GRS **Gabriel Roeder Smith & Company**
Consultants & Actuaries

PUBLIC EMPLOYEES POLICE & FIRE PLAN OF MINNESOTA

4-YEAR EXPERIENCE STUDY
JULY 1, 2011 THROUGH JUNE 30, 2015

August 30, 2016

Public Employees Retirement Association
Public Employees Police & Fire Plan

Dear Board of Directors:

The results of the four-year *actuarial experience study* of the Public Employees Police & Fire Plan (PEPFP) 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 Public Employees Police & Fire Retirement Plan.

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

The investigation covered the four-year period from *July 1, 2011 to June 30, 2015*, 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 Public Employees Police & Fire 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 Plan and those designated or approved by the Board. This report may be provided to parties other than PERA only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report.
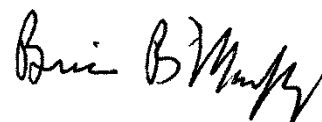
This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge and belief, the information contained in this report was performed in accordance with Minnesota Statutes Section 356.215 and the requirements of the Standards 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 Bonita J. 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

Bonita J. Wurst, ASA, EA, FCA, MAAA

Brian B Murphy

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BJW/BBM:sc

ACTUARIAL EXPERIENCE STUDY
2011 - 2015

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SUMMARY OF FINDINGS

The four-year period (July 1, 2011 to June 30, 2015) 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 Public Employees Police & Fire Plan (PEPFP). The recommended changes in actuarial assumptions and methods resulting from this experience study are summarized below:

Recommendations:

- Adjust rates of merit and seniority, resulting in an overall decrease to the assumed rates of merit and seniority increases:
    - Proposed rates are approximately equal to current rates for the first seven years of employment and are less than current rates after seven years.
    - Proposed rates average approximately 0.3% lower than current rates.
- Adjust assumed retirement rates:
    - Increase the assumed unreduced retirements (i.e. Normal Retirement) at ages 56 to 58 and decrease the assumed unreduced retirements at ages 55, 60, and 62-64. The net effect is a small reduction in the amount of unreduced retirements compared to the previous assumption.
    - Decrease the assumed reduced retirements (i.e. Early Retirement) at all ages except age 53. While there were more early retirements than expected over the four year period, we anticipate fewer early retirements in the future due to the change in the early retirement subsidy for retirements after June 30, 2014.
- Adjust assumed termination rates:
    - Decrease the assumed termination rates in the first three years of employment. While actual experience during the first three years shows more terminations than expected, these proposed rates recognize that the liability decrementing out during the first three years of employment is much less than expected.
    - Decrease the ultimate termination rates for members younger than age 29, increase the assumed ultimate termination rates for ages 29 to 49, and eliminate the withdrawal assumption for members over age 49.
- Change the base mortality table to the RP-2014 mortality table, with future improvement projected using scale MP-2015 from a base year of 2006.
- Minor changes to the assumed percent married, age difference and form of payment assumptions.

The recommendations are summarized on the following pages.

Review of economic assumptions (inflation, payroll growth, investment return) and actuarial methods is outside the scope of this experience study. Please refer to GRS' General Employees Retirement Fund experience study dated June 30, 2015.

INTRODUCTION

Each year as of June 30, the actuarial liabilities of the Plan are valued. In order to perform the valuation, assumptions must be made regarding the future experience of the Plan 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; and

- 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 Board of Directors.

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, 2012 actuarial valuation based on the results of the most recent experience study. Assumptions in effect prior to June 30, 2015 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. The various assumption changes are described on the following pages.

SUMMARY OF DECREMENT EXPERIENCE
2011 - 2015

| Decrement Risk Area | Actual Number | Expected | | Change |
		Present Assumptions	Proposed Assumptions	
Retirement				
Normal Retirement	666	662.5	640.0	(22.5)
Early Retirement	584	579.5	451.4	(128.1)
Withdrawal				
Select period (first three years)*	267	218.9	128.1	(90.8)
Ultimate period (after three years)	619	409.1	467.5	58.4
Disability				
Males	122	176.1	176.1	-
Females	29	21.8	21.8	-
Mortality				
Healthy Retired Lives - Male	560	582.0	549.3	(32.7)
- Female	19	18.6	18.3	(0.3)
Disabled Retired Lives - Male	49	95.3	38.7	(56.6)
- Female	7	3.4	1.7	(1.7)
Active Lives - Male	40	34.5	42.1	7.6
- Female	3	2.2	2.1	(0.1)

* *The plan experienced more withdrawals during the first three years of employment than projected by the present assumptions (267 actual terminations versus 219 expected). However, the liability associated with these members that left the plan was significantly less than expected. The proposed assumptions more closely match the liability-weighted results.*

SECTION B
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 (often referred to as "wage inflation", 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.

We reviewed the merit and seniority pay increases during the four-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. Excluding all negative pay increases would have overstated actual pay growth.

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. Based on our review of salary experience for PEPFP members for the period July 1, 2011 through June 30, 2015, we observed that members with longer periods of service (i.e. 20 or more years of service) averaged increases about 2.8% for this period. Members with less service received increases that were higher than 2.8% in general. For our analysis of the merit and seniority portion of total salary increase, we assumed that salary increase amounts in excess of 2.8% were attributable to merit and seniority. This assumes that once PEPFP members reach a certain length of service, merit and seniority increases are atypical.

PAY INCREASES DUE TO MERIT AND SENIORITY

Findings

The assumed wage inflation was changed from 3.75% to 3.50% effective July 1, 2015. However, based on the analysis described on the previous page, we estimated the average actual wage inflation component of pay increases was around 2.8% for members of the PEPFP during the four years of the study. 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 3.98% over the four-year period, ranging from 3.25% in 2013 to 5.12% in 2015. After adjusting for the 2.8% average wage inflation for this period, the average net salary increase (i.e., merit and seniority) averaged 1.18%, ranging from 0.45% to 2.32%. Salaries for police & fire employees during this period were impacted by tough economic conditions.

Fiscal Year Ending	Count	Gross		Net*	
		Expected	Actual	Expected	Actual
2012	9,758	5.21%	3.74%	1.71%	0.94%
2013	9,752	5.18%	3.25%	1.68%	0.45%
2014	9,571	5.22%	3.82%	1.72%	1.02%
2015	9,656	5.27%	5.12%	1.77%	2.32%
Total	**38,737**	**5.22%**	**3.98%**	**1.72%**	**1.18%**

* Net Expected increases are equal to Gross Expected increases minus assumed wage inflation of 3.5%. Net Actual increases are equal to Gross Actual increases minus the estimated actual wage inflation for the period of 2.8%.

The results of our analysis are shown on the following page. Using the techniques described above, observed merit and seniority pay increases were generally lower than the presently assumed increases for members with seven or more years of service and were about the same as expected for members with less than seven years of service.

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 four years.

PAY INCREASES DUE TO MERIT AND SENIORITY

Year	Exposures	Total Salary % Increase			Merit & Seniority % Increase		
		Actual	**Current**	**Proposed**	**Actual**	**Current**	**Proposed**
1	58	11.23%	12.75%	12.50%	8.43%	9.25%	9.00%
2	910	13.32%	10.75%	10.75%	10.52%	7.25%	7.25%
3	1,283	8.60%	8.75%	9.00%	5.80%	5.25%	5.50%
4	1,281	7.81%	7.75%	8.00%	5.01%	4.25%	4.50%
5	1,550	5.87%	6.25%	6.50%	3.07%	2.75%	3.00%
6	1,772	5.05%	5.85%	6.00%	2.25%	2.35%	2.50%
7	2,047	4.02%	5.55%	5.50%	1.22%	2.05%	2.00%
8	2,036	4.03%	5.35%	5.25%	1.23%	1.85%	1.75%
9	1,826	3.52%	5.15%	5.00%	0.72%	1.65%	1.50%
10	1,699	3.73%	5.05%	4.75%	0.93%	1.55%	1.25%
11	1,634	3.52%	4.95%	4.50%	0.72%	1.45%	1.00%
12	1,651	3.09%	4.85%	4.40%	0.29%	1.35%	0.90%
13	1,866	3.03%	4.75%	4.30%	0.23%	1.25%	0.80%
14	1,957	3.07%	4.65%	4.20%	0.27%	1.15%	0.70%
15	2,009	2.87%	4.55%	4.10%	0.07%	1.05%	0.60%
16	1,923	3.33%	4.55%	4.00%	0.53%	1.05%	0.50%
17	1,745	2.97%	4.55%	4.00%	0.17%	1.05%	0.50%
18	1,579	3.17%	4.55%	4.00%	0.37%	1.05%	0.50%
19	1,379	3.09%	4.55%	4.00%	0.29%	1.05%	0.50%
20	1,176	3.03%	4.55%	4.00%	0.23%	1.05%	0.50%
21	1,000	3.13%	4.45%	3.90%	0.33%	0.95%	0.40%
22	911	3.13%	4.35%	3.80%	0.33%	0.85%	0.30%
23	854	2.55%	4.25%	3.70%	-0.25%	0.75%	0.20%
24	860	2.88%	4.25%	3.60%	0.08%	0.75%	0.10%
25	816	2.89%	4.25%	3.50%	0.09%	0.75%	0.00%
26	735	2.76%	4.25%	3.50%	-0.04%	0.75%	0.00%
27	604	2.86%	4.25%	3.50%	0.06%	0.75%	0.00%
28	465	2.52%	4.25%	3.50%	-0.28%	0.75%	0.00%
29	335	2.62%	4.25%	3.50%	-0.18%	0.75%	0.00%
30	220	2.91%	4.25%	3.50%	0.11%	0.75%	0.00%
31+	556	1.71%	4.25%	3.50%	-1.09%	0.75%	0.00%
Total	**38,737**	**3.98%**	**5.22%**	**4.88%**	**1.18%**	**1.72%**	**1.38%**

* Net Expected increases are equal to Gross Expected increases minus assumed wage inflation of 3.5%. Net Actual increases are equal to Gross Actual increases minus the estimated actual wage inflation for the period of 2.8%.

PAY INCREASES DUE TO MERIT AND SENIORITY

Legend: Actual Experience | Present Assumptions | Proposed Assumptions
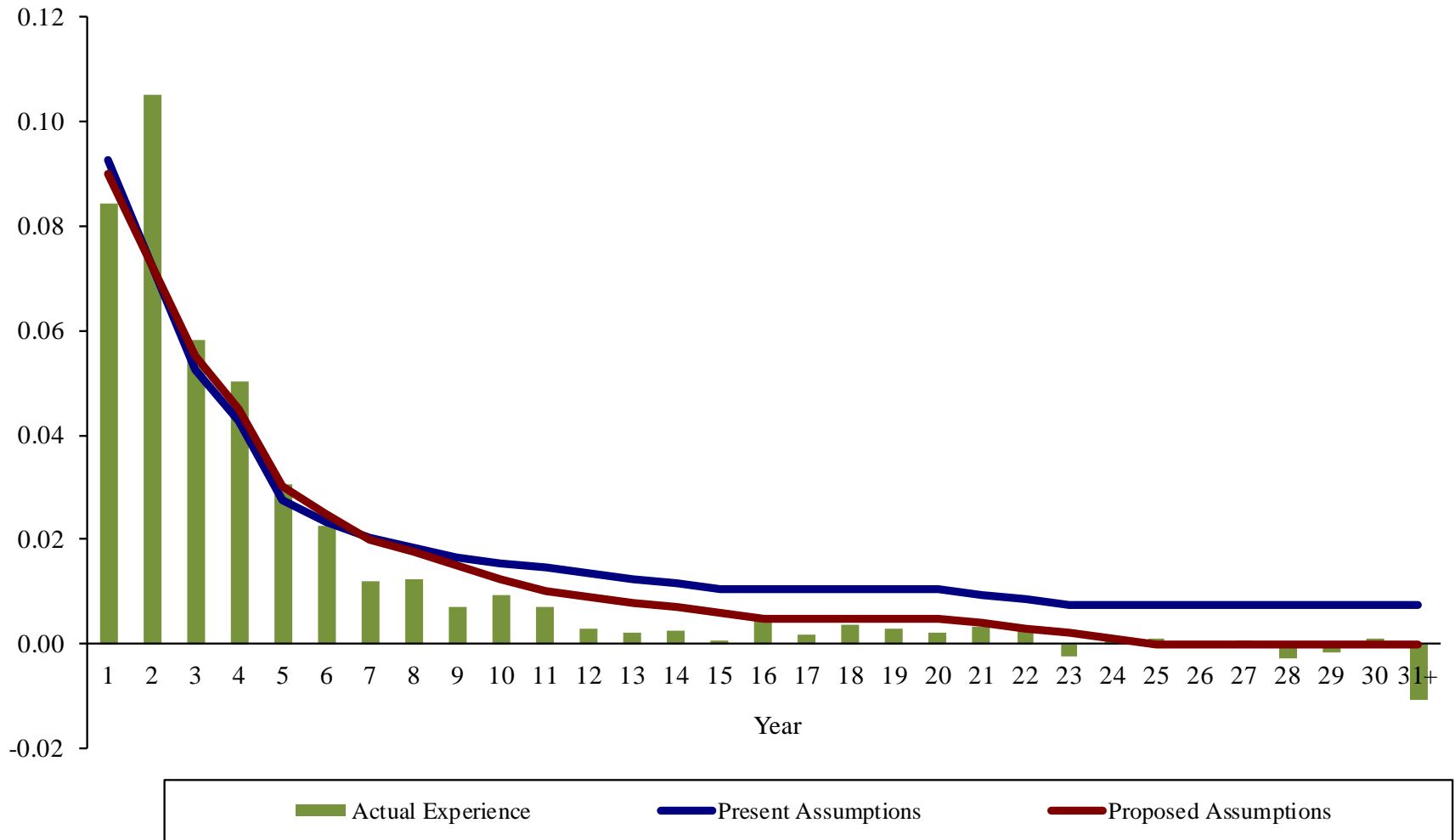
SECTION C
RETIREMENT EXPERIENCE

Findings

The benefit provisions of the PEPFP 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.

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 normal retirement benefit is outlined as follows:

(a) Age 55 and at least partially vested. Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service.
(b) 3.0% of Average Salary for each year of Allowable Service (up to 33 years if hired after June 30, 2014), pro-rata for completed months. A pro-rata share of member contributions will be refunded at retirement for excess service.

Retirements for the year ending June 30, 2014 were significantly greater than the other three years of the study, presumably due to the provision that results in a two-year delay in the first post-retirement benefit increase for retirements after May 31, 2014.

The current assumption ends at age 70; in other words, we assume all members currently under the age of 70 will retire by the age of 70. However, for members currently age 70 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 70 since the valuation assumption is all of these members work until the next valuation date and then retire. During the four-year period, there were four actual retirements at ages 70 or older, including two actual retirements at age 70. We believe assuming 100% retirement at age 70 is an appropriately approach.

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 70.

