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Correspondence Memorandum

Date: November 17, 2018
To: Employee Trust Funds Board
From: Cindy Klimke-Armatoski, CPA
 Chief Trust Finance Officer
Subject: WRS Three-Year Experience Study

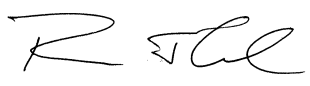
ETF requests the Employee Trust Funds Board (Board) accept the *Three-Year Experience Study January 1, 2015 – December 31, 2017*, including the updated demographic assumptions contained in the report, and select and approve specific economic assumptions.

Actuarial valuations of the Wisconsin Retirement System (WRS) are conducted annually by the Board’s consulting actuary, Gabriel, Roeder, Smith & Company (GRS) and are based on several demographic and economic assumptions. Wisconsin statutes require the Board’s actuary to conduct an experience study at least every three years to review the assumptions and determine if updates are needed. This study reviews current actuarial assumptions and methods and compares them to actual experience of the WRS during the years 2015 – 2017.

Demographic assumptions include rates of withdrawal, disability, retirement and mortality. GRS has made specific recommendations for these assumptions in the report.

Economic assumptions have a more significant impact on valuations and include the investment return assumption and wage inflation assumption. The investment return assumption is used to determine how much pension plan assets will grow to meet its pension liabilities. If the assumption is too optimistic, contributions to the fund will not meet pension obligations. If the assumption is too pessimistic, the contributions will be higher than necessary. The wage inflation assumption is used to help determine the rate of growth of future benefit liabilities.

GRS has recommended ranges for the economic assumptions that they believe are reasonable, based on their analysis, and has provided three options for your consideration. Page 15 of the report summarizes these options, along with the impact

Reviewed and approved by Robert J. Conlin, Secretary

 Electronically Signed 11/26/18

Board	Mtg Date	Item #
JM	12.13.18	3A
ETF	12.13.18	4A

the changes would have had on the December 31, 2017, active lives valuation had the changes been in place at that time. While it is important to understand the impact of changing actuarial assumptions, the impact should not drive the decision in setting the assumptions. The Board will need to discuss the options presented for the economic assumptions and decide on the specific assumptions to be used.

Assumptions adopted by the Board will be used in the December 31, 2018, actuarial valuations and will be the basis for 2020 contribution rates. These will be used in calculating new annuities beginning January 1, 2020.

Actuaries from GRS will be at the Board meeting to present their report and answer any questions.

Attachment: Three-Year Experience Study January 1, 2015 – December 31, 2017

Wisconsin Retirement System

Three-Year Experience Study

January 1, 2015 – December 31, 2017



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November 19, 2018

The Employee Trust Funds Board
4822 Madison Yards Way
Madison, Wisconsin 53705

Ladies and Gentlemen:

The results of the **3-year investigation of experience** of the Wisconsin Retirement System are presented in this report. The investigation was made for the purpose of updating the actuarial assumptions used in valuing the actuarial liabilities of the Wisconsin Retirement System in compliance with Section 40.03(5)(b) of the Wisconsin Statutes.

The investigation was based upon the statistical data furnished for annual active member and retired life actuarial valuations, supplemental information furnished by your Secretary and his staff, concerning Participants who died, withdrew, became disabled or retired during the last 3 years and on published historical economic data.

The investigation covered the 3-year period from **January 1, 2015 to December 31, 2017**, and was carried out using generally accepted actuarial principles and techniques.

To the best of our knowledge, this report is complete and accurate and was made in accordance with generally recognized actuarial methods. Mark Buis, James D. Anderson, and Brian B. Murphy 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. The signing actuaries are independent of the plan sponsor.

We believe that the new actuarial assumptions that are the result of this investigation represent a reasonable estimate of past and possible future experience of the Wisconsin Retirement System.

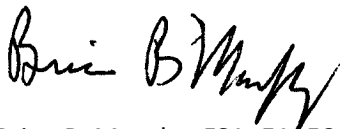
Respectfully submitted,



Mark Buis, FSA, EA, FCA, MAAA



James D. Anderson, FSA, EA, FCA, MAAA



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

MB/JDA/BBM:rmn:sc



EXECUTIVE SUMMARY

Executive Summary

The Wisconsin Statutes require reviewing the actuarial assumptions every three years. The last review was prepared for the period from January 1, 2012 to December 31, 2014. In this report, we review the current actuarial assumptions and methods and compare them to the actual experience of the Retirement System for the years 2015-2017.

The table below lists each of the primary assumptions and methods that we analyzed, including our recommendations for each item, and the overall financial impact of any recommended changes.

Assumption	2015 Recommendation	2018 Recommendation	Financial Impact – Plan Liabilities And Contribution Rates
Withdrawal rates	Higher Rates	Higher Rates	Decrease
Disability rates	Lower Rates	Lower Rates	Decrease
Pay increases due to seniority	Lower Rates	No Change	N/A
Retirement rates	Lower Rates	Higher Rates	Increase
Pre and post-retirement mortality rates	Lower Rates	Lower Rates	Increase
Investment return	No Change	Lower Rates	Increase
Wage inflation	No Change	Lower Rates	Decrease
Price inflation	No Change	Lower Rates	No direct impact
Total	Various	Various	Various

A common practice among public employee retirement systems is that the actuary recommends a set of demographic assumptions which the Board adopts. The actuary then suggests a range of reasonable alternate economic assumptions. Following discussion involving the actuary, the plan governing body, and other professionals, the plan governing body makes a final choice from the various alternatives.

See page 5 for the expected impact on the Retired lives mortality reserve due to the proposed mortality assumption change. The overall impact on the contribution rate will depend on the final economic set of assumptions selected. The impact of this is shown on page 15.

New assumptions will be first used in the December 31, 2018 actuarial valuations, at which time experience gains or losses incurred during 2018 will also be recognized. This would first impact rates in 2020. Consequently, no rate changes are recommended for 2019 based upon this study.

SUMMARY OF FINDINGS

Introduction

Each year, as of December 31, the liabilities of the Wisconsin Retirement System are valued. In order to perform the valuation, assumptions must be made regarding the future experience of the System with regard to the following risk areas:

- Rates of **withdrawal** of active participants.
- Rates of **disability** among active participants.
- Patterns of **salary increases** to active participants.
- Rates of **retirement** among active participants.
- Rates of **mortality** among active participants, retirees, and beneficiaries.
- Long-term rates of **investment return** to be generated by the assets of the Fund.

Assumptions should be carefully chosen and continually monitored. A poor initial choice of assumptions or continued use of outdated assumptions can lead to:

- Understated costs resulting in either an inability to pay benefits when due, or sharp increases in required contributions at some point in the future;
- Overstated costs resulting in either benefit levels that are kept below the level that could be supported by the computed rate or an unnecessarily large burden on the current generation of participants, employers and taxpayers.

A single set of assumptions will not be suitable indefinitely. Conditions change, and our understanding of conditions also changes.

In recognition of this, Wisconsin statutes require that assumptions used to value the liabilities of the Wisconsin Retirement System be studied in-depth every three years. 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 December 31, 2015 valuation which impacted contribution rates in 2017.

Summary of Decrement Experience

Background: With the exception of mortality and disability, the decrements that we study tend to relate to voluntary human behavior. Human behavior in any short period can be influenced by economic and societal factors that change from time to time. Observed data will very often contain anomalies that cannot be assumed to continue into the future. This happens particularly in smaller groups.

In most cases, when adjustments are indicated, the proposed assumptions give partial recognition to present assumptions as well as to results from actual experience. Complete recognition is rarely given to actual experience over a limited period. This would cause contribution rates to be unduly sensitive to short-term experience fluctuations. In general, we moved about half way to the observed experience, except for the mortality experience which is discussed in detail on page 5.

Consistent with the past few experience studies, we have continued the use of the 'liability weighted rate' for certain decrements. 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 and retirement decrements than with the population related rates. This makes some intuitive sense, since retirement and termination decisions are often made based on how much the members have to gain or lose if they retire or change jobs, whereas death and disability is typically not a decision at all, rather an event that happens. Comments on specific assumptions are provided on the following pages. Tabular results are presented in summary form on page 6.

While mortality is not typically a voluntary human behavior, a recent study by the Society of Actuaries found that mortality experience was highly correlated with education and income. That is, people with higher incomes and higher levels of education tended to live longer. As such, we also studied mortality rates on a 'benefit weighted' basis in addition to a 'number count' basis. This is discussed in more detail on page 5.

Summary of Decrement Experience

Withdrawal Rates: In general, there were more withdrawals (terminations) than expected. However, this varied by age, service and group. Additionally, the operation of the withdrawal decrement is impacted by the operation of a 'forfeiture' assumption. The current assumption is that 25% of members at age 35 will forfeit a withdrawal benefit (graded down to zero percent at retirement eligibility). We recommend that the forfeiture assumption remain unchanged and that the withdrawal (termination) rates be modified to move closer to the liability weighted rates (see discussion on page 3). This change had a small upward effect on liabilities. Detailed information, including proposed rates, is presented beginning on page A-1.

Disability Rates: Overall, there were fewer disabilities than expected and we recommend lowering the incidence of disability for most groups. This change had a small downward effect on liabilities. Detailed information, including proposed rates, begins on page B-1.

Pay Increase Rate (Merit and Longevity Portion): Actual rates varied by group and provide a fairly reasonable match to current assumptions. No changes are being recommended to the merit and longevity portion. Additional discussion of general wage inflation is on page 10.

Normal and Reduced Retirement Experience: Overall, there were slightly more normal retirements and fewer reduced retirements than expected in most groups. Additionally, retirement experience was found to be more highly correlated with the liability weighted method described on page 3. As such, we recommend modifying the normal retirement rates slightly for all groups to move closer to the observed liability weighted rates. As more experience emerges, we will monitor these rates to see if further adjustments are necessary. This change had a small upward effect on liabilities. Detailed information, including proposed rates, begins on page D-1.

Summary of Decrement Experience

Mortality Among Retirees: Mortality rates among retired public employees have been declining for years. These mortality rates are used to develop liabilities for both current retirees and future retirees (active members). Additionally, and perhaps consequently, the Actuarial Standard of Practice with regard to the mortality assumption has been revised. ASOP No. 35 Disclosure Section 4.1.1 now 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.”* During the last study, we introduced and incorporated the concept of fully generational mortality. Fully generational tables help take into account future improvements in mortality that are expected to occur. The current mortality assumption consists of a base mortality table (based on actual experience in the WRS) and 50% of the MP-2015 projection scale to measure future improvements in mortality.

