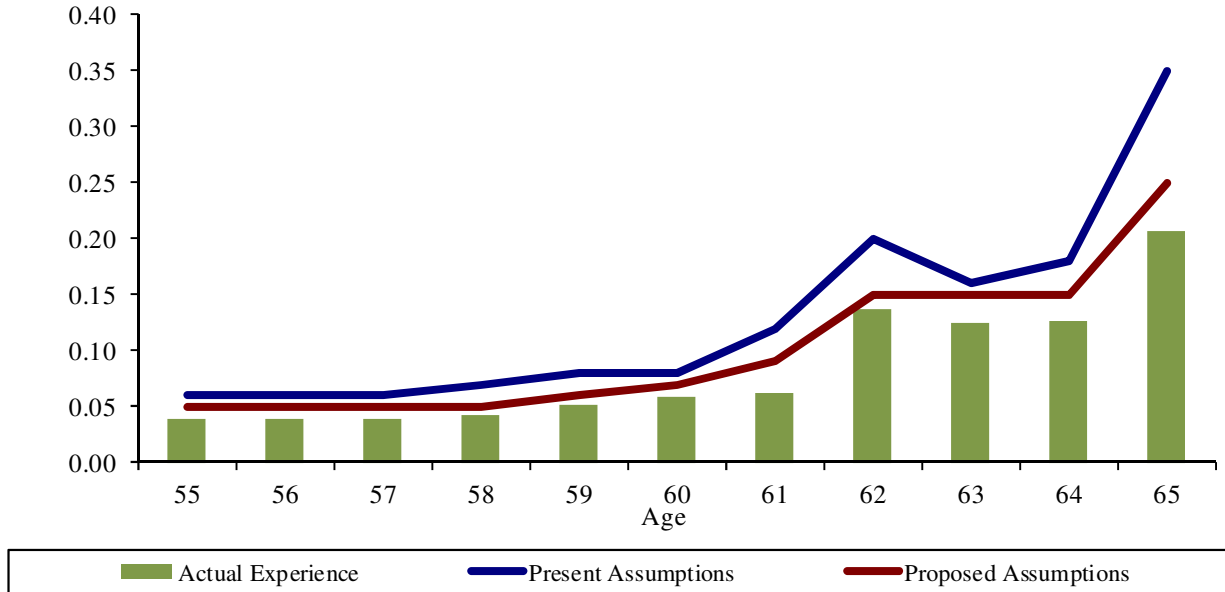
We reviewed the experience during the study period. Overall, the plan experienced fewer Tier 2 reduced early retirements than projected by the present assumptions (12,371 expected versus 8,131 actual – see totals on the following page). Eligible Tier 2 members retiring at age 65 with an unreduced benefit were included with the Tier 2 members retiring at age 65 with a reduced benefit, for purposes of determining proposed retirement rates.

Recommendation

We recommend a slight reduction in Tier 2 early retirement rates at all ages, with a more significant reduction at ages 62 and 65, as indicated on the next page. Furthermore, given the variance in early retirement patterns for Tier 1 versus Tier 2 members, we recommend distinct early retirement rates for Tier 2 members.

TIER 2 REDUCED EARLY RETIREMENT

Age	Actual Retirements	Exposure	Crude Rates	Rates		Expected Retirements		Actual / Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
55	646	16,478	3.9%	6.0%	5.0%	988.68	823.90	65.3%	78.4%
56	604	15,422	3.9%	6.0%	5.0%	925.32	771.10	65.3%	78.3%
57	581	14,491	4.0%	6.0%	5.0%	869.46	724.55	66.8%	80.2%
58	577	13,501	4.3%	7.0%	5.0%	945.07	675.05	61.1%	85.5%
59	650	12,428	5.2%	8.0%	6.0%	994.24	745.68	65.4%	87.2%
60	662	11,167	5.9%	8.0%	7.0%	893.36	781.69	74.1%	84.7%
61	620	9,921	6.2%	12.0%	9.0%	1,190.52	892.89	52.1%	69.4%
62	1,217	8,866	13.7%	20.0%	15.0%	1,773.20	1,329.90	68.6%	91.5%
63	887	7,079	12.5%	16.0%	15.0%	1,132.64	1,061.85	78.3%	83.5%
64	720	5,676	12.7%	18.0%	15.0%	1,021.68	851.40	70.5%	84.6%
65	967	4,676	20.7%	35.0%	25.0%	1,636.60	1,169.00	59.1%	82.7%
Totals	8,131	119,705				12,370.77	9,827.01	65.7%	82.7%



RETIREMENT FROM DEFERRED STATUS

Members who terminate after completing three years of service (five if hired after June 30, 2010) are vested and entitled to either a refund of employee contributions, with interest, or a deferred retirement benefit.

While some members actually elect a refund even if it is less valuable than the deferred annuity, the current valuation assumption is that members will elect a refund only if it is more valuable than the deferred annuity. When a member elects a refund that is less valuable than his or her deferred annuity (or when a member elects the deferred annuity even if the refund is more valuable), the plan experiences a small liability gain. Since the current assumption results in very small gains to the plan, we recommend no change to this assumption.

For those deferred vested members for whom the deferred benefit is more valuable than a refund, the current valuation assumption is that the member will commence benefits at Normal Retirement Age. Except for long-service members hired prior to July 1, 1989 that may qualify for a subsidized reduction, when a member elects to commence benefits prior to Normal Retirement Age, the benefit is reduced on an actuarially equivalent basis, meaning there is no liability gain or loss to the plan. We recommend no change to this set of assumptions.

SECTION E
WITHDRAWAL EXPERIENCE

WITHDRAWAL EXPERIENCE

Members who leave active employment, for reasons other than retirement or death, may be eligible for the following payments from the pension trust:

- A refund of employee contributions, or
- A deferred retirement benefit, if they are vested

Deferred retirement benefits are based on the pay and service credit at the time of withdrawal. The benefit is increased with augmentation (if applicable) from termination until commencement and is payable at Normal Retirement (or at Early Retirement with a reduction). Consequently, members who withdraw receive much less from the plan than members who stay in employment until retirement. Higher rates of withdrawal result in lower computed contributions, and vice-versa.

Our experience with similar systems has shown that sometimes the use of assumptions based solely on counts of people terminating employment does not always reduce the size of the gain or loss in a particular decrement. Sometimes this can be due to the relative magnitude of the actuarial accrued liability of the members that decrement, rather than number counts alone. For example, consider a plan with only two members who are both the same age and assume member one has an actuarial accrued liability of \$10,000 and member two has an actuarial accrued liability of \$90,000. If one of the members leaves and forfeits all of his or her liability, the rate of decrement is one out of two for a rate of 50%. However, the magnitude of the net gain or loss to the system is affected much more if member two leaves employment than if member one leaves employment.

As a result, we have added a column in the following tables that shows the liability-weighted rates. This represents the crude rate of decrement on a liability weighted basis as opposed to strictly a number count basis. The liability weighted rates were found to be more highly correlated with withdrawal than with other decrements. This makes some intuitive sense, since termination decisions are often made based on how much the member has to gain or lose if they change jobs, whereas death and disability is typically not a decision at all, but rather an event that happens to someone.

Some members are eligible for retirement but elect to defer the benefit and are consequently reported for the valuation as a termination with a deferred benefit. We included these terminations as retirements for the purposes of this study.

Current valuation termination rates for members are gender-specific with a 3-year select period.

WITHDRAWAL EXPERIENCE

Findings

Overall, the plan experienced more withdrawals than projected by the present assumptions (63,174 actual terminations versus 45,079 expected). Similar experience was observed for the 2004 to 2008 study. However, when we reviewed the liability that decremented out of the plan during the prior six-year period, the plan experienced less liability decrementing from the plan due to terminations than expected.

Recommendation

As we examined the patterns of withdrawal, the experience has a strong relationship to service. We recommend a service-based withdrawal table. We have based the proposed rates on a blend of the population and liability-weighted experience. In the next experience study, the proposed rates can be adjusted if needed to reflect ten years of service-based and liability-weighted experience.

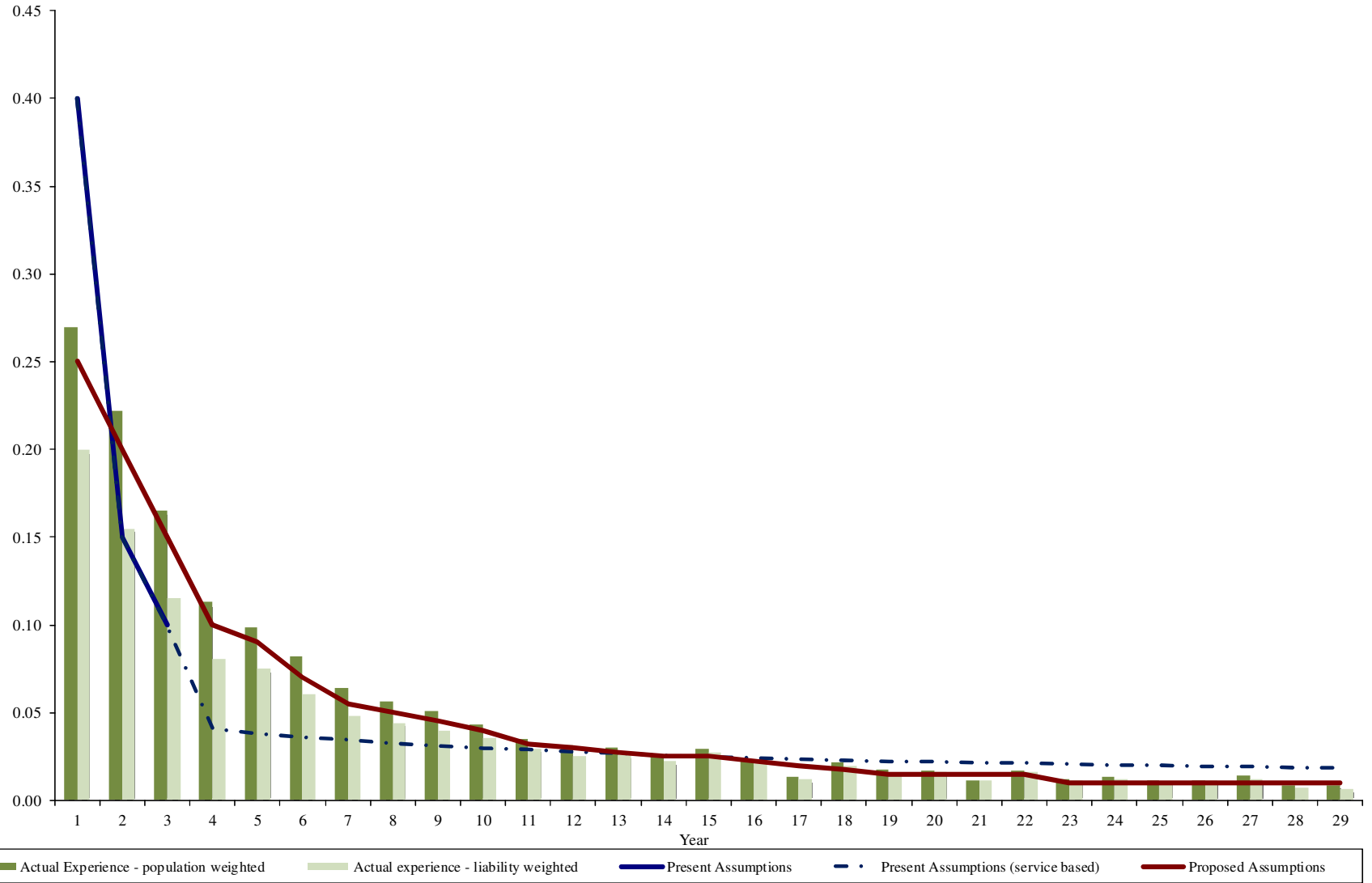
WITHDRAWAL EXPERIENCE

MALES

Year	Withdrawals	Exposure	Crude Rates		Sample Rates		Expected Withdrawals		Ratio of Actuals/Expecteds	
			Population Weighted	Liability Weighted	Old	New	Old	New	Old	New
1	3,105	11,496	0.2701	0.1998	0.4000	0.2500	4,598.40	2,874.00	67.5%	108.0%
2	5,454	24,514	0.2225	0.1550	0.1500	0.2000	3,677.10	4,902.80	148.3%	111.2%
3	2,787	16,885	0.1651	0.1158	0.1000	0.1500	1,688.50	2,532.75	165.1%	110.0%
4	1,397	12,344	0.1132	0.0812	0.0406	0.1000	500.88	1,234.40	278.9%	113.2%
5	1,089	11,027	0.0988	0.0756	0.0383	0.0900	422.83	992.43	257.6%	109.7%
6	801	9,759	0.0821	0.0610	0.0362	0.0700	352.80	683.13	227.0%	117.3%
7	549	8,585	0.0639	0.0484	0.0345	0.0550	296.39	472.18	185.2%	116.3%
8	438	7,763	0.0564	0.0443	0.0327	0.0500	254.17	388.15	172.3%	112.8%
9	366	7,174	0.0510	0.0404	0.0312	0.0450	224.07	322.83	163.3%	113.4%
10	283	6,547	0.0432	0.0357	0.0300	0.0400	196.30	261.88	144.2%	108.1%
11	221	6,242	0.0354	0.0299	0.0288	0.0325	179.90	202.87	122.8%	108.9%
12	193	6,125	0.0315	0.0258	0.0276	0.0300	169.30	183.75	114.0%	105.0%
13	171	5,646	0.0303	0.0263	0.0268	0.0275	151.12	155.27	113.2%	110.1%
14	130	5,160	0.0252	0.0225	0.0258	0.0250	133.38	129.00	97.5%	100.8%
15	138	4,661	0.0296	0.0279	0.0250	0.0250	116.74	116.53	118.2%	118.4%
16	95	4,136	0.0230	0.0211	0.0243	0.0225	100.37	93.06	94.6%	102.1%
17	52	3,700	0.0141	0.0126	0.0236	0.0200	87.28	74.00	59.6%	70.3%
18	73	3,351	0.0218	0.0199	0.0231	0.0175	77.42	58.64	94.3%	124.5%
19	56	3,148	0.0178	0.0145	0.0224	0.0150	70.66	47.22	79.3%	118.6%
20	52	2,998	0.0173	0.0162	0.0220	0.0150	65.85	44.97	79.0%	115.6%
21	33	2,767	0.0119	0.0120	0.0216	0.0150	59.64	41.51	55.3%	79.5%
22	47	2,683	0.0175	0.0163	0.0211	0.0150	56.60	40.25	83.0%	116.8%
23	32	2,619	0.0122	0.0116	0.0207	0.0100	54.21	26.19	59.0%	122.2%
24	35	2,490	0.0141	0.0123	0.0203	0.0100	50.48	24.90	69.3%	140.6%
25	27	2,321	0.0116	0.0110	0.0200	0.0100	46.33	23.21	58.3%	116.3%
26	23	2,010	0.0114	0.0116	0.0195	0.0100	39.28	20.10	58.6%	114.4%
27	24	1,691	0.0142	0.0126	0.0191	0.0100	32.35	16.91	74.2%	141.9%
28	13	1,436	0.0091	0.0077	0.0188	0.0100	26.93	14.36	48.3%	90.5%
29	11	1,266	0.0087	0.0069	0.0184	0.0100	23.32	12.66	47.2%	86.9%
30 and over	31	4,192	0.0074	0.0066	0.0175	0.0100	73.51	41.92	42.2%	74.0%
Totals	17,726	184,736	0.0960	0.0345	0.0748	0.0868	13,826.11	16,031.87	128.2%	110.6%

* The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service. In this exhibit, the age-based expected withdrawals are re-categorized on a service basis to illustrate the strong correlation to service.