Age	Actual Retirements	Exposure	Crude Rates	Rates		Expected Retirements		Actual / Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
55	172	666	25.8%	30.0%	25.0%	199.80	166.50	86.1%	103.3%
56	114	460	24.8%	20.0%	22.5%	92.00	103.50	123.9%	110.1%
57	89	361	24.7%	20.0%	22.5%	72.20	81.23	123.3%	109.6%
58	61	264	23.1%	20.0%	22.5%	52.80	59.40	115.5%	102.7%
59	45	217	20.7%	20.0%	20.0%	43.40	43.40	103.7%	103.7%
60	41	186	22.0%	25.0%	22.5%	46.50	41.85	88.2%	98.0%
61	37	151	24.5%	25.0%	25.0%	37.75	37.75	98.0%	98.0%
62	35	111	31.5%	35.0%	30.0%	38.85	33.30	90.1%	105.1%
63	21	72	29.2%	35.0%	30.0%	25.20	21.60	83.3%	97.2%
64	16	50	32.0%	35.0%	30.0%	17.50	15.00	91.4%	106.7%
65	19	38	50.0%	50.0%	50.0%	19.00	19.00	100.0%	100.0%
66	10	19	52.6%	50.0%	50.0%	9.50	9.50	105.3%	105.3%
67	3	9	33.3%	50.0%	50.0%	4.50	4.50	66.7%	66.7%
68	3	5	60.0%	50.0%	50.0%	2.50	2.50	120.0%	120.0%
69	-	2	0.0%	50.0%	50.0%	1.00	1.00	0.0%	0.0%
70+	*	*	N/A	*	100.0%	0.00	0.00	N/A	N/A
Totals	**666**	**2,611**	**25.5%**	**25.4%**	**24.5%**	**662.50**	**640.03**	**100.5%**	**104.1%**

* *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. 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 four actual retirements over age 70.*
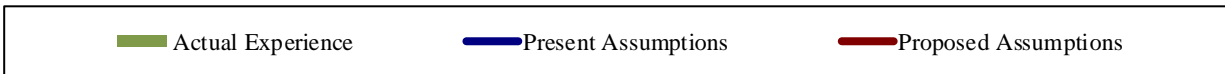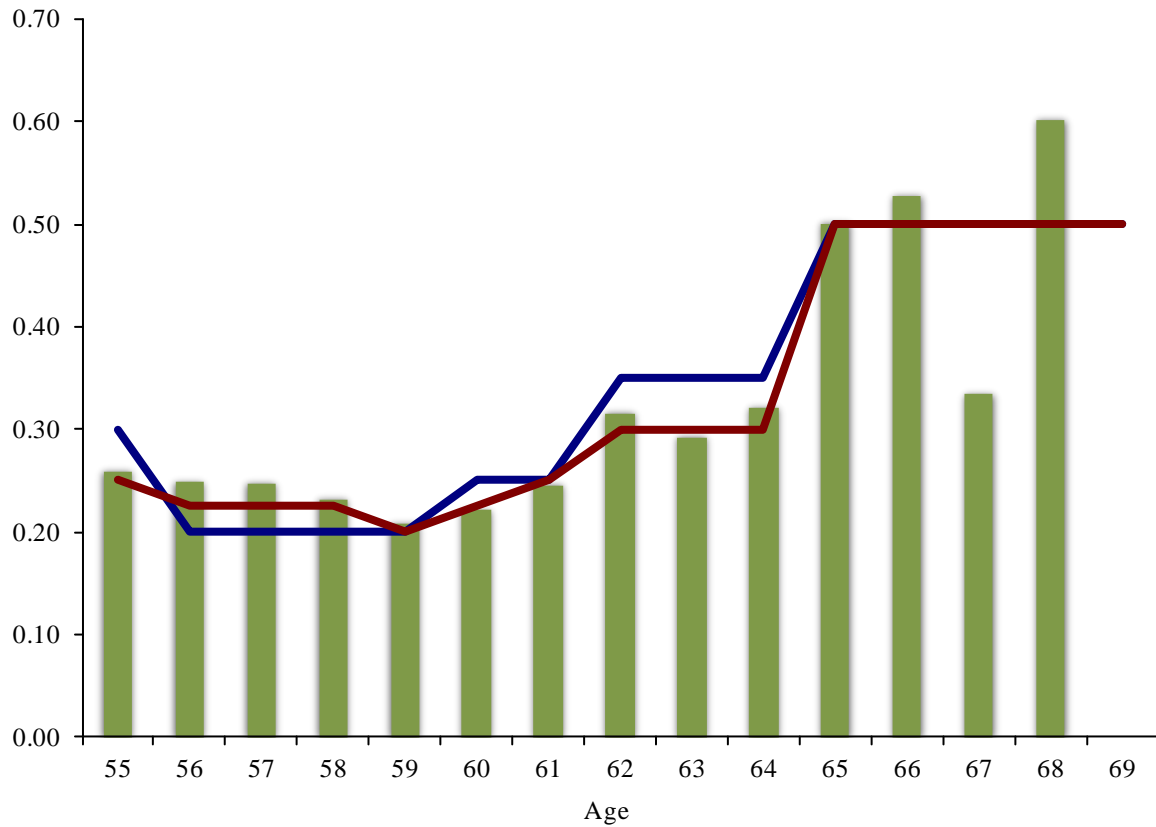
Findings

PEPFP members may also retire with a reduced benefit prior to the attainment of Normal Retirement. We refer to these cases as early retirements.

The early retirement benefit payable to PEPFP members is equal to the normal retirement benefit with a reduction for early retirement determined as follows:

> Normal Retirement Benefit based on Allowable Service and Average Salary at retirement date and 0.10% (0.20% for members enrolled in the plan after June 30, 2007) reduction for each month the member is under age 55. If the effective date of retirement is after June 30, 2019, the reduction is 5/12% for each month that the member is under age 55 at the time of retirement. The change in early retirement factors will be phased-in over a five-year period for retirements occurring between July l, 2014 and June 30, 2019.

Generally, higher rates of early retirement 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 more early retirements than projected by the present assumptions (579 expected versus 584 actual – see totals on the following page). Retirements for the year ending June 30, 2014 were significantly greater than the other three years of the study, presumably due to the provision that results in lower benefits and a delayed post-retirement benefit increase for early retirements after June 30, 2014. The plan experienced fewer early retirements than projected by the present assumptions during the first, second and fourth year of the study (426 expected versus 334 actual).

Recommendation

We recommend slight adjustments to the reduced early retirement rates, as indicated on the next page. The proposed rates reflect an expectation that there will be fewer early retirements in the future due to less generous early retirement subsidies.

2011-2015 Experience

Age	Actual Retirements	Exposure	Crude Rates	Rates		Expected Retirements		Actual / Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
50	171	1,354	12.6%	13.0%	10.0%	176.02	135.40	97.1%	126.3%
51	104	1,134	9.2%	10.0%	7.0%	113.40	79.38	91.7%	131.0%
52	100	1,017	9.8%	10.0%	7.0%	101.70	71.19	98.3%	140.5%
53	110	889	12.4%	10.0%	10.0%	88.90	88.90	123.7%	123.7%
54	99	765	12.9%	13.0%	10.0%	99.45	76.50	99.5%	129.4%
Totals	**584**	**5,159**	**11.3%**	**11.2%**	**8.7%**	**579.47**	**451.37**	**100.8%**	**129.4%**
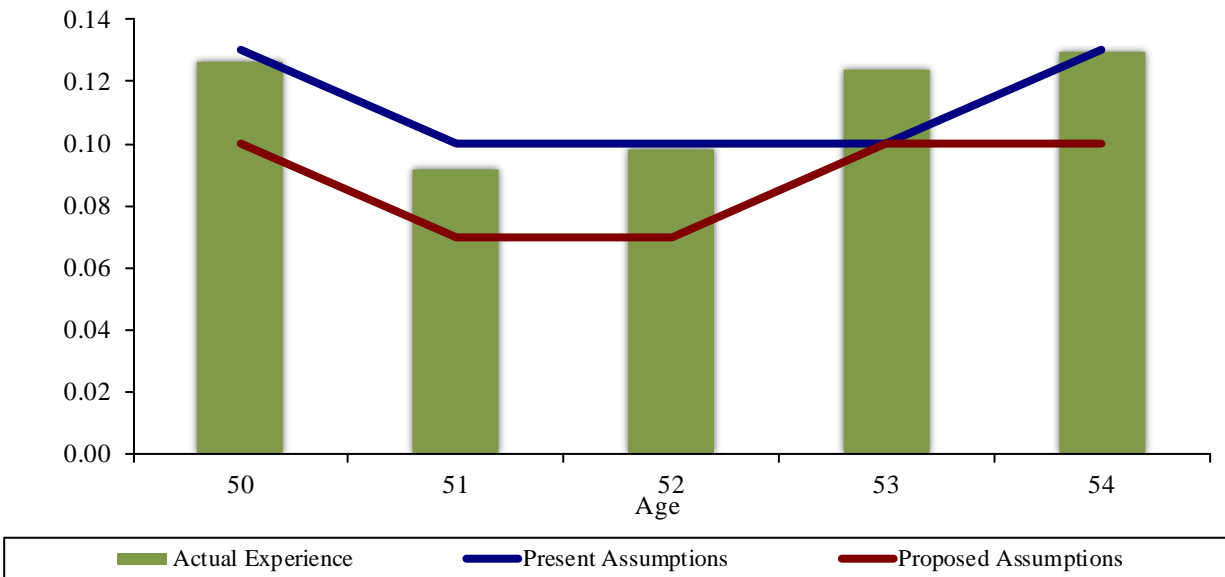
Members who terminate are vested according to the following schedule:

Years of Service	Before 7/1/2010	After 6/30/2010 & before 7/1/2014	After 6/30/2014
		Vesting Percent if First Hired	
<3	0%	0%	0%
3 - 4	100	0	0
5	100	50	0
6	100	60	0
7	100	70	0
8	100	80	0
9	100	90	0
10	100	100	50
11	100	100	55
12	100	100	60
13	100	100	65
14	100	100	70
15	100	100	75
16	100	100	80
17	100	100	85
18	100	100	90
19	100	100	95
20+	100	100	100

Vested members are 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 valuation 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. We recommend no change to this assumption.

SECTION D
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 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 purpose of this study.

Current valuation termination rates for members assume a higher rate of termination during the first three years of employment with age-based rates after the three-year select period.

Findings

The members in this plan are predominately male (approximately 90%). As such, results are not presented by gender.

The plan experienced more withdrawals than projected by the present assumptions during the first three years of employment (267 actual terminations versus 219 expected, or approximately 22% more than expected). However, when we reviewed the liability that decremented out of the plan during the prior four-year period, the results were reversed. Actual liability decrementing out in the first three years was approximately $1,500 while expected liability decrementing out was approximately $3,000.

The plan also experienced more withdrawals than projected by the present assumptions after the third year of employment (619 actual terminations versus 409 expected, or approximately 51% more than expected). The liability that decremented out of the plan during the prior four-year period after the third year of employment was approximately 36% more than expected.

Recommendation

We recommend decreasing rates during the first three years of employment in order to more closely align with the liability-weighted experience. For rates beyond the select period, we recommend decreasing rates for members younger than age 29, increasing rates for members age 29 through 49 and eliminating the withdrawal assumption for members over age 49.

WITHDRAWAL EXPERIENCE – SELECT RATES*
MALES & FEMALES

| Year | Actual Withdrawals | Exposure | Crude Rates | | Rates | | Expected Retirements | | Actual / Expected | |
			Pop. Wght.	Liab. Wght.	Present	Proposed	Present	Proposed	Present	Proposed
1	100	932	10.7%	1.6%	8.0%	3.0%	74.56	27.96	134.1%	357.7%
2	116	1,835	6.3%	2.1%	5.0%	3.0%	91.75	55.05	126.4%	210.7%
3	51	1,502	3.4%	2.7%	3.5%	3.0%	52.57	45.06	97.0%	113.2%
Totals	**267**	**4,269**	**6.3%**	**2.3%**	**5.1%**	**3.0%**	**218.88**	**128.07**	**122.0%**	**208.5%**
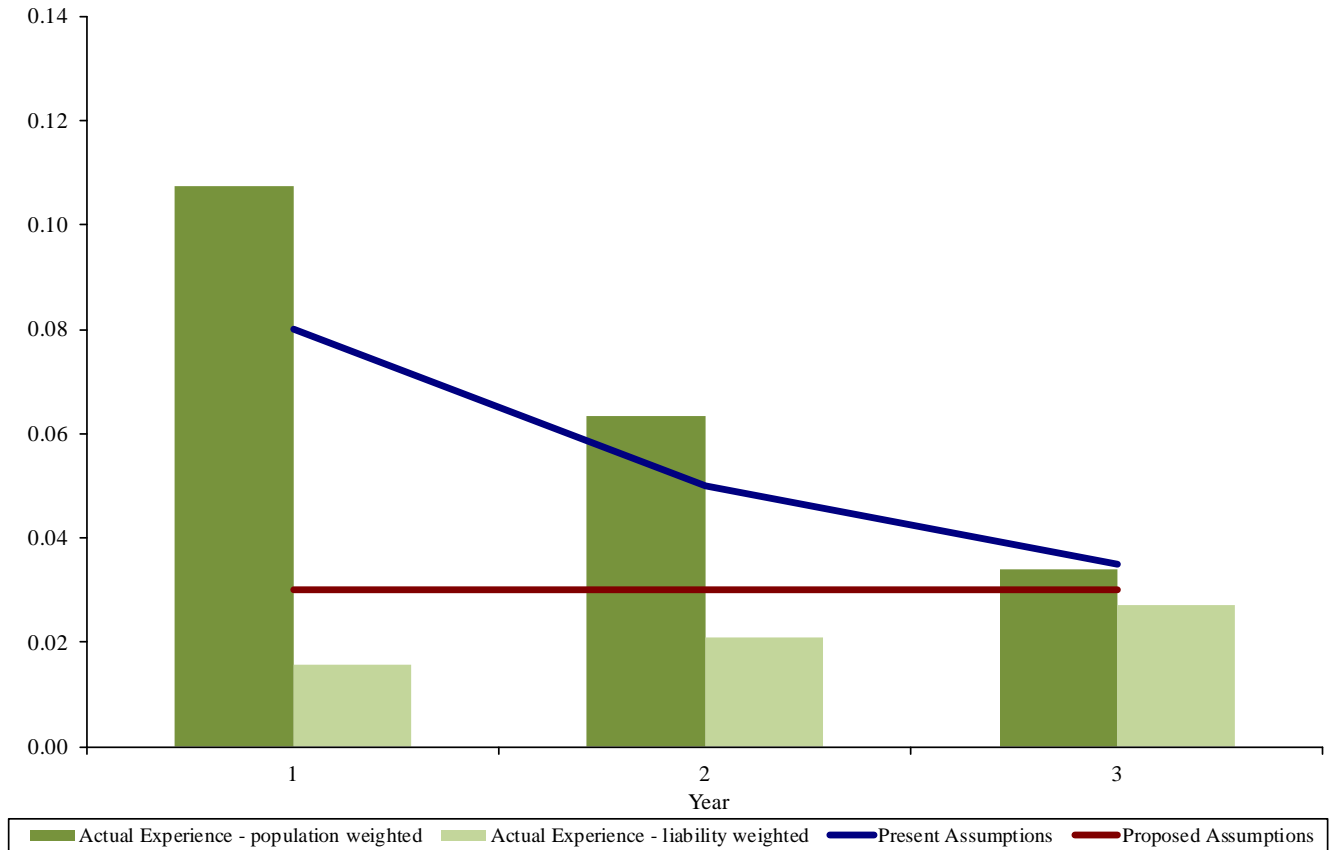
* *The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service.*