Recently, the Society of Actuaries published a draft mortality study that was specific to public sector retirement systems. This is a very comprehensive study and we are still in the process of reviewing the newly published tables. There are numerous mortality tables created for each classification of employee (General members, Public Safety, Teachers, Survivors, Juvenile, headcount-weighted, benefit-weighted, above median, below median), making it difficult to find the most appropriate table for the WRS. Until these tables can be studied in greater detail, we continue to recommend developing mortality rates based on WRS mortality experience. However, one of the key findings of the study is that there is a high correlation between longevity and income and education. As such, the SOA highly recommended the use of ‘benefit weighted’ rates when developing mortality tables. We were able to review the WRS retiree mortality on a ‘benefit weighted’ basis and have shown the results on page E-2 and E-4 of this report. Consistent with the SOA study, WRS members with higher benefits appear to experience longer lifespans, resulting in lower mortality rates. While we think there is some credibility to using this new methodology, we recommend moving about half way to the benefit weighted rates until further experience can be confirmed. With regard to the mortality improvement projection scale, there is not sufficient data to build a projection scale based on WRS experience alone. The Society of Actuaries updates the projection scale annually and the latest published table is called the MP-2018 Projection Scale. For each of the last 4 years, the updated projection scale has resulted in less mortality improvement than projected in the prior year’s projection scale. Until the projection scale begins to stabilize, we are recommending using 60% of the MP-2018 Projection Scale. The combination of slightly lower mortality rates in the base table and slightly higher rates in the projection scale table will result in a modest increase cost due to the overall change in the mortality assumption. For retired lives, we recommend phasing into the new mortality tables over a 3-year period (resulting in an expected increase in the mortality reserve of about 0.2% per year – this increase is lower than the previous experience study). This is similar to past practice with the intention to preserve equity in the operation of the dividend program. Detailed information begins on page E-1.

Mortality Among Disabled Retirees and Active Members: Mortality experience among disabled retirees and active members is very limited. As such, we recommend making similar adjustments to the current disabled and active mortality tables that were made to the current healthy mortality table. Detailed information for disabled retirees and active members begins on page E-3.

Complete listings of all assumptions begin on page F-1.

Summary of Decrement Experience

Decrement Risk Area	Actual	Expected	
		Current Assumption	Proposed Assumption
<u>Withdrawal - Total</u>			
General (Without Schools)	25,082	20,644	22,175
Public Schools and University	11,921	10,418	11,022
Protective			
With Social Security	2,393	1,505	1,731
Without Social Security	83	63	63
Executive and Elected	142	154	151
<u>Withdrawal - Service Greater than 10</u>			
General (Without Schools)	3,057	1,836	2,132
Public Schools and University	2,476	1,622	1,906
Protective			
With Social Security	626	317	387
Without Social Security	42	22	22
Executive and Elected	33	23	34
<u>Disability</u>			
General (Without Schools)	224	451	322
Public Schools and University	79	165	120
Protective			
With Social Security	27	56	39
Without Social Security	4	12	8
Executive and Elected	-	1	1
<u>Reduced Retirement</u>			
General (Without Schools)	6,451	7,704	8,051
Public Schools and University	4,161	4,832	4,886
Executive and Elected	36	28	28
<u>Normal Retirement</u>			
General (Without Schools) **	6,734	6,713	7,364
Public Schools and University **	3,499	3,606	3,688
Protective*			
With Social Security	1,844	1,640	1,828
Without Social Security	262	274	274
Executive and Elected	169	175	199
<u>Mortality - Retired Lives</u>			
Normal Retirement			
Male	6,474	6,499	6,173
Female	7,683	7,458	7,354
Disabled Retirement			
Male	360	385	368
Female	414	446	441

* Includes Reduced Retirements.

** Figures shown are for people below age 75.

Proposed rates for withdrawal, retirement and mortality decrements are based on liability weighting and therefore comparisons based on population counts alone may not be appropriate. Expected Mortality rates are based on the current and proposed Mortality tables with mortality improvement projections to the middle of the experience period.

Economic Assumptions

Economic assumptions include long-term rates of investment return and wage inflation (the across-the-board portion of salary increases). Unlike demographic activities, economic activities do not lend themselves to analysis solely on the basis of internal historical patterns because both salary increases and investment return are driven by external forces; and in particular by inflation which defies accurate long-term prediction. Estimates of investment return and pay increases are generally selected on the basis of expectations in an inflation-free environment and then both are increased by some provision for long-term inflation.

If inflation and/or productivity increases are higher than expected, actual rates of salary increase and investment return are likely to exceed the assumed rates. Salaries increasing faster than expected produce unexpected liabilities. Investment return exceeding the assumed rates (whether due to manager performance, change in the mix of assets, or general inflation) results in unanticipated assets. To the extent that inflation, productivity, and other factors have about the same effect on both sides of the balance sheet, these additional assets and liabilities can offset one another over the long-term.

Sources considered in the analysis of the economic assumptions included:

- Actual System experience over the last 3 years (i.e., merit and seniority pay increases)
- Future expectations of the investment consultant for WRS and future expectations of other investment consultants
- 2018 Social Security Trustees Report
- Historical observations of inflation statistics (both price and wage) and investment returns

Current economic assumptions for WRS are as follows:

Price Inflation	2.7%
Wage Inflation	3.2%
Net Investment Return	7.2%
Real Rate of Return	4.0%

Economic Assumptions – ASOP No. 27

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

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

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

Economic Assumptions

Price Inflation: Price inflation underlies both the wage inflation and investment return assumptions. Therefore, we recommend that a specific price inflation assumption be adopted in conjunction with this Experience Study. The current price inflation assumption is 2.7%. The chart below shows forward looking inflation expectations from various published sources. Over the past 50 years, price inflation has averaged 4.1%. This result is heavily affected by the high inflationary period of the 1970’s and early 1980’s. During the past decade, price inflation averaged 2.1%. The 2018 Social Security Trustees report uses 2.6% as the long-range intermediate price inflation assumption. Additional forward-looking forecasts are shown below. **Based upon the reviewed data, we are comfortable with an assumption in the 2.0% to 2.5% range. Our initial recommendation, however, is for the upper end of the range at 2.3% or 2.5%.** (Remember that the selected wage inflation and investment return assumptions should be consistent with the final selected price inflation assumption.)

Forward-Looking Price Inflation Forecasts	
Congressional Budget Office	
5-Year Annual Average	2.20%
10-Year Annual Average	2.30%
Federal Reserve Bank of Philadelphia	
5-Year Annual Average	2.22%
10-Year Annual Average	2.20%
Federal Reserve Bank of Cleveland	
10-Year Expectation	2.14%
20-Year Expectation	2.25%
30-Year Expectation	2.34%
Federal Reserve Bank of St. Louis	
10-Year Breakeven Inflation	2.08%
20-Year Breakeven Inflation	2.13%
30-Year Breakeven Inflation	2.15%
U.S. Department of the Treasury	
10-Year Breakeven Inflation	2.09%
20-Year Breakeven Inflation	2.12%
30-Year Breakeven Inflation	2.19%
50-Year Breakeven Inflation	2.23%
100-Year Breakeven Inflation	2.25%
Social Security Trustees	
Ultimate Intermediate Assumption	2.60%

Economic Assumptions

Wage Inflation: Wage inflation consists of two components, 1) a portion due to pure price inflation (i.e., increases due to changes in the CPI), and 2) increases in average salary levels in excess of pure price inflation (i.e., increases due to changes in productivity levels, supply and demand in the labor market and other macroeconomic factors). The long-term rate of increase in National Average Earnings over the last 50 years is somewhat higher than the current WRS assumption, although shorter term averages are below it. It is expected that, in the long run, salary increases in all parts of the country will be close to the national averages. However, none of the data we have reviewed suggests a repeat of the high inflation rates experienced in the 1970s. Average salaries in WRS have risen at approximately 2.5% a year since 1990. In conjunction with the lower price inflation of 2.5%, we recommend this assumption be lowered from 3.2% to 3.0%. **The data we have reviewed would support an assumption 30 basis points below this, or 2.7%. We would be willing to consider a lower assumption within the context of the review of the investment return assumption. The impact of these scenarios is illustrated on Page 15 (including an alternate scenario using a 2.8% wage inflation assumption).**

Year	Annual Increase in			WRS Wages
	Prices (CPI-U)	Wages (NAE)	Difference	
1958-1967	1.8%	3.7%	1.9%	N/A
1968-1977	6.2%	6.5%	0.3%	N/A
1978-1987	6.4%	6.5%	0.1%	N/A
1988-1997	3.4%	4.1%	0.7%	4.0%
1998-2007	2.7%	4.0%	1.3%	3.1%
2008-2017	1.6%	2.4%	0.8%	1.9%
3-Year Avg	1.6%	3.4%	1.8%	1.6%
5-Year Avg	1.4%	3.0%	1.6%	1.9%
10-Year Avg	1.6%	2.4%	0.8%	1.9%
20-Year Avg	2.1%	3.2%	1.1%	2.5%
30-Year Avg	2.6%	3.5%	0.9%	2.8%
50-Year Avg	4.0%	4.7%	0.7%	N/A

WRS Wage Inflation

Period	WRS Wage Inflation
Last 3 Years	1.6%
Last 5 Years	1.9%
Last 10 Years	1.9%
Last 20 Years	2.3%
Last 25 Years	2.5%

Economic Assumptions

Investment Return: The investment return assumption is the actuarial assumption that has the largest impact on actuarial valuation results. As more of the actuarial accrued liabilities are related to non-active members, the nominal (as opposed to real) investment return assumption becomes a more prominent factor. Since one of WRS's fundamental financial objectives is the receipt of level contributions over time, the discount rate assumption is set equal to the investment return assumption (with perhaps an adjustment for adverse deviation).

Presented below is the approximate current asset allocation for the WRS Core fund:

Asset Class	Approximate Asset Allocation
Global Equities	50.0%
Fixed Income	24.5
Inflation Sensitive Assets	15.5
Real Estate	8.0
Private Equity/Debt	8.0
Multi-Asset	4.0
Cash Equivalents	-10.0

Based upon the approximate asset allocation, future expectations of various investment consultants were analyzed. The next few exhibits show the results of this analysis. Final expected nominal investment return results are based upon the recommended 2.5% price inflation assumption. We used the actuarial assumption for price inflation rather than the consultant assumption, in order to be consistent with the calculation of liabilities. Investment results presented are net of investment and administrative expenses.

Economic Assumptions

The exhibits presented below are based upon the approximate asset allocation and the capital market assumptions of various investment consultants (identified by numbers 1 through 12 below).