WITHDRAWAL EXPERIENCE MALES



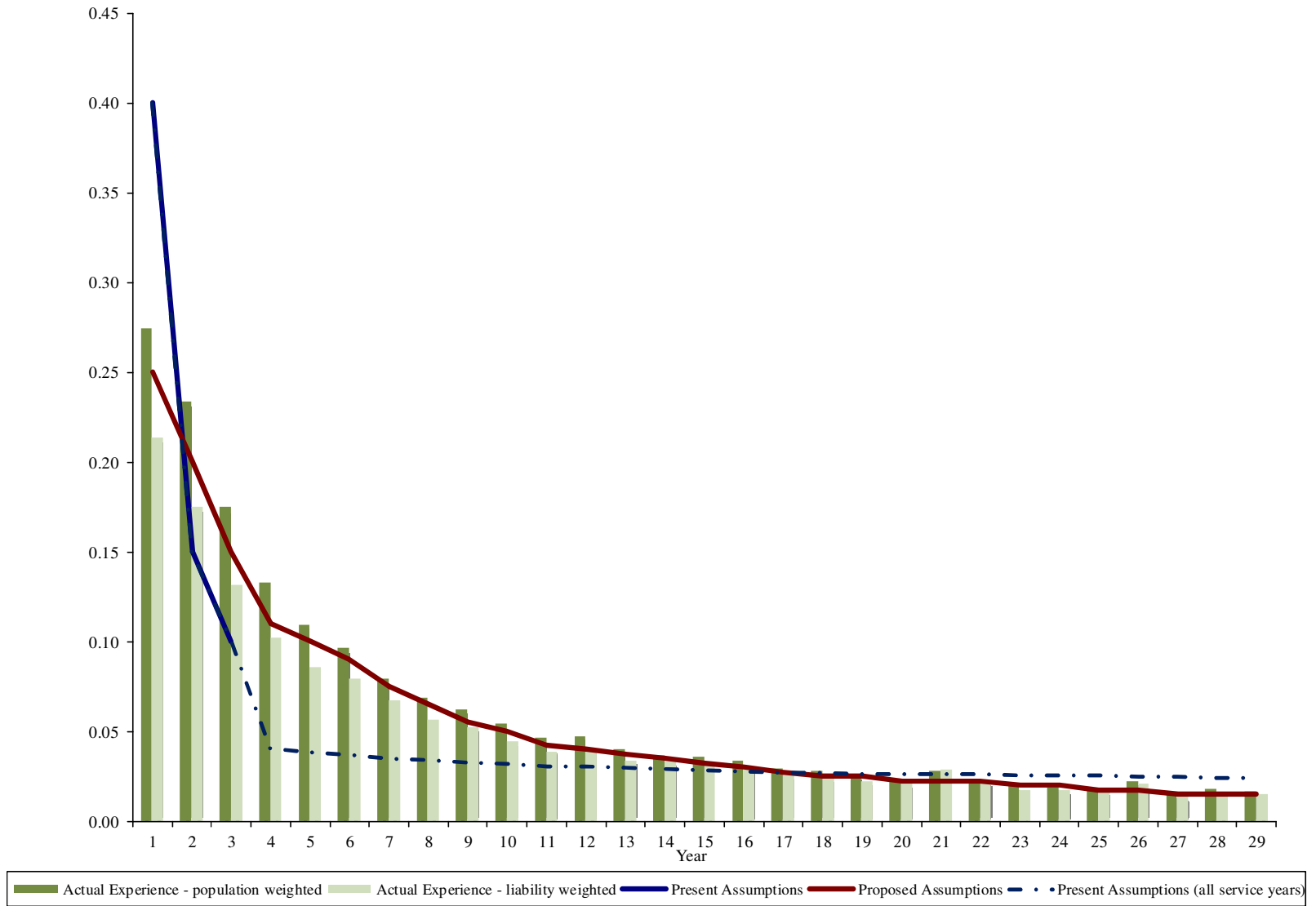
WITHDRAWAL EXPERIENCE

FEMALES

Year	Withdrawal	Exposure	Crude Rates		Sample Rates		Expected Withdrawals		Ratio of Actuals/Expecteds	
			Population Weighted	Liability Weighted	Old	New	Old	New	Old	New
1	6,517	23,768	0.2742	0.2135	0.4000	0.2500	9,507.20	5,942.00	68.5%	109.7%
2	12,995	55,632	0.2336	0.1753	0.1500	0.2000	8,344.80	11,126.40	155.7%	116.8%
3	6,943	39,692	0.1749	0.1316	0.1000	0.1500	3,969.20	5,953.80	174.9%	116.6%
4	4,061	30,458	0.1333	0.1022	0.0406	0.1100	1,237.94	3,350.38	328.0%	121.2%
5	2,935	26,807	0.1095	0.0858	0.0386	0.1000	1,033.52	2,680.70	284.0%	109.5%
6	2,322	24,008	0.0967	0.0795	0.0368	0.0900	882.59	2,160.72	263.1%	107.5%
7	1,718	21,560	0.0797	0.0676	0.0352	0.0750	758.94	1,617.00	226.4%	106.2%
8	1,343	19,469	0.0690	0.0566	0.0339	0.0650	659.20	1,265.49	203.7%	106.1%
9	1,127	18,007	0.0626	0.0527	0.0328	0.0550	591.16	990.39	190.6%	113.8%
10	903	16,611	0.0544	0.0443	0.0319	0.0500	529.13	830.55	170.7%	108.7%
11	735	15,875	0.0463	0.0390	0.0309	0.0425	491.10	674.69	149.7%	108.9%
12	708	15,044	0.0471	0.0397	0.0302	0.0400	454.72	601.76	155.7%	117.7%
13	538	13,423	0.0401	0.0339	0.0296	0.0375	396.80	503.36	135.6%	106.9%
14	442	11,948	0.0370	0.0341	0.0288	0.0350	344.58	418.18	128.3%	105.7%
15	379	10,542	0.0360	0.0321	0.0283	0.0325	298.13	342.62	127.1%	110.6%
16	314	9,215	0.0341	0.0296	0.0278	0.0300	256.13	276.45	122.6%	113.6%
17	232	7,927	0.0293	0.0256	0.0274	0.0275	216.92	217.99	107.0%	106.4%
18	198	6,988	0.0283	0.0244	0.0269	0.0250	188.25	174.70	105.2%	113.3%
19	163	6,265	0.0260	0.0221	0.0266	0.0250	166.81	156.63	97.7%	104.1%
20	136	5,637	0.0241	0.0209	0.0265	0.0225	149.10	126.83	91.2%	107.2%
21	138	4,939	0.0279	0.0287	0.0262	0.0225	129.61	111.13	106.5%	124.2%
22	106	4,465	0.0237	0.0221	0.0260	0.0225	115.93	100.46	91.4%	105.5%
23	82	4,019	0.0204	0.0173	0.0257	0.0200	103.36	80.38	79.3%	102.0%
24	69	3,635	0.0190	0.0175	0.0255	0.0200	92.54	72.70	74.6%	94.9%
25	56	3,192	0.0175	0.0166	0.0253	0.0175	80.67	55.86	69.4%	100.3%
26	61	2,708	0.0225	0.0210	0.0249	0.0175	67.48	47.39	90.4%	128.7%
27	36	2,244	0.0160	0.0139	0.0246	0.0150	55.30	33.66	65.1%	107.0%
28	36	1,968	0.0183	0.0160	0.0244	0.0150	47.94	29.52	75.1%	122.0%
29	30	1,832	0.0164	0.0154	0.0240	0.0150	44.02	27.48	68.2%	109.2%
30 and over	125	6,767	0.0185	0.0168	0.0228	0.0150	154.43	101.51	80.9%	123.1%
Totals	45,448	414,645	0.1096	0.0475	0.0756	0.0966	31,367.50	40,070.73	144.9%	113.4%

* The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service. In this exhibit, the age-based expected withdrawals are re-categorized on a service basis to illustrate the strong correlation to service.

WITHDRAWAL EXPERIENCE FEMALES



SECTION F

DISABILITY EXPERIENCE

DISABILITY EXPERIENCE

The assumed rates of disability (leaving active service due to injury or illness while not entitled to age and service retirement benefits) are a minor ingredient in cost calculations, since the incidence of disability is low. Higher rates of disability generally result in somewhat higher computed contributions, and vice-versa.

Findings

We reviewed the disability experience during the six-year period. The results are shown on the following pages. Overall, the actual number of disability retirements (904) is half of the number projected by the present assumption (1,829 – see chart on the following page).

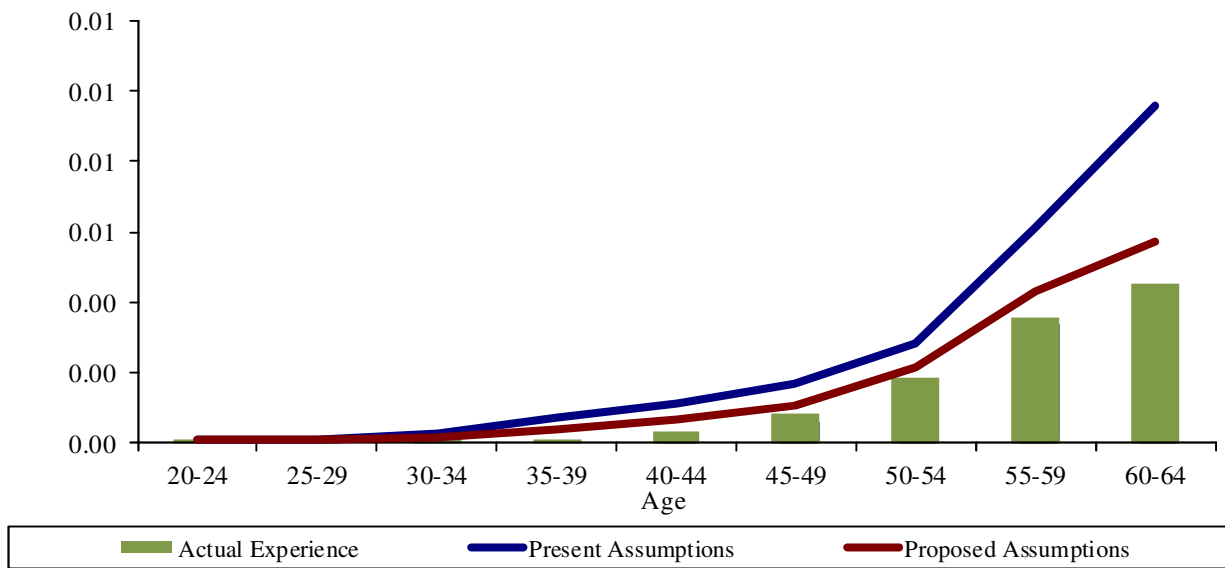
Recommendation

We recommend adopting lower rates of disability at every age.

DISABILITY EXPERIENCE MALES

Male Disability Table

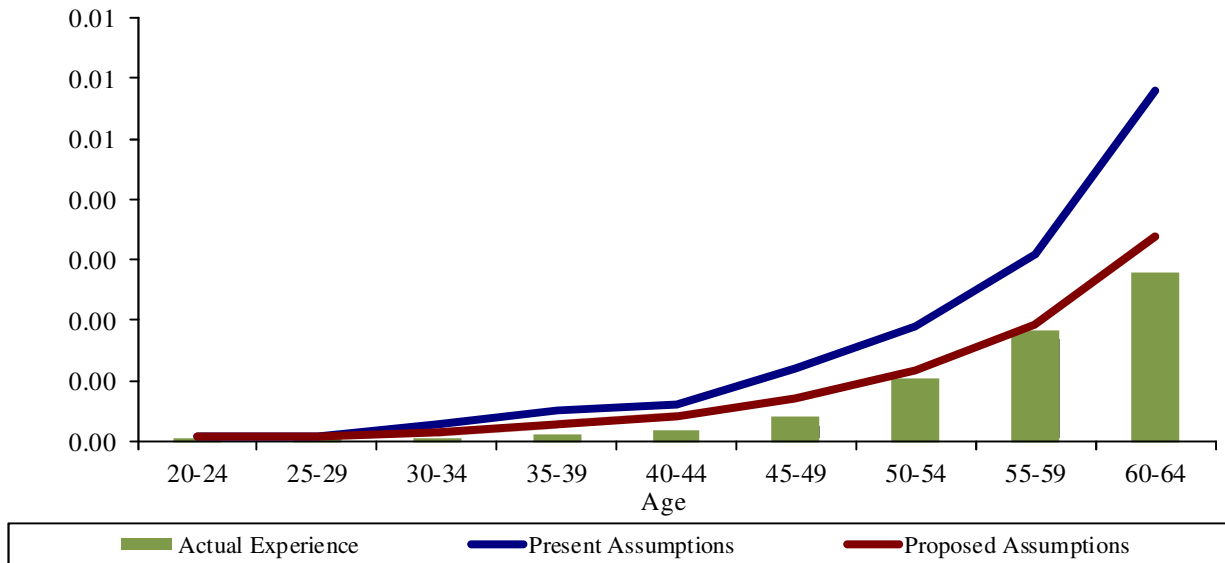
Age	Disabilities	Exposure	Crude Rates	Sample Rates		Expected Disabilities*		Ratio of Actuals/Expecteds	
				Old	New	Old	New	Old	New
Under 20	0	185	0.0000	0.0001	0.0001	0.02	0.02	0.0%	0.0%
20-24	0	7,096	0.0000	0.0001	0.0001	0.71	0.71	0.0%	0.0%
25-29	0	19,607	0.0000	0.0001	0.0001	1.96	1.96	0.0%	0.0%
30-34	2	22,096	0.0001	0.0003	0.0002	6.20	3.72	32.3%	53.8%
35-39	0	22,845	0.0000	0.0007	0.0004	15.15	9.09	0.0%	0.0%
40-44	9	27,352	0.0003	0.0011	0.0007	30.30	18.18	29.7%	49.5%
45-49	27	34,162	0.0008	0.0017	0.0011	60.20	36.12	44.9%	74.8%
50-54	79	43,430	0.0018	0.0028	0.0021	133.87	92.77	59.0%	85.2%
55-59	157	44,181	0.0036	0.0061	0.0043	271.98	190.39	57.7%	82.5%
60-64	140	31,092	0.0045	0.0096	0.0057	291.42	178.11	48.0%	78.6%
Totals	414	252,046	0.0016	0.0032	0.0021	811.81	531.07	51.0%	78.0%



DISABILITY EXPERIENCE FEMALES

Female Disability Table

Age	Disabilities	Exposure	Crude Rates	Sample Rates		Expected Disabilities*		Ratio of Actuals/Expecteds	
				Old	New	Old	New	Old	New
Under 20	0	470	0.0000	0.0001	0.0001	0.05	0.05	0.0%	0.0%
20-24	0	13,906	0.0000	0.0001	0.0001	1.39	1.39	0.0%	0.0%
25-29	0	38,284	0.0000	0.0001	0.0001	3.83	3.83	0.0%	0.0%
30-34	1	42,208	0.0000	0.0003	0.0002	11.86	7.11	8.4%	14.1%
35-39	5	48,024	0.0001	0.0005	0.0003	22.24	13.35	22.5%	37.5%
40-44	12	68,442	0.0002	0.0006	0.0004	45.60	27.36	26.3%	43.9%
45-49	36	89,508	0.0004	0.0012	0.0007	105.04	63.02	34.3%	57.1%
50-54	105	102,495	0.0010	0.0019	0.0012	202.93	121.76	51.7%	86.2%
55-59	169	93,100	0.0018	0.0031	0.0019	298.20	178.92	56.7%	94.5%
60-64	162	58,079	0.0028	0.0058	0.0034	326.18	195.71	49.7%	82.8%
Totals	490	554,516	0.0009	0.0018	0.0011	1,017.32	612.50	48.2%	80.0%



SECTION G

MORTALITY EXPERIENCE

MORTALITY EXPERIENCE

Post-retirement mortality is an important component in cost calculations and should be updated from time to time to reflect current and expected future longevity improvements. Pre-retirement mortality is a relatively minor component in cost calculations. The frequency of pre-retirement deaths is so low that mortality assumptions based on actual experience can only be produced for very large retirement systems, if at all.

Actuarial Standards of Practice

Actuarial Standards of Practice (ASOP) No. 35 Disclosure Section 4.1.1 states, “The disclosure of the mortality assumption should contain sufficient detail to permit another qualified actuary to understand the provision made for future mortality improvement. If the actuary assumes zero mortality improvement after the measurement date, the actuary should state that no provision was made for future mortality improvement.” The current mortality rates used in the valuation include a provision for future mortality improvement.

The New Mortality Tables and Projection Scale

The Society of Actuaries (SOA) released updated mortality tables late in 2014 which reflect the improvement in longevity of the studied group of private pension plan participants, and which also reflects projected future improvements for current and future generations of participants. The new mortality table is called the RP-2014 table. The mortality improvement scale is called the MP-2014 improvement scale. The mortality improvement scale is applied to the RP-2014 table to show the improvements in mortality that are expected to occur.

The SOA has developed combined experience tables and collar-specific experience versions of the RP-2014 tables. The Blue Collar tables have higher mortality rates than the combined tables and the White Collar tables have lower mortality than the combined tables.

Mortality Improvement Observations at a National Level

The updated mortality and mortality improvement tables show that among males age 65, overall longevity rose 2.0 years, from 84.6 in 2000 to 86.6 in 2014. Saying it another way, men age 65 in the year 2000 were expected to live to be 84.6 years old. Men age 65 in the year 2014 were expected to live to be 86.6 years old. For women age 65, overall longevity rose 2.4 years, from age 86.4 in 2000 to age 88.8 in 2014.

MORTALITY EXPERIENCE

Findings

Healthy Retirees

We reviewed the mortality experience of healthy retirees during the six-year period. Due to potential anti-selection bias as well as data needs which are outside the scope of the annual valuation process, we did not include beneficiary and survivor mortality experience in our study. The results are shown on the following pages.

In total, the plan experienced as many male deaths as expected (4,471 actual versus 4,472 expected). While this seems like a good fit, the fit varies by age groups. The actual number of deaths among retired females (5,656) was slightly more than the number projected by the present assumptions (5,595) but the actual number of female deaths at ages below 80 was far below expected while the actual number of female deaths ages above 85 were far above expected.

Disabled Retirees

We reviewed the mortality experience of disabled retirees during the six-year period. The results are shown on the following pages.

The plan experienced fewer deaths among disabled males (247) than projected by the present assumptions (289) and the actual number of male deaths at ages 50 to 70 was far below expected. The actual number of deaths among disabled females (320) was less than the number projected by the present assumptions (384), and the actual number of female deaths at ages 60 to 89 was far below expected.

Due to changes in the way data was reported over the six-year period, disabled members over age 65 were not tracked prior to 2012. As such, we have given more credibility to the rates established by the standard RP-2014 mortality table.

Active Members

We reviewed the mortality experience among active members during the six-year period. The results are shown on the following pages.

The actual number of male deaths among active members (418) was less than the number projected by the present assumption (643). The plan experienced fewer deaths among females (509) than projected by the present assumptions (643).

MORTALITY EXPERIENCE

Recommendations

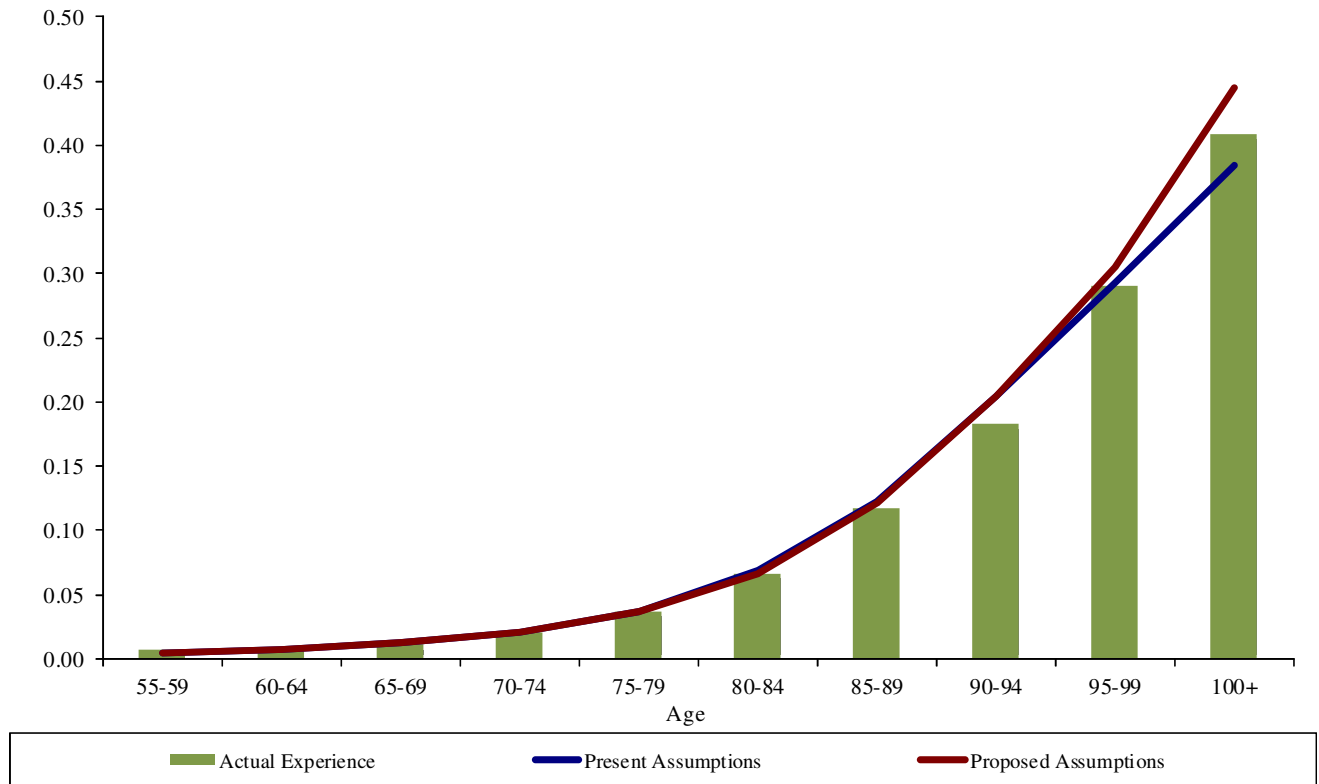
We did not find a published standard table that fit the observed experience at all ages. We focused on cohorts of members that represented a large percentage of counts and liability for each group. For post-retirement mortality, this group included the retirees in the 60 to 89 age group (92% of the total); for post-disability mortality, this group included disabled retirees in the 50 to 79 age group (92% of the total). As such, we recommend adoption of the RP-2014 mortality tables, with adjustments in order to produce a better fit to observed experience when possible. In some cases, even after adjustments, the fit was not uniform and we put more credibility on the rates in the published table than the plan's experience over the past six years. We recommend adoption of the following mortality tables:

Healthy Male Retirees:	RP-2014 Male Healthy Annuitant Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2014. Rates are set forward two years.
Healthy Female Retirees:	RP-2014 Female Healthy Annuitant Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2014. Rates are multiplied by a factor of 0.90.
Disabled Male Retirees:	RP-2014 Male Disabled Mortality Table, adjusted for mortality improvements using projection scale MP-2014. Rates are set forward one year.
Disabled Female Retirees:	RP-2014 Female Disabled Mortality Table, adjusted for mortality improvements using projection scale MP-2014. Rates are set forward six years.
Male Active Members:	RP-2014 Male Employee Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2014. Rates are set forward one year.
Female Active Members:	RP-2014 Female Employee Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2014. Rates are set back one year.