WITHDRAWAL EXPERIENCE – ULTIMATE RATES*
MALES & FEMALES

Age Group	Actual Withdrawals	Exposure	Crude Rates		Rates		Expected Retirements		Actual / Expected	
			Pop. Wght.	Liab. Wght.	Present	Proposed	Present	Proposed	Present	Proposed
< 25	-	26	0.0%	0.0%	4.0%	3.0%	0.95	0.71	0.0%	0.0%
25-29	61	2,348	2.6%	2.2%	2.4%	2.3%	57.01	54.37	107.0%	112.2%
30-34	154	5,978	2.6%	2.1%	1.7%	1.9%	101.02	112.97	152.5%	136.3%
35-39	130	7,053	1.8%	1.4%	1.4%	1.4%	97.09	98.89	133.9%	131.5%
40-44	138	8,504	1.6%	1.2%	1.1%	1.3%	94.02	106.31	146.8%	129.8%
45-49	136	7,600	1.8%	1.5%	0.8%	1.2%	59.06	95.00	230.3%	143.2%
Totals	**619**	**31,509**	**2.0%**	**1.4%**	**1.3%**	**1.5%**	**409.14**	**467.54**	**151.3%**	**132.4%**
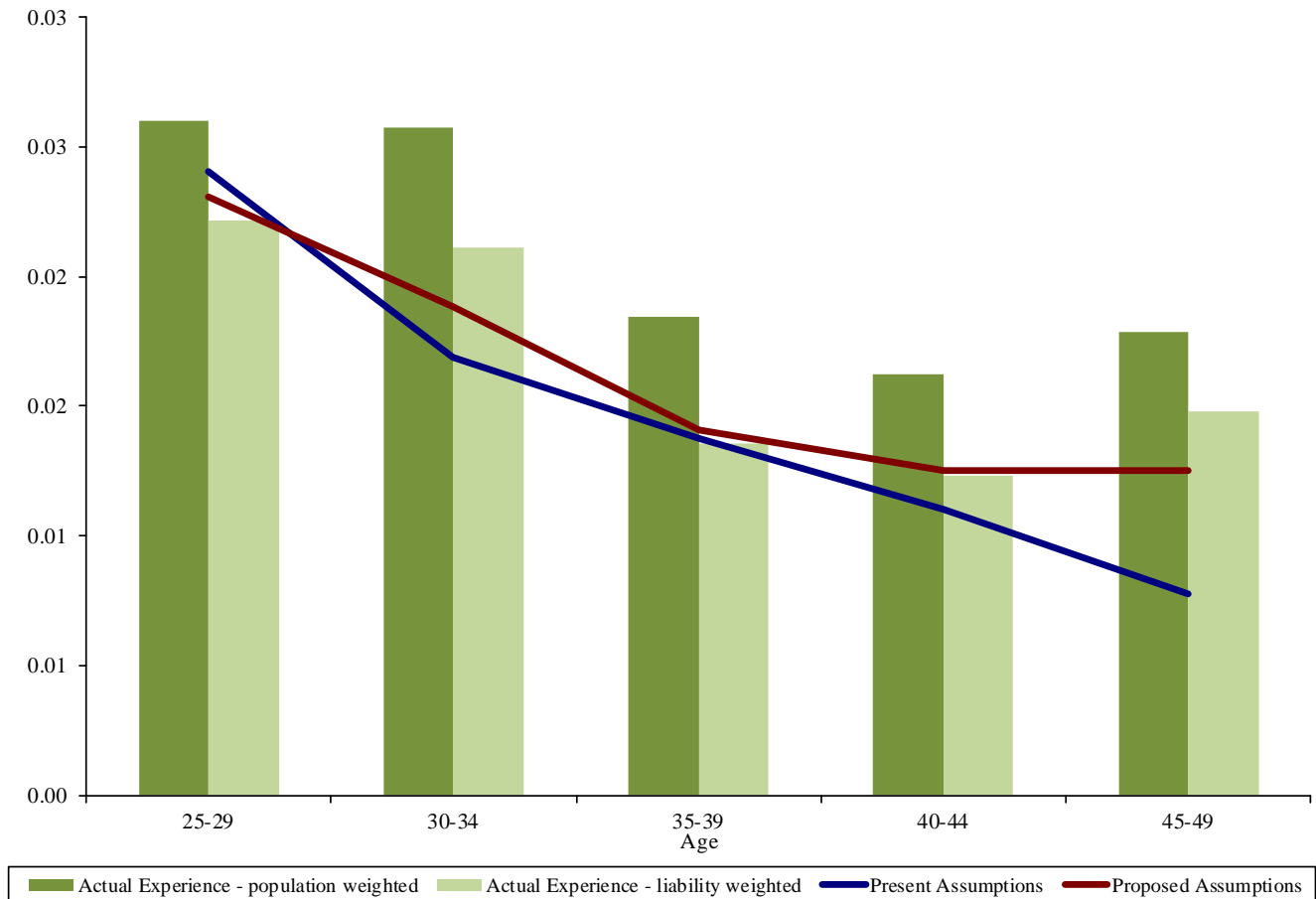
Actual Experience - population weighted   Actual Experience - liability weighted   Present Assumptions   Proposed Assumptions

* The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service.

SECTION E
DISABILITY EXPERIENCE

Findings

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.

Members are not eligible for a disability benefit if age 55 or older with 20 or more years of service (15 or more years of service for a non-duty disability). Disability type (duty or non-duty) is not provided with the valuation data; for valuation purposes, all future disabilities are assumed to be duty related.

We reviewed the disability experience during the four-year period. The results are shown on the following page. Overall, the actual number of disability retirements (151) is lower than the number projected by the present assumption (198 – see chart on the following page).

Members must apply within 18 months from the date service public service is terminated and must provide evidence that he/she is unable to perform job-related duties. As such, there could be a delay in the classification of a member as a disability retirement. Over the four-year period of this study, there were an additional 28 members that were re-classified as a disability retirement after termination. Due to the disclosed experience study methodology, these members are not included in our analysis on the following page but should be considered in setting rates for the future.

Most members will have 20 years of service by age 55 and are not eligible for a disability benefit. However, there were 22 members over the age of 55 that were reported as a disability over the four-year period of our study (17 ages 55-59 as shown on the following page); this result suggests there is high utilization among the few members that are eligible or there is unreliable data.

PERA staff has observed an increasing numbers of disability retirements over the past few years, including approximately 12 months of data beyond the period studied in this report. We are working with PERA to analyze this data.

Recommendation

Due to the issues listed above, we recommend no change to the current disability rates.

DISABILITY EXPERIENCE
MALES & FEMALES

Age	Disabilities	Exposure	Crude Rates	Sample Rates		Expected Disabilities		Ratio of Actuals/Expecteds	
				Old	New	Old	New	Old	New
20-24	-	451	0.0000	0.0012	0.0012	0.57	0.57	0.0%	0.0%
25-29	1	4,130	0.0002	0.0014	0.0014	5.86	5.86	17.1%	17.1%
30-34	9	7,014	0.0013	0.0017	0.0017	11.80	11.80	76.3%	76.3%
35-39	18	7,542	0.0024	0.0022	0.0022	16.36	16.36	110.0%	110.0%
40-44	30	8,787	0.0034	0.0039	0.0039	34.38	34.38	87.3%	87.3%
45-49	46	7,749	0.0059	0.0074	0.0074	56.52	56.52	81.4%	81.4%
50-54	30	5,225	0.0057	0.0143	0.0143	71.69	71.69	41.8%	41.8%
55-59	17	36	0.4722	0.0209	0.0209	0.76	0.76	2236.8%	2236.8%
Totals	**151**	**40,934**	**0.0037**	**0.0049**	**0.0049**	**197.94**	**197.94**	**76.3%**	**76.3%**

Actual Experience ▪ Present Assumptions
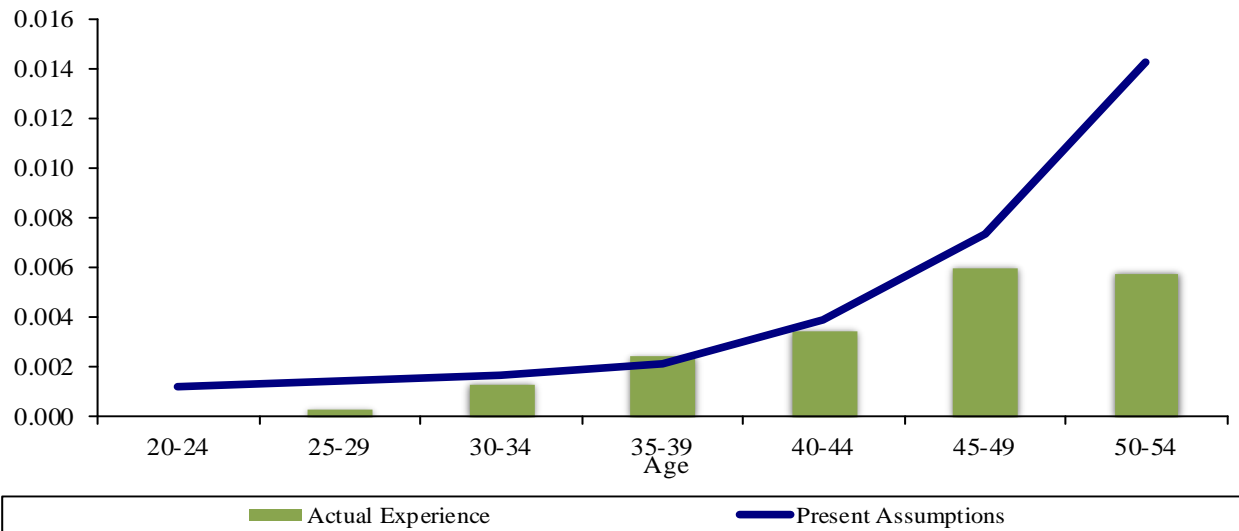
Proposed disability rates are equal to the Present Assumption. Actual experience for ages 55-59 is not shown on the graph above since including it would make the remaining data on the graph illegible.

SECTION F
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. In 2015, the SOA released an updated mortality improvement scale called MP-2015. 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 base experience tables and collar-specific experience versions of the RP-2014 tables. The Blue Collar tables have higher mortality rates than the base tables and the White Collar tables have lower mortality than the base 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

Similar to the withdrawal decrement, 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 RP-2014 mortality rates were developed by the Society of Actuaries using benefit-weighted experience. As such, we show both liability-weighted and population-weighted results in the following exhibits.

Healthy Retirees
We reviewed the mortality experience of healthy retirees during the four-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.

The plan experienced slightly fewer deaths (579) than projected by the present assumptions (601).

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

The plan experienced fewer deaths among disabled retirees (56) than projected by the present assumptions (99).

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

The plan experienced more deaths among active members (43) than projected by the present assumptions (37).

Recommendations

We recommend adoption of the following RP-2014 mortality tables:

Healthy Male Retirees:	RP-2014 Male Healthy Annuitant Mortality Table, adjusted for mortality improvements using projection scale MP-2015. Rates are adjusted by a factor of 0.96.
Healthy Female Retirees:	RP-2014 Female Healthy Annuitant Mortality Table, adjusted for mortality improvements using projection scale MP-2015.
Disabled Male Retirees:	RP-2014 Male Healthy Annuitant Mortality Table, adjusted for mortality improvements using projection scale MP-2015. Rates are adjusted by a factor of 0.96.
Disabled Female Retirees:	RP-2014 Female Healthy Annuitant Mortality Table, adjusted for mortality improvements using projection scale MP-2015.
Male Active Members:	RP-2014 Male Employee Mortality Table, adjusted for mortality improvements using projection scale MP-2015.
Female Active Members:	RP-2014 Female Employee Mortality Table, adjusted for mortality improvements using projection scale MP-2015.

The adjustment factors above were based on credibility theory formulas. Very large retirement systems experiencing at least 1,000 deaths of each gender in the experience period could be considered fully credible, and the plan's experience could carry significant weight in setting the mortality assumption. In the Police and Fire Plan, there were 560 male retiree deaths during the four-year period and the recommendation is to adjust the published mortality rates by -4%. With only 19 female deaths during the four-year period, there is not enough data to justify rates that are significantly different than the published rates; therefore, the proposed rates are unadjusted.

The RP-2014 tables as published by the Society of Actuaries (SOA) are based on rates for 2006. The SOA applied eight years of projection scale MP-2014 to produce the rates published as the "RP-2014" table, to be used for calendar year 2014. Recently, the SOA published an update to the MP-2014 projection scale, called MP-2015, which generally reflects lower improvements to life expectancy than MP-2014. All the proposed tables referred to in the above exhibit are based on the appropriate RP-2014 table as published by the Society of Actuaries (i.e. healthy retiree, disabled retiree or employee), projected backwards to 2006 using Scale MP-2014 and projected forward from 2006 using Scale MP-2015. In addition, mortality rates at some ages were adjusted to prevent decreasing mortality rates.

POST-RETIREMENT MORTALITY EXPERIENCE
HEALTHY MALES

Age	Deaths	Exposure	Crude Rates		Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
			Population Weighted	Liability Weighted	Old	New*	Old	New*	Old	New*
50-54	2	1,405	0.001423	0.001985	0.004510	0.004650	6.23	6.82	32.1%	29.3%
55-59	9	3,832	0.002349	0.001346	0.004482	0.006297	17.34	24.48	51.9%	36.8%
60-64	37	5,193	0.007125	0.006196	0.006887	0.008612	36.01	44.90	102.7%	82.4%
65-69	64	4,933	0.012974	0.012769	0.012085	0.012829	58.66	62.38	109.1%	102.6%
70-74	79	3,539	0.022323	0.022166	0.019920	0.020494	69.80	71.90	113.2%	109.9%
75-79	72	2,416	0.029801	0.030009	0.036366	0.033878	85.96	80.38	83.8%	89.6%
80-84	110	1,708	0.064403	0.059878	0.068054	0.057758	113.63	96.69	96.8%	113.8%
85-89	110	991	0.110999	0.100285	0.121835	0.100539	115.84	95.75	95.0%	114.9%
90-94	56	277	0.202166	0.178014	0.203178	0.169258	54.03	44.84	103.6%	124.9%
95+	21	85	0.247059	0.207692	0.292474	0.252470	24.53	21.19	85.6%	99.1%
Totals	**560**	**24,379**	**0.022971**	**0.015752**	**0.023874**	**0.022533**	**582.03**	**549.33**	**96.2%**	**101.9%**

In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.

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.

POST-RETIREMENT MORTALITY EXPERIENCE
HEALTHY MALES

Legend: Actual Experience - population weighted | Actual Experience - liability weighted | Present Assumptions | Proposed Assumptions

POST-RETIREMENT MORTALITY EXPERIENCE
HEALTHY FEMALES

Age	Deaths	Exposure	Crude Rates		Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
			Population Weighted	Liability Weighted	Old	New*	Old	New*	Old	New*
50-54	-	233	0.000000	0.000000	0.002300	0.003098	0.54	0.74	0.0%	0.0%
55-59	-	369	0.000000	0.000000	0.003978	0.004292	1.48	1.59	0.0%	0.0%
60-64	1	238	0.004202	0.000297	0.006395	0.006439	1.50	1.51	66.7%	66.2%
65-69	1	107	0.009346	0.000488	0.010595	0.010203	1.07	1.04	93.5%	96.2%
70-74	1	69	0.014493	0.013014	0.017494	0.016595	1.21	1.15	82.6%	87.0%
75-79	2	66	0.030303	0.048080	0.028984	0.027403	1.95	1.84	102.6%	108.7%
80-84	5	61	0.081967	0.083569	0.049338	0.047113	2.85	2.71	175.4%	184.5%
85-89	5	47	0.106383	0.133512	0.088336	0.083554	4.25	4.01	117.6%	124.7%
90-94	4	26	0.153846	0.238776	0.145996	0.143903	3.58	3.50	111.7%	114.3%
95+	-	1	0.000000	0.000000	0.208827	0.225283	0.18	0.19	0.0%	0.0%
Totals	**19**	**1,217**	**0.015612**	**0.006795**	**0.015292**	**0.015021**	**18.61**	**18.28**	**102.1%**	**103.9%**

* In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.

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.