Investment Consultant	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)-(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Plan Incurred Administrative Expenses	Expected Nominal Return Net of Expenses (6)-(7)	Standard Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	6.03%	2.20%	3.83%	2.50%	6.33%	0.05%	6.28%	12.96%
2	6.55%	2.26%	4.29%	2.50%	6.79%	0.05%	6.74%	11.21%
3	6.86%	2.50%	4.36%	2.50%	6.86%	0.05%	6.81%	13.62%
4	6.48%	2.00%	4.48%	2.50%	6.98%	0.05%	6.93%	11.07%
5	6.77%	2.21%	4.55%	2.50%	7.05%	0.05%	7.00%	14.31%
6	7.14%	2.50%	4.64%	2.50%	7.14%	0.05%	7.09%	13.74%
7	6.70%	2.00%	4.70%	2.50%	7.20%	0.05%	7.15%	12.80%
8	7.15%	2.26%	4.89%	2.50%	7.39%	0.05%	7.34%	14.58%
9	7.37%	2.31%	5.07%	2.50%	7.57%	0.05%	7.52%	12.74%
10	7.10%	1.95%	5.15%	2.50%	7.65%	0.05%	7.60%	12.96%
11	7.83%	2.25%	5.58%	2.50%	8.08%	0.05%	8.03%	16.51%
12	8.28%	2.00%	6.28%	2.50%	8.78%	0.05%	8.73%	11.20%
Average	7.02%	2.20%	4.82%	2.50%	7.32%	0.05%	7.27%	13.14%

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of exceeding 7.20%
	40th	50th	60th	
(1)	(2)	(3)	(4)	(5)
1	4.77%	5.50%	6.23%	27.79%
2	5.53%	6.15%	6.79%	33.78%
3	5.19%	5.95%	6.71%	33.96%
4	5.75%	6.37%	6.99%	36.75%
5	5.26%	6.06%	6.86%	35.98%
6	5.46%	6.22%	7.00%	37.44%
7	5.68%	6.39%	7.11%	38.81%
8	5.55%	6.36%	7.18%	39.79%
9	6.06%	6.77%	7.49%	43.96%
10	6.11%	6.83%	7.56%	44.88%
11	5.87%	6.79%	7.71%	45.47%
12	7.53%	8.16%	8.79%	65.08%
Average	5.73%	6.46%	7.20%	40.31%

Economic Assumptions

The current version of ASOP No. 27 (applicable to valuation dates on or after September 30, 2014) suggests that either the expected geometric return (i.e., 50th percentile) or the expected arithmetic return are suitable for use as a reasonable investment return assumption. Based on the average of each of the investment consultants' expectations, this would result in a range of 6.46% to 7.27% over a 10 year horizon. While the current assumption of 7.2% is at the upper end of this range, keep in mind that this analysis is based on averages and a certain amount of subjective judgment in mapping the WRS asset allocation into the asset classes provided by the consultants that we monitor. NEPC, SWIB's investment consultant, has a 5-7 year return expectation of 6%, and a 30 year return expectation of 7.3% -- note that these both include an active return component of 0.3%-0.8%. Lastly, a reduction in the inflation assumption without a corresponding reduction in the investment return assumption would result in an increase in the expected real rate of return.

While a 7.2% investment assumption was historically conservative by industry standards, there is considerable movement among all Public Sector Retirement Systems to reduce this assumption. It is important to remember that this assumption should not drive the asset allocation or investment goals of the investment managers. Rather, it simply reflects a more realistic expectation which is being driven by lower inflation forecasts and fixed income returns. In order to keep the assumptions consistent with the lower rates of price inflation and wage inflation, we have illustrated the impact of lowering the investment return assumption from 7.2% to 7.0% or 6.8%. Note that we do not expect the change in the investment return assumption to impact Retiree Dividends in any material way since Retiree Dividends are determined by the actual return (i.e. MRA) in excess of 5%. While the asset smoothing method may dampen gains slightly, it has the same effect on losses so the impact on dividends is negligible. We have illustrated the impact on various economic alternatives on Page 15.

Summary of Economic Assumption options

Measure	Current Assumption	Reasonable Range	Recommended Assumption
Price Inflation	2.7%	2.0%-2.5%	2.3%-2.5%
Wage Inflation	3.2%	2.7%-3.2%	2.8%-3.0%
Investment Return	7.2%	6.5%-7.3%	6.8%-7.0%

Economic Assumptions Illustrative Charts

Historical Patterns of Investment Return, Pay Increases & Inflation

Calendar Year Period	Gross Market Returns			Stocks (S&P 500)	Price Inflation (CPI)	National Average Earnings	Sample Balanced Fund	
	Bonds (Long)		Cash Equiv. (T Bills)				Total Return (I)	Spread: I - NAE - e
	U.S. Treasury	Corp. (S&P AA)						
1960-1969	1.4 %	1.7 %	3.9 %	7.8 %	2.5 %	4.3 %	6.2 %	1.6 %
1970-1979	5.5 %	6.2 %	6.3 %	5.9 %	7.4 %	6.9 %	6.1 %	(1.2)%
1980-1989	12.6 %	13.0 %	8.9 %	17.5 %	5.1 %	5.8 %	16.3 %	10.2 %
1990-1999	8.8 %	8.4 %	4.9 %	18.2 %	2.9 %	4.2 %	15.4 %	10.9 %
2000-2009	7.7 %	7.6 %	2.8 %	(0.9)%	2.5 %	2.9 %	2.4 %	(0.9)%
2010	10.1 %	12.4 %	0.1 %	15.1 %	1.5 %	2.4 %	13.8 %	11.1 %
2011	28.2 %	18.0 %	0.0%	2.1 %	3.0 %	3.1 %	8.2 %	4.8 %
2012	3.3 %	10.7 %	0.1 %	16.0 %	1.7 %	3.1 %	13.2 %	9.8 %
2013	(11.4)%	(7.1)%	0.0%	32.4 %	1.5 %	1.3 %	20.0 %	18.4 %
2014	23.9 %	17.3 %	0.0%	13.7 %	0.8 %	4.2 %	15.6 %	11.1 %
2015	(1.3)%	(4.8)%	0.5%	1.4 %	0.7 %	3.5 %	0.1 %	(3.8)%
2016	1.2 %	10.8 %	1.1%	12.0 %	2.1 %	1.1 %	10.1 %	8.7 %
2017	8.6 %	11.7 %	(0.4)%	21.8 %	2.1 %	5.5 %	18.2 %	12.4 %
Last 5 Years	3.6 %	5.1 %	0.2 %	15.8 %	1.4 %	3.0 %	12.6 %	9.3 %

Sample Balanced Fund	
Equities	70%
Bonds - Government	15%
- Corporate	14%
Cash Equivalents	<u>1%</u>
	100%
Fund expenses(e)	0.35%

Historical Spread	
Observed spread is very sensitive to the observation period, even over long periods, as illustrated below:	
Observation Period	Spread
55 years	4.7%
45 years	5.4%
35 years	7.2%

This page should not be interpreted as a recommendation for a 70% equity allocation. It is just an illustration showing what a 70% allocation to equities could have achieved in the past. The future could be very different. In particular, the chart does not discuss the volatility embedded in a 70% allocation. Asset volatility can lead to dividend volatility, and even to negative dividends.

Summary of Valuation Results

The table below describes hypothetical valuation results at December 31, 2017 with current and proposed actuarial assumptions. The rate changes are illustrative only since 2019 contribution rates have already been set based upon the actual December 31, 2017 valuation results.

Hypothetical Normal Cost Rates Based on the December 31, 2017 Active Lives Valuation

	Current	Demographic Changes Only	Proposed Assumptions*		
	Price Inflation	2.70%	2.70%	2.50%	2.30%
Wage Inflation	3.20%	3.20%	3.00%	2.80%	3.00%
Investment Return	7.20%	7.20%	7.00%	6.80%	6.80%
General and Executive & Elected	13.1%	13.1%	13.1%	13.2%	13.6%
Protective With Social Security	17.1%	17.5%	17.7%	17.9%	18.3%
Protective Without Social Security	21.5%	21.9%	22.1%	22.4%	23.1%

* Results above include proposed demographic assumptions (changes to the withdrawal, retirement, disability and mortality rates discussed earlier in this report)

New assumptions will be first used in the December 31, 2018 actuarial valuations, at which time experience gains or losses incurred during 2018 will also be recognized. This would first impact rates in 2020. Consequently, no rate changes are recommended for 2019 based upon this study.

Other Recommendations

Option Factors are calculated using a 5% interest assumption and the assumed rates of mortality with a blended mortality table consisting of 50% male rates and 50% female rates. If a retiring member elects an optional form of benefit, the straight life benefit is multiplied by the appropriate option factor to produce the benefit actually payable. Examples of option factors calculated using the present and proposed mortality assumptions are shown below.

Age		Joint and 75%		Joint and 100%		Joint and 100% with 180 Payments Guaranteed		Money Purchase	
Retiree	Beneficiary	Current	Proposed	Current	Proposed	Current	Proposed	Current	Proposed
50	45	0.927	0.929	0.905	0.908	0.905	0.908	0.005169	0.005134
55	50	0.910	0.912	0.884	0.886	0.883	0.886	0.005515	0.005468
60	55	0.891	0.894	0.860	0.863	0.859	0.862	0.005975	0.005910
65	60	0.866	0.870	0.829	0.834	0.826	0.831	0.006640	0.006542
75	70	0.800	0.805	0.750	0.756	0.723	0.732	0.009092	0.008866

Recommended Implementation Schedule. It is recommended that the results of this experience study be implemented in accordance with the following schedule.

Active and Inactive Lives Valuation:	12/31/2018 Valuation
Retired Lives Valuation:	12/31/2018 Valuation
Option Factors:	Not later than January 1, 2020

SECTION A

WITHDRAWAL EXPERIENCE

General Males Withdrawal Experience

Male Service-Based Withdrawals

Service Index	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	1,149	6,389	0.1798	0.1711	0.1680	0.1700	1,073	1,086
2	1,562	11,984	0.1303	0.1185	0.1270	0.1230	1,522	1,474
3	1,029	10,148	0.1014	0.0951	0.0900	0.0930	913	944
4	728	8,625	0.0844	0.0794	0.0730	0.0760	630	656
5	539	6,374	0.0846	0.0800	0.0700	0.0750	446	478
6	312	4,438	0.0703	0.0676	0.0480	0.0580	213	257
7	211	3,621	0.0583	0.0532	0.0430	0.0480	156	174
8	189	3,496	0.0541	0.0514	0.0420	0.0470	147	164
9	186	3,568	0.0521	0.0488	0.0340	0.0410	121	146
10	160	3,368	0.0475	0.0481	0.0310	0.0400	104	135
Totals (10 and under)	6,065	62,011	0.0978	0.0674	0.0564	0.0620	5,325	5,514

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0978	0.0674	0.0620
Previous Investigation Results			
2012-2014	0.0971	0.0596	0.0546
2009-2011	0.0870		0.0790
2006-2008	0.0883		0.0808

General Males Withdrawal Experience

Male Age-Based Withdrawals with 10 or More Years of Service

Age	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates*		Expected Withdrawals	
					Present	Proposed	Present	Proposed
25-29	1	20	0.0500	0.0652	0.0250	0.0400	1	1
30-34	40	908	0.0441	0.0445	0.0250	0.0350	22	30
35-39	128	4,020	0.0318	0.0299	0.0225	0.0260	90	106
40-44	190	6,643	0.0286	0.0259	0.0200	0.0230	131	150
45-49	250	10,375	0.0241	0.0206	0.0160	0.0180	169	190
50-54	328	14,609	0.0225	0.0178	0.0150	0.0160	221	237
Totals	937	36,575	0.0256	0.0208	0.0166	0.0185	634	714

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0256	0.0208	0.0185
Previous Investigation Results (combined)			
2012-2014	0.0239	0.0202	0.0165
2009-2011	0.0547		0.0495
2006-2008	0.0547		0.0509
2003-2005	0.0564		0.0506
2000-2002	0.0527		0.0529
1997-1999	0.0531		0.0520
1994-1996	0.0499		0.0478

* Sample rates are taken from midpoint of age group.