POST-RETIREMENT MORTALITY EXPERIENCE HEALTHY MALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old	New*	Old	New*	Old	New*
55-59	36	5,290	0.006805	0.004602	0.005033	25.06	27.88	143.7%	129.1%
60-64	151	18,660	0.008092	0.007044	0.007298	137.04	140.64	110.2%	107.4%
65-69	331	27,569	0.012006	0.012339	0.011994	339.26	330.51	97.6%	100.1%
70-74	503	24,210	0.020777	0.020384	0.020745	488.71	497.92	102.9%	101.0%
75-79	764	20,406	0.037440	0.037073	0.036338	748.07	734.11	102.1%	104.1%
80-84	1,005	15,072	0.066680	0.068910	0.065950	1,017.22	973.84	98.8%	103.2%
85-89	973	8,280	0.117512	0.122921	0.120932	980.79	964.18	99.2%	100.9%
90-94	554	3,025	0.183140	0.204206	0.204807	589.81	589.59	93.9%	94.0%
95-99	145	500	0.290000	0.293163	0.305529	138.68	143.38	104.6%	101.1%
100+	9	22	0.409091	0.384386	0.444838	7.79	8.44	115.5%	106.6%
Totals	4,471	123,034	0.036340	0.036351	0.035848	4,472.43	4,410.49	100.0%	101.4%

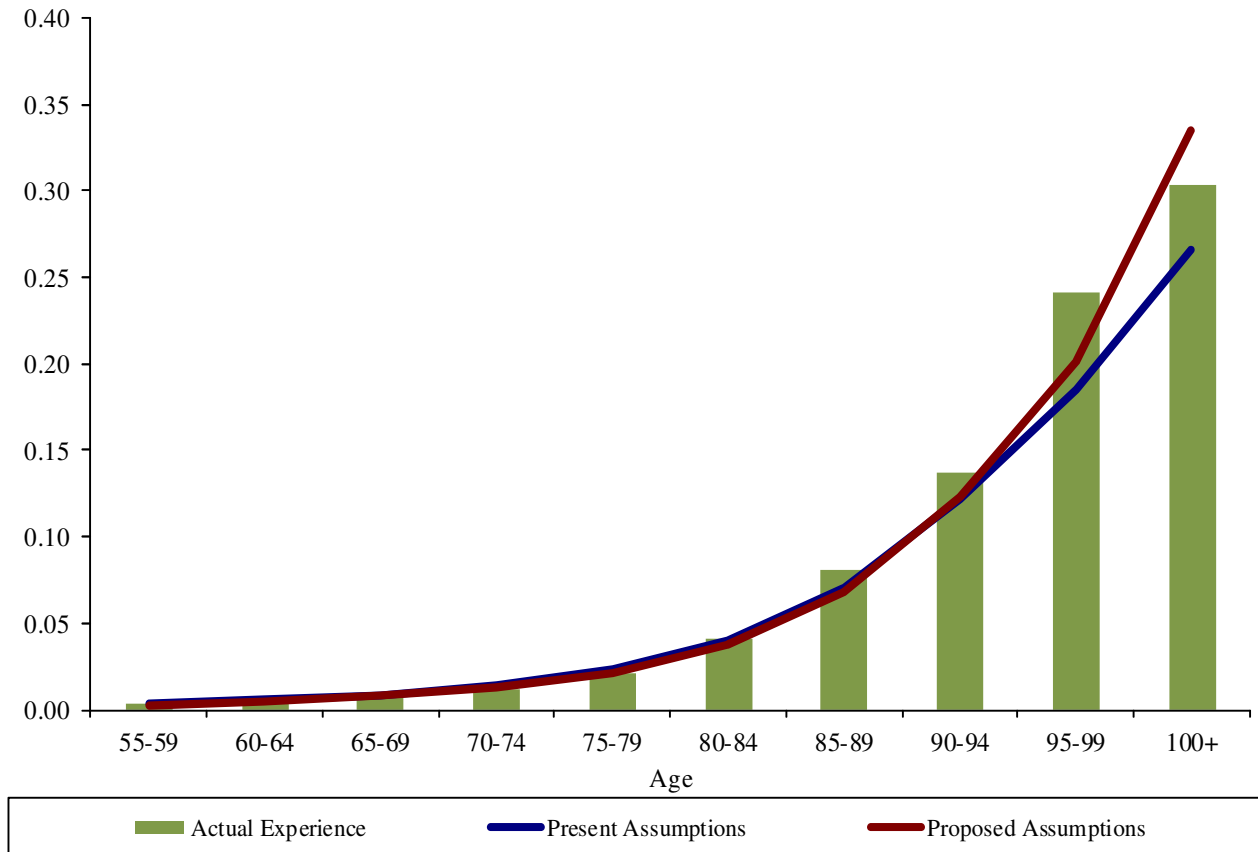
** In order to show the fit for the six-year period of the study, New Sample Rates and New Expected Deaths were determined using the proposed mortality rates for 2014 projected backwards to the mid-point of the study using projection scale MP-2014.*



POST-RETIREMENT MORTALITY EXPERIENCE HEALTHY FEMALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old	New*	Old	New*	Old	New*
55-59	29	9,428	0.003076	0.003227	0.002875	33.16	28.67	87.5%	101.2%
60-64	145	34,673	0.004182	0.005347	0.004649	192.02	168.43	75.5%	86.1%
65-69	386	58,029	0.006652	0.008697	0.007705	505.86	448.45	76.3%	86.1%
70-74	582	50,265	0.011579	0.014451	0.012585	717.29	625.21	81.1%	93.1%
75-79	774	36,954	0.020945	0.023846	0.021236	869.01	773.96	89.1%	100.0%
80-84	1,056	26,292	0.040164	0.040240	0.037402	1,040.42	966.12	101.5%	109.3%
85-89	1,262	15,751	0.080122	0.070377	0.068236	1,071.75	1,039.54	117.8%	121.4%
90-94	942	6,915	0.136226	0.122066	0.122945	811.74	813.83	116.0%	115.7%
95-99	428	1,778	0.240720	0.185475	0.201081	312.59	335.26	136.9%	127.7%
100+	52	172	0.302326	0.265296	0.335140	40.06	48.34	129.8%	107.6%
Totals	5,656	240,257	0.023541	0.023283	0.021842	5,593.90	5,247.81	101.1%	107.8%

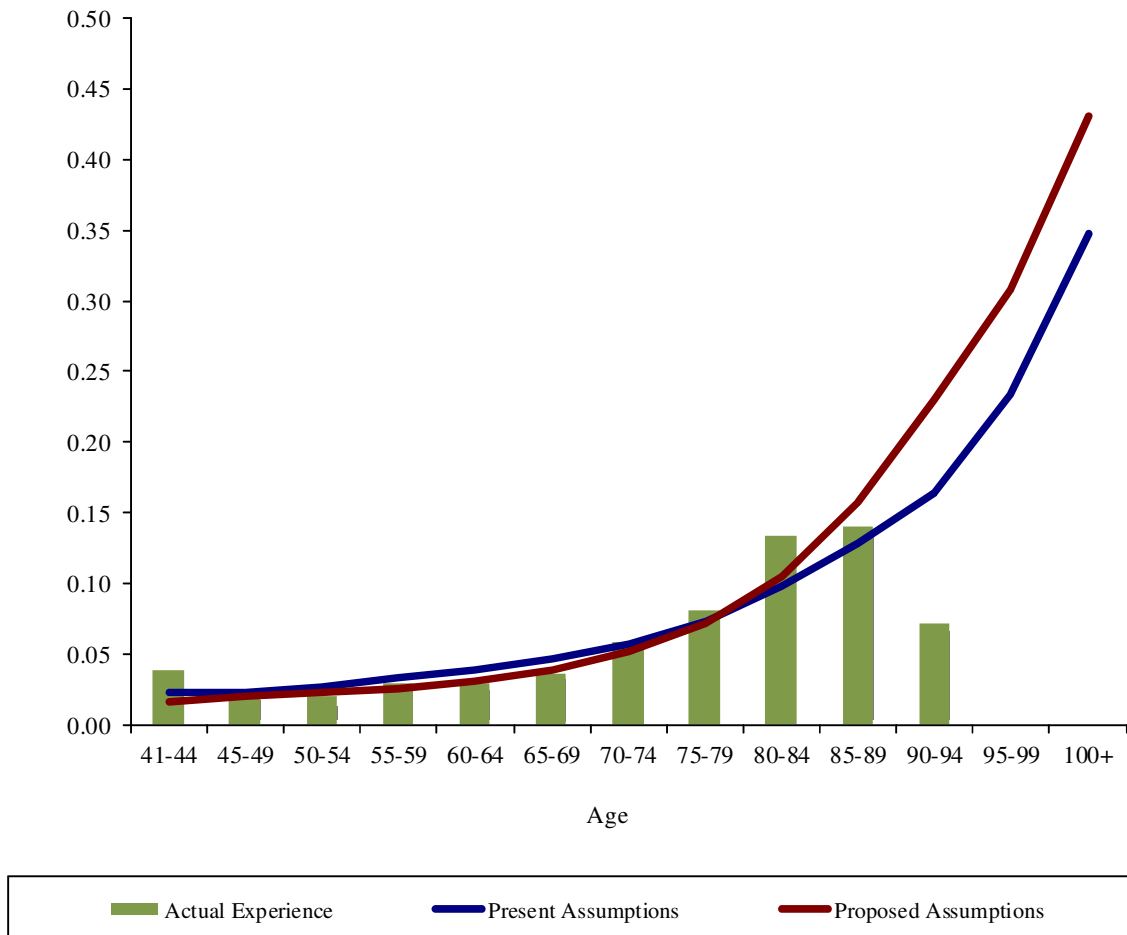
** In order to show the fit for the six-year period of the study, New Sample Rates and New Expected Deaths were determined using the proposed mortality rates for 2014 projected backwards to the mid-point of the study using projection scale MP-2014.*



POST-RETIREMENT MORTALITY EXPERIENCE DISABLED MALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old	New*	Old	New*	Old	New*
41-44	2	52	0.038462	0.022571	0.016869	1.17	0.89	170.9%	224.7%
45-49	5	217	0.023041	0.022571	0.020571	4.90	4.55	102.0%	109.9%
50-54	15	783	0.019157	0.026407	0.023419	21.07	18.47	71.2%	81.2%
55-59	46	1,568	0.029337	0.032857	0.025767	52.00	40.63	88.5%	113.2%
60-64	68	2,390	0.028452	0.039360	0.030288	94.20	72.50	72.2%	93.8%
65-69	45	1,253	0.035914	0.046704	0.038572	56.97	46.40	79.0%	97.0%
70-74	21	362	0.058011	0.057154	0.051660	20.70	18.71	101.4%	112.2%
75-79	18	225	0.080000	0.073623	0.071969	16.35	15.93	110.1%	113.0%
80-84	19	143	0.132867	0.097901	0.104460	13.87	14.74	137.0%	128.9%
85-89	7	50	0.140000	0.128458	0.157060	6.25	7.52	112.0%	93.1%
90-94	1	14	0.071429	0.163687	0.230047	2.22	3.08	45.0%	32.5%
95-99	0	0	0.000000	0.233644	0.307766	0.00	0.00	N/A	N/A
100+	0	0	0.000000	0.347706	0.430935	0.00	0.00	N/A	N/A
Totals	247	7,057	0.035001	0.041051	0.034493	289.70	243.42	85.3%	101.5%

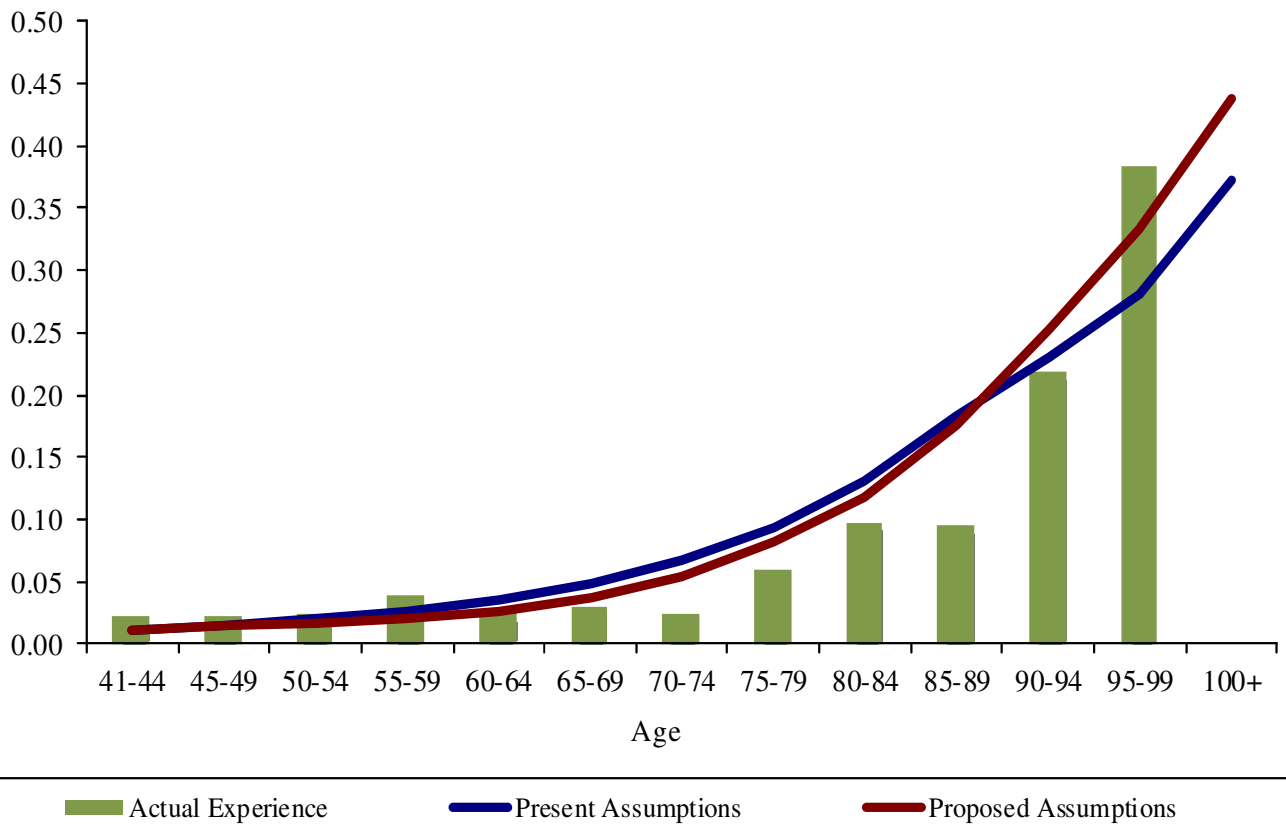
* In order to show the fit for the six-year period of the study, New Sample Rates and New Expected Deaths were determined using the proposed mortality rates for 2014 projected backwards to the mid-point of the study using projection scale MP-2014.