POST-RETIREMENT MORTALITY EXPERIENCE
HEALTHY FEMALES

Legend: Actual Experience - population weighted | Actual Experience - liability weighted | Present Assumptions | Proposed Assumptions

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*
35-39	1	87	0.011494	0.001346	0.001360	0.12	0.12	833.3%	833.3%
40-44	-	154	0.000000	0.004272	0.002066	0.74	0.33	0.0%	0.0%
45-49	3	315	0.009524	0.005518	0.003159	1.74	1.01	172.4%	297.0%
50-54	-	479	0.000000	0.006773	0.004650	3.28	2.25	0.0%	0.0%
55-59	9	720	0.012500	0.011714	0.006297	8.56	4.57	105.1%	196.9%
60-64	5	783	0.006386	0.019562	0.008612	15.46	6.79	32.3%	73.6%
65-69	14	689	0.020319	0.034090	0.012829	22.59	8.58	62.0%	163.2%
70-74	8	313	0.025559	0.060357	0.020494	17.97	6.15	44.5%	130.1%
75-79	5	141	0.035461	0.105881	0.033878	14.41	4.62	34.7%	108.2%
80-84	3	41	0.073171	0.178253	0.057759	6.54	2.13	45.9%	140.8%
85-89	1	22	0.045455	0.264571	0.100539	3.92	2.15	25.5%	46.5%
Totals	**49**	**3,744**	**0.013088**	**0.025462**	**0.010337**	**95.33**	**38.70**	**51.4%**	**126.6%**

* In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.
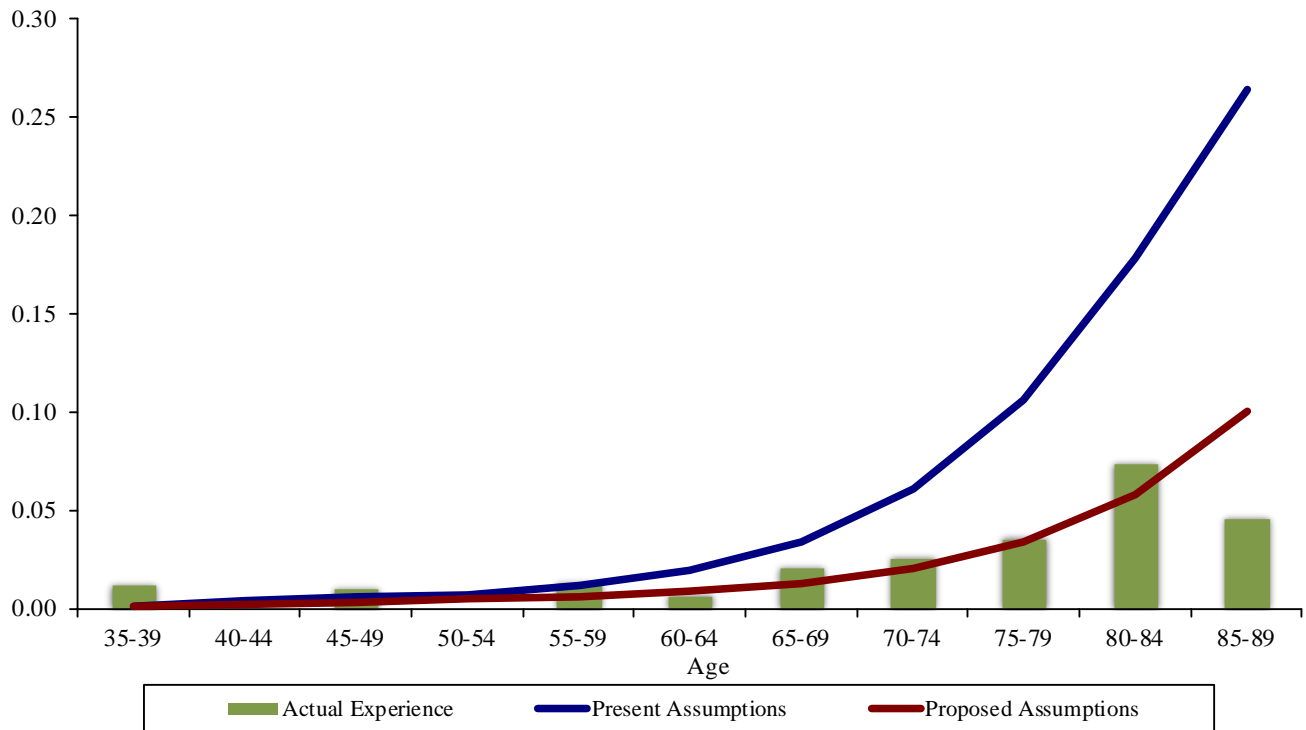
POST-RETIREMENT MORTALITY EXPERIENCE
DISABLED FEMALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old	New*	Old	New*	Old	New*
35-39	-	17	0.000000	0.001025	0.001275	0.01	0.02	0.0%	0.0%
40-44	1	63	0.015873	0.002093	0.001802	0.10	0.09	1000.0%	1111.1%
45-49	2	103	0.019417	0.003532	0.002381	0.31	0.22	645.2%	909.1%
50-54	-	93	0.000000	0.005664	0.003098	0.54	0.31	0.0%	0.0%
55-59	-	86	0.000000	0.009213	0.004292	0.69	0.33	0.0%	0.0%
60-64	-	39	0.000000	0.015389	0.006439	0.69	0.29	0.0%	0.0%
65-69	-	18	0.000000	0.025975	0.010203	0.46	0.18	0.0%	0.0%
70-74	2	9	0.222222	0.043623	0.016595	0.40	0.15	500.0%	1333.3%
75-79	1	1	1.000000	0.075081	0.027403	0.12	0.04	833.3%	2500.0%
80-84	1	1	1.000000	0.126592	0.047113	0.10	0.05	1000.0%	2000.0%
85-89	-	-	N/A	0.189295	0.083554	-	-	N/A	N/A
Totals	**7**	**430**	**0.016279**	**0.007953**	**0.003907**	**3.42**	**1.68**	**204.7%**	**416.7%**

In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.
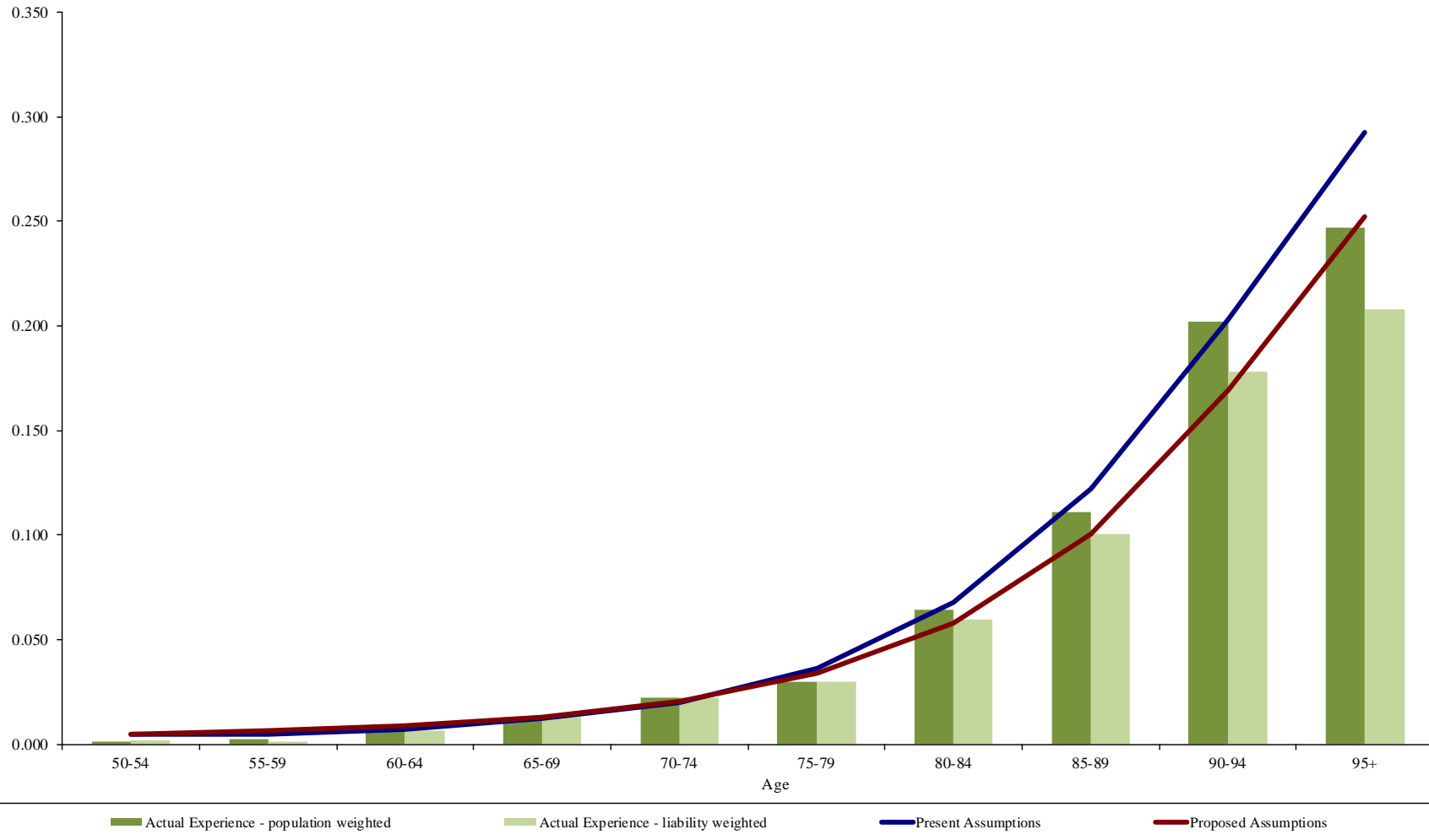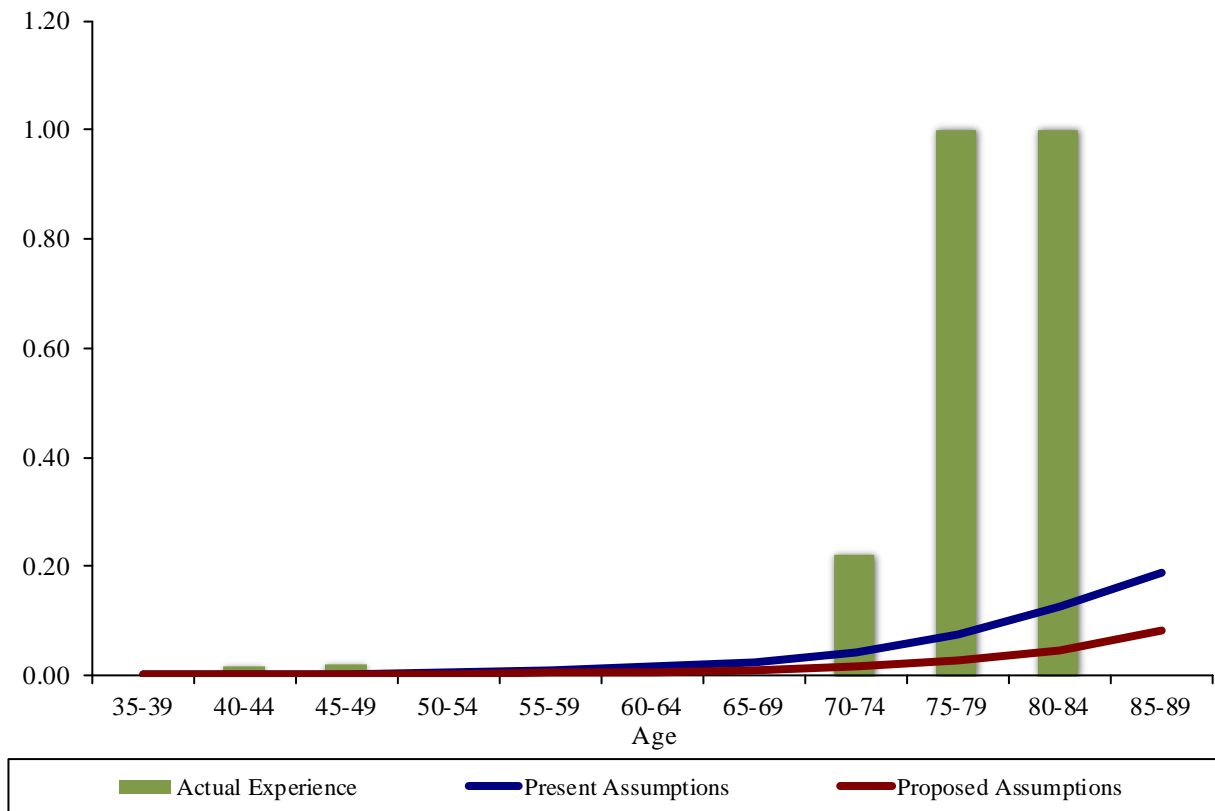
PRE-RETIREMENT MORTALITY EXPERIENCE
HEALTHY MALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old	New	Old	New	Old	New
20-24	0	389	0.0000	0.0003	0.0005	0.11	0.19	0.1%	0.1%
25-29	2	3,612	0.0006	0.0003	0.0004	1.22	1.58	163.6%	126.6%
30-34	3	6,122	0.0005	0.0004	0.0005	2.27	2.88	132.2%	104.2%
35-39	6	6,613	0.0009	0.0006	0.0005	3.69	3.63	162.5%	165.3%
40-44	7	7,725	0.0009	0.0008	0.0007	6.23	5.69	112.4%	123.0%
45-49	6	6,928	0.0009	0.0011	0.0013	7.81	8.59	76.8%	69.8%
50-54	8	4,687	0.0017	0.0016	0.0021	7.21	9.79	111.0%	81.7%
55-59	5	1,825	0.0027	0.0022	0.0035	3.80	6.03	131.4%	82.9%
60-64	3	550	0.0055	0.0035	0.0060	1.81	3.06	165.3%	98.1%
65-69	0	71	0.0000	0.0057	0.0105	0.36	0.66	0.0%	0.0%
Totals	**40**	**38,522**	**0.0010**	**0.0009**	**0.0011**	**34.52**	**42.09**	**115.9%**	**95.0%**