General Females Withdrawal Experience

Female Service-Based Withdrawals

Service Index	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	3,046	15,099	0.2017	0.2093	0.2000	0.2000	3,020	3,020
2	4,198	25,777	0.1629	0.1580	0.1410	0.1500	3,635	3,867
3	2,675	20,551	0.1302	0.1268	0.1100	0.1150	2,261	2,363
4	1,833	16,679	0.1099	0.1075	0.0890	0.1000	1,484	1,668
5	1,318	12,440	0.1059	0.1090	0.0850	0.0950	1,057	1,182
6	818	9,133	0.0896	0.0885	0.0670	0.0780	612	712
7	662	7,913	0.0837	0.0842	0.0560	0.0700	443	554
8	535	7,314	0.0731	0.0705	0.0500	0.0600	366	439
9	483	6,878	0.0702	0.0705	0.0470	0.0570	323	392
10	392	6,264	0.0626	0.0607	0.0450	0.0530	282	332
Totals (10 and under)	15,960	128,048	0.1246	0.0919	0.0712	0.0810	13,483	14,529

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.1246	0.0919	0.0810
Previous Investigation Results			
2012-2014	0.1091	0.0769	0.0697
2009-2011	0.0903		0.0937
2006-2008	0.0980		0.0940

General Females Withdrawal Experience

Female Age-Based Withdrawals with 10 or More Years of Service

Age	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates*		Expected Withdrawals	
					Present	Proposed	Present	Proposed
25-29	3	23	0.1304	0.1652	0.0450	0.0500	1	1
30-34	83	1,533	0.0541	0.0497	0.0420	0.0450	61	66
35-39	316	6,336	0.0499	0.0451	0.0300	0.0350	192	222
40-44	436	9,771	0.0446	0.0398	0.0250	0.0300	243	292
45-49	514	14,551	0.0353	0.0299	0.0200	0.0250	294	362
50-54	768	23,149	0.0332	0.0283	0.0175	0.0200	411	475
Totals	2,120	55,363	0.0383	0.0319	0.0206	0.0244	1,202	1,418

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0383	0.0319	0.0244
Previous Investigation Results (combined)			
2012-2014	0.0293	0.0225	0.0203
2009-2011	0.0665		0.0686
2006-2008	0.0731		0.0699
2003-2005	0.0734		0.0695
2000-2002	0.0730		0.0723
1997-1999	0.0722		0.0714
1994-1996	0.0650		0.0680

* Sample rates are taken from midpoint of age group.

Public School Males Withdrawal Experience

Male Service-Based Withdrawals

Service Index	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	184	1,574	0.1169	0.1900	0.1830	0.1850	288	291
2	304	3,037	0.1001	0.1125	0.1100	0.1100	334	334
3	242	3,026	0.0800	0.0833	0.0780	0.0800	236	242
4	195	2,897	0.0673	0.0650	0.0590	0.0650	171	188
5	156	2,525	0.0618	0.0587	0.0490	0.0550	124	139
6	91	2,065	0.0441	0.0410	0.0360	0.0400	74	83
7	62	1,820	0.0341	0.0363	0.0320	0.0350	58	64
8	66	1,775	0.0372	0.0263	0.0260	0.0320	46	57
9	67	1,838	0.0365	0.0320	0.0260	0.0300	48	55
10	65	1,883	0.0345	0.0296	0.0240	0.0280	45	53
Totals (10 and under)	1,432	22,440	0.0638	0.0420	0.0388	0.0431	1,424	1,506

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0638	0.0420	0.0431
Previous Investigation Results			
2012-2014	0.0599	0.0420	0.0371
2009-2011	0.0509		0.0553
2006-2008	0.0522		0.0540

Public School Males Withdrawal Experience

Male Age-Based Withdrawals with 10 or More Years of Service

Age	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates*		Expected Withdrawals	
					Present	Proposed	Present	Proposed
25-29	-	-	N\A	N\A	0.0125	0.0250	-	-
30-34	15	556	0.0270	0.0259	0.0125	0.0200	7	10
35-39	108	5,251	0.0206	0.0187	0.0125	0.0160	66	85
40-44	117	7,481	0.0156	0.0143	0.0125	0.0150	94	112
45-49	150	8,482	0.0177	0.0153	0.0125	0.0140	106	119
50-54	147	7,798	0.0189	0.0157	0.0125	0.0130	97	102
Totals	537	29,568	0.0182	0.0156	0.0125	0.0141	370	428

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0182	0.0156	0.0141
Previous Investigation Results (combined)			
2012-2014	0.0184	0.0156	0.0125
2009-2011	0.0298		0.0309
2006-2008	0.0301		0.0316
2003-2005	0.0334		0.0316
2000-2002	0.0285		0.0276
1997-1999	0.0233		0.0241
1994-1996	0.0198		0.0238

* Sample rates are taken from midpoint of age group.

Public School Females Withdrawal Experience

Female Service-Based Withdrawals

Service Index	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	445	4,756	0.0936	0.1407	0.1600	0.1500	761	713
2	918	9,317	0.0985	0.1149	0.1080	0.1100	1,006	1,025
3	738	9,359	0.0789	0.0811	0.0770	0.0800	721	749
4	556	8,649	0.0643	0.0642	0.0580	0.0600	502	519
5	438	7,409	0.0591	0.0601	0.0500	0.0550	370	407
6	358	6,332	0.0565	0.0559	0.0430	0.0500	272	317
7	246	5,755	0.0427	0.0407	0.0380	0.0400	219	230
8	250	5,760	0.0434	0.0403	0.0340	0.0370	196	213
9	234	5,901	0.0397	0.0372	0.0280	0.0330	165	195
10	235	5,904	0.0398	0.0377	0.0250	0.0300	148	177
Totals (10 and under)	4,418	69,142	0.0639	0.0496	0.0411	0.0451	4,360	4,545

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0639	0.0496	0.0451
Previous Investigation Results			
2012-2014	0.0601	0.0429	0.0397
2009-2011	0.0520		0.0565
2006-2008	0.0564		0.0563

Public School Females Withdrawal Experience

Female Age-Based Withdrawals with 10 or More Years of Service

Age	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates*		Expected Withdrawals	
					Present	Proposed	Present	Proposed
25-29	-	-	N\A	N\A	0.0220	0.0250	-	-
30-34	55	1,942	0.0283	0.0274	0.0175	0.0230	32	41
35-39	300	14,141	0.0212	0.0191	0.0150	0.0170	210	242
40-44	332	17,761	0.0187	0.0166	0.0120	0.0140	217	253
45-49	361	20,938	0.0172	0.0139	0.0110	0.0130	230	272
50-54	356	19,995	0.0178	0.0142	0.0100	0.0120	202	242
Totals	1,404	74,777	0.0188	0.0152	0.0113	0.0133	891	1,050

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0188	0.0152	0.0133
Previous Investigation Results (combined)			
2012-2014	0.0178	0.0147	0.0113
2009-2011	0.0313		0.0336
2006-2008	0.0353		0.0353
2003-2005	0.0373		0.0348
2000-2002	0.0315		0.0332
1997-1999	0.0315		0.0332
1994-1996	0.0270		0.0352

* Sample rates are taken from midpoint of age group.

University Males Withdrawal Experience

Male Service-Based Withdrawals

Service Index	Withdrawal	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	168	1,024	0.1641	0.1436	0.1600	0.1600	164	164
2	395	2,006	0.1969	0.1798	0.1400	0.1500	281	301
3	326	1,988	0.1640	0.1360	0.1200	0.1300	239	258
4	245	1,810	0.1354	0.1198	0.1000	0.1100	181	199
5	144	1,451	0.0992	0.0897	0.0850	0.0900	123	131
6	108	1,199	0.0901	0.0784	0.0800	0.0800	96	96
7	89	1,021	0.0872	0.0835	0.0750	0.0750	77	77
8	59	955	0.0618	0.0640	0.0570	0.0600	54	57
9	54	872	0.0619	0.0624	0.0460	0.0550	40	48
10	46	806	0.0571	0.0581	0.0400	0.0500	32	40
Totals (10 and under)	1,634	13,132	0.1244	0.0836	0.0719	0.0777	1,287	1,371

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.1244	0.0836	0.0777
Previous Investigation Results			
2012-2014	0.1187	0.0771	0.0720
2009-2011	0.1050		0.0967
2006-2008	0.1114		0.0981

University Males Withdrawal Experience

Male Age-Based Withdrawals with 10 or More Years of Service

Age	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates*		Expected Withdrawals	
					Present	Proposed	Present	Proposed
25-29	-	-	N\A	N\A	0.0400	0.0500	-	-
30-34	3	59	0.0508	0.0622	0.0375	0.0450	2	3
35-39	31	537	0.0577	0.0551	0.0350	0.0400	18	21
40-44	35	1,296	0.0270	0.0208	0.0275	0.0300	35	39
45-49	87	2,377	0.0366	0.0348	0.0200	0.0250	49	59
50-54	76	2,652	0.0287	0.0239	0.0175	0.0200	47	55
Totals	232	6,921	0.0335	0.0284	0.0206	0.0240	151	177

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0335	0.0284	0.0240
Previous Investigation Results (combined)			
2012-2014	0.0289	0.0248	0.0206
2009-2011	0.0749		0.0695
2006-2008	0.0827		0.0725
2003-2005	0.0771		0.0747
2000-2002	0.0719		0.0733
1997-1999	0.0734		0.0732
1994-1996	0.0552		0.0707

* Sample rates are taken from midpoint of age group.

University Females Withdrawal Experience

Female Service-Based Withdrawals

Service Index	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	202	1,269	0.1592	0.1245	0.1600	0.1450	203	184
2	411	2,577	0.1595	0.1356	0.1500	0.1400	387	361
3	393	2,639	0.1489	0.1292	0.1300	0.1300	343	343
4	262	2,215	0.1183	0.1045	0.1000	0.1000	222	222
5	217	1,874	0.1158	0.1099	0.0990	0.0950	186	178
6	139	1,451	0.0958	0.0905	0.0840	0.0900	122	131
7	118	1,333	0.0885	0.0817	0.0640	0.0700	85	93
8	95	1,307	0.0727	0.0680	0.0570	0.0600	74	78
9	79	1,204	0.0656	0.0556	0.0470	0.0500	57	60
10	45	1,097	0.0410	0.0362	0.0420	0.0400	46	44
Totals (10 and under)	1,961	16,966	0.1156	0.0797	0.0738	0.0750	1,725	1,694

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.1156	0.0797	0.0750
Previous Investigation Results			
2012-2014	0.1140	0.0734	0.0735
2009-2011	0.0999		0.1054
2006-2008	0.1176		0.1137

University Females Withdrawal Experience

Female Age-Based Withdrawals with 10 or More Years of Service

Age	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates*		Expected Withdrawals	
					Present	Proposed	Present	Proposed
25-29	-	-	N\A	N\A	0.0500	0.0400	-	-
30-34	5	115	0.0435	0.0399	0.0440	0.0400	5	5
35-39	44	966	0.0455	0.0399	0.0400	0.0400	37	38
40-44	64	1,738	0.0368	0.0329	0.0300	0.0350	52	61
45-49	99	2,431	0.0407	0.0372	0.0230	0.0300	57	73
50-54	91	2,879	0.0316	0.0296	0.0200	0.0250	59	74
Totals	303	8,129	0.0373	0.0333	0.0242	0.0294	210	251

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0373	0.0333	0.0294
Previous Investigation Results (combined)			
2012-2014	0.0322	0.0256	0.0238
2009-2011	0.0765		0.0799
2006-2008	0.0883		0.0865
2003-2005	0.0941		0.0885
2000-2002	0.0878		0.0876
1997-1999	0.0827		0.0887
1994-1996	0.0887		0.0967

* Sample rates are taken from midpoint of age group.