POST-RETIREMENT MORTALITY EXPERIENCE DISABLED FEMALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old	New*	Old	New*	Old	New*
41-44	3	130	0.023077	0.011105	0.011769	1.49	1.53	201.3%	196.1%
45-49	11	463	0.023758	0.015512	0.013866	7.36	6.42	149.5%	171.3%
50-54	29	1,147	0.025283	0.020781	0.016617	24.26	19.06	119.5%	152.2%
55-59	84	2,068	0.040619	0.026719	0.020445	55.75	42.28	150.7%	198.7%
60-64	70	2,704	0.025888	0.035534	0.026794	96.34	72.45	72.7%	96.6%
65-69	54	1,775	0.030423	0.049104	0.036315	83.89	64.46	64.4%	83.8%
70-74	14	576	0.024306	0.068066	0.054896	38.59	31.62	36.3%	44.3%
75-79	20	335	0.059701	0.094246	0.082448	31.31	27.62	63.9%	72.4%
80-84	15	153	0.098039	0.131539	0.118431	19.47	18.12	77.0%	82.8%
85-89	8	84	0.095238	0.182609	0.176071	15.04	14.79	53.2%	54.1%
90-94	7	32	0.218750	0.230575	0.252188	7.30	8.07	95.9%	86.7%
95-99	5	13	0.384615	0.280105	0.332308	3.51	4.32	142.5%	115.7%
100+	0	0	0.000000	0.373040	0.437659	0.00	0.00	N/A	N/A
Totals	320	9,480	0.033755	0.040539	0.032778	384.31	310.74	83.3%	103.0%

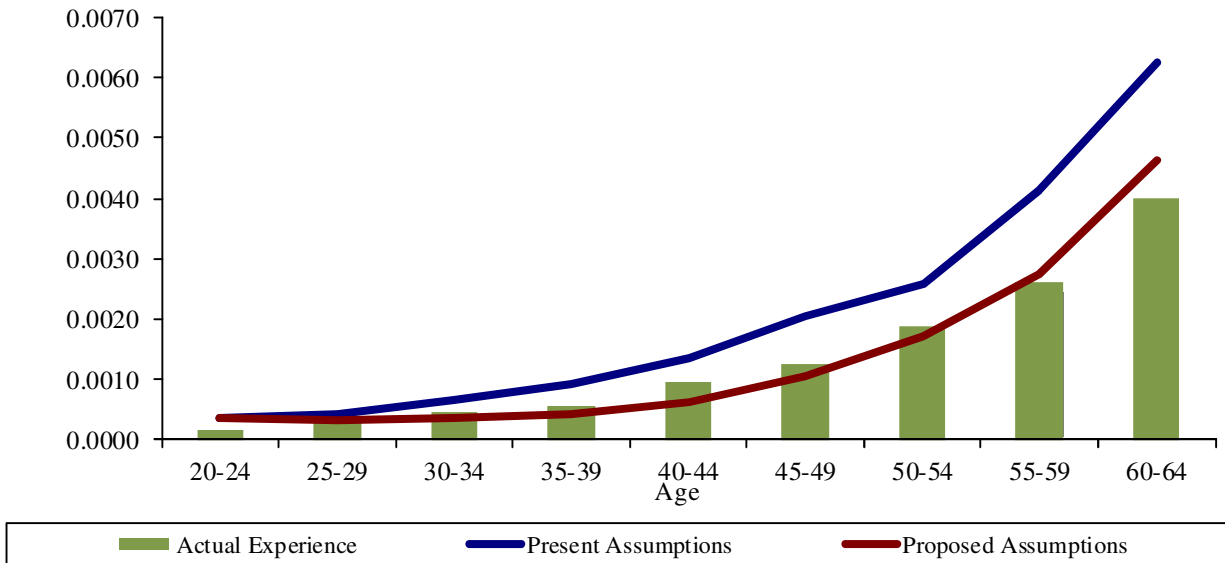
* In order to show the fit for the six-year period of the study, New Sample Rates and New Expected Deaths were determined using the proposed mortality rates for 2014 projected backwards to the mid-point of the study using projection scale MP-2014.



PRE-RETIREMENT MORTALITY EXPERIENCE HEALTHY MALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old	New*	Old	New*	Old	New*
Under 20	0	185	0.0000	0.0003	0.0003	0.06	0.06	0.0%	0.0%
20-24	1	7,096	0.0001	0.0004	0.0004	2.64	2.64	37.9%	37.9%
25-29	7	19,607	0.0004	0.0004	0.0003	8.18	6.48	85.6%	108.0%
30-34	10	22,096	0.0005	0.0007	0.0004	14.66	7.86	68.2%	127.2%
35-39	12	22,845	0.0005	0.0009	0.0004	21.34	9.69	56.2%	123.8%
40-44	26	27,352	0.0010	0.0013	0.0006	36.67	16.84	70.9%	154.4%
45-49	42	34,162	0.0012	0.0020	0.0011	69.82	36.04	60.2%	116.5%
50-54	81	43,430	0.0019	0.0026	0.0017	112.10	74.43	72.3%	108.8%
55-59	115	44,181	0.0026	0.0041	0.0027	183.26	120.70	62.8%	95.3%
60-64	124	31,092	0.0040	0.0062	0.0046	194.22	143.90	63.8%	86.2%
Totals	418	252,046	0.0017	0.0026	0.0017	642.94	418.64	65.0%	99.8%

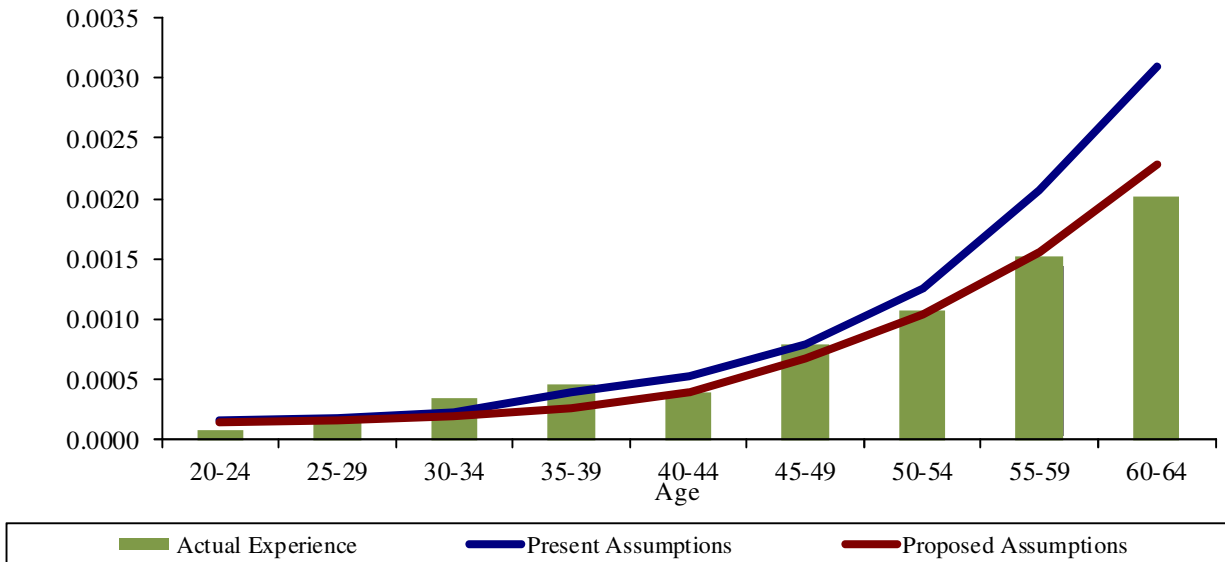
** In order to show the fit for the six-year period of the study, New Sample Rates and New Expected Deaths were determined using the proposed mortality rates for 2014 projected backwards to the mid-point of the study using projection scale MP-2014.*



PRE-RETIREMENT MORTALITY EXPERIENCE HEALTHY FEMALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old	New*	Old	New*	Old	New*
Under 20	0	470	0.0000	0.0001	0.0001	0.07	0.07	0.0%	0.0%
20-24	1	13,906	0.0001	0.0002	0.0001	2.21	2.06	45.3%	48.5%
25-29	7	38,284	0.0002	0.0002	0.0002	6.56	6.07	106.7%	115.3%
30-34	14	42,208	0.0003	0.0002	0.0002	9.83	8.20	142.4%	170.7%
35-39	22	48,024	0.0005	0.0004	0.0003	18.62	12.65	118.1%	173.9%
40-44	27	68,442	0.0004	0.0005	0.0004	35.49	27.45	76.1%	98.4%
45-49	70	89,508	0.0008	0.0008	0.0007	70.32	59.92	99.5%	116.8%
50-54	110	102,495	0.0011	0.0013	0.0010	128.47	107.27	85.6%	102.5%
55-59	141	93,100	0.0015	0.0021	0.0015	191.85	143.89	73.5%	98.0%
60-64	117	58,079	0.0020	0.0031	0.0023	179.60	132.99	65.1%	88.0%
Totals	509	554,516	0.0009	0.0012	0.0009	643.03	500.57	79.2%	101.7%

* In order to show the fit for the six-year period of the study, New Sample Rates and New Expected Deaths were determined using the proposed mortality rates for 2014 projected backwards to the mid-point of the study using projection scale MP-2014.



SECTION H
ACTUARIAL METHODS

ASSET VALUATION METHOD

Background

Employer contribution calculations are based on a smoothed asset valuation method (the actuarial value of assets). Such smoothed valuation methods aid in developing a contribution amount calculated to remain approximately level from year to year.

Per Minnesota Statute 356.215(f), the actuarial value of assets is based on a five-year moving average of expected and market values determined as follows:

- At the end of each plan year, an average asset value is calculated as the average of the market asset value at the beginning and end of the fiscal year, net of investment income for the fiscal year;
- The investment gain or (loss) is equal to the excess of actual investment income over the expected investment income based on the average asset value as calculated above;
- The investment gain or (loss) so determine is recognized over five years at 20% per year; and
- The asset value is the sum of the expected asset value plus the schedule recognition of investment gains or (losses) during the current and the preceding four plan years.

During periods when investment performance exceeds the assumed rate, the actuarial value of assets will tend to be less than the market value of assets. During periods when investment performance is less than the assumed rate, the actuarial value of assets will tend to be greater than the market value of assets. If assumed rates are exactly realized for four consecutive years, the actuarial value of assets will become equal to market value of assets.

This asset valuation method satisfies current standards of practice, which require that the asset valuation method reflect some function of market value, be unbiased in relation to market value, and recognize gains and losses consistently and over a reasonable period.

In 2007, the Actuarial Standards Board issued a standard on asset valuation methods which requires that the asset valuation method bear a reasonable relationship to current market value. There may be some concern that if the deviation between the funding value of assets and the market value of assets becomes too large, it could be considered unreasonable. The alternative to allowing large deviations usually involves setting upper and lower bounds (corridors) for the relationship between funding value and market value. Once a corridor limit is reached, any further market experience in the same direction is recognized immediately, which can introduce substantial fluctuations in the results of the actuarial valuation. If a 20% corridor were applied to the June 30, 2014 actuarial value of assets, it would not change the numerical result (the asset value would be unchanged).

Recommendation

We recommend continued use of the current asset valuation method. PERA should continue to consider results based on the market value of assets as well as the actuarial value of assets, especially when the two values are significantly different.

FUNDING POLICY – ACTUARIAL FUNDING METHOD

An actuarial funding method is a set of techniques for conversion of the actuarial present values of benefits into contribution information. Minnesota Statute requires the actuary to use the entry age actuarial cost method, characterized by:

1. Normal Cost – the level percent of payroll contribution, paid from each member’s date of plan entry to date of retirement, which will accumulate enough assets at retirement to fund the member’s projected benefits from retirement to death.
2. Actuarial Accrued Liability – the assets which would have accumulated to date had contributions been made at the level of the normal cost since the date of the first benefit accrual, all actuarial assumptions had been exactly realized, and there had been no benefit changes.

The total contribution produced by an actuarial method is the total of the normal cost and an amount to amortize any unfunded actuarial accrued liability.

The entry age actuarial method is the most prevalent funding method in the public sector. It is appropriate for the public sector because it produces costs that remain stable as a percentage of payroll over time, resulting in intergenerational equity for taxpayers.

Recommendations

We recommend continued use of the entry age actuarial cost method.

FUNDING POLICY – AMORTIZATION

Amortization Period

Minnesota Statute 356.215, Subdivision 11 specifies the established date for full funding of the General Employees Retirement Plan (GERP). A provision that re-determines the statutory amortization date when the unfunded actuarial accrued liability increases due to changes in benefits, assumptions, or methods resulted in the amortization date moving from June 30, 2031 to June 30, 2033 in 2014.

The June 30, 2014 actuarial valuation amortizes the UAAL over a 19-year period. We suggest that the present practice of decreasing the amortization period each year by one year (like a typical mortgage) be continued.

Past practice has typically been to re-establish a new 30-year statutory amortization period occasionally in order to minimize volatility and manage cost requirements. This practice shifts costs to the future. In lieu of this, PERA could consider using a shorter maximum period, such as 15, 20 or 25 years. Actuarial practice, including Governmental Accounting Standards Board policy, is moving toward shorter amortization periods than in the past. Another option to consider is the use of “layered” amortization – which continues to amortize the initial unfunded liability over the closed amortization period, but spreads out gains and losses as they occur over a separate closed period. This methodology maintains steady progress toward eliminating the unfunded liability, but mitigates the volatility caused by gains and losses. We would be happy to provide more information and analysis on this topic.

Amortization Method

Because GERP is an open retirement plan (new employees enter the plan), level percent of payroll amortization payments are used.

Longer amortization periods combined with the level percent of pay methodology results in initial payments that are less than the “interest only” payment on the unfunded actuarial accrued liability, i.e., “negative amortization.” Payments less than the interest only amount will result in the UAAL increasing for an initial period of time. With 18 years remaining as of June 30, 2015, calculated GERP amortization payments are expected to exceed the interest only amount.

It should be noted that actual growth in GERP payroll over the past six years has fallen short of the expected rate of 3.75% (proposed payroll growth rate is 3.50%). When payroll grows slower than expected, contributions collected will also be less than expected, and insufficient to eliminate the UAAL by the statutory amortization date. Some plans address this issue by not permitting the payroll growth assumption to exceed the actual average growth rate over the past 5 years. If payroll growth continues to fall short of expectations, a method change should be considered.

Recommendation

We recommend continued use of the current amortization policy of reducing the amortization period each year by one year until the next study, at which point the method should be re-evaluated. We also recommend continued use of the level percent of payroll amortization method.

FUNDING POLICY – POST-RETIREMENT BENEFIT INCREASES

Valuation of Future Post-Retirement Benefit Increases

If the plan has reached the funding ratio threshold required to pay a 2.5% benefit increase, Minnesota Statutes require the 2.5% benefit increase rate to be reflected in the liability calculations. If the plan has not yet reached the threshold required to pay a 2.5% benefit increase, Minnesota Statutes require a projection to be performed to determine the expected attainment of the funding ratio threshold, and the expected reversion to a 2.5% benefit increase rate must be reflected in the liability calculations. As of June 30, 2014, based on projection methodology described in the GERP valuation report, the benefit increase rate was assumed to increase to 2.5% on January 1, 2027. The date will be re-determined as of each valuation date.

Recommendation

We recommend continued use of the methodologies described above, with one refinement. We recommend that the benefit increase date assumed for valuation purposes never be later than the statutory amortization date. This will produce required contributions that are more consistent with the funding policy goal of eliminating unfunded liabilities by the statutory amortization date.

FUNDING POLICY – PROJECTED PAYROLL

Required contributions are expressed as a percent of payroll. The Minnesota Standards for Actuarial Work state that the projected payroll will be developed from the reported payroll in the base year by increasing each person's pay by one full year's pay increase according to the actuarial salary scale. This appears to make sense on the surface, but in our judgement such a calculation is not fully in compliance with level percent of payroll funding. There are two issues:

1. With respect to the total payroll used for the amortization of the unfunded liability: Total payroll is expected to increase at 3.75% according to the actuarial assumptions. (This experience study is proposing a change to this assumption, from 3.75% to 3.50%). The total payroll, increased at the assumed payroll growth rate (currently 3.75%) is the proper series of payroll amounts over which to fund the unfunded liability. The first year payroll stated in the Minnesota Standards is not consistent with this principle.
2. With respect to the normal cost dollar amount: The normal cost percentage for active members is developed as the ratio of the present value of future benefits at entry age to the present value of future pay at entry age. The present value of future pay must take into account both the timing of pay increases within the year, and the probability that an individual may exit the active member group during the year. The first year payroll stated in the Minnesota Standards is not mathematically consistent with this principle since it assumes the member will earn an entire year of payroll, even though there may be a probability of decrement for the member during the year.

Recommendation

We recommend that the Minnesota Standards for Actuarial Practice be amended to be less prescriptive and more principles-based, so that the actuaries for the systems may use their best judgment to calculate contribution rates and liabilities in a mathematically consistent manner and in accordance with actuarial standards of practice.

SECTION I

MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

MARITAL STATUS

Married members will frequently make different annuity selections than non-married members. The current valuation assumption is 75% of male members are married and 70% of female members are married. Actual marital status is used for retired members.

Findings

We reviewed the marital status of healthy members retiring from active status during the six-year period. The results are shown below.

Gender	Married New Retirees	Total New Retirees	Crude Rates	Sample Rates		Expected Married Retirees		Ratio of Actuals/Expecteds	
				Old	New	Old	New	Old	New
Males	5,024	6,279	0.8001	0.7500	0.8000	4,709.25	5,023.20	106.7%	100.0%
Females	7,417	10,301	0.7200	0.7000	0.7000	7,210.70	7,210.70	102.9%	102.9%
Total	12,441	16,580	0.7504			11,919.95	12,233.90	104.4%	101.7%

The experience shows that more new retirees are married than expected, especially for males.

Recommendation

We recommend increasing the assumed percentage of members that are married to 80% for males. We recommend keeping the assumed percentage of members that are married at 70% for females.

AGE OF SURVIVOR

Joint & Survivor annuity benefit amounts are determined based on the member's and survivor's age. Currently, the valuation assumes that male members have a beneficiary three years younger and female members have a beneficiary two years older.

Findings

We reviewed the ages of married new retirees and their beneficiaries during the six-year period. The results are shown below.

Gender	Married New Retirees	Average Age Difference	Expected Age Difference		Ratio of Actuals/Expecteds	
			Old	New	Old	New
Males	5,024	2.95	3.00	3.00	98.2%	98.2%
Females	7,417	(1.65)	(2.00)	(2.00)	82.3%	82.3%
Total	12,441					

The experience shows that the age differences are slightly less than expected, but still consistent with the current assumption when viewed in whole years. This experience is consistent with the experience from the prior study.

Recommendation

We recommend no change to the age difference assumption for new married retirees.

FORM OF PAYMENT

Upon retirement, a member can elect any of the following forms of payment:

- Single-life annuity – the benefit is paid for the lifetime of the member. No benefit is payable to a beneficiary upon the member’s death.
- 25% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 25% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.
- 50% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 50% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.
- 75% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 75% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.
- 100% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 100% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.

There is no actuarial reduction for the bounce-back feature (i.e., this is subsidized by the plan). Married members retiring from active status are currently assumed to elect annuities as follows:

Males:	5% elect 25% Joint & Survivor option
	15% elect 50% Joint & Survivor option
	10% elect 75% Joint & Survivor option
	30% elect 100% Joint & Survivor option
Females:	5% elect 25% Joint & Survivor option
	5% elect 50% Joint & Survivor option
	5% elect 75% Joint & Survivor option
	15% elect 100% Joint & Survivor option

Remaining married and unmarried members are assumed to elect the Single-life option.

Findings

We reviewed the benefit elections of married new retirees and their beneficiaries during the six-year period. The results are shown on the following pages.

We found slightly more married new retirees are electing the joint & survivor options for both males and females.

Recommendation

We recommend increasing the assumed percentage of males electing the 25% and 100% joint and survivor annuity and reducing the assumed percentage of males electing the single life annuity accordingly. Similarly, we recommend increasing the assumed percentage of females electing the 25% and 50% joint & survivor annuity and reducing the assumed percentage of females electing the single life annuity accordingly.