* In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.
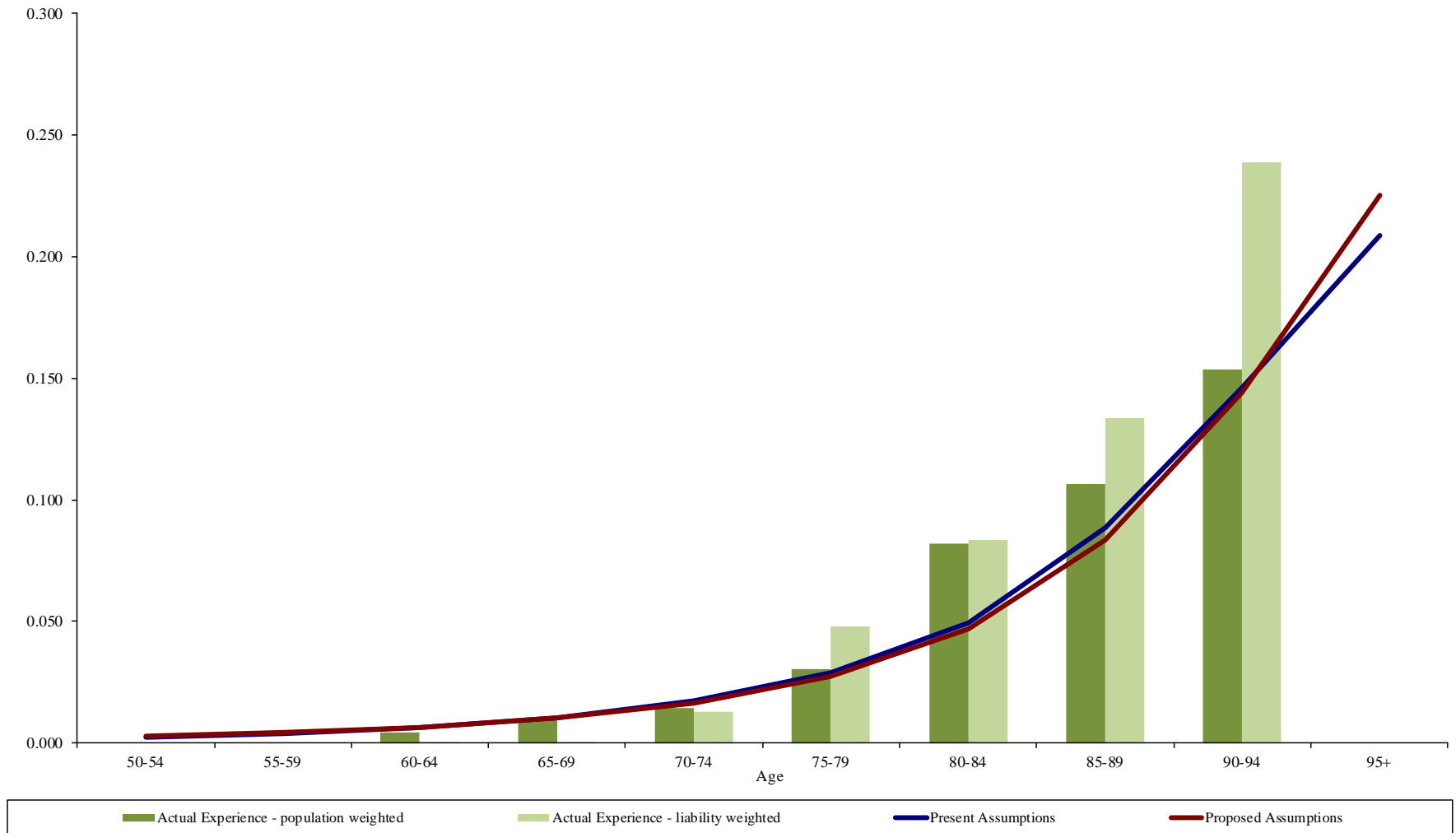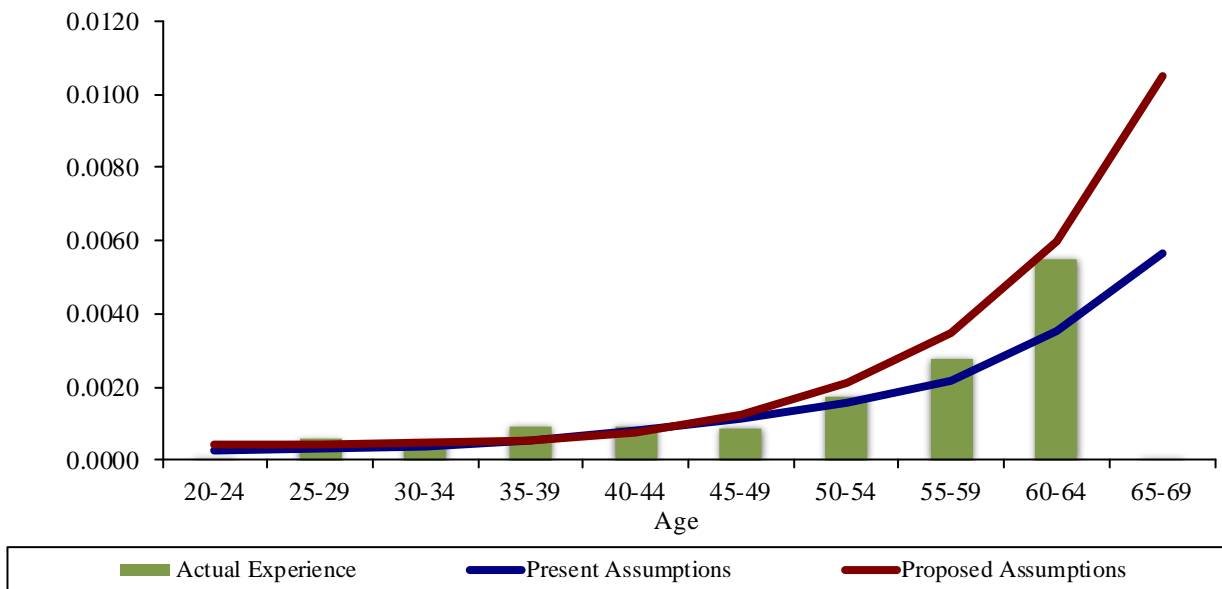
PRE-RETIREMENT MORTALITY EXPERIENCE
HEALTHY FEMALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old	New*	Old	New*	Old	New*
20-24	0	404	0.0000	0.0002	0.0002	0.06	0.06	0.0%	0.0%
25-29	1	858	0.0012	0.0002	0.0002	0.15	0.16	665.8%	628.2%
30-34	0	918	0.0000	0.0003	0.0002	0.24	0.23	0.0%	0.0%
35-39	0	1,050	0.0000	0.0004	0.0003	0.42	0.36	0.0%	0.0%
40-44	0	864	0.0000	0.0005	0.0005	0.46	0.43	0.0%	0.0%
45-49	1	631	0.0016	0.0008	0.0008	0.51	0.50	197.3%	199.0%
50-54	1	239	0.0042	0.0013	0.0013	0.29	0.30	345.6%	332.6%
55-59	0	39	0.0000	0.0022	0.0020	0.08	0.08	0.0%	0.0%
60-64	0	4	0.0000	0.0036	0.0030	0.01	0.01	0.0%	0.0%
65-69	0	1	0.0000	0.0056	0.0048	0.01	0.00	0.0%	0.0%
Totals	**3**	**5,008**	**0.0006**	**0.0004**	**0.0004**	**2.23**	**2.13**	**134.7%**	**141.1%**

* In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.
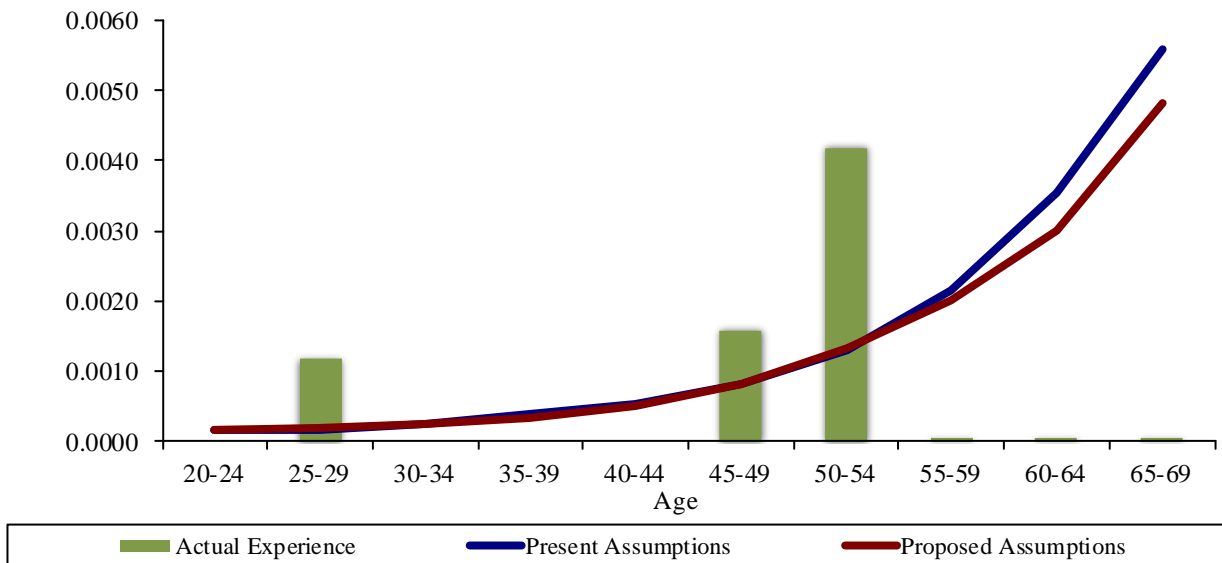
SECTION G
MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

Upon the death of an active PEPFP member, a benefit is payable to the surviving spouse. If the PEPFP member is unmarried at the time of death, the non-spouse beneficiary (estate if no beneficiary) is entitled to a refund of accumulated contributions.

The current valuation assumption is 85% of male and 65% of female members are married.

Findings

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

Gender	Married New Retirees	Total New Retirees	Crude Rates	Sample Rates Old	Sample Rates New	Expected Married Retirees Old	Expected Married Retirees New	Ratio of Actuals/Expecteds Old	Ratio of Actuals/Expecteds New
Males	824	958	0.8601	0.8500	0.8500	814.30	814.30	101.2%	101.2%
Females	75	127	0.5906	0.6500	0.6000	82.55	76.20	90.9%	98.4%
Total	**899**	**1,085**	**0.8286**	**0.8266**	**0.8207**	**896.85**	**890.50**	**100.2%**	**101.0%**

Members who terminated employment and were retirement eligible were included in the retirement analysis in this report but are excluded from this analysis.

The experience shows that fewer new retirees are married than expected.

Recommendation

We recommend changing the assumed percentage of female members that are married from 65% to 60% and no change to the assumed percentage of male members that are married (i.e. remains at 85%).

Joint & Survivor annuity benefit amounts are determined based on the member's and survivor's age. Currently, the valuation assumes that wives are three years younger than their husbands for male members, and husbands are four years older than their wives for female members.

Findings

We reviewed the ages of married new retirees and their beneficiaries during the four-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	824	2.22	3.00	2.00	74.1%	111.2%
Females	75	(2.21)	(4.00)	(2.00)	55.3%	110.6%
Total	899					

The experience shows that actual age differences among new retirees are closer to two years for male and female retirees.

Recommendation

We recommend changing the assumed age difference to two years (with males older than females).

Upon the death of an active PEPFP member, a benefit is payable to the member's dependent children. The dependent child's benefit ends when the child is no longer considered to be a dependent.

The current valuation assumption is members have no dependent children.

The valuation data does not contain information regarding children of active members. As such, we are unable to evaluate the credibility of this assumption.

Recommendation

We recommend no change to the assumption regarding dependent children of active members.

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:	10% elect 25% Joint & Survivor option
	20% elect 50% Joint & Survivor option
	20% elect 75% Joint & Survivor option
	35% elect 100% Joint & Survivor option
Females:	5% elect 25% Joint & Survivor option
	15% 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 four-year period. The results are shown on the following pages.

We found more married new retirees are electing a joint & survivor option for both males and females.

Recommendation

We recommend increasing the assumed percentage of females electing joint and survivor annuities, as indicated on the following page, and reducing the assumed percentage of females electing the single life annuity accordingly. We recommend no change to the male form of payment election assumption.

FORM OF PAYMENT

Male Experience

Form of Payment	Actual Electing Annuity	Married New Retirees	Crude Rates	Sample Rates Old	Sample Rates New	Expected Electing Annuity Old	Expected Electing Annuity New	Ratio of Actuals/Expecteds Old	Ratio of Actuals/Expecteds New
Life annuity	129	824	0.1566	0.1500	0.1500	123.60	123.60	104.4%	104.4%
25% joint & survivor	57	824	0.0692	0.1000	0.1000	82.40	82.40	69.2%	69.2%
50% joint & survivor	173	824	0.2100	0.2000	0.2000	164.80	164.80	105.0%	105.0%
75% joint & survivor	142	824	0.1723	0.2000	0.2000	164.80	164.80	86.2%	86.2%
100% joint & survivor	323	824	0.3920	0.3500	0.3500	288.40	288.40	112.0%	112.0%
Total	**824**	**824**	**1.0000**	**1.0000**	**1.0000**	**824.00**	**824.00**		

Female Experience

Form of Payment	Actual Electing Annuity	Married New Retirees	Crude Rates	Sample Rates Old	Sample Rates New	Expected Electing Annuity Old	Expected Electing Annuity New	Ratio of Actuals/Expecteds Old	Ratio of Actuals/Expecteds New
Life annuity	24	75	0.3200	0.6000	0.3000	45.00	22.50	53.3%	106.7%
25% joint & survivor	15	75	0.2000	0.0500	0.2000	3.75	15.00	400.0%	100.0%
50% joint & survivor	15	75	0.2000	0.1500	0.2000	11.25	15.00	133.3%	100.0%
75% joint & survivor	7	75	0.0933	0.0500	0.1000	3.75	7.50	N/A	93.3%
100% joint & survivor	14	75	0.1867	0.1500	0.2000	11.25	15.00	124.4%	93.3%
Total	**75**	**75**	**1.0000**	**1.0000**	**1.0000**	**75.00**	**75.00**		

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 2027 using Scale AA, no setbacks, blended 90% males, and 7.0% post-retirement interest. The post-retirement interest rate assumption 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, as applicable. We will work with PERA staff to develop appropriate factors.

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 G-8. We recommend that the Liability Adjustments related to Combined Service Annuities be reviewed and updated (we note that the LCPR Actuary is currently working on such a review). This assumption has been unchanged since 2002. We recommend continued use of the other Miscellaneous and Technical Assumptions.

MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

Benefit Service	Exact fractional service is used to determine the amount of benefit payable.
Decrement Operation	Withdrawal decrements do not operate during retirement eligibility.
Decrement Timing	Decrements of all types are assumed to occur mid-year.
Eligibility Testing	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
Forfeitures	For vested separations from service, it is assumed that members separating will withdraw their contributions and forfeit an annuity benefit when the value of member contributions is greater than the value of the annuity benefit.
Incidence of Contributions	Contributions are assumed to be received on a monthly basis, per the Standards of Actuarial Work.
Liability Adjustments	Liabilities for active members are increased by 0% and liabilities for former members are increased by 30% 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.
Pay Increase Timing	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.
Service Credit Accruals	Members were assumed to accrue one year of service credit per year.

SECTION H
PROPOSED ASSUMPTION LISTING

PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2011-2015 EXPERIENCE STUDY

MERIT AND SENIORITY PAY INCREASES

% Merit & Seniority Increases in Salaries Next Year	
Year	Rate
1	9.00%
2	7.25%
3	5.50%
4	4.50%
5	3.00%
6	2.50%
7	2.00%
8	1.75%
9	1.50%
10	1.25%
11	1.00%
12	0.90%
13	0.80%
14	0.70%
15	0.60%
16	0.50%
17	0.50%
18	0.50%
19	0.50%
20	0.50%
21	0.40%
22	0.30%
23	0.20%
24	0.10%
25	0.00%
26	0.00%
27	0.00%
28	0.00%
29	0.00%
30	0.00%
31+	0.00%

PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2011-2015 EXPERIENCE STUDY

AGE & SERVICE RETIREMENT PATTERN
UNREDUCED (NORMAL) RETIREMENT

Age	% Retiring
55	25.0%
56	22.5%
57	22.5%
58	22.5%
59	20.0%
60	22.5%
61	25.0%
62	30.0%
63	30.0%
64	30.0%
65	50.0%
66	50.0%
67	50.0%
68	50.0%
69	50.0%
70+	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 2011-2015 EXPERIENCE STUDY

AGE & SERVICE RETIREMENT PATTERN
REDUCED (EARLY) RETIREMENT

Age	% Retiring
50	10.0%
51	7.0%
52	7.0%
53	10.0%
54	10.0%

PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2011-2015 EXPERIENCE STUDY

SELECT WITHDRAWAL (FIRST THREE YEARS)

	% Withdrawals	
Year	**Male**	**Female**
1	0.0300	0.0300
2	0.0300	0.0300
3	0.0300	0.0300

ULTIMATE WITHDRAWAL (AFTER THREE YEARS)

After Third Year		
Age	**Male**	**Female**
25	0.0260	0.0260
26	0.0250	0.0250
27	0.0240	0.0240
28	0.0230	0.0230
29	0.0220	0.0220
30	0.0210	0.0210
31	0.0200	0.0200
32	0.0190	0.0190
33	0.0180	0.0180
34	0.0170	0.0170
35	0.0160	0.0160
36	0.0150	0.0150
37	0.0140	0.0140
38	0.0130	0.0130
39	0.0125	0.0125
40	0.0125	0.0125
41	0.0125	0.0125
42	0.0125	0.0125
43	0.0125	0.0125
44	0.0125	0.0125
45	0.0125	0.0125
46	0.0125	0.0125
47	0.0125	0.0125
48	0.0125	0.0125
49	0.0125	0.0125
50+	0.0000	0.0000

PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2011-2015 EXPERIENCE STUDY

DISABILITY RATES

Age	% Becoming Disabled	
	Male	Female
20	0.11%	0.11%
21	0.11%	0.11%
22	0.12%	0.12%
23	0.12%	0.12%
24	0.13%	0.13%
25	0.13%	0.13%
26	0.14%	0.14%
27	0.14%	0.14%
28	0.14%	0.14%
29	0.15%	0.15%
30	0.16%	0.16%
31	0.16%	0.16%
32	0.17%	0.17%
33	0.17%	0.17%
34	0.18%	0.18%
35	0.19%	0.19%
36	0.20%	0.20%
37	0.22%	0.22%
38	0.23%	0.23%
39	0.24%	0.24%
40	0.29%	0.29%
41	0.34%	0.34%
42	0.39%	0.39%
43	0.44%	0.44%
44	0.49%	0.49%
45	0.54%	0.54%
46	0.64%	0.64%
47	0.74%	0.74%
48	0.84%	0.84%
49	0.94%	0.94%
50	1.04%	1.04%
51	1.23%	1.23%
52	1.43%	1.43%
53	1.63%	1.63%
54	1.83%	1.83%
55	2.03%	2.03%
56	2.06%	2.06%
57	2.09%	2.09%
58	2.12%	2.12%
59	2.15%	2.15%
60+	0.00%	0.00%

HEALTHY POST-RETIREMENT MORTALITY RATES

Age in 2013	% Dying Next Year* Male	% Dying Next Year* Female	Age in 2013	% Dying Next Year* Male	% Dying Next Year* Female
50	0.4009%	0.2771%	81	5.1112%	4.1532%
51	0.4332%	0.2915%	82	5.7006%	4.6439%
52	0.4662%	0.3077%	83	6.3647%	5.2031%
53	0.4969%	0.3261%	84	7.1126%	5.8372%
54	0.5277%	0.3467%	85	7.9501%	6.5518%
55	0.5594%	0.3699%	86	8.8880%	7.3562%
56	0.5923%	0.3960%	87	9.9351%	8.2556%
57	0.6274%	0.4254%	88	11.1018%	9.2548%
58	0.6646%	0.4585%	89	12.3947%	10.3588%
59	0.7047%	0.4960%	90	13.8290%	11.5838%
60	0.7490%	0.5378%	91	15.3439%	12.9097%
61	0.7982%	0.5850%	92	16.9036%	14.3197%
62	0.8533%	0.6377%	93	18.4819%	15.8007%
63	0.9167%	0.6965%	94	20.0704%	17.3377%
64	0.9888%	0.7623%	95	21.6630%	18.9378%
65	1.0709%	0.8358%	96	23.4063%	20.6606%
66	1.1642%	0.9180%	97	25.1932%	22.4564%
67	1.2694%	1.0098%	98	27.0367%	24.3265%
68	1.3881%	1.1122%	99	28.9358%	26.2600%
69	1.5221%	1.2256%	100	30.8688%	28.2457%
70	1.6722%	1.3512%	101	32.8187%	30.2637%
71	1.8399%	1.4900%	102	34.7412%	32.2965%
72	2.0276%	1.6432%	103	36.6412%	34.3199%
73	2.2370%	1.8125%	104	38.4902%	36.3151%
74	2.4703%	2.0007%	105	40.2584%	38.2764%
75	2.7304%	2.2101%	106	41.9697%	40.1842%
76	3.0213%	2.4435%	107	43.5734%	42.0039%
77	3.3476%	2.7067%	108	45.0915%	43.7559%
78	3.7139%	3.0029%	109	46.5248%	45.4050%
79	4.1256%	3.3385%	110	47.8376%	46.9470%
80	4.5901%	3.7189%			

The rates shown are RP-2014 mortality for healthy annuitants, with adjustments, if applicable (see Section F). Recommended rates include adjustments for white collar and mortality improvements from 2006 to the mid-point of this study (2013) using projection scale MP-2015.

PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2011-2015 EXPERIENCE STUDY

DISABLED POST-RETIREMENT MORTALITY RATES

Age in 2013	% Dying Next Year*		Age in 2013	% Dying Next Year*	
	Male	Female		Male	Female
20	0.0373%	0.0171%	56	0.5923%	0.3960%
21	0.0408%	0.0189%	57	0.6274%	0.4254%
22	0.0443%	0.0215%	58	0.6646%	0.4585%
23	0.0477%	0.0246%	59	0.7047%	0.4960%
24	0.0514%	0.0283%	60	0.7490%	0.5378%
25	0.0552%	0.0327%	61	0.7982%	0.5850%
26	0.0591%	0.0371%	62	0.8533%	0.6377%
27	0.0634%	0.0419%	63	0.9167%	0.6965%
28	0.0679%	0.0471%	64	0.9888%	0.7623%
29	0.0729%	0.0533%	65	1.0709%	0.8358%
30	0.0784%	0.0601%	66	1.1642%	0.9180%
31	0.0846%	0.0679%	67	1.2694%	1.0098%
32	0.0913%	0.0765%	68	1.3881%	1.1122%
33	0.0988%	0.0856%	69	1.5221%	1.2256%
34	0.1064%	0.0955%	70	1.6722%	1.3512%
35	0.1149%	0.1058%	71	1.8399%	1.4900%
36	0.1243%	0.1167%	72	2.0276%	1.6432%
37	0.1349%	0.1275%	73	2.2370%	1.8125%
38	0.1466%	0.1383%	74	2.4703%	2.0007%
39	0.1595%	0.1491%	75	2.7304%	2.2101%
40	0.1737%	0.1599%	76	3.0213%	2.4435%
41	0.1885%	0.1698%	77	3.3476%	2.7067%
42	0.2049%	0.1799%	78	3.7139%	3.0029%
43	0.2230%	0.1902%	79	4.1256%	3.3385%
44	0.2428%	0.2012%	80	4.5901%	3.7189%
45	0.2648%	0.2129%	81	5.1112%	4.1532%
46	0.2885%	0.2252%	82	5.7006%	4.6439%
47	0.3141%	0.2381%	83	6.3647%	5.2031%
48	0.3416%	0.2506%	84	7.1126%	5.8372%
49	0.3705%	0.2635%	85	7.9501%	6.5518%
50	0.4009%	0.2771%	86	8.8880%	7.3562%
51	0.4332%	0.2915%	87	9.9351%	8.2556%
52	0.4662%	0.3077%	88	11.1018%	9.2548%
53	0.4969%	0.3261%	89	12.3947%	10.3588%
54	0.5277%	0.3467%	90	13.8290%	11.5838%
55	0.5594%	0.3699%			

The rates shown are RP-2014 mortality for disabled annuitants, with adjustments, if applicable (see Section F). Recommended rates include mortality improvements from 2006 to the mid-point of this study using projection scale MP-2015.

PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2011-2015 EXPERIENCE STUDY

HEALTHY PRE-RETIREMENT MORTALITY RATES

Age in 2013	% Dying Next Year*		Age in 2013	% Dying Next Year*	
	Male	Female		Male	Female
20	0.0388%	0.0159%	46	0.1099%	0.0737%
21	0.0429%	0.0159%	47	0.1235%	0.0820%
22	0.0466%	0.0159%	48	0.1387%	0.0908%
23	0.0488%	0.0159%	49	0.1553%	0.1002%
24	0.0488%	0.0159%	50	0.1732%	0.1103%
25	0.0466%	0.0159%	51	0.1925%	0.1210%
26	0.0447%	0.0180%	52	0.2137%	0.1324%
27	0.0435%	0.0186%	53	0.2350%	0.1444%
28	0.0431%	0.0194%	54	0.2580%	0.1573%
29	0.0431%	0.0203%	55	0.2833%	0.1709%
30	0.0441%	0.0216%	56	0.3115%	0.1853%
31	0.0454%	0.0230%	57	0.3437%	0.2006%
32	0.0469%	0.0246%	58	0.3804%	0.2168%
33	0.0485%	0.0264%	59	0.4224%	0.2342%
34	0.0500%	0.0281%	60	0.4707%	0.2530%
35	0.0515%	0.0299%	61	0.5260%	0.2738%
36	0.0528%	0.0315%	62	0.5890%	0.2967%
37	0.0543%	0.0336%	63	0.6616%	0.3225%
38	0.0563%	0.0359%	64	0.7443%	0.3514%
39	0.0589%	0.0385%	65	0.8384%	0.3838%
40	0.0624%	0.0415%	66	0.9338%	0.4281%
41	0.0666%	0.0450%	67	1.0401%	0.4775%
42	0.0720%	0.0490%	68	1.1589%	0.5328%
43	0.0790%	0.0539%	69	1.2915%	0.5943%
44	0.0876%	0.0596%	70	1.4391%	0.6624%
45	0.0978%	0.0662%			

* The rates shown are RP-2014 mortality for employees, with adjustments, if applicable (see Section F). Recommended rates include adjustments for white collar and mortality improvements from 2006 to the mid-point of this study using projection scale MP-2015.

SECTION I
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.

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 J
APPENDIX

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

2011-2015 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
1	58	11.23%	12.75%
2	910	13.32%	10.75%
3	1,283	8.60%	8.75%
4	1,281	7.81%	7.75%
5	1,550	5.87%	6.25%
6	1,772	5.05%	5.85%
7	2,047	4.02%	5.55%
8	2,036	4.03%	5.35%
9	1,826	3.52%	5.15%
10	1,699	3.73%	5.05%
11	1,634	3.52%	4.95%
12	1,651	3.09%	4.85%
13	1,866	3.03%	4.75%
14	1,957	3.07%	4.65%
15	2,009	2.87%	4.55%
16	1,923	3.33%	4.55%
17	1,745	2.97%	4.55%
18	1,579	3.17%	4.55%
19	1,379	3.09%	4.55%
20	1,176	3.03%	4.55%
21	1,000	3.13%	4.45%
22	911	3.13%	4.35%
23	854	2.55%	4.25%
24	860	2.88%	4.25%
25	816	2.89%	4.25%
26	735	2.76%	4.25%
27	604	2.86%	4.25%
28	465	2.52%	4.25%
29	335	2.62%	4.25%
30	220	2.91%	4.25%
31+	556	1.71%	4.25%
Totals	**38,737**	**3.98%**	**5.22%**

2011-2012 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
1	8	22.66%	12.75%
2	167	14.19%	10.75%
3	248	7.63%	8.75%
4	414	6.71%	7.75%
5	591	5.42%	6.25%
6	530	4.85%	5.85%
7	553	4.15%	5.55%
8	441	3.93%	5.35%
9	340	2.88%	5.15%
10	408	3.08%	5.05%
11	485	3.23%	4.95%
12	487	3.23%	4.85%
13	558	2.82%	4.75%
14	488	3.04%	4.65%
15	521	2.47%	4.55%
16	417	3.24%	4.55%
17	379	2.89%	4.55%
18	325	3.05%	4.55%
19	311	2.57%	4.55%
20	230	2.99%	4.55%
21	209	2.43%	4.45%
22	230	2.32%	4.35%
23	249	2.70%	4.25%
24	246	2.76%	4.25%
25	208	2.81%	4.25%
26	183	2.51%	4.25%
27	121	2.23%	4.25%
28	118	2.66%	4.25%
29	83	2.98%	4.25%
30	46	2.76%	4.25%
31+	164	2.59%	4.25%
Totals	**9,758**	**3.74%**	**5.21%**

2012-2013 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
1	15	6.76%	12.75%
2	202	13.62%	10.75%
3	265	8.39%	8.75%
4	261	7.31%	7.75%
5	421	5.31%	6.25%
6	566	4.39%	5.85%
7	531	3.31%	5.55%
8	540	3.30%	5.35%
9	446	2.99%	5.15%
10	333	3.22%	5.05%
11	394	3.17%	4.95%
12	473	2.46%	4.85%
13	482	2.54%	4.75%
14	557	2.46%	4.65%
15	477	2.09%	4.55%
16	508	2.53%	4.55%
17	415	1.64%	4.55%
18	371	2.20%	4.55%
19	314	2.07%	4.55%
20	299	2.20%	4.55%
21	226	2.49%	4.45%
22	199	2.39%	4.35%
23	225	2.06%	4.25%
24	235	1.49%	4.25%
25	227	2.78%	4.25%
26	191	1.72%	4.25%
27	162	2.96%	4.25%
28	98	2.26%	4.25%
29	97	1.29%	4.25%
30	64	1.94%	4.25%
31+	158	1.36%	4.25%
Totals	**9,752**	**3.25%**	**5.18%**

2013-2014 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
1	15	12.00%	12.75%
2	254	13.70%	10.75%
3	346	8.66%	8.75%
4	264	8.07%	7.75%
5	267	5.90%	6.25%
6	416	5.12%	5.85%
7	551	3.95%	5.55%
8	526	3.83%	5.35%
9	530	3.68%	5.15%
10	437	3.51%	5.05%
11	320	2.85%	4.95%
12	386	3.17%	4.85%
13	457	2.82%	4.75%
14	470	2.94%	4.65%
15	547	3.15%	4.55%
16	469	3.04%	4.55%
17	493	2.69%	4.55%
18	406	2.88%	4.55%
19	365	2.78%	4.55%
20	299	2.64%	4.55%
21	281	2.84%	4.45%
22	207	2.44%	4.35%
23	181	1.52%	4.25%
24	206	2.99%	4.25%
25	194	2.04%	4.25%
26	187	2.64%	4.25%
27	148	1.74%	4.25%
28	117	1.27%	4.25%
29	59	1.92%	4.25%
30	63	3.31%	4.25%
31+	110	2.86%	4.25%
Totals	**9,571**	**3.82%**	**5.22%**

2014-2015 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
1	20	9.45%	12.75%
2	287	12.26%	10.75%
3	424	9.26%	8.75%
4	342	9.33%	7.75%
5	271	7.70%	6.25%
6	260	6.78%	5.85%
7	412	4.86%	5.55%
8	529	5.04%	5.35%
9	510	4.26%	5.15%
10	521	4.75%	5.05%
11	435	4.65%	4.95%
12	305	3.75%	4.85%
13	369	4.25%	4.75%
14	442	3.99%	4.65%
15	464	3.81%	4.55%
16	529	4.42%	4.55%
17	458	4.53%	4.55%
18	477	4.25%	4.55%
19	389	4.63%	4.55%
20	348	4.11%	4.55%
21	284	4.44%	4.45%
22	275	4.87%	4.35%
23	199	3.84%	4.25%
24	173	4.79%	4.25%
25	187	3.99%	4.25%
26	174	4.29%	4.25%
27	173	4.18%	4.25%
28	132	3.69%	4.25%
29	96	4.10%	4.25%
30	47	3.83%	4.25%
31+	124	0.00%	4.25%
Totals	**9,656**	**5.12%**	**5.27%**

2011-2015 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	171	1,354	176.02	97.1%
51	104	1,134	113.40	91.7%
52	100	1,017	101.70	98.3%
53	110	889	88.90	123.7%
54	99	765	99.45	99.5%
55	172	666	199.80	86.1%
56	114	460	92.00	123.9%
57	89	361	72.20	123.3%
58	61	264	52.80	115.5%
59	45	217	43.40	103.7%
60	41	186	46.50	88.2%
61	37	151	37.75	98.0%
62	35	111	38.85	90.1%
63	21	72	25.20	83.3%
64	16	50	17.50	91.4%
65	19	38	19.00	100.0%
66	10	19	9.50	105.3%
67	3	9	4.50	66.7%
68	3	5	2.50	120.0%
69	-	2	1.00	0.0%
70+	4	N/A	N/A	N/A
Totals	**1,254**	**7,770**	**1,241.97**	**101.0%**

2011-2012 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	36	341	44.33	81.2%
51	19	251	25.10	75.7%
52	25	263	26.30	95.1%
53	27	216	21.60	125.0%
54	24	198	25.74	93.2%
55	47	149	44.70	105.1%
56	27	113	22.60	119.5%
57	28	98	19.60	142.9%
58	17	73	14.60	116.4%
59	9	60	12.00	75.0%
60	11	49	12.25	89.8%
61	8	30	7.50	106.7%
62	5	25	8.75	57.1%
63	5	15	5.25	95.2%
64	2	11	3.85	51.9%
65	7	14	7.00	100.0%
66	1	3	1.50	66.7%
67	2	3	1.50	133.3%
68	-	-	-	N/A
69	-	1	0.50	0.0%
70+	2	N/A	N/A	N/A
Totals	**302**	**1,913**	**304.67**	**99.1%**