Protective With Social Security Withdrawal Experience

Male and Female Service-Based Withdrawals

Service Index	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	353	1,712	0.2062	0.1477	0.1700	0.1600	291	274
2	458	3,636	0.1260	0.1136	0.0800	0.0950	291	345
3	236	2,997	0.0787	0.0741	0.0500	0.0600	150	180
4	144	2,663	0.0541	0.0480	0.0430	0.0500	115	133
5	139	2,207	0.0630	0.0575	0.0380	0.0450	84	99
6	97	1,791	0.0542	0.0466	0.0310	0.0400	56	72
7	99	1,659	0.0597	0.0506	0.0300	0.0375	50	62
8	90	1,828	0.0492	0.0411	0.0290	0.0350	53	64
9	79	2,076	0.0381	0.0321	0.0250	0.0300	52	62
10	72	2,108	0.0342	0.0290	0.0220	0.0250	46	53
Totals (10 and under)	1,767	22,677	0.0779	0.0445	0.0321	0.0382	1,188	1,344

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0779	0.0445	0.0382
Previous Investigation Results			
2012-2014	0.0537	0.0366	0.0313
2009-2011	0.0357		0.0390
2006-2008	0.0440		0.0402

Protective With Social Security Withdrawal Experience

Male and Female Age-Based Withdrawals with 10 or More Years of Service

Age	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates*		Expected Withdrawals	
					Present	Proposed	Present	Proposed
25-29	1	22	0.0455	0.0504	0.0200	0.0250	-	1
30-34	55	1,618	0.0340	0.0280	0.0170	0.0220	27	34
35-39	152	5,659	0.0269	0.0211	0.0150	0.0180	84	102
40-44	168	7,486	0.0224	0.0186	0.0120	0.0150	91	113
45-49	179	9,009	0.0199	0.0151	0.0110	0.0130	99	118
50-54	71	1,575	0.0451	0.0708	0.0100	0.0120	16	19
Totals	626	25,369	0.0247	0.0206	0.0120	0.0146	317	387

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0247	0.0206	0.0146
Previous Investigation Results (combined)			
2012-2014	0.0182	0.0163	0.0121
2009-2011	0.0238		0.0249
2006-2008	0.0293		0.0276
2003-2005	0.0302		0.0275
2000-2002	0.0256		0.0258
1997-1999	0.0269		0.0248
1994-1996	0.0212		0.0246

* Sample rates are taken from midpoint of age group.

Protective Without Social Security Withdrawal Experience

Male and Female Service-Based Withdrawals

Service Index	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	-	88	0.0000	0.0000	0.0400	0.0400	4	4
2	7	316	0.0222	0.0338	0.0350	0.0350	11	11
3	9	327	0.0275	0.0242	0.0150	0.0150	5	5
4	10	331	0.0302	0.0299	0.0130	0.0130	4	4
5	1	304	0.0033	0.0039	0.0120	0.0120	4	4
6	2	296	0.0068	0.0061	0.0110	0.0110	3	3
7	5	281	0.0178	0.0177	0.0100	0.0100	3	3
8	-	287	0.0000	0.0000	0.0090	0.0090	3	3
9	3	287	0.0105	0.0101	0.0080	0.0080	2	2
10	4	298	0.0134	0.0120	0.0070	0.0070	2	2
Totals (10 and under)	41	2,815	0.0146	0.0111	0.0102	0.0102	41	41

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0146	0.0111	0.0102
Previous Investigation Results			
2012-2014	0.0161	0.0119	0.0100
2009-2011	0.0129		0.0148
2006-2008	0.0150		0.0150

Protective Without Social Security Withdrawal Experience

Male and Female Age-Based Withdrawals with 10 or More Years of Service

Age	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates*		Expected Withdrawals*	
					Present	Proposed	Present	Proposed
25-29	-	1	0.0000	0.0000	0.0070	0.0070	-	-
30-34	3	184	0.0163	0.0176	0.0070	0.0070	1	1
35-39	3	737	0.0041	0.0034	0.0065	0.0065	5	5
40-44	8	1,167	0.0069	0.0061	0.0060	0.0060	7	7
45-49	9	1,404	0.0064	0.0054	0.0055	0.0055	8	8
50-54	19	221	0.0860	0.1763	0.0050	0.0050	1	1
Totals	42	3,714	0.0113	0.0170	0.0058	0.0058	22	22

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0113	0.0170	0.0058
Previous Investigation Results			
2012-2014	0.0107	0.0160	0.0058
2009-2011	0.0108		0.0094
2006-2008	0.0143		0.0103
2003-2005	0.0116		0.0105
2000-2002	0.0117		0.0117
1997-1999	0.0112		0.0115
1994-1996	0.0080		0.0102

* Sample rates are taken from midpoint of age group.

Executive and Elective Withdrawal Experience

Male and Female Service-Based Withdrawals

Service Index	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	20	141	0.1418	0.0843	0.1800	0.1400	25	20
2	17	217	0.0783	0.0730	0.1400	0.1300	30	28
3	25	203	0.1232	0.1184	0.1200	0.1200	24	24
4	16	155	0.1032	0.0954	0.1000	0.1000	16	16
5	18	141	0.1277	0.1088	0.1000	0.1000	14	14
6	2	87	0.0230	0.0268	0.0800	0.0500	7	4
7	5	66	0.0758	0.0869	0.0700	0.0500	5	3
8	1	51	0.0196	0.0153	0.0600	0.0500	3	3
9	2	61	0.0328	0.0300	0.0600	0.0500	4	3
10	3	49	0.0612	0.0435	0.0600	0.0500	3	2
Totals(10 and under)	109	1,171	0.0931	0.0689	0.0908	0.0799	131	117

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0931	0.0689	0.0799
Previous Investigation Results			
2012-2014	0.1217	0.0801	0.0913
2009-2011	0.1212		0.1246
2006-2008	0.1257		0.1211

Executive and Elective Withdrawal Experience

Male and Female Age-Based Withdrawals with 10 or More Years of Service

Age	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates*		Expected Withdrawals*	
					Present	Proposed	Present	Proposed
25-29	-	-	N\A	N\A	0.0600	0.0500	-	-
30-34	-	4	0.0000	0.0000	0.0450	0.0500	-	-
35-39	2	49	0.0408	0.0643	0.0420	0.0500	2	2
40-44	10	156	0.0641	0.0663	0.0400	0.0500	6	8
45-49	6	230	0.0261	0.0376	0.0260	0.0450	6	10
50-54	15	356	0.0421	0.0527	0.0240	0.0400	9	14
Totals	33	795	0.0415	0.0506	0.0274	0.0431	23	34

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0415	0.0506	0.0431
Previous Investigation Results (combined)			
2012-2014	0.0300	0.0273	0.0268
2009-2011	0.0797		0.0855
2006-2008	0.0861		0.0870
2003-2005	0.0901		0.0832
2000-2002	0.0504		0.0477
1997-1999	0.0489		0.0450
1994-1996	0.0498		0.0398

* Sample rates are taken from midpoint of age group.

SECTION B

DISABILITY EXPERIENCE

General Males Disability Experience

Male Disability Experience

Age	Disabilities	Exposure	Population Weighted Rates	Sample Rates*		Expected Disabilities	
				Present	Proposed	Present	Proposed
Under 20	-	35	0.0000	0.0001	0.0000	-	-
20-24	-	2,222	0.0000	0.0001	0.0000	-	-
25-29	-	9,387	0.0000	0.0001	0.0000	-	-
30-34	-	12,746	0.0000	0.0001	0.0000	1	-
35-39	-	14,072	0.0000	0.0002	0.0001	2	2
40-44	-	14,298	0.0000	0.0005	0.0003	6	4
45-49	6	17,943	0.0003	0.0006	0.0004	13	9
50-54	18	21,990	0.0008	0.0017	0.0012	37	26
55-59	39	21,739	0.0018	0.0030	0.0021	64	45
60-64	32	13,539	0.0024	0.0059	0.0041	68	48
65-69	-	2,932	0.0000	0.0023	0.0016	9	6
70-74	-	662	0.0000	0.0020	0.0014	1	1
75 and over	-	-	N\A	0.0020	0.0014	-	-
Totals	95	131,565	0.0007	0.0015	0.0011	201	141

	<u>Actual Experience</u>	<u>Proposed Assumption</u>
Current	0.0007	0.0011
Previous Investigation Results		
2012-2014	0.0011	0.0016
2009-2011	0.0011	0.0018
2006-2008	0.0016	0.0022
2003-2005	0.0024	0.0026
2000-2002	0.0029	0.0030
1997-1999	0.0024	0.0026
1994-1996	0.0025	0.0027

* Sample rates are taken from midpoint of age group.

General Females Disability Experience

Female Disability Experience

Age	Disabilities	Exposure	Population Weighted Rates	Sample Rates*		Expected Disabilities	
				Present	Proposed	Present	Proposed
Under 20	-	98	0.0000	0.0001	0.0000	-	-
20-24	-	5,011	0.0000	0.0001	0.0000	-	-
25-29	-	17,879	0.0000	0.0001	0.0000	2	1
30-34	-	22,185	0.0000	0.0002	0.0002	5	4
35-39	-	24,499	0.0000	0.0003	0.0002	8	6
40-44	-	26,664	0.0000	0.0004	0.0003	12	9
45-49	9	33,898	0.0003	0.0006	0.0004	22	16
50-54	33	42,325	0.0008	0.0010	0.0008	47	34
55-59	47	42,402	0.0011	0.0020	0.0014	80	58
60-64	36	26,074	0.0014	0.0025	0.0018	61	44
65-69	4	5,559	0.0007	0.0020	0.0014	11	8
70-74	-	1,023	0.0000	0.0017	0.0012	2	1
75 and over	-	-	N\A	0.0017	0.0012	-	-
Totals	129	247,617	0.0005	0.0010	0.0007	250	181

	<u>Actual Experience</u>	<u>Proposed Assumption</u>
Current	0.0005	0.0007
Previous Investigation Results		
2012-2014	0.0007	0.0010
2009-2011	0.0007	0.0013
2006-2008	0.0014	0.0017
2003-2005	0.0017	0.0018
2000-2002	0.0020	0.0017
1997-1999	0.0014	0.0017
1994-1996	0.0018	0.0021

* Sample rates are taken from midpoint of age group.