FORM OF PAYMENT

Male Experience

Form of Payment	Actual Electing Annuity	Married New Retirees	Crude Rates	Sample Rates		Expected		Ratio of	
						Electing Annuity		Actuals/Expecteds	
						Old	New	Old	New
Single-life annuity	1,381	5,024	0.2749	0.4000	0.3000	2,009.60	1,507.20	68.7%	91.6%
25% joint & survivor	439	5,024	0.0874	0.0500	0.1000	251.20	502.40	174.8%	87.4%
50% joint & survivor	861	5,024	0.1714	0.1500	0.1500	753.60	753.60	114.3%	114.3%
75% joint & survivor	521	5,024	0.1037	0.1000	0.1000	502.40	502.40	103.7%	103.7%
100% joint & survivor	1,822	5,024	0.3627	0.3000	0.3500	1,507.20	1,758.40	120.9%	103.6%
Total	5,024	5,024	1.0000	1.0000	1.0000	5,024.00	5,024.00		

Female Experience

Form of Payment	Actual Electing Annuity	Married New Retirees	Crude Rates	Sample Rates		Expected		Ratio of	
						Electing Annuity		Actuals/Expecteds	
						Old	New	Old	New
Life annuity	4,429	7,417	0.5971	0.7000	0.6000	5,191.90	4,450.20	85.3%	99.5%
25% joint & survivor	670	7,417	0.0903	0.0500	0.1000	370.85	741.70	180.7%	90.3%
50% joint & survivor	782	7,417	0.1054	0.0500	0.1000	370.85	741.70	210.9%	105.4%
75% joint & survivor	254	7,417	0.0342	0.0500	0.0500	370.85	370.85	68.5%	68.5%
100% joint & survivor	1,282	7,417	0.1728	0.1500	0.1500	1,112.55	1,112.55	115.2%	115.2%
Total	7,417	7,417	1.0000	1.0000	1.0000	7,417.00	7,417.00		

ACTUARIAL EQUIVALENT OPTIONAL FORM FACTORS

Joint and Survivor benefits are actuarially equivalent to the Single-life annuity. Current actuarial equivalent factors are based on the RP-2000 mortality table for healthy annuitants, white collar adjustment, projected to 2025, females set back two years and no setback for males, blended 45% males, 7.5% post-retirement interest and 8.5% pre-retirement interest. The interest rate will change to 6.5% on the earlier of the effective date of the next mortality adjustment or July 1, 2017.

Recommendation

We recommend the actuarial equivalent factors be updated to reflect changes in expected mortality, interest rate, and benefit increase assumption.

PROPOSED MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

Background

A number of miscellaneous and technical assumptions are used in the actuarial valuation. The present assumptions are listed on the following page.

Recommendation

Miscellaneous and Technical Assumptions are listed on page I-7. We recommend that the Liability Adjustments related to Combined Service Annuities be reviewed and updated. This assumption has been unchanged since 2002. We recommend continued use of the other Miscellaneous and Technical Assumptions.

MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

<i>Benefit Service</i>	Exact fractional service is used to determine the amount of benefit payable.
<i>Decrement Operation</i>	Withdrawal decrements do not operate during retirement eligibility.
<i>Decrement Timing</i>	Decrements of all types are assumed to occur mid-year.
<i>Eligibility Testing</i>	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.
<i>Forfeitures</i>	For vested separations from service, it is assumed that members separating will withdraw their contributions and forfeit an employer financed benefit when the value of member contributions is greater than the value of the employer financed benefit.
<i>Incidence of Contributions</i>	Contributions are assumed to be received on a monthly basis, per the Standards of Actuarial Work.
<i>Liability Adjustments</i>	Liabilities for active members are increased by 0.80% and liabilities for former members are increased by 60.00% to account for the effect of some participants having eligibility for a Combined Service Annuity. We are unable to judge the reasonableness of this assumption without additional data and without performing a substantial amount of additional work beyond the scope of this assignment.
<i>Pay Increase Timing</i>	Pay increases were assumed to be at the beginning of the fiscal year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.
<i>Service Credit Accruals</i>	Members were assumed to accrue one year of service credit per year.

SECTION J

PROPOSED ASSUMPTION LISTING

**PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2008-2014 EXPERIENCE STUDY**

MERIT AND SENIORITY PAY INCREASES

% Merit & Seniority Increases in Salaries Next Year	
Year	Rate
1	8.00%
2	5.00%
3	3.50%
4	2.50%
5	2.00%
6	1.70%
7	1.40%
8	1.30%
9	1.20%
10	1.00%
11	0.75%
12	0.60%
13	0.50%
14	0.40%
15	0.40%
16	0.35%
17	0.30%
18	0.25%
19	0.25%
20	0.25%
21	0.25%
22	0.20%
23	0.10%
24	0.10%
25	0.10%
26	0.00%
27	0.00%
28	0.00%
29	0.00%
30	0.00%
31+	0.00%

**PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2008-2014 EXPERIENCE STUDY**

**AGE & SERVICE RETIREMENT PATTERN
UNREDUCED (NORMAL) RETIREMENT**

Age	% Retiring
65	32.5%
66	25.0%
67	20.0%
68	17.5%
69	15.0%
70	17.5%
71+*	100.0%

* *The current assumption prescribed by the Minnesota Standards for Actuarial Work is that members who have reached 100% retirement eligibility will delay retirement one year.*

**PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2008-2014 EXPERIENCE STUDY**

RULE OF 90 RETIREMENT PATTERN

Age	% Retiring
55	20.0%
56	15.0%
57	15.0%
58	15.0%
59	15.0%
60	15.0%
61	18.0%
62	35.0%
63	25.0%
64	25.0%

**PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2008-2014 EXPERIENCE STUDY**

**AGE & SERVICE RETIREMENT PATTERN
TIER 1 REDUCED (EARLY) RETIREMENT**

Age	% Retiring
55	5.0%
56	5.0%
57	5.0%
58	6.0%
59	7.0%
60	8.0%
61	10.0%
62	20.0%
63	20.0%
64	25.0%

**PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2008-2014 EXPERIENCE STUDY**

**AGE & SERVICE RETIREMENT PATTERN
TIER 2 REDUCED (EARLY) RETIREMENT**

Age	% Retiring
55	5.0%
56	5.0%
57	5.0%
58	5.0%
59	6.0%
60	7.0%
61	9.0%
62	15.0%
63	15.0%
64	15.0%
65	25.0%

**PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2008-2014 EXPERIENCE STUDY**

WITHDRAWAL

Year	% Withdrawals	
	Male	Female
1	0.2500	0.2500
2	0.2000	0.2000
3	0.1500	0.1500
4	0.1000	0.1100
5	0.0900	0.1000
6	0.0700	0.0900
7	0.0550	0.0750
8	0.0500	0.0650
9	0.0450	0.0550
10	0.0400	0.0500
11	0.0325	0.0425
12	0.0300	0.0400
13	0.0275	0.0375
14	0.0250	0.0350
15	0.0250	0.0325
16	0.0225	0.0300
17	0.0200	0.0275
18	0.0175	0.0250
19	0.0150	0.0250
20	0.0150	0.0225
21	0.0150	0.0225
22	0.0150	0.0225
23	0.0100	0.0200
24	0.0100	0.0200
25	0.0100	0.0175
26	0.0100	0.0175
27	0.0100	0.0150
28	0.0100	0.0150
29	0.0100	0.0150
30+	0.0100	0.0150

**PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2008-2014 EXPERIENCE STUDY**

DISABILITY RATES

Age	% Becoming Disabled	
	Male	Female
20	0.01%	0.01%
21	0.01%	0.01%
22	0.01%	0.01%
23	0.01%	0.01%
24	0.01%	0.01%
25	0.01%	0.01%
26	0.01%	0.01%
27	0.01%	0.01%
28	0.01%	0.01%
29	0.01%	0.01%
30	0.01%	0.01%
31	0.01%	0.01%
32	0.02%	0.02%
33	0.02%	0.02%
34	0.02%	0.02%
35	0.03%	0.02%
36	0.04%	0.02%
37	0.04%	0.03%
38	0.04%	0.03%
39	0.05%	0.03%
40	0.05%	0.04%
41	0.06%	0.04%
42	0.07%	0.04%
43	0.07%	0.04%
44	0.08%	0.05%
45	0.08%	0.05%
46	0.10%	0.06%
47	0.10%	0.07%
48	0.11%	0.08%
49	0.13%	0.08%
50	0.15%	0.10%
51	0.18%	0.11%
52	0.20%	0.11%
53	0.25%	0.13%
54	0.29%	0.14%
55	0.34%	0.16%
56	0.39%	0.17%
57	0.43%	0.19%
58	0.48%	0.22%
59	0.53%	0.25%
60	0.53%	0.28%
61	0.53%	0.31%
62	0.58%	0.35%
63	0.62%	0.39%
64	0.66%	0.43%

**PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2008-2014 EXPERIENCE STUDY**

HEALTHY POST-RETIREMENT MORTALITY RATES

Age	% Dying Next Year*		Age	% Dying Next Year*	
	Male	Female		Male	Female
50	0.3202%	0.1868%	81	5.3459%	3.0691%
51	0.3429%	0.1961%	82	6.0449%	3.4457%
52	0.3661%	0.2063%	83	6.8396%	3.8740%
53	0.3908%	0.2177%	84	7.7396%	4.3611%
54	0.4121%	0.2303%	85	8.7552%	4.9152%
55	0.4356%	0.2444%	86	9.8978%	5.5450%
56	0.4616%	0.2605%	87	11.1806%	6.2598%
57	0.4905%	0.2786%	88	12.6190%	7.0695%
58	0.5225%	0.2994%	89	14.1713%	7.9851%
59	0.5582%	0.3232%	90	15.8130%	9.0186%
60	0.5984%	0.3502%	91	17.5288%	10.1563%
61	0.6442%	0.3930%	92	19.3131%	11.3900%
62	0.6969%	0.4380%	93	21.1674%	12.7153%
63	0.7580%	0.4855%	94	23.0976%	14.1306%
64	0.8290%	0.5357%	95	25.1106%	15.6362%
65	0.9114%	0.5894%	96	27.2113%	17.2329%
66	1.0066%	0.6477%	97	29.3848%	18.9212%
67	1.1159%	0.7116%	98	31.3988%	20.6998%
68	1.2402%	0.7825%	99	33.4365%	22.5651%
69	1.3803%	0.8615%	100	35.4599%	24.3772%
70	1.5375%	0.9499%	101	37.4524%	26.1936%
71	1.7130%	1.0488%	102	39.3982%	28.0300%
72	1.9088%	1.1597%	103	41.2831%	29.8710%
73	2.1279%	1.2843%	104	43.0946%	31.7009%
74	2.3738%	1.4243%	105	44.8227%	33.5046%
75	2.6510%	1.5819%	106	46.4592%	35.2674%
76	2.9651%	1.7600%	107	47.9987%	36.9764%
77	3.3225%	1.9610%	108	49.4376%	38.6201%
78	3.7307%	2.1884%	109	50.0000%	40.1890%
79	4.1980%	2.4458%	110	50.0000%	41.6755%
80	4.7333%	2.7377%			

* The rates shown are RP-2014 mortality for healthy annuitants, with adjustments, if applicable (see Section G). Recommended rates include adjustments for white collar and mortality improvements using projection scale MP-2014.

**PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2008-2014 EXPERIENCE STUDY**

DISABLED POST RETIREMENT MORTALITY RATES

Age	% Dying Next Year*		Age	% Dying Next Year*	
	Male	Female		Male	Female
20	0.0668%	0.1118%	56	2.4557%	1.8273%
21	0.0919%	0.1372%	57	2.5190%	1.9028%
22	0.1233%	0.1652%	58	2.5868%	1.9884%
23	0.1607%	0.1956%	59	2.6604%	2.0860%
24	0.2035%	0.2284%	60	2.7414%	2.1976%
25	0.2517%	0.2633%	61	2.8312%	2.3250%
26	0.3046%	0.3004%	62	2.9314%	2.4702%
27	0.3621%	0.3395%	63	3.0433%	2.6348%
28	0.4237%	0.3804%	64	3.1685%	2.8203%
29	0.4891%	0.4230%	65	3.3081%	3.0280%
30	0.5579%	0.4673%	66	3.4633%	3.2591%
31	0.6297%	0.5131%	67	3.6353%	3.5148%
32	0.7043%	0.5602%	68	3.8253%	3.7962%
33	0.7812%	0.6087%	69	4.0346%	4.1045%
34	0.8602%	0.6582%	70	4.2647%	4.4413%
35	0.9407%	0.7088%	71	4.5170%	4.8078%
36	1.0225%	0.7603%	72	4.7935%	5.2059%
37	1.1053%	0.8126%	73	5.0965%	5.6372%
38	1.1886%	0.8656%	74	5.4287%	6.1036%
39	1.2721%	0.9191%	75	5.7934%	6.6074%
40	1.3554%	0.9730%	76	6.1945%	7.1506%
41	1.4383%	1.0273%	77	6.6363%	7.7357%
42	1.5202%	1.0817%	78	7.1235%	8.3652%
43	1.6010%	1.1362%	79	7.6616%	9.0420%
44	1.6801%	1.1907%	80	8.2562%	9.7694%
45	1.7573%	1.2450%	81	8.9136%	10.5510%
46	1.8322%	1.2979%	82	9.6405%	11.3909%
47	1.9045%	1.3494%	83	10.4436%	12.2939%
48	1.9737%	1.3992%	84	11.3303%	13.2652%
49	2.0395%	1.4479%	85	12.3081%	14.3420%
50	2.1016%	1.4958%	86	13.3850%	15.5186%
51	2.1621%	1.5439%	87	14.5697%	16.7890%
52	2.2210%	1.5931%	88	15.8714%	18.1474%
53	2.2791%	1.6447%	89	17.3005%	19.5880%
54	2.3369%	1.6999%	90	18.7464%	21.1049%
55	2.3953%	1.7603%			

* The rates shown are RP-2014 mortality for disabled annuitants, with adjustments if applicable (see Section G) Recommended rates include mortality improvements using projection scale MP-2014

**PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2008-2014 EXPERIENCE STUDY**

HEALTHY PRE RETIREMENT MORTALITY RATES

Age	% Dying Next Year*		Age	% Dying Next Year*	
	Male	Female		Male	Female
20	0.0315%	0.0137%	46	0.0852%	0.0554%
21	0.0342%	0.0137%	47	0.0952%	0.0618%
22	0.0357%	0.0137%	48	0.1062%	0.0689%
23	0.0362%	0.0137%	49	0.1182%	0.0764%
24	0.0339%	0.0140%	50	0.1312%	0.0845%
25	0.0324%	0.0143%	51	0.1453%	0.0930%
26	0.0315%	0.0146%	52	0.1605%	0.1018%
27	0.0311%	0.0151%	53	0.1772%	0.1110%
28	0.0313%	0.0158%	54	0.1955%	0.1206%
29	0.0317%	0.0165%	55	0.2159%	0.1306%
30	0.0325%	0.0174%	56	0.2389%	0.1412%
31	0.0335%	0.0184%	57	0.2650%	0.1523%
32	0.0345%	0.0195%	58	0.2948%	0.1642%
33	0.0356%	0.0206%	59	0.3288%	0.1769%
34	0.0367%	0.0218%	60	0.3675%	0.1908%
35	0.0376%	0.0230%	61	0.4114%	0.2060%
36	0.0386%	0.0241%	62	0.4612%	0.2229%
37	0.0400%	0.0253%	63	0.5173%	0.2417%
38	0.0417%	0.0268%	64	0.5805%	0.2627%
39	0.0440%	0.0286%	65	0.6508%	0.2859%
40	0.0471%	0.0308%	66	0.7296%	0.3119%
41	0.0508%	0.0334%	67	0.8179%	0.3485%
42	0.0556%	0.0365%	68	0.9169%	0.3894%
43	0.0614%	0.0402%	69	1.0279%	0.4351%
44	0.0682%	0.0446%	70	1.1523%	0.4862%
45	0.0762%	0.0497%			

* The rates shown are RP-2014 mortality for employees, with adjustments, if applicable (see Section G). Recommended rates include adjustments for white collar and mortality improvements using projection scale MP-2014.

SECTION K
GLOSSARY

GLOSSARY

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

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

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

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

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

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

GLOSSARY

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

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

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

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

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

SECTION L
APPENDIX

APPENDIX – DETAILED EXPERIENCE ANALYSIS

In this section, we present the annual experience for each major assumption that was analyzed for the study. Please note that totals may not sum correctly due to rounding of intermediate results.