2012-2013 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	19	310	40.30	47.1%
51	28	305	30.50	91.8%
52	16	230	23.00	69.6%
53	24	239	23.90	100.4%
54	22	189	24.57	89.5%
55	37	175	52.50	70.5%
56	25	105	21.00	119.0%
57	17	86	17.20	98.8%
58	13	70	14.00	92.9%
59	10	58	11.60	86.2%
60	10	54	13.50	74.1%
61	8	42	10.50	76.2%
62	10	25	8.75	114.3%
63	8	22	7.70	103.9%
64	4	13	4.55	87.9%
65	5	9	4.50	111.1%
66	5	7	3.50	142.9%
67	-	2	1.00	0.0%
68	1	1	0.50	200.0%
69	-	-	-	N/A
70+	2	N/A	N/A	N/A
Totals	**264**	**1,942**	**313.07**	**84.3%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
RETIREMENT

2013-2014 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	75	366	47.58	157.6%
51	42	289	28.90	145.3%
52	48	276	27.60	173.9%
53	45	210	21.00	214.3%
54	40	215	27.95	143.1%
55	56	167	50.10	111.8%
56	37	134	26.80	138.1%
57	27	81	16.20	166.7%
58	24	67	13.40	179.1%
59	19	56	11.20	169.6%
60	11	46	11.50	95.7%
61	15	43	10.75	139.5%
62	12	33	11.55	103.9%
63	3	15	5.25	57.1%
64	8	14	4.90	163.3%
65	4	9	4.50	88.9%
66	2	4	2.00	100.0%
67	-	2	1.00	0.0%
68	1	2	1.00	100.0%
69	-	-	-	N/A
70+	-	N/A	N/A	N/A
Totals	**469**	**2,029**	**323.18**	**145.1%**

2014-2015 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	41	337	43.81	93.6%
51	15	289	28.90	51.9%
52	11	248	24.80	44.4%
53	14	224	22.40	62.5%
54	13	163	21.19	61.3%
55	32	175	52.50	61.0%
56	25	108	21.60	115.7%
57	17	96	19.20	88.5%
58	7	54	10.80	64.8%
59	7	43	8.60	81.4%
60	9	37	9.25	97.3%
61	6	36	9.00	66.7%
62	8	28	9.80	81.6%
63	5	20	7.00	71.4%
64	2	12	4.20	47.6%
65	3	6	3.00	100.0%
66	2	5	2.50	80.0%
67	1	2	1.00	100.0%
68	1	2	1.00	100.0%
69	-	1	0.50	0.0%
70+	-	N/A	N/A	N/A
Totals	**219**	**1,886**	**301.05**	**72.7%**

2011-2015 Experience

	Males				Females				Total			
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	95	822	65.76	144.5%	5	110	8.80	56.8%	100	932	74.56	134.1%
2	100	1,634	81.70	122.4%	16	201	10.05	159.2%	116	1,835	91.75	126.4%
3	47	1,322	46.27	101.6%	4	180	6.30	63.5%	51	1,502	52.57	97.0%
Totals	**242**	**3,778**	**193.73**	**124.9%**	**25**	**491**	**25.15**	**99.4%**	**267**	**4,269**	**218.88**	**122.0%**

2011-2012 Experience

	Males				Females				Total			
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	15	156	12.48	120.2%	1	16	1.28	78.1%	16	172	13.76	116.3%
2	24	296	14.80	162.2%	4	23	1.15	347.8%	28	319	15.95	175.5%
3	11	291	10.19	108.0%	1	41	1.44	69.7%	12	332	11.62	103.3%
Totals	**50**	**743**	**37.47**	**133.5%**	**6**	**80**	**3.87**	**155.2%**	**56**	**823**	**41.33**	**135.5%**

2012-2013 Experience

	Males				Females				Total			
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	17	153	12.24	138.9%	1	30	2.40	41.7%	18	183	14.64	123.0%
2	29	396	19.80	146.5%	4	47	2.35	170.2%	33	443	22.15	149.0%
3	12	277	9.70	123.8%	-	21	0.74	0.0%	12	298	10.43	115.1%
Totals	**58**	**826**	**41.74**	**139.0%**	**5**	**98**	**5.49**	**91.2%**	**63**	**924**	**47.22**	**133.4%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
TERMINATIONS, SERVICE <3 YEARS

2013-2014 Experience

	Males				Females				Total			
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	35	233	18.64	187.8%	2	29	2.32	86.2%	37	262	20.96	176.5%
2	21	408	20.40	102.9%	3	73	3.65	82.2%	24	481	24.05	99.8%
3	15	355	12.43	120.7%	1	45	1.58	63.5%	16	400	14.00	114.3%
Totals	**71**	**996**	**51.47**	**138.0%**	**6**	**147**	**7.55**	**79.5%**	**77**	**1,143**	**59.01**	**130.5%**

2014-2015 Experience

	Males				Females				Total			
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	28	280	22.40	125.0%	1	35	2.80	35.7%	29	315	25.20	115.1%
2	26	534	26.70	97.4%	5	58	2.90	172.4%	31	592	29.60	104.7%
3	9	399	13.97	64.4%	2	73	2.56	78.3%	11	472	16.52	66.6%
Totals	**63**	**1,213**	**63.07**	**99.9%**	**8**	**166**	**8.26**	**96.9%**	**71**	**1,379**	**71.32**	**99.6%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
TERMINATIONS, SERVICE >3 YEARS

2011-2015 Experience, Service >3 Years

Age Group	Males Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Females Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Total Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
Under 25	-	25	0.91	0.0%	-	1	0.04	0.0%	-	26	0.95	0.0%
25-29	50	2,074	50.42	99.2%	11	274	6.59	167.0%	61	2,348	57.01	107.0%
30-34	127	5,201	87.91	144.5%	27	777	13.11	206.0%	154	5,978	101.02	152.5%
35-39	101	6,174	84.98	118.9%	29	879	12.11	239.4%	130	7,053	97.09	133.9%
40-44	108	7,458	82.46	131.0%	30	1,046	11.56	259.4%	138	8,504	94.02	146.8%
45-49	115	6,783	52.74	218.1%	21	817	6.32	332.4%	136	7,600	59.06	230.3%
Totals	**501**	**27,715**	**359.42**	**139.4%**	**118**	**3,794**	**49.72**	**237.3%**	**619**	**31,509**	**409.14**	**151.3%**

2011-2012 Experience, Service >3 Years

Age Group	Males				Females				Total			
	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
Under 25	-	11	0.40	0.0%	-	1	0.04	0.0%	-	12	0.44	0.0%
25-29	11	656	16.23	67.8%	7	93	2.26	310.1%	18	749	18.49	97.4%
30-34	29	1,330	22.55	128.6%	9	205	3.47	259.4%	38	1,535	26.02	146.0%
35-39	26	1,623	22.34	116.4%	8	236	3.25	245.9%	34	1,859	25.59	132.8%
40-44	33	1,899	21.11	156.3%	9	272	3.03	296.8%	42	2,171	24.14	174.0%
45-49	27	1,621	12.62	213.9%	4	197	1.52	263.6%	31	1,818	14.14	219.3%
Totals	**126**	**7,140**	**95.25**	**132.3%**	**37**	**1,004**	**13.57**	**272.7%**	**163**	**8,144**	**108.82**	**149.8%**

2012-2013 Experience, Service >3 Years

Age Group	Males				Females				Total			
	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
Under 25	-	6	0.22	0.0%	-	-	-	N/A	-	6	0.22	0.0%
25-29	12	570	13.90	86.3%	2	78	1.90	105.3%	14	648	15.80	88.6%
30-34	33	1,299	22.00	150.0%	6	198	3.36	178.8%	39	1,497	25.36	153.8%
35-39	26	1,566	21.57	120.5%	6	221	3.04	197.1%	32	1,787	24.61	130.0%
40-44	20	1,907	21.13	94.7%	7	275	3.04	230.6%	27	2,182	24.17	111.7%
45-49	15	1,675	13.01	115.3%	2	205	1.54	129.9%	17	1,880	14.55	116.8%
Totals	**106**	**7,023**	**91.83**	**115.4%**	**23**	**977**	**12.87**	**178.7%**	**129**	**8,000**	**104.70**	**123.2%**

2013-2014 Experience, Service >3 Years

Age Group	Males Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Females Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Total Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
Under 25	-	3	0.11	0.0%	-	-	-	N/A	-	3	0.11	0.0%
25-29	9	454	10.94	82.3%	2	53	1.25	160.3%	11	507	12.19	90.3%
30-34	35	1,295	21.87	160.0%	6	194	3.26	183.9%	41	1,489	25.13	163.1%
35-39	20	1,525	20.96	95.4%	6	213	2.93	204.7%	26	1,738	23.89	108.8%
40-44	31	1,841	20.25	153.1%	10	255	2.81	356.3%	41	2,096	23.06	177.8%
45-49	47	1,724	13.40	350.7%	7	205	1.59	439.2%	54	1,929	14.99	360.2%
Totals	**142**	**6,842**	**87.53**	**162.2%**	**31**	**920**	**11.84**	**261.8%**	**173**	**7,762**	**99.37**	**174.1%**

2014-2015 Experience, Service >3 Years

Age Group	Males Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Females Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Total Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
Under 25	-	5	0.18	0.0%	-	-	-	N/A	-	5	0.18	0.0%
25-29	18	394	9.35	192.5%	-	50	1.18	0.0%	18	444	10.53	170.9%
30-34	30	1,277	21.49	139.6%	6	180	3.02	198.7%	36	1,457	24.51	146.9%
35-39	29	1,460	20.11	144.2%	9	209	2.88	312.1%	38	1,669	22.99	165.3%
40-44	24	1,811	19.97	120.2%	4	244	2.69	148.7%	28	2,055	22.66	123.6%
45-49	26	1,763	13.71	189.6%	8	210	1.67	479.8%	34	1,973	15.38	221.1%
Totals	**127**	**6,710**	**84.81**	**149.7%**	**27**	**893**	**11.44**	**236.0%**	**154**	**7,603**	**96.25**	**160.0%**

2011-2015 Experience

Age Group	Males Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Females Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Total Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	389	0.49	0.0%	-	62	0.08	0.0%	-	451	0.57	0.0%
25-29	1	3,612	5.12	19.5%	-	518	0.74	0.0%	1	4,130	5.86	17.1%
30-34	6	6,122	10.29	58.3%	3	892	1.51	109.9%	9	7,014	11.80	109.9%
35-39	14	6,613	14.34	97.6%	4	929	2.02	198.0%	18	7,542	16.36	110.0%
40-44	27	7,725	30.22	89.3%	3	1,062	4.16	72.1%	30	8,787	34.38	87.3%
45-49	34	6,928	50.50	67.3%	12	821	6.02	199.3%	46	7,749	56.52	81.4%
50-54	24	4,686	64.41	37.3%	6	539	7.28	82.4%	30	5,225	71.69	41.8%
55-59	16	35	0.74	2162.2%	1	1	0.02	5000.0%	17	36	0.76	2236.8%
Totals	**122**	**36,110**	**176.11**	**69.3%**	**29**	**4,824**	**21.83**	**132.8%**	**151**	**40,934**	**197.94**	**76.3%**

2011-2012 Experience

| | Males | | | | Females | | | | Total | | | |
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	82	0.10	0.0%	-	10	0.01	0.0%	-	92	0.11	0.0%
25-29	-	976	1.38	0.0%	-	138	0.20	0.0%	-	1,114	1.58	0.0%
30-34	2	1,489	2.50	80.0%	2	224	0.38	526.3%	4	1,713	2.88	109.9%
35-39	2	1,701	3.69	54.2%	2	241	0.52	384.6%	4	1,942	4.21	95.0%
40-44	6	1,957	7.57	79.3%	2	273	1.05	190.5%	8	2,230	8.62	92.8%
45-49	9	1,651	12.02	74.9%	1	198	1.47	68.0%	10	1,849	13.49	74.1%
50-54	3	1,146	15.82	19.0%	-	135	1.83	0.0%	3	1,281	17.65	17.0%
55-59	2	10	0.21	952.4%	-	-	-	N/A	2	10	0.21	952.4%
Totals	**24**	**9,012**	**43.29**	**55.4%**	**7**	**1,219**	**5.46**	**128.2%**	**31**	**10,231**	**48.75**	**63.6%**

2012-2013 Experience

| | Males | | | | Females | | | | Total | | | |
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	85	0.11	0.0%	-	13	0.02	0.0%	-	98	0.13	0.0%
25-29	-	917	1.30	0.0%	-	120	0.17	0.0%	-	1,037	1.47	0.0%
30-34	1	1,490	2.50	40.0%	-	229	0.39	0.0%	1	1,719	2.89	109.9%
35-39	7	1,655	3.59	195.0%	1	229	0.50	200.0%	8	1,884	4.09	195.6%
40-44	6	1,977	7.71	77.8%	1	278	1.09	91.7%	7	2,255	8.80	79.5%
45-49	9	1,701	12.44	72.3%	5	205	1.56	320.5%	14	1,906	14.00	100.0%
50-54	8	1,155	15.93	50.2%	2	128	1.76	113.6%	10	1,283	17.69	56.5%
55-59	4	8	0.17	2352.9%	1	1	0.02	5000.0%	5	9	0.19	2631.6%
Totals	**35**	**8,988**	**43.75**	**80.0%**	**10**	**1,203**	**5.51**	**181.5%**	**45**	**10,191**	**49.26**	**91.4%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
DISABILITY RETIREMENTS

2013-2014 Experience

Age Group	Males Actual Disabilities	Exposure	Males Expected Disabilities	Males Actual/ Expected	Females Actual Disabilities	Exposure	Females Expected Disabilities	Females Actual/ Expected	Total Actual Disabilities	Exposure	Total Expected Disabilities	Total Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	98	0.12	0.0%	-	21	0.03	0.0%	-	119	0.15	0.0%
25-29	1	866	1.23	81.3%	-	125	0.18	0.0%	1	991	1.41	70.9%
30-34	2	1,540	2.59	77.2%	-	226	0.38	0.0%	2	1,766	2.97	109.9%
35-39	3	1,644	3.57	84.0%	-	229	0.50	0.0%	3	1,873	4.07	73.7%
40-44	6	1,907	7.52	79.8%	-	260	1.03	0.0%	6	2,167	8.55	70.2%
45-49	6	1,763	12.84	46.7%	3	206	1.49	201.3%	9	1,969	14.33	62.8%
50-54	6	1,220	16.75	35.8%	2	151	2.03	98.5%	8	1,371	18.78	42.6%
55-59	4	8	0.17	2352.9%	-	-	-	N/A	4	8	0.17	2352.9%
Totals	**28**	**9,046**	**44.79**	**62.5%**	**5**	**1,218**	**5.64**	**88.7%**	**33**	**10,264**	**50.43**	**65.4%**

2014-2015 Experience

Age Group	Males Actual Disabilities	Exposure	Males Expected Disabilities	Males Actual/ Expected	Females Actual Disabilities	Exposure	Females Expected Disabilities	Females Actual/ Expected	Total Actual Disabilities	Exposure	Total Expected Disabilities	Total Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	124	0.16	0.0%	-	18	0.02	0.0%	-	142	0.18	0.0%
25-29	-	853	1.21	0.0%	-	135	0.19	0.0%	-	988	1.40	0.0%
30-34	1	1,603	2.70	37.0%	1	213	0.36	277.8%	2	1,816	3.06	109.9%
35-39	2	1,613	3.49	57.3%	1	230	0.50	200.0%	3	1,843	3.99	75.2%
40-44	9	1,884	7.42	121.3%	-	251	0.99	0.0%	9	2,135	8.41	107.0%
45-49	10	1,813	13.20	75.8%	3	212	1.50	200.0%	13	2,025	14.70	88.4%
50-54	7	1,165	15.91	44.0%	2	125	1.66	120.5%	9	1,290	17.57	51.2%
55-59	6	9	0.19	3157.9%	-	-	-	N/A	6	9	0.19	3157.9%
Totals	**35**	**9,064**	**44.28**	**79.0%**	**7**	**1,184**	**5.22**	**134.1%**	**42**	**10,248**	**49.50**	**84.8%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
POST-RETIREMENT MORTALITY