Public School Males Disability Experience

Male Disability Experience

Age	Disabilities	Exposure	Population Weighted Rates	Sample Rates*		Expected Disabilities	
				Present	Proposed	Present	Proposed
Under 20	-	-	N/A	0.0001	0.0000	-	-
20-24	-	421	0.0000	0.0001	0.0000	-	-
25-29	-	5,211	0.0000	0.0001	0.0000	-	-
30-34	-	7,358	0.0000	0.0001	0.0000	-	-
35-39	-	9,319	0.0000	0.0001	0.0000	1	1
40-44	-	9,765	0.0000	0.0002	0.0001	2	1
45-49	-	10,128	0.0000	0.0004	0.0003	4	3
50-54	7	9,016	0.0008	0.0013	0.0010	11	8
55-59	7	5,827	0.0012	0.0017	0.0013	10	8
60-64	5	2,302	0.0022	0.0031	0.0023	7	5
65-69	-	508	0.0000	0.0043	0.0032	2	2
70-74	-	104	0.0000	0.0045	0.0034	-	-
75 and over	-	-	N/A	0.0045	0.0034	-	-
Totals	19	59,959	0.0003	0.0006	0.0005	37	28

	<u>Actual Experience</u>	<u>Proposed Assumption</u>
Current	0.0003	0.0005
Previous Investigation Results		
2012-2014	0.0005	0.0006
2009-2011	0.0006	0.0009
2006-2008	0.0010	0.0011
2003-2005	0.0012	0.0013
2000-2002	0.0017	0.0016
1997-1999	0.0013	0.0014
1994-1996	0.0016	0.0016

* Sample rates are taken from midpoint of age group.

Public School Females Disability Experience

Female Disability Experience

Age	Disabilities	Exposure	Population Weighted Rates	Sample Rates*		Expected Disabilities	
				Present	Proposed	Present	Proposed
Under 20	-	4	0.0000	0.0001	0.0001	-	-
20-24	-	2,217	0.0000	0.0001	0.0001	-	-
25-29	-	18,694	0.0000	0.0001	0.0001	1	1
30-34	-	22,198	0.0000	0.0001	0.0001	2	1
35-39	-	24,350	0.0000	0.0001	0.0001	2	2
40-44	-	24,097	0.0000	0.0002	0.0002	7	5
45-49	2	26,543	0.0001	0.0008	0.0006	20	15
50-54	21	24,014	0.0009	0.0011	0.0008	27	20
55-59	20	16,736	0.0012	0.0017	0.0013	28	20
60-64	9	6,967	0.0013	0.0024	0.0018	15	11
65-69	-	1,258	0.0000	0.0014	0.0010	2	1
70-74	-	186	0.0000	0.0011	0.0008	-	-
75 and over	-	-	N\A	0.0011	0.0008	-	-
Totals	52	167,264	0.0003	0.0006	0.0005	104	76

	<u>Actual Experience</u>	<u>Proposed Assumption</u>
Current	0.0003	0.0005
Previous Investigation Results		
2102-2014	0.0005	0.0006
2009-2011	0.0006	0.0008
2006-2008	0.0010	0.0011
2003-2005	0.0012	0.0013
2000-2002	0.0016	0.0013
1997-1999	0.0010	0.0010
1994-1996	0.0011	0.0011

* Sample rates are taken from midpoint of age group.

University Males Disability Experience

Male Disability Experience

Age	Disabilities	Exposure	Population Weighted Rates	Sample Rates*		Expected Disabilities	
				Present	Proposed	Present	Proposed
Under 20	-	-	N\A	0.0000	0.0000	-	-
20-24	-	147	0.0000	0.0000	0.0000	-	-
25-29	-	1,130	0.0000	0.0000	0.0000	-	-
30-34	-	2,555	0.0000	0.0000	0.0000	-	-
35-39	-	3,807	0.0000	0.0000	0.0000	-	-
40-44	-	3,848	0.0000	0.0001	0.0000	-	-
45-49	-	4,141	0.0000	0.0001	0.0001	1	-
50-54	1	3,778	0.0003	0.0002	0.0002	1	1
55-59	-	3,548	0.0000	0.0007	0.0006	2	2
60-64	3	2,779	0.0011	0.0007	0.0005	2	2
65-69	-	760	0.0000	0.0009	0.0007	1	-
70-74	-	185	0.0000	0.0008	0.0006	-	-
75 and over	-	-	N\A	0.0008	0.0006	-	-
Totals	4	26,678	0.0001	0.0003	0.0002	7	5

	<u>Actual Experience</u>	<u>Proposed Assumption</u>
Current	0.0001	0.0002
Previous Investigation Results		
2012-2014	0.0000	0.0003
2009-2011	0.0004	0.0005
2006-2008	0.0007	0.0007
2003-2005	0.0009	0.0008
2000-2002	0.0008	0.0010
1997-1999	0.0008	0.0011
1994-1996	0.0010	0.0011

* Sample rates are taken from midpoint of age group.

University Females Disability Experience

Female Disability Experience

Age	Disabilities	Exposure	Population Weighted Rates	Sample Rates*		Expected Disabilities	
				Present	Proposed	Present	Proposed
Under 20	-	-	N\A	0.0000	0.0000	-	-
20-24	-	271	0.0000	0.0000	0.0000	-	-
25-29	-	2,033	0.0000	0.0000	0.0000	-	-
30-34	-	3,810	0.0000	0.0000	0.0000	-	-
35-39	-	4,926	0.0000	0.0003	0.0002	1	1
40-44	-	4,473	0.0000	0.0004	0.0003	2	1
45-49	-	4,390	0.0000	0.0003	0.0002	2	1
50-54	1	4,418	0.0002	0.0007	0.0005	3	2
55-59	3	3,790	0.0008	0.0010	0.0007	4	3
60-64	-	2,567	0.0000	0.0015	0.0011	4	3
65-69	-	604	0.0000	0.0010	0.0007	1	-
70-74	-	102	0.0000	0.0009	0.0006	-	-
75 and over	-	-	N\A	0.0009	0.0006	-	-
Totals	4	31,384	0.0001	0.0005	0.0004	17	11

	<u>Actual Experience</u>	<u>Proposed Assumption</u>
Current	0.0001	0.0004
Previous Investigation Results		
2012-2014	0.0004	0.0005
2009-2011	0.0004	0.0006
2006-2008	0.0007	0.0009
2003-2005	0.0010	0.0011
2000-2002	0.0006	0.0011
1997-1999	0.0010	0.0012
1994-1996	0.0003	0.0014

* Sample rates are taken from midpoint of age group.

Protective With Social Security Disability Experience

Male and Female Disability Experience

Age	Disabilities	Exposure	Population Weighted Rates	Sample Rates*		Expected Disabilities	
				Present	Proposed	Present	Proposed
Under 20	-	10	0.0000	0.0001	0.0001	-	-
20-24	-	1,707	0.0000	0.0001	0.0001	-	-
25-29	-	6,812	0.0000	0.0001	0.0001	1	-
30-34	-	8,766	0.0000	0.0001	0.0001	1	1
35-39	-	8,894	0.0000	0.0002	0.0001	2	1
40-44	-	9,155	0.0000	0.0003	0.0002	2	2
45-49	4	10,182	0.0004	0.0004	0.0003	4	3
50-54	22	5,958	0.0037	0.0007	0.0005	9	6
55-59	1	1,937	0.0005	0.0140	0.0098	23	16
60-64	-	929	0.0000	0.0150	0.0105	13	9
65-69	-	189	0.0000	0.0010	0.0007	1	1
70-74	-	15	0.0000	0.0010	0.0007	-	-
75 and over	-	4	0.0000	0.0010	0.0007	-	-
Totals	27	54,558	0.0005	0.0010	0.0007	56	39

	<u>Actual Experience</u>	<u>Proposed Assumption</u>
Current	0.0005	0.0007
Previous Investigation Results		
2012-2014	0.0005	0.0010
2009-2011	0.0007	0.0011
2006-2008	0.0009	0.0011
2003-2005	0.0009	0.0009
2000-2002	0.0012	0.0017
1997-1999	0.0016	0.0019
1994-1996	0.0019	0.0019
1991-1993	0.0013	0.0018

* Sample rates are taken from midpoint of age group.

Protective Without Social Security Disability Experience

Male and Female Disability Experience

Age	Disabilities	Exposure	Population Weighted Rates	Sample Rates*		Expected Disabilities	
				Present	Proposed	Present	Proposed
Under 20	-	-	N\A	0.0004	0.0003	-	-
20-24	-	121	0.0000	0.0004	0.0003	-	-
25-29	-	800	0.0000	0.0004	0.0003	-	-
30-34	-	1,210	0.0000	0.0004	0.0003	-	-
35-39	-	1,289	0.0000	0.0004	0.0003	1	-
40-44	-	1,363	0.0000	0.0007	0.0005	1	1
45-49	2	1,478	0.0014	0.0014	0.0010	3	2
50-54	2	879	0.0023	0.0098	0.0070	7	5
55-59	-	158	0.0000	0.0014	0.0010	-	-
60-64	-	24	0.0000	0.0014	0.0010	-	-
65-69	-	-	N\A	0.0014	0.0010	-	-
70-74	-	-	N\A	0.0014	0.0010	-	-
75 and over	-	-	N\A	0.0014	0.0010	-	-
Totals	4	7,322	0.0005	0.0016	0.0011	12	8

	<u>Actual Experience</u>	<u>Proposed Assumption</u>
Current	0.0005	0.0011
Previous Investigation Results		
2012-2014	0.0012	0.0018
2009-2011	0.0014	0.0019
2006-2008	0.0028	0.0025
2003-2005	0.0027	0.0025
2000-2002	0.0030	0.0025
1997-1999	0.0017	0.0021
1994-1996	0.0031	0.0029

* Sample rates are taken from midpoint of age group.

Executive and Elected Disability Experience

Male and Female Disability Experience

Age	Disabilities	Exposure	Population Weighted Rates	Sample Rates*		Expected Disabilities	
				Present	Proposed	Present	Proposed
Under 20	-	-	N\A	0.0000	0.0000	-	-
20-24	-	2	0.0000	0.0000	0.0000	-	-
25-29	-	35	0.0000	0.0000	0.0000	-	-
30-34	-	102	0.0000	0.0000	0.0000	-	-
35-39	-	154	0.0000	0.0001	0.0001	-	-
40-44	-	315	0.0000	0.0001	0.0001	-	-
45-49	-	479	0.0000	0.0002	0.0002	-	-
50-54	-	637	0.0000	0.0003	0.0003	-	-
55-59	-	731	0.0000	0.0012	0.0012	1	1
60-64	-	438	0.0000	0.0011	0.0011	-	-
65-69	-	252	0.0000	0.0009	0.0009	-	-
70-74	-	97	0.0000	0.0009	0.0009	-	-
75 and over	-	-	N\A	0.0009	0.0009	-	-
Totals	-	3,242	0.0000	0.0003	0.0003	1	1

	<u>Actual Experience</u>	<u>Proposed Assumption</u>
Current	0.0000	0.0003
Previous Investigation Results		
2012-2014	0.0000	0.0006
2009-2011	0.0000	0.0003
2006-2008	0.0000	0.0004
2003-2005	0.0004	0.0008
2000-2002	0.0006	0.0012

* Sample rates are taken from midpoint of age group.

SECTION C

PAY INCREASES

MERIT & LONGEVITY PORTION

General Merit & Longevity Pay Increase Assumption

Service-Based Pay Increase Experience

Service Group		Merit/Seniority % Increase		
Beginning of Year	Number	Actual	Expected*	
			Present	Proposed
1-5	119,452	3.85 %	3.45 %	3.45 %
6-10	69,544	2.12 %	1.90 %	1.90 %
11-15	54,334	1.25 %	1.25 %	1.25 %
16-20	47,252	0.72 %	1.00 %	1.00 %
21-25	28,167	0.36 %	0.75 %	0.75 %
26-30	20,569	0.17 %	0.50 %	0.50 %
31-35	9,666	0.07 %	0.30 %	0.30 %
36-40	4,499	0.00 %	0.20 %	0.20 %
Over 40	947	0.00 %	0.10 %	0.10 %
Total	354,430			

* Sample values are selected from mid-point of service group.