APPENDIX – DETAILED EXPERIENCE ANALYSIS
SALARY INCREASES

2008-2014 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
0	5,555	6.39%	12.03%
1	40,419	8.90%	8.90%
2	40,402	4.71%	7.46%
3	37,775	4.32%	6.58%
4	36,061	3.87%	5.97%
5	33,895	3.67%	5.52%
6	32,121	3.42%	5.16%
7	30,490	3.27%	4.87%
8	29,123	3.16%	4.63%
9	27,830	3.00%	4.42%
10	27,165	2.81%	4.24%
11	26,924	2.70%	4.08%
12	25,196	2.48%	3.94%
13	23,113	2.39%	3.82%
14	21,457	2.43%	3.70%
15	19,750	2.45%	3.60%
16	18,007	2.38%	3.51%
17	16,788	2.28%	3.50%
18	16,258	2.23%	3.50%
19	15,724	2.29%	3.50%
20	14,749	2.37%	3.50%
21	14,062	2.21%	3.50%
22	13,381	2.08%	3.50%
23	12,804	2.11%	3.50%
24	11,846	2.14%	3.50%
25	10,343	2.10%	3.50%
26	8,862	2.01%	3.50%
27	7,776	2.06%	3.50%
28	7,238	2.14%	3.50%
29	6,892	2.31%	3.50%
30+	35,222	1.95%	3.50%
Totals	667,228	3.33%	4.87%

APPENDIX – DETAILED EXPERIENCE ANALYSIS
SALARY INCREASES

2008-2009 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
0	1,247	9.16%	12.03%
1	8,279	9.53%	8.90%
2	7,967	6.70%	7.46%
3	6,996	6.18%	6.58%
4	5,839	5.35%	5.97%
5	4,371	5.27%	5.52%
6	5,543	5.33%	5.16%
7	5,680	5.35%	4.87%
8	5,648	5.00%	4.63%
9	4,953	4.79%	4.42%
10	4,750	4.69%	4.24%
11	4,110	4.65%	4.08%
12	3,573	4.57%	3.94%
13	3,282	4.19%	3.82%
14	3,565	4.23%	3.70%
15	3,045	4.57%	3.60%
16	2,833	4.30%	3.51%
17	2,704	4.07%	3.50%
18	2,973	4.00%	3.50%
19	2,839	4.13%	3.50%
20	2,524	4.30%	3.50%
21	2,469	4.05%	3.50%
22	2,176	4.02%	3.50%
23	2,168	4.07%	3.50%
24	1,921	3.99%	3.50%
25	1,295	4.17%	3.50%
26	962	4.11%	3.50%
27	1,270	3.67%	3.50%
28	1,505	3.81%	3.50%
29	1,577	3.65%	3.50%
30+	5,282	3.71%	3.50%
Totals	113,346	5.22%	4.99%

APPENDIX – DETAILED EXPERIENCE ANALYSIS
SALARY INCREASES

2009-2010 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
0	788	6.35%	12.03%
1	7,607	8.91%	8.90%
2	8,232	4.01%	7.46%
3	7,509	4.05%	6.58%
4	6,665	3.85%	5.97%
5	5,557	3.69%	5.52%
6	4,234	2.99%	5.16%
7	5,305	3.23%	4.87%
8	5,445	2.78%	4.63%
9	5,465	2.94%	4.42%
10	4,786	2.80%	4.24%
11	4,617	2.65%	4.08%
12	3,999	2.56%	3.94%
13	3,454	2.56%	3.82%
14	3,166	2.47%	3.70%
15	3,436	2.31%	3.60%
16	2,948	2.20%	3.51%
17	2,746	2.19%	3.50%
18	2,601	2.15%	3.50%
19	2,847	2.29%	3.50%
20	2,715	2.24%	3.50%
21	2,378	2.19%	3.50%
22	2,343	2.17%	3.50%
23	2,042	1.80%	3.50%
24	2,064	1.77%	3.50%
25	1,804	2.15%	3.50%
26	1,204	2.09%	3.50%
27	907	1.87%	3.50%
28	1,176	1.84%	3.50%
29	1,418	2.13%	3.50%
30+	5,992	1.87%	3.50%
Totals	115,450	3.26%	4.94%

APPENDIX – DETAILED EXPERIENCE ANALYSIS
SALARY INCREASES

2010-2011 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
0	834	5.67%	12.03%
1	5,161	8.09%	8.90%
2	7,286	4.34%	7.46%
3	7,383	3.81%	6.58%
4	6,955	3.51%	5.97%
5	6,176	3.49%	5.52%
6	5,215	3.11%	5.16%
7	3,970	2.75%	4.87%
8	5,002	2.64%	4.63%
9	5,138	2.65%	4.42%
10	5,148	2.57%	4.24%
11	4,544	2.50%	4.08%
12	4,413	2.26%	3.94%
13	3,840	2.15%	3.82%
14	3,311	2.04%	3.70%
15	3,001	2.08%	3.60%
16	3,220	2.15%	3.51%
17	2,786	1.96%	3.50%
18	2,617	1.85%	3.50%
19	2,438	1.84%	3.50%
20	2,691	1.93%	3.50%
21	2,542	1.92%	3.50%
22	2,245	1.82%	3.50%
23	2,182	1.77%	3.50%
24	1,920	1.80%	3.50%
25	1,908	1.84%	3.50%
26	1,673	1.83%	3.50%
27	1,098	1.89%	3.50%
28	848	1.72%	3.50%
29	1,061	1.67%	3.50%
30+	6,320	1.56%	3.50%
Totals	112,926	2.89%	4.84%

APPENDIX – DETAILED EXPERIENCE ANALYSIS
SALARY INCREASES

2011-2012 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
0	826	6.24%	12.03%
1	5,444	9.20%	8.90%
2	4,875	4.19%	7.46%
3	6,518	3.88%	6.58%
4	6,674	3.63%	5.97%
5	6,335	3.34%	5.52%
6	5,678	2.80%	5.16%
7	4,808	2.53%	4.87%
8	3,671	2.51%	4.63%
9	4,697	2.50%	4.42%
10	4,873	2.29%	4.24%
11	4,849	1.98%	4.08%
12	4,288	1.87%	3.94%
13	4,171	1.95%	3.82%
14	3,626	1.73%	3.70%
15	3,127	1.97%	3.60%
16	2,834	1.83%	3.51%
17	3,061	1.52%	3.50%
18	2,631	1.63%	3.50%
19	2,458	1.53%	3.50%
20	2,247	1.92%	3.50%
21	2,498	1.67%	3.50%
22	2,373	1.53%	3.50%
23	2,074	1.46%	3.50%
24	1,991	1.49%	3.50%
25	1,744	1.72%	3.50%
26	1,735	1.39%	3.50%
27	1,496	1.26%	3.50%
28	985	1.42%	3.50%
29	747	1.70%	3.50%
30+	6,216	1.33%	3.50%
Totals	109,550	2.73%	4.78%

APPENDIX – DETAILED EXPERIENCE ANALYSIS
SALARY INCREASES

2012-2013 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
0	812	4.40%	12.03%
1	6,348	9.11%	8.90%
2	5,378	3.85%	7.46%
3	4,405	3.59%	6.58%
4	5,900	3.17%	5.97%
5	6,053	2.93%	5.52%
6	5,830	2.60%	5.16%
7	5,302	2.21%	4.87%
8	4,444	2.45%	4.63%
9	3,396	1.88%	4.42%
10	4,468	1.93%	4.24%
11	4,634	1.95%	4.08%
12	4,562	1.64%	3.94%
13	4,040	1.48%	3.82%
14	3,952	1.82%	3.70%
15	3,429	1.77%	3.60%
16	2,937	1.66%	3.51%
17	2,702	1.97%	3.50%
18	2,872	1.56%	3.50%
19	2,459	1.59%	3.50%
20	2,287	1.71%	3.50%
21	2,064	1.40%	3.50%
22	2,331	1.26%	3.50%
23	2,188	1.51%	3.50%
24	1,925	1.83%	3.50%
25	1,828	1.35%	3.50%
26	1,609	1.40%	3.50%
27	1,555	1.74%	3.50%
28	1,349	1.48%	3.50%
29	885	1.77%	3.50%
30+	5,844	1.40%	3.50%
Totals	107,788	2.57%	4.78%

APPENDIX – DETAILED EXPERIENCE ANALYSIS
SALARY INCREASES

2013-2014 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
0	1,048	5.35%	12.03%
1	7,580	8.36%	8.90%
2	6,664	4.69%	7.46%
3	4,964	4.12%	6.58%
4	4,028	3.79%	5.97%
5	5,403	3.80%	5.52%
6	5,621	3.66%	5.16%
7	5,425	3.21%	4.87%
8	4,913	3.11%	4.63%
9	4,181	2.87%	4.42%
10	3,140	2.41%	4.24%
11	4,170	2.70%	4.08%
12	4,361	2.38%	3.94%
13	4,326	2.35%	3.82%
14	3,837	2.36%	3.70%
15	3,712	2.20%	3.60%
16	3,235	2.26%	3.51%
17	2,789	2.10%	3.50%
18	2,564	1.97%	3.50%
19	2,683	2.08%	3.50%
20	2,285	2.01%	3.50%
21	2,111	1.90%	3.50%
22	1,913	1.76%	3.50%
23	2,150	2.01%	3.50%
24	2,025	2.01%	3.50%
25	1,764	1.96%	3.50%
26	1,679	2.16%	3.50%
27	1,450	2.04%	3.50%
28	1,375	1.97%	3.50%
29	1,204	2.10%	3.50%
30+	5,568	2.07%	3.50%
Totals	108,168	3.23%	4.87%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
RULE OF 90 RETIREMENT**

2008-2014 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	123	794	158.80	77.5%
56	213	1,515	303.00	70.3%
57	296	2,272	454.40	65.1%
58	349	2,919	583.80	59.8%
59	434	3,393	678.60	64.0%
60	490	3,605	721.00	68.0%
61	463	3,681	920.25	50.3%
62	1,089	3,751	1,312.85	82.9%
63	691	2,961	740.25	93.3%
64	524	2,615	653.75	80.2%
Totals	4,672	27,506	6,526.70	71.6%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
RULE OF 90 RETIREMENT**

2008-2009 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	23	122	24.40	94.3%
56	27	205	41.00	65.9%
57	37	309	61.80	59.9%
58	52	405	81.00	64.2%
59	54	466	93.20	57.9%
60	60	473	94.60	63.4%
61	69	494	123.50	55.9%
62	169	594	207.90	81.3%
63	70	333	83.25	84.1%
64	44	296	74.00	59.5%
Totals	605	3,697	884.65	68.4%

2009-2010 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	13	117	23.40	55.6%
56	31	239	47.80	64.9%
57	51	374	74.80	68.2%
58	55	446	89.20	61.7%
59	63	532	106.40	59.2%
60	87	574	114.80	75.8%
61	64	580	145.00	44.1%
62	152	527	184.45	82.4%
63	127	518	129.50	98.1%
64	59	311	77.75	75.9%
Totals	702	4,218	993.10	70.7%

2010-2011 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	25	154	30.80	81.2%
56	39	250	50.00	78.0%
57	41	388	77.60	52.8%
58	71	522	104.40	68.0%
59	95	592	118.40	80.2%
60	97	643	128.60	75.4%
61	87	586	146.50	59.4%
62	192	600	210.00	91.4%
63	121	458	114.50	105.7%
64	119	506	126.50	94.1%
Totals	887	4,699	1,107.30	80.1%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
RULE OF 90 RETIREMENT**

2011-2012 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	18	121	24.20	74.4%
56	36	275	55.00	65.5%
57	66	389	77.80	84.8%
58	59	545	109.00	54.1%
59	85	638	127.60	66.6%
60	79	626	125.20	63.1%
61	77	631	157.75	48.8%
62	210	638	223.30	94.0%
63	135	526	131.50	102.7%
64	105	459	114.75	91.5%
Totals	870	4,848	1,146.10	75.9%

2012-2013 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	21	148	29.60	70.9%
56	42	265	53.00	79.2%
57	41	410	82.00	50.0%
58	57	513	102.60	55.6%
59	65	617	123.40	52.7%
60	78	630	126.00	61.9%
61	79	668	167.00	47.3%
62	177	660	231.00	76.6%
63	99	534	133.50	74.2%
64	95	502	125.50	75.7%
Totals	754	4,947	1,173.60	64.2%

2013-2014 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	23	132	26.40	87.1%
56	38	281	56.20	67.6%
57	60	402	80.40	74.6%
58	55	488	97.60	56.4%
59	72	548	109.60	65.7%
60	89	659	131.80	67.5%
61	87	722	180.50	48.2%
62	189	732	256.20	73.8%
63	139	592	148.00	93.9%
64	102	541	135.25	75.4%
Totals	854	5,097	1,221.95	69.9%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
NON-RULE OF 90 RETIREMENT**

2008-2014 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	1,025	26,333	1,579.98	64.9%
56	1,022	25,067	1,504.02	68.0%
57	995	23,594	1,415.64	70.3%
58	984	21,798	1,525.86	64.5%
59	1,073	19,978	1,598.24	67.1%
60	1,198	18,090	1,447.20	82.8%
61	1,144	15,869	1,904.28	60.1%
62	2,247	13,970	2,794.00	80.4%
63	1,616	10,624	1,699.84	95.1%
64	1,255	8,078	1,454.04	86.3%
65	2,119	8,543	2,990.05	70.9%
66	1,392	5,998	1,499.50	92.8%
67	757	4,110	822.00	92.1%
68	446	3,052	610.40	73.1%
69	322	2,490	498.00	64.7%
70	320	2,067	413.40	77.4%
Totals	17,915	209,661	23,756.45	75.4%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
NON-RULE OF 90 RETIREMENT**

2008-2009 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	170	4,445	266.70	63.7%
56	161	4,145	248.70	64.7%
57	134	3,872	232.32	57.7%
58	143	3,463	242.41	59.0%
59	147	3,019	241.52	60.9%
60	151	2,714	217.12	69.5%
61	146	2,362	283.44	51.5%
62	285	2,197	439.40	64.9%
63	176	1,290	206.40	85.3%
64	121	1,049	188.82	64.1%
65	214	1,132	396.20	54.0%
66	170	876	219.00	77.6%
67	91	580	116.00	78.4%
68	58	434	86.80	66.8%
69	38	372	74.40	51.1%
70	38	282	56.40	67.4%
Totals	2,243	32,232	3,515.63	63.8%

2009-2010 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	169	4,446	266.76	63.4%
56	151	4,247	254.82	59.3%
57	151	3,914	234.84	64.3%
58	144	3,659	256.13	56.2%
59	152	3,227	258.16	58.9%
60	173	2,807	224.56	77.0%
61	136	2,465	295.80	46.0%
62	326	2,190	438.00	74.4%
63	266	1,887	301.92	88.1%
64	137	1,111	199.98	68.5%
65	299	1,214	424.90	70.4%
66	195	936	234.00	83.3%
67	117	691	138.20	84.7%
68	62	502	100.40	61.8%
69	52	388	77.60	67.0%
70	45	337	67.40	66.8%
Totals	2,575	34,021	3,773.47	68.2%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
NON-RULE OF 90 RETIREMENT**

2010-2011 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	149	4,331	259.86	57.3%
56	149	4,253	255.18	58.4%
57	170	4,011	240.66	70.6%
58	153	3,671	256.97	59.5%
59	193	3,417	273.36	70.6%
60	182	3,005	240.40	75.7%
61	173	2,609	313.08	55.3%
62	336	2,304	460.80	72.9%
63	261	1,836	293.76	88.8%
64	220	1,544	277.92	79.2%
65	317	1,253	438.55	72.3%
66	245	921	230.25	106.4%
67	152	722	144.40	105.3%
68	97	569	113.80	85.2%
69	56	432	86.40	64.8%
70	52	334	66.80	77.8%
Totals	2,905	35,212	3,952.19	73.5%

2011-2012 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	169	4,531	271.86	62.2%
56	173	4,125	247.50	69.9%
57	197	4,014	240.84	81.8%
58	172	3,739	261.73	65.7%
59	198	3,408	272.64	72.6%
60	230	3,164	253.12	90.9%
61	240	2,781	333.72	71.9%
62	450	2,331	466.20	96.5%
63	313	1,909	305.44	102.5%
64	269	1,474	265.32	101.4%
65	472	1,729	605.15	78.0%
66	247	938	234.50	105.3%
67	136	668	133.60	101.8%
68	94	557	111.40	84.4%
69	64	475	95.00	67.4%
70	61	371	74.20	82.2%
Totals	3,485	36,214	4,172.22	83.5%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
NON-RULE OF 90 RETIREMENT**

2012-2013 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	189	4,340	260.40	72.6%
56	208	4,293	257.58	80.8%
57	181	3,866	231.96	78.0%
58	218	3,707	259.49	84.0%
59	193	3,504	280.32	68.8%
60	208	3,180	254.40	81.8%
61	237	2,873	344.76	68.7%
62	417	2,465	493.00	84.6%
63	274	1,794	287.04	95.5%
64	250	1,486	267.48	93.5%
65	389	1,583	554.05	70.2%
66	280	1,214	303.50	92.3%
67	108	643	128.60	84.0%
68	57	497	99.40	57.3%
69	54	435	87.00	62.1%
70	57	400	80.00	71.3%
Totals	3,320	36,280	4,188.98	79.3%

2013-2014 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
55	179	4,240	254.40	70.4%
56	180	4,004	240.24	74.9%
57	162	3,917	235.02	68.9%
58	154	3,559	249.13	61.8%
59	190	3,403	272.24	69.8%
60	254	3,220	257.60	98.6%
61	212	2,779	333.48	63.6%
62	433	2,483	496.60	87.2%
63	326	1,908	305.28	106.8%
64	258	1,414	254.52	101.4%
65	428	1,632	571.20	74.9%
66	255	1,113	278.25	91.6%
67	153	806	161.20	94.9%
68	78	493	98.60	79.1%
69	58	388	77.60	74.7%
70	67	343	68.60	97.7%
Totals	3,387	35,702	4,153.96	81.5%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
TERMINATIONS, SERVICE <3 YEARS**

2008-2014 Experience, Service <3 Years

Males					Females				
Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	3,105	11,496	4,598.40	67.5%	1	6,517	23,768	9,507.20	68.5%
2	5,454	24,514	3,677.10	148.3%	2	12,995	55,632	8,344.80	155.7%
3	2,787	16,885	1,688.50	165.1%	3	6,943	39,692	3,969.20	174.9%
Totals	11,346	52,895	9,964.00	113.9%	Totals	26,455	119,092	21,821.20	121.2%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
TERMINATIONS, SERVICE <3 YEARS**

2008-2009 Experience, Service <3 Years

Males					Females				
Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
1	567	2,119	847.60	66.9%	1	1,291	4,714	1,885.60	68.5%
2	905	4,517	677.55	133.6%	2	2,433	10,849	1,627.35	149.5%
3	442	3,044	304.40	145.2%	3	1,207	7,560	756.00	159.7%
Totals	1,914	9,680	1,829.55	104.6%	Totals	4,931	23,123	4,268.95	115.5%

2009-2010 Experience, Service <3 Years

Males					Females				
Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
1	533	1,641	656.40	81.2%	1	1,139	3,653	1,461.20	77.9%
2	964	4,185	627.75	153.6%	2	2,427	10,003	1,500.45	161.8%
3	474	3,175	317.50	149.3%	3	1,284	7,669	766.90	167.4%
Totals	1,971	9,001	1,601.65	123.1%	Totals	4,850	21,325	3,728.55	130.1%

2010-2011 Experience, Service <3 Years

Males					Females				
Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
1	427	1,622	648.80	65.8%	1	843	3,123	1,249.20	67.5%
2	757	3,398	509.70	148.5%	2	1,788	7,627	1,144.05	156.3%
3	443	2,859	285.90	154.9%	3	1,180	7,016	701.60	168.2%
Totals	1,627	7,879	1,444.40	112.6%	Totals	3,811	17,766	3,094.85	123.1%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
TERMINATIONS, SERVICE <3 YEARS**

2011-2012 Experience, Service <3 Years

Males					Females				
Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
1	526	1,897	758.80	69.3%	1	957	3,675	1,470.00	65.1%
2	887	3,690	553.50	160.3%	2	2,033	7,825	1,173.75	173.2%
3	443	2,321	232.10	190.9%	3	1,132	5,377	537.70	210.5%
Totals	1,856	7,908	1,544.40	120.2%	Totals	4,122	16,877	3,181.45	129.6%

2012-2013 Experience, Service <3 Years

Males					Females				
Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
1	553	2,092	836.80	66.1%	1	1,207	4,213	1,685.20	71.6%
2	1,003	4,143	621.45	161.4%	2	2,236	9,035	1,355.25	165.0%
3	508	2,515	251.50	202.0%	3	1,088	5,448	544.80	199.7%
Totals	2,064	8,750	1,709.75	120.7%	Totals	4,531	18,696	3,585.25	126.4%

2013-2014 Experience, Service <3 Years

Males					Females				
Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Service Index	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
1	499	2,125	850.00	58.7%	1	1,080	4,390	1,756.00	61.5%
2	938	4,581	687.15	136.5%	2	2,078	10,293	1,543.95	134.6%
3	477	2,971	297.10	160.6%	3	1,052	6,622	662.20	158.9%
Totals	1,914	9,677	1,834.25	104.3%	Totals	4,210	21,305	3,962.15	106.3%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
TERMINATIONS, SERVICE >3 YEARS**