2011-2015 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
50-54	2	1,405	6.23	32.1%	55-59	-	233	0.54	0.0%
55-59	9	3,832	17.34	51.9%	60-64	-	369	1.48	0.0%
60-64	37	5,193	36.01	102.7%	65-69	1	238	1.50	66.7%
65-69	64	4,933	58.66	109.1%	70-74	1	107	1.07	93.5%
70-74	79	3,539	69.80	113.2%	75-79	1	69	1.21	82.6%
75-79	72	2,416	85.96	83.8%	80-84	2	66	1.95	102.6%
80-84	110	1,708	113.63	96.8%	85-89	5	61	2.85	175.4%
85-89	110	991	115.84	95.0%	90-94	5	47	4.25	117.6%
90-94	56	277	54.03	103.6%	95-99	4	26	3.58	111.7%
95+	21	85	24.53	85.6%	100+	-	1	0.18	0.0%
Totals	**560**	**24,379**	**582.03**	**96.2%**	**Totals**	**19**	**1,217**	**18.61**	**102.1%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
POST-RETIREMENT MORTALITY

2011-2012 Experience

Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
	Males					**Females**			
50-54	-	320	1.42	0.0%	50-54	-	40	0.09	0.0%
55-59	1	957	4.33	23.1%	55-59	-	76	0.30	0.0%
60-64	13	1,240	8.64	150.5%	60-64	1	47	0.30	333.3%
65-69	14	973	11.62	120.5%	65-69	1	17	0.17	588.2%
70-74	14	740	14.62	95.8%	70-74	1	18	0.31	322.6%
75-79	9	468	16.89	53.3%	75-79	1	19	0.58	172.4%
80-84	29	358	24.04	120.6%	80-84	2	13	0.62	322.6%
85-89	24	179	20.78	115.5%	85-89	2	13	1.16	172.4%
90-94	10	55	10.96	91.2%	90-94	-	4	0.53	0.0%
95+	2	11	3.18	62.9%	95+	-	-	-	N/A
Totals	**116**	**5,301**	**116.48**	**99.6%**	**Totals**	**8**	**247**	**4.06**	**197.0%**

2012-2013 Experience

Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
	Males					**Females**			
50-54	1	323	1.43	69.9%	50-54	-	48	0.11	0.0%
55-59	3	976	4.42	67.9%	55-59	-	85	0.33	0.0%
60-64	7	1,314	9.13	76.7%	60-64	-	60	0.38	0.0%
65-69	12	1,246	14.68	81.7%	65-69	-	22	0.23	0.0%
70-74	21	918	18.10	116.0%	70-74	-	16	0.28	0.0%
75-79	21	623	22.44	93.6%	75-79	1	18	0.53	188.7%
80-84	30	432	28.89	103.8%	80-84	-	12	0.54	0.0%
85-89	29	254	29.36	98.8%	85-89	-	14	1.24	0.0%
90-94	18	71	13.82	130.2%	90-94	1	6	0.83	120.5%
95+	4	25	6.95	57.6%	95+	-	-	-	N/A
Totals	**146**	**6,182**	**149.22**	**97.8%**	**Totals**	**2**	**281**	**4.47**	**44.7%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
POST-RETIREMENT MORTALITY

2013-2014 Experience

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
50-54	-	335	1.48	0.0%	50-54	-	55	0.13	0.0%
55-59	3	904	4.10	73.2%	55-59	-	98	0.40	0.0%
60-64	9	1,300	8.98	100.2%	60-64	-	60	0.39	0.0%
65-69	23	1,340	15.88	144.8%	65-69	-	27	0.27	0.0%
70-74	28	934	18.46	151.7%	70-74	-	18	0.32	0.0%
75-79	20	641	22.66	88.3%	75-79	-	15	0.45	0.0%
80-84	24	449	29.63	81.0%	80-84	1	16	0.73	137.0%
85-89	28	272	31.65	88.5%	85-89	2	12	1.09	183.5%
90-94	15	73	14.04	106.8%	90-94	1	8	1.12	89.3%
95+	6	26	7.51	79.9%	95+	-	-	-	N/A
Totals	**156**	**6,274**	**154.39**	**101.0%**	**Totals**	**4**	**309**	**4.90**	**81.6%**

2014-2015 Experience

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
50-54	1	427	1.90	52.6%	50-54	-	90	0.21	0.0%
55-59	2	995	4.49	44.5%	55-59	-	110	0.45	0.0%
60-64	8	1,339	9.26	86.4%	60-64	-	71	0.43	0.0%
65-69	15	1,374	16.48	91.0%	65-69	-	41	0.40	0.0%
70-74	16	947	18.62	85.9%	70-74	-	17	0.30	0.0%
75-79	22	684	23.97	91.8%	75-79	-	14	0.39	0.0%
80-84	27	469	31.07	86.9%	80-84	2	20	0.96	208.3%
85-89	29	286	34.05	85.2%	85-89	1	8	0.76	131.6%
90-94	13	78	15.21	85.5%	90-94	2	8	1.10	181.8%
95+	9	23	6.89	130.6%	95+	-	1	0.18	0.0%
Totals	**142**	**6,622**	**161.94**	**87.7%**	**Totals**	**5**	**380**	**5.18**	**96.5%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
DISABLED MORTALITY

2011-2015 Experience

		Males					Females		
Age Group	**Actual Deaths**	**Exposure**	**Expected Deaths**	**Actual/ Expected**	**Age Group**	**Actual Deaths**	**Exposure**	**Expected Deaths**	**Actual/ Expected**
35-39	1	87	0.12	821.3%	35-39	-	17	0.02	0.0%
45-49	-	154	0.74	0.0%	45-49	1	63	0.14	703.7%
45-49	3	315	1.74	172.8%	45-49	2	103	0.37	540.7%
50-54	-	479	3.28	0.0%	50-54	-	93	0.52	0.0%
55-59	9	720	8.56	105.2%	55-59	-	86	0.80	0.0%
60-64	5	783	15.46	32.3%	60-64	-	39	0.57	0.0%
65-69	14	689	22.59	62.0%	65-69	-	18	0.45	0.0%
70-74	8	313	17.97	44.5%	70-74	2	9	0.39	517.2%
75-79	5	141	14.41	34.7%	75-79	1	1	0.07	1506.3%
80-84	3	41	6.54	45.9%	80-84	1	1	0.10	970.8%
85-89	1	22	3.92	25.5%	85-89	-	-	-	N/A
Totals	**49**	**3,744**	**95.33**	**51.4%**	**Totals**	**7**	**430**	**3.42**	**204.7%**

2011-2012 Experience

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
35-39	-	35	0.05	0.0%	35-39	-	2	0.00	0.0%
45-49	-	58	0.29	0.0%	45-49	-	19	0.04	0.0%
45-49	2	122	0.67	298.1%	45-49	-	26	0.09	0.0%
50-54	-	159	1.09	0.0%	50-54	-	16	0.09	0.0%
55-59	4	225	2.67	150.1%	55-59	-	19	0.16	0.0%
60-64	2	112	2.12	94.1%	60-64	-	6	0.09	0.0%
65-69	1	34	1.11	90.0%	65-69	-	3	0.08	0.0%
70-74	-	2	0.10	0.0%	70-74	-	1	0.04	0.0%
75-79	-	1	0.08	0.0%	75-79	-	-	-	N/A
80-84	-	-	-	N/A	80-84	-	-	-	N/A
85-89	-	-	-	N/A	85-89	-	-	-	N/A
Totals	**9**	**748**	**8.19**	**109.9%**	**Totals**	**-**	**92**	**0.59**	**0.0%**

2012-2013 Experience

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
35-39	-	13	0.02	0.0%	35-39	-	4	0.00	0.0%
45-49	-	36	0.18	0.0%	45-49	-	18	0.04	0.0%
45-49	-	61	0.34	0.0%	45-49	1	22	0.08	1290.7%
50-54	-	108	0.75	0.0%	50-54	-	23	0.12	0.0%
55-59	1	172	2.06	48.5%	55-59	-	23	0.22	0.0%
60-64	1	237	4.73	21.1%	60-64	-	8	0.12	0.0%
65-69	3	197	6.45	46.5%	65-69	-	3	0.07	0.0%
70-74	3	88	5.01	59.9%	70-74	-	3	0.12	0.0%
75-79	2	44	4.45	45.0%	75-79	1	1	0.07	1506.3%
80-84	2	9	1.45	137.7%	80-84	1	1	0.10	970.8%
85-89	-	7	1.25	0.0%	85-89	-	-	-	N/A
Totals	**12**	**972**	**26.70**	**44.9%**	**Totals**	**3**	**106**	**0.95**	**316.2%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
DISABLED MORTALITY

2013-2014 Experience

Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
		Males					**Females**		
35-39	1	18	0.03	3991.5%	35-39	-	5	0.01	0.0%
45-49	-	30	0.13	0.0%	45-49	1	14	0.03	2923.6%
45-49	1	67	0.37	269.7%	45-49	1	28	0.10	1006.2%
50-54	-	102	0.69	0.0%	50-54	-	26	0.15	0.0%
55-59	2	167	1.96	101.8%	55-59	-	21	0.20	0.0%
60-64	1	224	4.43	22.6%	60-64	-	12	0.17	0.0%
65-69	6	223	7.28	82.4%	65-69	-	5	0.12	0.0%
70-74	3	106	6.11	49.1%	70-74	1	3	0.13	770.5%
75-79	1	45	4.67	21.4%	75-79	-	-	-	N/A
80-84	-	12	1.89	0.0%	80-84	-	-	-	N/A
85-89	1	8	1.43	70.1%	85-89	-	-	-	N/A
Totals	**16**	**1,002**	**28.99**	**55.2%**	**Totals**	**3**	**114**	**0.90**	**331.7%**

2014-2015 Experience

Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
		Males					**Females**		
35-39	-	21	0.03	0.0%	35-39	-	6	0.01	0.0%
45-49	-	30	0.14	0.0%	45-49	-	12	0.03	0.0%
45-49	-	65	0.36	0.0%	45-49	-	27	0.10	0.0%
50-54	-	110	0.75	0.0%	50-54	-	28	0.16	0.0%
55-59	2	156	1.86	107.3%	55-59	-	23	0.22	0.0%
60-64	1	210	4.17	24.0%	60-64	-	13	0.19	0.0%
65-69	4	235	7.75	51.6%	65-69	-	7	0.18	0.0%
70-74	2	117	6.75	29.6%	70-74	1	2	0.10	987.1%
75-79	2	51	5.21	38.4%	75-79	-	-	-	N/A
80-84	1	20	3.20	31.3%	80-84	-	-	-	N/A
85-89	-	7	1.25	0.0%	85-89	-	-	-	N/A
Totals	**12**	**1,022**	**31.45**	**38.2%**	**Totals**	**1**	**118**	**0.97**	**102.9%**

2011-2015 Experience

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected		Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
20-24	-	389	0.11	0.0%	20-24	-	404	0.06	0.0%
25-29	2	3,612	1.22	163.6%	25-29	1	858	0.15	665.8%
30-34	3	6,122	2.27	132.2%	30-34	-	918	0.24	0.0%
35-39	6	6,613	3.69	162.5%	35-39	-	1,050	0.42	0.0%
40-44	7	7,725	6.23	112.4%	40-44	-	864	0.46	0.0%
45-49	6	6,928	7.81	76.8%	45-49	1	631	0.51	197.3%
50-54	8	4,687	7.21	111.0%	50-54	1	239	0.29	345.6%
55-59	5	1,825	3.80	131.4%	55-59	-	39	0.08	0.0%
60-64	3	550	1.81	165.3%	60-64	-	4	0.01	0.0%
65-69	-	71	0.36	0.0%	65-69	-	1	0.01	0.0%
Totals	**40**	**38,522**	**34.52**	**115.9%**	**Totals**	**3**	**5,008**	**2.23**	**134.7%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
PRE-RETIREMENT MORTALITY

2011-2012 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
20-24	-	82	0.02	0.0%	20-24	-	103	0.02	0.0%
25-29	-	976	0.33	0.0%	25-29	1	223	0.04	2565.4%
30-34	1	1,489	0.55	181.0%	30-34	-	232	0.06	0.0%
35-39	3	1,701	0.95	315.6%	35-39	-	283	0.11	0.0%
40-44	3	1,957	1.57	191.2%	40-44	-	211	0.12	0.0%
45-49	2	1,651	1.86	107.5%	45-49	1	143	0.12	863.3%
50-54	5	1,146	1.76	283.3%	50-54	-	62	0.07	0.0%
55-59	1	460	0.97	103.2%	55-59	-	9	0.02	0.0%
60-64	1	124	0.41	245.2%	60-64	-	-	-	N/A
65-69	-	21	0.10	0.0%	65-69	-	1	0.01	0.0%
Totals	**16**	**9,607**	**8.53**	**187.5%**	**Totals**	**2**	**1,267**	**0.56**	**358.5%**

2012-2013 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
20-24	-	85	0.02	0.0%	20-24	-	89	0.01	0.0%
25-29	1	917	0.31	321.8%	25-29	-	221	0.04	0.0%
30-34	2	1,490	0.55	363.1%	30-34	-	228	0.06	0.0%
35-39	3	1,655	0.92	325.2%	35-39	-	264	0.11	0.0%
40-44	-	1,977	1.59	0.0%	40-44	-	212	0.11	0.0%
45-49	1	1,701	1.92	52.1%	45-49	-	162	0.13	0.0%
50-54	1	1,156	1.78	56.2%	50-54	1	60	0.07	1385.3%
55-59	1	456	0.95	105.0%	55-59	-	13	0.03	0.0%
60-64	1	150	0.49	202.8%	60-64	-	-	-	N/A
65-69	-	19	0.10	0.0%	65-69	-	-	-	N/A
Totals	**10**	**9,606**	**8.64**	**115.7%**	**Totals**	**1**	**1,249**	**0.56**	**178.8%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
PRE-RETIREMENT MORTALITY

2013-2014 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
20-24	-	98	0.03	0.0%	20-24	-	104	0.02	0.0%
25-29	1	866	0.29	340.2%	25-29	-	211	0.04	0.0%
30-34	-	1,540	0.57	0.0%	30-34	-	228	0.06	0.0%
35-39	-	1,644	0.92	0.0%	35-39	-	256	0.10	0.0%
40-44	4	1,907	1.54	259.2%	40-44	-	217	0.11	0.0%
45-49	-	1,763	1.99	0.0%	45-49	-	172	0.14	0.0%
50-54	-	1,220	1.87	0.0%	50-54	-	64	0.08	0.0%
55-59	1	469	0.98	102.4%	55-59	-	9	0.02	0.0%
60-64	-	144	0.47	0.0%	60-64	-	2	0.01	0.0%
65-69	-	17	0.09	0.0%	65-69	-	-	-	N/A
Totals	**6**	**9,668**	**8.76**	**68.5%**	**Totals**	**-**	**1,263**	**0.57**	**0.0%**

2014-2015 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
20-24	-	124	0.04	0.0%	20-24	-	108	0.02	0.0%
25-29	-	853	0.29	0.0%	25-29	-	203	0.04	0.0%
30-34	-	1,603	0.60	0.0%	30-34	-	230	0.06	0.0%
35-39	-	1,613	0.90	0.0%	35-39	-	247	0.10	0.0%
40-44	-	1,884	1.52	0.0%	40-44	-	224	0.12	0.0%
45-49	3	1,813	2.04	146.9%	45-49	-	154	0.12	0.0%
50-54	2	1,165	1.79	112.0%	50-54	-	53	0.07	0.0%
55-59	2	440	0.91	220.5%	55-59	-	8	0.02	0.0%
60-64	1	132	0.44	227.4%	60-64	-	2	0.01	0.0%
65-69	-	14	0.07	0.0%	65-69	-	-	-	N/A
Totals	**8**	**9,641**	**8.59**	**93.1%**	**Totals**	**-**	**1,229**	**0.54**	**0.0%**