Public Schools

Merit & Longevity Pay Increase Assumption

Service-Based Pay Increase Experience

Service Group		Merit/Seniority % Increase		
Beginning of Year	Number	Actual	Expected*	
			Present	Proposed
1-5	49,083	4.58 %	5.60 %	5.60 %
6-10	40,233	3.33 %	3.40 %	3.40 %
11-15	40,118	2.13 %	2.10 %	2.10 %
16-20	39,119	1.05 %	1.00 %	1.00 %
21-25	26,571	0.61 %	0.35 %	0.35 %
26-30	16,911	0.25 %	0.20 %	0.20 %
31-35	5,874	0.17 %	0.15 %	0.15 %
36-40	1,189	0.26 %	0.10 %	0.10 %
Over 40	218	0.00 %	0.05 %	0.05 %
Total	219,316			

* Sample values are selected from mid-point of service group.

University

Merit & Longevity Pay Increase Assumption

Service-Based Pay Increase Experience

Service Group		Merit/Seniority % Increase		
Beginning of Year	Number	Actual	Expected*	
			Present	Proposed
1-5	16,362	3.09 %	3.00 %	3.00 %
6-10	11,920	2.64 %	2.50 %	2.50 %
11-15	9,321	1.91 %	2.00 %	2.00 %
16-20	7,695	1.30 %	1.50 %	1.50 %
21-25	4,328	0.93 %	0.95 %	0.95 %
26-30	3,277	0.46 %	0.80 %	0.80 %
31-35	1,694	0.03 %	0.60 %	0.60 %
36-40	619	0.07 %	0.20 %	0.20 %
Over 40	279	0.06 %	0.10 %	0.10 %
Total	55,495			

* Sample values are selected from mid-point of service group.

Protective With Social Security Merit & Longevity Pay Increase Assumption

Service-Based Pay Increase Experience

Service Group		Merit/Seniority % Increase		
Beginning of Year	Number	Actual	Expected*	
			Present	Proposed
1-5	11,562	5.03 %	4.75 %	4.75 %
6-10	9,302	1.51 %	1.50 %	1.50 %
11-15	9,637	0.70 %	0.90 %	0.90 %
16-20	10,670	0.41 %	0.80 %	0.80 %
21-25	7,273	0.28 %	0.70 %	0.70 %
26-30	3,622	0.20 %	0.60 %	0.60 %
31-35	771	0.03 %	0.50 %	0.50 %
36-40	208	(0.16)%	0.40 %	0.40 %
Over 40	32	0.00 %	0.20 %	0.20 %
Total	53,077			

* Sample values are selected from mid-point of service group.

Protective Without Social Security Merit & Longevity Pay Increase Assumption

Service-Based Pay Increase Experience

Service Group		Merit/Seniority % Increase		
Beginning of Year	Number	Actual	Expected*	
			Present	Proposed
1-5	1,334	6.40 %	5.50 %	5.50 %
6-10	1,446	1.30 %	1.30 %	1.30 %
11-15	1,250	0.39 %	0.60 %	0.60 %
16-20	1,678	0.48 %	0.50 %	0.50 %
21-25	1,177	0.65 %	0.40 %	0.40 %
26-30	772	0.64 %	0.30 %	0.30 %
31-35	148	0.06 %	0.20 %	0.20 %
36-40	14	0.00 %	0.10 %	0.10 %
Over 40	-	0.00 %	0.05 %	0.05 %
Total	7,819			

* Sample values are selected from mid-point of service group.

Executive and Elected Merit & Longevity Pay Increase Assumption Service-Based Pay Increase Experience

Service Group		Merit/Seniority % Increase		
Beginning of Year	Number	Actual	Expected*	
			Present	Proposed
1-5	1,087	4.89 %	2.50 %	2.50 %
6-10	611	0.95 %	0.20 %	0.20 %
11-15	454	0.49 %	0.20 %	0.20 %
16-20	487	0.18 %	0.20 %	0.20 %
21-25	334	0.12 %	0.20 %	0.20 %
26-30	310	0.79 %	0.20 %	0.20 %
31-35	200	0.21 %	0.20 %	0.20 %
36-40	124	0.26 %	0.20 %	0.20 %
Over 40	35	0.01 %	0.20 %	0.20 %
Total	3,642			

* Sample values are selected from mid-point of service group.

SECTION D

NORMAL & REDUCED RETIREMENT EXPERIENCE

General Males

Normal Retirement Experience

Male Age-Based Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
57	136	799	0.1702	0.1744	0.1800	0.1900	144	152
58	157	791	0.1985	0.2017	0.1800	0.1900	142	150
59	132	799	0.1652	0.1679	0.1800	0.1900	144	152
60	160	785	0.2038	0.2163	0.1800	0.1900	141	149
61	132	752	0.1755	0.1902	0.1800	0.1900	135	143
62	197	701	0.2810	0.2742	0.2500	0.2600	175	182
63	167	594	0.2811	0.2768	0.3000	0.2900	178	172
64	142	477	0.2977	0.3069	0.2500	0.2800	119	134
65	485	1,947	0.2491	0.3316	0.2500	0.3000	487	584
66	397	1,351	0.2939	0.3902	0.3200	0.3500	432	473
67	216	925	0.2335	0.3413	0.2600	0.3000	241	278
68	138	688	0.2006	0.3360	0.1900	0.1900	131	131
69	96	553	0.1736	0.3139	0.1900	0.1900	105	105
70	60	403	0.1489	0.2385	0.1900	0.1900	77	77
71	49	297	0.1650	0.3169	0.1900	0.1900	56	56
72	22	236	0.0932	0.1404	0.1900	0.1900	45	45
73	24	209	0.1148	0.1907	0.1900	0.1900	40	40
74	12	166	0.0723	0.2192	0.1900	0.1900	32	32
Sub Totals	2,766	12,473	0.2218	0.2560	0.2213	0.2367	2,824	3,055
75 & Over	78	636	0.1226	0.2535			636	636
Total	2,844	13,109	0.2170	0.2560			3,460	3,691

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.2218	0.2560	0.2367
Previous Investigation Results			
2012-2014	0.1900	0.2166	0.2163
2009-2011	0.2103		0.2196
2006-2008	0.1840		0.2251
2003-2005	0.1768		0.2089

General Males

Reduced Retirement Experience

Male Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
55	235	4,424	0.0531	0.0714	0.0900	0.0800	398	354
56	219	4,277	0.0512	0.0678	0.0900	0.0800	385	342
57	127	3,404	0.0373	0.0496	0.0475	0.0480	162	163
58	139	3,212	0.0433	0.0556	0.0580	0.0570	186	183
59	159	3,000	0.0530	0.0711	0.0650	0.0680	195	204
60	189	2,735	0.0691	0.0869	0.0850	0.0850	232	232
61	196	2,514	0.0780	0.1004	0.0850	0.0900	214	226
62	355	2,340	0.1517	0.1773	0.1600	0.1700	374	398
63	310	1,930	0.1606	0.1951	0.1700	0.1800	328	347
64	226	1,549	0.1459	0.1647	0.1700	0.1700	263	263
Totals	2,155	29,385	0.0733	0.0892	0.0824	0.0913	2,737	2,712

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0733	0.0892	0.0913
Previous Investigation Results			
2012-2014	0.0735	0.0946	0.0913
2009-2011	0.0736		0.0819
2006-2008	0.0663		0.0821
2003-2005	0.0741		0.0777

General Females Normal Retirement Experience

Female Age-Based Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
57	181	1,088	0.1664	0.1792	0.1500	0.1700	163	185
58	185	1,095	0.1689	0.1820	0.1500	0.1700	164	186
59	174	1,033	0.1684	0.1762	0.1500	0.1700	155	176
60	193	952	0.2027	0.2064	0.1500	0.1700	143	162
61	173	827	0.2092	0.2100	0.1500	0.1700	124	141
62	208	756	0.2751	0.2771	0.2500	0.2700	189	204
63	188	624	0.3013	0.2984	0.2500	0.2700	156	168
64	129	478	0.2699	0.2580	0.2500	0.2700	120	129
65	872	3,205	0.2721	0.3524	0.2800	0.3000	897	962
66	617	2,125	0.2904	0.3876	0.3200	0.3500	680	744
67	365	1,431	0.2551	0.3473	0.2600	0.3000	372	429
68	210	995	0.2111	0.2853	0.2200	0.2500	219	249
69	150	779	0.1926	0.2839	0.2000	0.2500	156	195
70	122	551	0.2214	0.3177	0.2000	0.2500	110	138
71	72	386	0.1865	0.2533	0.2000	0.2000	77	77
72	44	311	0.1415	0.1770	0.2000	0.2000	62	62
73	37	287	0.1289	0.2496	0.2000	0.2000	57	57
74	21	227	0.0925	0.1419	0.2000	0.2000	45	45
Sub Totals	3,968	17,150	0.2314	0.2524	0.2046	0.2269	3,889	4,309
75 & Over	103	691	0.1491	0.2624			691	691
Total	4,071	17,841	0.2282	0.2526			4,580	5,000

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.2314	0.2524	0.2269
Previous Investigation Results			
2012-2014	0.2075	0.2147	0.2029
2009-2011	0.2198		0.2125
2006-2008	0.1904		0.2047
2003-2005	0.1773		0.1849

General Females

Reduced Retirement Experience

Female Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
55	339	7,903	0.0429	0.0706	0.0700	0.0700	553	553
56	362	7,981	0.0454	0.0754	0.0700	0.0700	559	559
57	283	6,797	0.0416	0.0601	0.0500	0.0550	340	374
58	331	6,547	0.0506	0.0694	0.0600	0.0650	393	426
59	360	6,096	0.0591	0.0797	0.0600	0.0700	366	427
60	440	5,690	0.0773	0.1028	0.0850	0.0950	484	541
61	415	5,148	0.0806	0.1032	0.0850	0.0950	438	489
62	632	4,614	0.1370	0.1642	0.1600	0.1600	738	738
63	614	3,779	0.1625	0.1947	0.1600	0.1800	605	680
64	520	3,069	0.1694	0.2045	0.1600	0.1800	491	552
Totals	4,296	57,624	0.0746	0.0980	0.0852	0.0912	4,967	5,339

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0746	0.0980	0.0912
Previous Investigation Results			
2012-2014	0.0702	0.0910	0.0835
2009-2011	0.0669		0.0768
2006-2008	0.0636		0.0765
2003-2005	0.0682		0.0696