2008-2014 Experience, Service >3 Years

Males					Females				
Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
Under 20	-	4	0.34	0.0%	Under 20	2	3	0.25	793.7%
20-24	122	981	72.56	168.1%	20-24	310	1,626	120.38	257.5%
25-29	1,008	8,234	506.89	198.9%	25-29	2,298	15,414	947.44	242.5%
30-34	1,107	14,611	696.86	158.9%	30-34	2,835	27,075	1,309.79	216.4%
35-39	980	17,458	594.39	164.9%	35-39	2,531	33,988	1,305.21	193.9%
40-44	997	22,323	622.86	160.1%	40-44	3,198	51,046	1,675.83	190.8%
45-49	1,010	29,400	671.84	150.3%	45-49	3,823	74,473	2,074.51	184.3%
50-54	1,156	38,830	696.38	166.0%	50-54	3,996	91,928	2,112.84	189.1%
Totals	6,380	131,841	3,862.11	165.2%	Totals	18,993	295,553	9,546.26	199.0%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
TERMINATIONS, SERVICE >3 YEARS**

2008-2009 Experience, Service >3 Years

Males					Females				
Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
Under 20	-	1	0.08	0.0%	Under 20	-	-	-	N/A
20-24	14	192	14.27	98.1%	20-24	61	327	24.22	251.8%
25-29	132	1,250	76.95	171.5%	25-29	358	2,476	152.18	235.3%
30-34	150	2,188	104.22	143.9%	30-34	386	4,159	201.30	191.8%
35-39	163	2,938	99.34	164.1%	35-39	415	5,733	219.36	189.2%
40-44	160	3,760	104.85	152.6%	40-44	512	8,982	294.94	173.6%
45-49	172	5,565	127.14	135.3%	45-49	623	13,675	381.34	163.4%
50-54	191	6,704	120.30	158.8%	50-54	601	15,363	353.54	170.0%
Totals	982	22,598	647.17	151.7%	Totals	2,956	50,715	1,626.88	181.7%

2009-2010 Experience, Service >3 Years

Males					Females				
Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
Under 20	-	-	-	N/A	Under 20	-	1	0.08	0.0%
20-24	23	189	14.02	164.1%	20-24	49	290	21.47	228.2%
25-29	147	1,428	87.97	167.1%	25-29	361	2,608	160.72	224.6%
30-34	146	2,254	107.39	136.0%	30-34	434	4,424	214.27	202.5%
35-39	156	2,896	98.31	158.7%	35-39	362	5,714	218.97	165.3%
40-44	148	3,785	105.72	140.0%	40-44	533	8,969	294.48	181.0%
45-49	176	5,271	120.24	146.4%	45-49	670	13,373	372.16	180.0%
50-54	172	6,668	119.71	143.7%	50-54	589	15,373	353.56	166.6%
Totals	968	22,491	653.34	148.2%	Totals	2,998	50,752	1,635.72	183.3%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
TERMINATIONS, SERVICE >3 YEARS**

2010-2011 Experience, Service >3 Years

Males					Females				
Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	20	198	14.64	136.6%	20-24	56	307	22.73	246.4%
25-29	148	1,464	89.97	164.5%	25-29	331	2,751	169.56	195.2%
30-34	154	2,470	117.93	130.6%	30-34	419	4,648	225.21	186.0%
35-39	135	2,877	97.99	137.8%	35-39	371	5,735	220.22	168.5%
40-44	170	3,830	107.17	158.6%	40-44	493	8,826	289.96	170.0%
45-49	160	5,021	114.70	139.5%	45-49	590	12,834	357.14	165.2%
50-54	158	6,631	119.13	132.6%	50-54	607	15,645	359.65	168.8%
Totals	945	22,491	661.52	142.9%	Totals	2,867	50,746	1,644.47	174.3%

2011-2012 Experience, Service >3 Years

Males					Females				
Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
Under 20	-	1	0.08	0.0%	Under 20	2	2	0.17	1190.5%
20-24	21	168	12.38	169.7%	20-24	62	272	20.13	308.0%
25-29	195	1,482	91.40	213.3%	25-29	467	2,816	173.55	269.1%
30-34	220	2,624	125.41	175.4%	30-34	547	4,811	232.93	234.8%
35-39	194	2,906	99.25	195.5%	35-39	477	5,756	221.49	215.4%
40-44	187	3,828	106.96	174.8%	40-44	613	8,657	284.33	215.6%
45-49	166	4,773	109.08	152.2%	45-49	684	12,243	340.98	200.6%
50-54	234	6,515	116.92	200.1%	50-54	717	15,673	360.42	198.9%
Totals	1,217	22,297	661.47	184.0%	Totals	3,569	50,230	1,633.98	218.4%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
TERMINATIONS, SERVICE >3 YEARS**

2012-2013 Experience, Service >3 Years

Males					Females				
Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
Under 20	-	1	0.08	0.0%	Under 20	-	-	-	N/A
20-24	26	131	9.65	269.4%	20-24	44	231	17.14	256.7%
25-29	181	1,334	82.35	219.8%	25-29	419	2,507	153.61	272.8%
30-34	218	2,576	123.14	177.0%	30-34	529	4,576	221.03	239.3%
35-39	173	2,918	99.70	173.5%	35-39	479	5,585	214.92	222.9%
40-44	180	3,607	100.49	179.1%	40-44	565	8,016	263.09	214.8%
45-49	174	4,502	103.01	168.9%	45-49	651	11,531	321.44	202.5%
50-54	216	6,304	113.00	191.1%	50-54	800	15,296	351.29	227.7%
Totals	1,168	21,373	631.44	185.0%	Totals	3,487	47,742	1,542.53	226.1%

2013-2014 Experience, Service >3 Years

Males					Females				
Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected	Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/Expected
Under 20	-	1	0.08	0.0%	Under 20	-	-	-	N/A
20-24	18	103	7.61	236.5%	20-24	38	199	14.69	258.7%
25-29	205	1,276	78.25	262.0%	25-29	362	2,256	137.83	262.6%
30-34	219	2,499	118.77	184.4%	30-34	520	4,457	215.04	241.8%
35-39	159	2,923	99.80	159.3%	35-39	427	5,465	210.26	203.1%
40-44	152	3,513	97.67	155.6%	40-44	482	7,596	249.04	193.5%
45-49	162	4,268	97.67	165.9%	45-49	605	10,817	301.45	200.7%
50-54	185	6,008	107.32	172.4%	50-54	682	14,578	334.37	204.0%
Totals	1,100	20,591	607.18	181.2%	Totals	3,116	45,368	1,462.68	213.0%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
DISABILITY RETIREMENTS**

2008-2014 Experience

Males					Females				
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	185	0.02	0.0%	Under 20	-	470	0.05	0.0%
20-24	-	7,096	0.71	0.0%	20-24	-	13,906	1.39	0.0%
25-29	-	19,607	1.96	0.0%	25-29	-	38,284	3.83	0.0%
30-34	2	22,096	6.20	32.3%	30-34	1	42,208	11.86	8.4%
35-39	-	22,845	15.15	0.0%	35-39	5	48,024	22.24	22.5%
40-44	9	27,352	30.30	29.7%	40-44	12	68,442	45.60	26.3%
45-49	27	34,162	60.20	44.9%	45-49	36	89,508	105.04	34.3%
50-54	79	43,430	133.87	59.0%	50-54	105	102,495	202.93	51.7%
55-59	157	44,181	271.98	57.7%	55-59	169	93,100	298.20	56.7%
60-64	140	31,092	291.42	48.0%	60-64	162	58,079	326.18	49.7%
Totals	414	252,046	811.81	51.0%	Totals	490	554,516	1,017.32	48.2%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
DISABILITY RETIREMENTS**

2008-2009 Experience

Males					Females				
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected
Under 20	-	32	0.00	0.0%	Under 20	-	103	0.01	0.0%
20-24	-	1,313	0.13	0.0%	20-24	-	2,721	0.27	0.0%
25-29	-	3,270	0.33	0.0%	25-29	-	6,617	0.66	0.0%
30-34	-	3,466	0.97	0.0%	30-34	-	6,870	1.93	0.0%
35-39	-	3,983	2.67	0.0%	35-39	-	8,631	4.02	0.0%
40-44	2	4,742	5.26	38.0%	40-44	1	12,847	8.51	11.7%
45-49	8	6,559	11.56	69.2%	45-49	4	16,671	19.50	20.5%
50-54	20	7,580	23.31	85.8%	50-54	23	17,438	34.43	66.8%
55-59	32	7,383	45.36	70.5%	55-59	40	14,678	46.64	85.8%
60-64	32	4,472	41.60	76.9%	60-64	26	8,292	46.19	56.3%
Totals	94	42,800	131.21	71.6%	Totals	94	94,868	162.17	58.0%

2009-2010 Experience

Males					Females				
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected
Under 20	-	23	0.00	0.0%	Under 20	-	103	0.01	0.0%
20-24	-	1,218	0.12	0.0%	20-24	-	2,423	0.24	0.0%
25-29	-	3,258	0.33	0.0%	25-29	-	6,514	0.65	0.0%
30-34	1	3,453	0.97	102.8%	30-34	-	6,981	1.96	0.0%
35-39	-	3,828	2.55	0.0%	35-39	1	8,271	3.84	26.0%
40-44	1	4,747	5.25	19.0%	40-44	4	12,482	8.33	48.0%
45-49	4	6,189	10.94	36.6%	45-49	9	16,187	19.05	47.2%
50-54	12	7,496	23.06	52.0%	50-54	20	17,266	34.14	58.6%
55-59	27	7,430	45.71	59.1%	55-59	28	15,283	48.77	57.4%
60-64	22	4,893	45.67	48.2%	60-64	25	9,003	50.59	49.4%
Totals	67	42,535	134.61	49.8%	Totals	87	94,513	167.58	51.9%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
DISABILITY RETIREMENTS**

2010-2011 Experience

Males					Females				
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected
Under 20	-	29	0.00	0.0%	Under 20	-	83	0.01	0.0%
20-24	-	1,148	0.11	0.0%	20-24	-	2,148	0.21	0.0%
25-29	-	3,165	0.32	0.0%	25-29	-	6,218	0.62	0.0%
30-34	-	3,540	0.99	0.0%	30-34	-	6,809	1.90	0.0%
35-39	-	3,609	2.39	0.0%	35-39	1	7,769	3.60	27.8%
40-44	2	4,606	5.07	39.4%	40-44	3	11,485	7.66	39.1%
45-49	5	5,759	10.16	49.2%	45-49	6	15,177	17.89	33.5%
50-54	10	7,377	22.66	44.1%	50-54	14	17,285	34.21	40.9%
55-59	25	7,397	45.57	54.9%	55-59	33	15,468	49.63	66.5%
60-64	23	5,289	49.67	46.3%	60-64	29	9,591	54.24	53.5%
Totals	65	41,919	136.95	47.5%	Totals	86	92,033	169.99	50.6%

2011-2012 Experience

Males					Females				
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected
Under 20	-	35	0.00	0.0%	Under 20	-	64	0.01	0.0%
20-24	-	1,095	0.11	0.0%	20-24	-	2,078	0.21	0.0%
25-29	-	3,241	0.32	0.0%	25-29	-	6,236	0.62	0.0%
30-34	-	3,734	1.04	0.0%	30-34	-	6,969	1.96	0.0%
35-39	-	3,656	2.41	0.0%	35-39	1	7,614	3.52	28.4%
40-44	3	4,552	5.02	59.7%	40-44	1	10,970	7.30	13.7%
45-49	3	5,472	9.64	31.1%	45-49	4	14,425	16.92	23.6%
50-54	12	7,211	22.16	54.2%	50-54	21	17,171	33.97	61.8%
55-59	26	7,385	45.43	57.2%	55-59	20	15,756	50.57	39.5%
60-64	24	5,431	50.97	47.1%	60-64	29	9,953	55.98	51.8%
Totals	68	41,812	137.10	49.6%	Totals	76	91,236	171.05	44.4%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
DISABILITY RETIREMENTS**

2012-2013 Experience

Males					Females				
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected
Under 20	-	34	0.00	0.0%	Under 20	-	59	0.01	0.0%
20-24	-	1,141	0.11	0.0%	20-24	-	2,226	0.22	0.0%
25-29	-	3,304	0.33	0.0%	25-29	-	6,200	0.62	0.0%
30-34	1	3,915	1.09	91.8%	30-34	1	7,149	2.01	49.7%
35-39	-	3,798	2.50	0.0%	35-39	2	7,721	3.57	56.0%
40-44	-	4,367	4.85	0.0%	40-44	1	10,460	6.97	14.3%
45-49	4	5,184	9.11	43.9%	45-49	7	13,810	16.17	43.3%
50-54	14	7,010	21.65	64.7%	50-54	13	16,896	33.50	38.8%
55-59	22	7,328	45.14	48.7%	55-59	24	15,945	51.29	46.8%
60-64	29	5,447	51.16	56.7%	60-64	27	10,332	58.00	46.6%
Totals	70	41,528	135.95	51.5%	Totals	75	90,798	172.36	43.5%

2013-2014 Experience

Males					Females				
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected
Under 20	-	32	0.00	0.0%	Under 20	-	58	0.01	0.0%
20-24	-	1,181	0.12	0.0%	20-24	-	2,310	0.23	0.0%
25-29	-	3,369	0.34	0.0%	25-29	-	6,499	0.65	0.0%
30-34	-	3,988	1.13	0.0%	30-34	-	7,430	2.10	0.0%
35-39	-	3,971	2.62	0.0%	35-39	-	8,018	3.70	0.0%
40-44	1	4,338	4.84	20.7%	40-44	2	10,198	6.82	29.3%
45-49	3	4,999	8.79	34.1%	45-49	6	13,238	15.51	38.7%
50-54	11	6,756	21.03	52.3%	50-54	14	16,439	32.68	42.8%
55-59	25	7,258	44.77	55.8%	55-59	24	15,970	51.29	46.8%
60-64	10	5,560	52.35	19.1%	60-64	26	10,908	61.18	42.5%
Totals	50	41,452	135.98	36.8%	Totals	72	91,068	174.16	41.3%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
POST-RETIREMENT MORTALITY**

2008-2014 Experience

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
55-59	36	5,290	25.06	143.7%	55-59	29	9,428	33.16	87.5%
60-64	151	18,660	137.04	110.2%	60-64	145	34,673	192.02	75.5%
65-69	331	27,569	339.26	97.6%	65-69	386	58,029	505.86	76.3%
70-74	503	24,210	488.71	102.9%	70-74	582	50,265	717.29	81.1%
75-79	764	20,406	748.07	102.1%	75-79	774	36,954	869.01	89.1%
80-84	1,005	15,072	1,017.22	98.8%	80-84	1,056	26,292	1,040.42	101.5%
85-89	973	8,280	980.79	99.2%	85-89	1,262	15,751	1,071.75	117.8%
90-94	554	3,025	589.81	93.9%	90-94	942	6,915	811.74	116.0%
95-99	145	500	138.68	104.6%	95-99	428	1,778	312.59	136.9%
100+	9	22	7.79	115.5%	100+	52	172	40.06	129.8%
Totals	4,471	123,034	4,472.43	100.0%	Totals	5,656	240,257	5,593.90	101.1%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
POST-RETIREMENT MORTALITY**

2008-2009 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
55-59	9	953	4.70	191.5%	55-59	6	1,675	5.93	101.2%
60-64	25	2,682	20.12	124.3%	60-64	24	5,178	28.81	83.3%
65-69	46	3,973	50.85	90.5%	65-69	61	8,630	76.09	80.2%
70-74	77	3,804	79.88	96.4%	70-74	84	7,242	104.95	80.0%
75-79	116	3,273	123.35	94.0%	75-79	113	5,477	131.53	85.9%
80-84	179	2,419	165.43	108.2%	80-84	164	3,978	160.39	102.3%
85-89	148	1,259	151.82	97.5%	85-89	181	2,252	156.07	116.0%
90-94	72	408	79.77	90.3%	90-94	114	965	114.18	99.8%
95-99	20	51	14.21	140.7%	95-99	61	211	37.18	164.1%
100+	3	5	1.77	169.5%	100+	6	25	5.93	101.2%
Totals	695	18,827	691.90	100.4%	Totals	814	35,633	821.06	99.1%

2009-2010 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
55-59	4	909	4.40	90.9%	55-59	3	1,578	5.60	53.6%
60-64	19	2,870	21.24	89.5%	60-64	18	5,303	29.40	61.2%
65-69	48	4,092	51.72	92.8%	65-69	55	8,856	77.93	70.6%
70-74	88	3,855	79.73	110.4%	70-74	103	7,727	111.30	92.5%
75-79	134	3,386	126.36	106.0%	75-79	131	5,741	137.04	95.6%
80-84	156	2,447	167.56	93.1%	80-84	160	4,138	166.46	96.1%
85-89	154	1,303	156.84	98.2%	85-89	197	2,384	164.19	120.0%
90-94	85	455	89.03	95.5%	90-94	147	1,051	123.98	118.6%
95-99	14	56	15.58	89.9%	95-99	63	251	44.00	143.2%
100+	1	2	0.72	138.9%	100+	9	22	5.25	171.4%
Totals	703	19,375	713.18	98.6%	Totals	886	37,051	865.15	102.4%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
POST-RETIREMENT MORTALITY**

2010-2011 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
55-59	6	844	4.03	148.9%	55-59	3	1,564	5.56	54.0%
60-64	23	3,087	22.91	100.4%	60-64	22	5,579	31.09	70.8%
65-69	50	4,247	53.13	94.1%	65-69	62	9,065	79.83	77.7%
70-74	83	3,989	81.65	101.7%	70-74	88	8,100	115.97	75.9%
75-79	128	3,363	124.34	102.9%	75-79	129	6,046	142.92	90.3%
80-84	194	2,528	171.65	113.0%	80-84	175	4,262	169.31	103.4%
85-89	173	1,367	163.46	105.8%	85-89	221	2,583	175.26	126.1%
90-94	90	480	93.68	96.1%	90-94	153	1,131	132.81	115.2%
95-99	28	80	22.01	127.2%	95-99	65	282	49.35	131.7%
100+	-	3	1.05	0.0%	100+	8	22	5.14	155.6%
Totals	775	19,988	737.91	105.0%	Totals	926	38,634	907.24	102.1%

2011-2012 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
55-59	2	858	4.02	49.8%	55-59	7	1,525	5.38	130.1%
60-64	30	3,235	23.77	126.2%	60-64	24	5,988	33.22	72.2%
65-69	53	4,716	57.94	91.5%	65-69	63	9,820	86.02	73.2%
70-74	88	4,083	82.14	107.1%	70-74	104	8,626	123.05	84.5%
75-79	134	3,473	126.88	105.6%	75-79	136	6,313	148.10	91.8%
80-84	156	2,544	171.84	90.8%	80-84	189	4,497	177.10	106.7%
85-89	172	1,386	163.13	105.4%	85-89	219	2,728	184.54	118.7%
90-94	89	539	104.42	85.2%	90-94	161	1,198	140.35	114.7%
95-99	24	87	23.98	100.1%	95-99	65	318	55.71	116.7%
100+	3	4	1.44	208.3%	100+	10	29	6.86	145.8%
Totals	751	20,925	759.56	98.9%	Totals	978	41,042	960.33	101.8%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
POST-RETIREMENT MORTALITY**

2012-2013 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
55-59	7	865	3.99	175.4%	55-59	3	1,523	5.29	56.7%
60-64	26	3,373	24.46	106.3%	60-64	29	6,190	34.12	85.0%
65-69	73	5,049	60.58	120.5%	65-69	74	10,494	90.58	81.7%
70-74	81	4,145	81.62	99.2%	70-74	94	8,938	126.61	74.2%
75-79	125	3,411	122.94	101.7%	75-79	137	6,478	150.36	91.1%
80-84	163	2,530	169.05	96.4%	80-84	193	4,622	180.43	107.0%
85-89	149	1,437	167.62	88.9%	85-89	232	2,855	192.90	120.3%
90-94	113	567	110.32	102.4%	90-94	179	1,245	145.88	122.7%
95-99	20	103	28.57	70.0%	95-99	90	350	61.70	145.9%
100+	1	3	1.07	93.5%	100+	10	34	7.72	129.5%
Totals	758	21,483	770.22	98.4%	Totals	1,041	42,729	995.59	104.6%

2013-2014 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
55-59	8	861	3.92	204.1%	55-59	7	1,563	5.40	129.6%
60-64	28	3,413	24.54	114.1%	60-64	28	6,435	35.38	79.1%
65-69	61	5,492	65.05	93.8%	65-69	71	11,164	95.41	74.4%
70-74	86	4,334	83.70	102.7%	70-74	109	9,632	135.40	80.5%
75-79	127	3,500	124.19	102.3%	75-79	128	6,899	159.06	80.5%
80-84	157	2,604	171.69	91.4%	80-84	175	4,795	186.74	93.7%
85-89	177	1,528	177.93	99.5%	85-89	212	2,949	198.78	106.7%
90-94	105	576	112.60	93.3%	90-94	188	1,325	154.54	121.7%
95-99	39	123	34.34	113.6%	95-99	84	366	64.64	130.0%
100+	1	5	1.74	57.5%	100+	9	40	9.17	98.1%
Totals	789	22,436	799.70	98.7%	Totals	1,011	45,168	1,044.52	96.8%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
PRE-RETIREMENT MORTALITY**

2008-2014 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	185	0.06	0.0%	Under 20	-	470	0.07	0.0%
20-24	1	7,096	2.64	37.9%	20-24	1	13,906	2.21	45.3%
25-29	7	19,607	8.18	85.6%	25-29	7	38,284	6.56	106.7%
30-34	10	22,096	14.66	68.2%	30-34	14	42,208	9.83	142.4%
35-39	12	22,845	21.34	56.2%	35-39	22	48,024	18.62	118.1%
40-44	26	27,352	36.67	70.9%	40-44	27	68,442	35.49	76.1%
45-49	42	34,162	69.82	60.2%	45-49	70	89,508	70.32	99.5%
50-54	81	43,430	112.10	72.3%	50-54	110	102,495	128.47	85.6%
55-59	115	44,181	183.26	62.8%	55-59	141	93,100	191.85	73.5%
60-64	124	31,092	194.22	63.8%	60-64	117	58,079	179.60	65.1%
Totals	418	252,046	642.94	65.0%	Totals	509	554,516	643.03	79.2%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
PRE-RETIREMENT MORTALITY**

2008-2009 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	32	0.01	0.0%	Under 20	-	103	0.02	0.0%
20-24	-	1,313	0.49	0.0%	20-24	-	2,721	0.45	0.0%
25-29	1	3,270	1.38	72.6%	25-29	2	6,617	1.18	170.1%
30-34	4	3,466	2.34	171.2%	30-34	2	6,870	1.64	121.7%
35-39	1	3,983	3.85	26.0%	35-39	8	8,631	3.45	231.9%
40-44	7	4,742	6.61	105.9%	40-44	5	12,847	6.88	72.7%
45-49	6	6,559	14.03	42.8%	45-49	11	16,671	13.55	81.2%
50-54	14	7,580	20.37	68.7%	50-54	25	17,438	22.74	109.9%
55-59	16	7,383	31.70	50.5%	55-59	27	14,678	30.81	87.6%
60-64	12	4,472	28.79	41.7%	60-64	15	8,292	25.87	58.0%
Totals	61	42,800	109.56	55.7%	Totals	95	94,868	106.58	89.1%

2009-2010 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	23	0.01	0.0%	Under 20	-	103	0.02	0.0%
20-24	-	1,218	0.46	0.0%	20-24	-	2,423	0.39	0.0%
25-29	3	3,258	1.37	219.1%	25-29	2	6,514	1.14	175.5%
30-34	-	3,453	2.32	0.0%	30-34	4	6,981	1.65	242.2%
35-39	2	3,828	3.65	54.8%	35-39	5	8,271	3.27	153.1%
40-44	5	4,747	6.50	77.0%	40-44	4	12,482	6.61	60.5%
45-49	9	6,189	12.99	69.3%	45-49	7	16,187	13.02	53.8%
50-54	14	7,496	19.80	70.7%	50-54	18	17,266	22.16	81.2%
55-59	21	7,430	31.48	66.7%	55-59	35	15,283	31.87	109.8%
60-64	23	4,893	31.14	73.9%	60-64	19	9,003	28.08	67.7%
Totals	77	42,535	109.70	70.2%	Totals	94	94,513	108.20	86.9%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
PRE-RETIREMENT MORTALITY**

2010-2011 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	29	0.01	0.0%	Under 20	-	83	0.01	0.0%
20-24	-	1,148	0.43	0.0%	20-24	-	2,148	0.34	0.0%
25-29	1	3,165	1.33	75.2%	25-29	1	6,218	1.07	93.2%
30-34	1	3,540	2.36	42.4%	30-34	1	6,809	1.59	62.8%
35-39	2	3,609	3.39	59.1%	35-39	-	7,769	3.03	0.0%
40-44	1	4,606	6.19	16.2%	40-44	3	11,485	5.99	50.1%
45-49	7	5,759	11.85	59.1%	45-49	16	15,177	12.03	133.0%
50-54	13	7,377	19.14	67.9%	50-54	16	17,285	21.83	73.3%
55-59	21	7,397	30.92	67.9%	55-59	22	15,468	32.10	68.5%
60-64	28	5,289	33.35	84.0%	60-64	24	9,591	29.87	80.3%
Totals	74	41,919	108.95	67.9%	Totals	83	92,033	107.86	76.9%

2011-2012 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	35	0.01	0.0%	Under 20	-	64	0.01	0.0%
20-24	1	1,095	0.41	245.0%	20-24	-	2,078	0.33	0.0%
25-29	-	3,241	1.35	0.0%	25-29	1	6,236	1.06	94.3%
30-34	-	3,734	2.46	0.0%	30-34	3	6,969	1.61	185.9%
35-39	2	3,656	3.38	59.2%	35-39	3	7,614	2.93	102.5%
40-44	4	4,552	6.03	66.3%	40-44	6	10,970	5.63	106.6%
45-49	5	5,472	11.03	45.3%	45-49	14	14,425	11.21	124.9%
50-54	15	7,211	18.40	81.5%	50-54	17	17,171	21.30	79.8%
55-59	18	7,385	30.37	59.3%	55-59	18	15,756	32.37	55.6%
60-64	20	5,431	33.77	59.2%	60-64	19	9,953	30.75	61.8%
Totals	65	41,812	107.21	60.6%	Totals	81	91,236	107.19	75.6%

**APPENDIX – DETAILED EXPERIENCE ANALYSIS
PRE-RETIREMENT MORTALITY**

2012-2013 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	34	0.01	0.0%	Under 20	-	59	0.01	0.0%
20-24	-	1,141	0.42	0.0%	20-24	1	2,226	0.34	290.6%
25-29	1	3,304	1.36	73.4%	25-29	-	6,200	1.04	0.0%
30-34	2	3,915	2.57	77.8%	30-34	-	7,149	1.64	0.0%
35-39	5	3,798	3.48	143.8%	35-39	3	7,721	2.94	102.1%
40-44	5	4,367	5.73	87.3%	40-44	5	10,460	5.30	94.4%
45-49	8	5,184	10.24	78.1%	45-49	11	13,810	10.55	104.3%
50-54	15	7,010	17.62	85.1%	50-54	8	16,896	20.64	38.8%
55-59	21	7,328	29.73	70.6%	55-59	20	15,945	32.50	61.5%
60-64	24	5,447	33.44	71.8%	60-64	19	10,332	31.73	59.9%
Totals	81	41,528	104.61	77.4%	Totals	67	90,798	106.69	62.8%

2013-2014 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	32	0.01	0.0%	Under 20	-	58	0.01	0.0%
20-24	-	1,181	0.43	0.0%	20-24	-	2,310	0.35	0.0%
25-29	1	3,369	1.39	71.7%	25-29	1	6,499	1.07	93.1%
30-34	3	3,988	2.62	114.6%	30-34	4	7,430	1.69	236.6%
35-39	-	3,971	3.60	0.0%	35-39	3	8,018	3.02	99.5%
40-44	4	4,338	5.62	71.2%	40-44	4	10,198	5.10	78.5%
45-49	7	4,999	9.68	72.3%	45-49	11	13,238	9.96	110.5%
50-54	10	6,756	16.76	59.7%	50-54	26	16,439	19.80	131.3%
55-59	18	7,258	29.06	61.9%	55-59	19	15,970	32.20	59.0%
60-64	17	5,560	33.73	50.4%	60-64	21	10,908	33.31	63.0%
Totals	60	41,452	102.90	58.3%	Totals	89	91,068	106.50	83.6%

APPENDIX – DETAILED EXPERIENCE ANALYSIS DISABLED MORTALITY

2008-2014 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
41-44	2	52	1.17	170.9%	41-44	3	130	1.49	201.9%
45-49	5	217	4.90	102.0%	45-49	11	463	7.36	149.4%
50-54	15	783	21.07	71.2%	50-54	29	1,147	24.26	119.5%
55-59	46	1,568	52.00	88.5%	55-59	84	2,068	55.75	150.7%
60-64	68	2,390	94.20	72.2%	60-64	70	2,704	96.34	72.7%
65-69	45	1,253	56.97	79.0%	65-69	54	1,775	83.89	64.4%
70-74	21	362	20.70	101.4%	70-74	14	576	38.59	36.3%
75-79	18	225	16.35	110.1%	75-79	20	335	31.31	63.9%
80-84	19	143	13.87	137.0%	80-84	15	153	19.47	77.1%
85-89	7	50	6.25	112.0%	85-89	8	84	15.04	53.2%
90-94	1	14	2.22	45.0%	90-94	7	32	7.30	95.9%
95-99	-	-	0.00	0.0%	95-99	5	13	3.51	142.5%
>= 100	-	-	0.00	0.0%	>= 100	-	-	-	N/A
Totals	247	7,057	289.70	85.3%	Totals	320	9,480	384.31	83.3%

APPENDIX – DETAILED EXPERIENCE ANALYSIS DISABLED MORTALITY

2008-2009 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
41-44	-	10	0.23	0.0%	41-44	1	32	0.36	278.7%
45-49	1	55	1.24	80.6%	45-49	2	98	1.55	129.1%
50-54	3	153	4.12	72.8%	50-54	8	215	4.51	177.4%
55-59	10	272	9.04	110.7%	55-59	15	342	9.21	162.9%
60-64	12	344	13.47	89.1%	60-64	11	418	14.94	73.6%
65-69	4	83	3.66	109.4%	65-69	1	129	5.66	17.7%
70-74	-	-	-	N/A	70-74	-	-	-	N/A
75-79	-	-	-	N/A	75-79	-	-	-	N/A
80-84	-	-	-	N/A	80-84	-	-	-	N/A
85-89	-	-	-	N/A	85-89	-	-	-	N/A
90-94	-	-	-	N/A	90-94	-	-	-	N/A
95-99	-	-	-	N/A	95-99	-	-	-	N/A
>= 100	-	-	-	N/A	>= 100	-	-	-	N/A
Totals	30	917	31.75	94.5%	Totals	38	1,234	36.23	104.9%

2009-2010 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
41-44	-	10	0.23	0.0%	41-44	-	31	0.36	0.0%
45-49	1	48	1.08	92.3%	45-49	1	82	1.31	76.3%
50-54	4	153	4.11	97.4%	50-54	6	221	4.67	128.5%
55-59	7	264	8.75	80.0%	55-59	13	353	9.56	136.0%
60-64	12	391	15.32	78.3%	60-64	11	414	14.79	74.4%
65-69	3	134	5.99	50.0%	65-69	5	223	10.07	49.7%
70-74	-	-	-	N/A	70-74	-	-	-	N/A
75-79	-	-	-	N/A	75-79	-	-	-	N/A
80-84	-	-	-	N/A	80-84	-	-	-	N/A
85-89	-	-	-	N/A	85-89	-	-	-	N/A
90-94	-	-	-	N/A	90-94	-	-	-	N/A
95-99	-	-	-	N/A	95-99	-	-	-	N/A
>= 100	-	-	-	N/A	>= 100	-	-	-	N/A
Totals	27	1,000	35.48	76.1%	Totals	36	1,324	40.76	88.3%

Due to changes in the way data was reported over the six-year period, disabled members over age 65 were not tracked prior to 2012.

APPENDIX – DETAILED EXPERIENCE ANALYSIS DISABLED MORTALITY

2010-2011 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
41-44	1	10	0.23	443.0%	41-44	2	23	0.26	765.5%
45-49	1	34	0.77	130.3%	45-49	3	88	1.40	214.2%
50-54	1	139	3.70	27.0%	50-54	2	203	4.32	46.3%
55-59	12	273	9.03	132.9%	55-59	11	347	9.38	117.3%
60-64	9	409	16.15	55.7%	60-64	13	431	15.32	84.8%
65-69	9	190	8.63	104.2%	65-69	9	312	14.56	61.8%
70-74	-	-	-	N/A	70-74	-	-	-	N/A
75-79	-	-	-	N/A	75-79	-	-	-	N/A
80-84	-	-	-	N/A	80-84	-	-	-	N/A
85-89	-	-	-	N/A	85-89	-	-	-	N/A
90-94	-	-	-	N/A	90-94	-	-	-	N/A
95-99	-	-	-	N/A	95-99	-	-	-	N/A
>= 100	-	-	-	N/A	>= 100	-	-	-	N/A
Totals	33	1,055	38.51	85.7%	Totals	40	1,404	45.24	88.4%

2011-2012 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
41-44	-	8	0.18	0.0%	41-44	-	18	0.20	0.0%
45-49	2	27	0.61	328.2%	45-49	1	74	1.17	85.5%
50-54	5	128	3.43	145.9%	50-54	4	184	3.89	102.8%
55-59	5	260	8.61	58.1%	55-59	15	356	9.56	156.9%
60-64	14	426	16.86	83.0%	60-64	12	466	16.56	72.4%
65-69	5	152	6.77	73.8%	65-69	11	224	10.24	107.4%
70-74	-	-	-	N/A	70-74	-	-	-	N/A
75-79	-	-	-	N/A	75-79	-	-	-	N/A
80-84	-	-	-	N/A	80-84	-	-	-	N/A
85-89	-	-	-	N/A	85-89	-	-	-	N/A
90-94	-	-	-	N/A	90-94	-	-	-	N/A
95-99	-	-	-	N/A	95-99	-	-	-	N/A
>= 100	-	-	-	N/A	>= 100	-	-	-	N/A
Totals	31	1,001	36.46	85.0%	Totals	43	1,322	41.63	103.3%

Due to changes in the way data was reported over the six-year period, disabled members over age 65 were not tracked prior to 2012.

APPENDIX – DETAILED EXPERIENCE ANALYSIS DISABLED MORTALITY

2012-2013 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
41-44	1	9	0.20	492.3%	41-44	-	15	0.18	0.0%
45-49	-	26	0.59	0.0%	45-49	1	61	0.98	102.6%
50-54	2	117	3.17	63.0%	50-54	6	174	3.69	162.6%
55-59	6	253	8.41	71.3%	55-59	13	341	9.18	141.6%
60-64	9	407	16.09	55.9%	60-64	15	490	17.44	86.0%
65-69	15	325	14.93	100.5%	65-69	15	438	21.45	69.9%
70-74	7	179	10.23	68.5%	70-74	4	273	18.31	21.8%
75-79	11	111	8.09	136.0%	75-79	8	165	15.52	51.5%
80-84	10	74	7.15	139.8%	80-84	7	69	8.88	78.9%
85-89	5	25	3.16	158.2%	85-89	6	45	8.04	74.6%
90-94	-	5	0.79	0.0%	90-94	4	17	3.94	101.6%
95-99	-	-	-	N/A	95-99	2	5	1.37	146.0%
>= 100	-	-	-	N/A	>= 100	-	-	-	N/A
Totals	66	1,531	72.81	90.7%	Totals	81	2,093	108.97	74.3%

2013-2014 Experience

Males					Females				
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/Expected
41-44	-	5	0.11	0.0%	41-44	-	11	0.13	0.0%
45-49	-	27	0.61	0.0%	45-49	3	60	0.96	312.6%
50-54	-	93	2.54	0.0%	50-54	3	150	3.18	94.2%
55-59	6	246	8.16	73.5%	55-59	17	329	8.86	191.8%
60-64	12	413	16.32	73.5%	60-64	8	485	17.29	46.3%
65-69	9	369	16.99	53.0%	65-69	13	449	21.90	59.4%
70-74	14	183	10.47	133.7%	70-74	10	303	20.28	49.3%
75-79	7	114	8.26	84.7%	75-79	12	170	15.79	76.0%
80-84	9	69	6.71	134.0%	80-84	8	84	10.59	75.5%
85-89	2	25	3.09	64.6%	85-89	2	39	6.99	28.6%
90-94	1	9	1.43	70.1%	90-94	3	15	3.36	89.3%
95-99	-	-	-	N/A	95-99	3	8	2.14	140.3%
>= 100	-	-	-	N/A	>= 100	-	-	-	N/A
Totals	60	1,553	74.71	80.3%	Totals	82	2,103	111.49	73.5%

Due to changes in the way data was reported over the six-year period, disabled members over age 65 were not tracked prior to 2012.