Public School Males Normal Retirement Experience

Male Age-Based Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
57	113	389	0.2905	0.2922	0.3600	0.3300	140	128
58	87	314	0.2771	0.2725	0.3100	0.2900	97	91
59	62	256	0.2422	0.2446	0.2400	0.2400	61	61
60	62	230	0.2696	0.2694	0.3000	0.2500	69	58
61	39	165	0.2364	0.2292	0.2800	0.2500	46	41
62	43	133	0.3233	0.3305	0.3700	0.3500	49	47
63	29	91	0.3187	0.3181	0.3200	0.3200	29	29
64	22	71	0.3099	0.3152	0.2700	0.2900	19	21
65	77	345	0.2232	0.2903	0.2900	0.2900	100	100
66	63	245	0.2571	0.3637	0.3300	0.3500	81	86
67	39	165	0.2364	0.3989	0.2700	0.3300	45	54
68	22	136	0.1618	0.3007	0.2400	0.2700	33	37
69	17	104	0.1635	0.2251	0.2400	0.2300	25	24
70	15	80	0.1875	0.3136	0.2000	0.2500	16	20
71	10	63	0.1587	0.1884	0.2000	0.2000	13	13
72	4	47	0.0851	0.0923	0.2000	0.1500	9	7
73	3	31	0.0968	0.0673	0.2000	0.1500	6	5
74	3	18	0.1667	0.1342	0.2000	0.1500	4	3
Totals	717	2,883	0.2487	0.2840	0.3007	0.2878	842	825
75 & Over	10	72	0.1389	0.3863			72	72
Total	727	2,955	0.2460	0.2850			914	897

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.2487	0.2840	0.2878
Previous Investigation Results			
2012-2014	0.2720	0.3163	0.3024
2009-2011	0.3295		0.3000
2006-2008	0.2907		0.3216
2003-2005	0.3376		0.3360

Public School Males Reduced Retirement Experience

Male Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
55	152	1,589	0.0957	0.1191	0.1300	0.1300	207	207
56	126	1,445	0.0872	0.1061	0.1300	0.1300	188	188
57	94	934	0.1006	0.1254	0.1200	0.1200	112	112
58	91	800	0.1138	0.1383	0.1300	0.1300	104	104
59	67	632	0.1060	0.1305	0.1400	0.1400	88	88
60	63	501	0.1257	0.1442	0.1400	0.1400	70	70
61	70	448	0.1563	0.1679	0.1500	0.1500	67	67
62	69	380	0.1816	0.2037	0.2100	0.2100	80	80
63	57	325	0.1754	0.1937	0.2100	0.2100	68	68
64	53	285	0.1860	0.2056	0.2100	0.2100	60	60
Totals	842	7,339	0.1147	0.1330	0.1402	0.1402	1,044	1,044

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.1147	0.1330	0.1402
Previous Investigation Results			
2012-2014	0.1358	0.1596	0.1407
2009-2011	0.1316		0.1307
2006-2008	0.1190		0.1499
2003-2005	0.1592		0.1514

Public School Females Normal Retirement Experience

Female Age-Based Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
57	225	879	0.2560	0.2559	0.2800	0.2700	246	237
58	189	754	0.2507	0.2535	0.2800	0.2700	211	204
59	142	563	0.2522	0.2489	0.2800	0.2700	158	152
60	135	494	0.2733	0.2778	0.2800	0.2700	138	133
61	112	411	0.2725	0.2692	0.2800	0.2700	115	111
62	120	314	0.3822	0.3756	0.3600	0.3700	113	116
63	75	229	0.3275	0.3123	0.3000	0.3000	69	69
64	52	163	0.3190	0.2918	0.2700	0.2800	44	46
65	265	844	0.3140	0.3821	0.3500	0.3700	295	312
66	180	531	0.3390	0.4262	0.3500	0.3900	186	207
67	79	328	0.2409	0.3539	0.3000	0.3300	98	108
68	54	249	0.2169	0.3006	0.3000	0.3000	75	75
69	31	176	0.1761	0.2475	0.3000	0.2800	53	49
70	21	123	0.1707	0.4174	0.3500	0.3800	43	47
71	14	78	0.1795	0.1452	0.3000	0.2000	23	16
72	4	56	0.0714	0.1379	0.2200	0.2000	12	11
73	3	43	0.0698	0.4373	0.2200	0.2000	9	9
74	3	37	0.0811	0.1730	0.2200	0.2000	8	7
Totals	1,708	6,272	0.2723	0.2943	0.2972	0.2957	1,896	1,909
75 & Over	15	129	0.1163	0.3532			129	129
Total	1,723	6,401	0.2692	0.2947			2,025	2,038

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.2723	0.2943	0.2957
Previous Investigation Results			
2012-2014	0.2879	0.3166	0.2972
2009-2011	0.3323		0.2716
2006-2008	0.2719		0.2932
2003-2005	0.2975		0.2940

Public School Females Reduced Retirement Experience

Female Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighte Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
55	368	4,290	0.0858	0.1073	0.1200	0.1200	515	515
56	382	4,060	0.0941	0.1201	0.1200	0.1200	487	487
57	216	2,780	0.0777	0.0970	0.1200	0.1200	334	334
58	226	2,389	0.0946	0.1166	0.1200	0.1200	287	287
59	239	2,080	0.1149	0.1392	0.1300	0.1300	270	270
60	272	1,733	0.1570	0.1805	0.1700	0.1700	295	295
61	216	1,478	0.1461	0.1721	0.1700	0.1700	251	251
62	252	1,225	0.2057	0.2399	0.2300	0.2300	282	282
63	226	1,050	0.2152	0.2469	0.2300	0.2300	242	242
64	162	816	0.1985	0.2229	0.2300	0.2300	188	188
Totals	2,559	21,901	0.1168	0.1377	0.1409	0.1409	3,151	3,151

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.1168	0.1377	0.1409
Previous Investigation Results			
2012-2014	0.1383	0.1691	0.1429
2009-2011	0.1357		0.1286
2006-2008	0.1124		0.1354
2003-2005	0.1245		0.1236

University Males Normal Retirement Experience

Male Age-Based Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
57	14	58	0.2414	0.2300	0.1200	0.1200	7	7
58	9	66	0.1364	0.1384	0.1200	0.1200	8	8
59	11	98	0.1122	0.0868	0.1200	0.1200	12	12
60	20	120	0.1667	0.1442	0.1200	0.1200	14	14
61	10	129	0.0775	0.0915	0.1200	0.1200	15	15
62	27	158	0.1709	0.1414	0.1200	0.1200	19	19
63	23	164	0.1402	0.1313	0.1200	0.1200	20	20
64	18	171	0.1053	0.1070	0.1200	0.1200	21	21
65	98	551	0.1779	0.1703	0.1500	0.1500	83	83
66	100	454	0.2203	0.2130	0.1700	0.2000	77	91
67	69	334	0.2066	0.2315	0.1600	0.2000	53	67
68	43	272	0.1581	0.1821	0.1600	0.1800	44	49
69	29	225	0.1289	0.1641	0.1600	0.1600	36	36
70	40	199	0.2010	0.2278	0.1600	0.2000	32	40
71	25	143	0.1748	0.1799	0.1800	0.1800	26	26
72	21	113	0.1858	0.1726	0.1400	0.1600	16	18
73	20	81	0.2469	0.2239	0.1400	0.1600	11	13
74	12	64	0.1875	0.1653	0.1000	0.1600	6	10
Sub Totals	589	3,400	0.1732	0.1714	0.1438	0.1578	500	549
75 & Over	31	186	0.1667	0.1515			186	186
Total	620	3,586	0.1729	0.1693			686	735

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.1732	0.1714	0.1578
Previous Investigation Results			
2012-2014	0.1300	0.1199	0.1430
2009-2011	0.1947		0.1617
2006-2008	0.1712		0.1789
2003-2005	0.1698		0.1809

University Males Reduced Retirement Experience

Male Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
55	19	645	0.0295	0.0272	0.0400	0.0300	26	19
56	26	657	0.0396	0.0334	0.0300	0.0300	20	20
57	21	623	0.0337	0.0368	0.0250	0.0300	16	19
58	23	634	0.0363	0.0326	0.0250	0.0300	16	19
59	26	613	0.0424	0.0495	0.0300	0.0400	18	25
60	42	598	0.0702	0.0696	0.0425	0.0550	25	33
61	33	562	0.0587	0.0558	0.0500	0.0550	28	31
62	46	515	0.0893	0.0860	0.0600	0.0740	31	38
63	40	442	0.0905	0.0776	0.0700	0.0740	31	33
64	48	391	0.1228	0.1241	0.0700	0.1000	27	39
Totals	324	5,680	0.0570	0.0564	0.0425	0.0494	238	276

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0570	0.0564	0.0494
Previous Investigation Results			
2012-2014	0.0382	0.0355	0.0413
2009-2011	0.0402		0.0451
2006-2008	0.0507		0.0539
2003-2005	0.0498		0.0520

University Females Normal Retirement Experience

Female Age-Based Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
57	13	79	0.1646	0.1504	0.1400	0.1500	11	12
58	16	80	0.2000	0.1896	0.1200	0.1500	10	12
59	13	83	0.1566	0.1245	0.1000	0.1000	8	8
60	14	93	0.1505	0.1310	0.1150	0.1200	11	11
61	17	103	0.1650	0.1512	0.1600	0.1600	16	16
62	17	99	0.1717	0.1557	0.1400	0.1500	14	15
63	25	108	0.2315	0.2141	0.1850	0.2000	20	22
64	29	107	0.2710	0.2467	0.1300	0.2000	14	21
65	88	393	0.2239	0.2279	0.1800	0.2000	71	79
66	80	308	0.2597	0.2676	0.2200	0.2400	68	74
67	56	221	0.2534	0.2483	0.1700	0.2000	38	44
68	39	160	0.2438	0.1925	0.1550	0.1700	25	27
69	24	110	0.2182	0.2095	0.1350	0.1700	15	19
70	21	94	0.2234	0.2140	0.1800	0.1800	17	17
71	17	66	0.2576	0.2076	0.1800	0.1800	12	12
72	9	43	0.2093	0.1581	0.1800	0.1800	8	8
73	3	28	0.1071	0.0825	0.1800	0.1500	5	4
74	2	25	0.0800	0.0533	0.1800	0.1500	5	4
Totals	485	2,200	0.2205	0.2010	0.1622	0.1796	368	405
75 & Over	16	71	0.2254	0.1147			71	71
Total	501	2,271	0.2206	0.1960			439	476

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.2205	0.2010	0.1796
Previous Investigation Results			
2012-2014	0.1501	0.1332	0.1561
2009-2011	0.2185		0.1811
2006-2008	0.1840		0.1831
2003-2005	0.1777		0.1901

University Females Reduced Retirement Experience

Female Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
55	19	767	0.0248	0.0316	0.0550	0.0500	42	38
56	35	764	0.0458	0.0447	0.0550	0.0500	42	38
57	36	640	0.0563	0.0744	0.0400	0.0500	26	32
58	29	589	0.0492	0.0591	0.0550	0.0500	32	29
59	32	547	0.0585	0.0497	0.0650	0.0500	36	27
60	50	536	0.0933	0.0927	0.0800	0.0900	43	48
61	57	514	0.1109	0.1038	0.0600	0.0900	31	46
62	57	484	0.1178	0.1226	0.1200	0.1200	58	58
63	58	404	0.1436	0.1455	0.1200	0.1200	48	48
64	63	338	0.1864	0.1973	0.1200	0.1500	41	51
Totals	436	5,583	0.0781	0.0817	0.0714	0.0747	399	415

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0781	0.0817	0.0747
Previous Investigation Results			
2012-2014	0.0682	0.0749	0.0704
2009-2011	0.0651		0.0647
2006-2008	0.0682		0.0748
2003-2005	0.0803		0.0767

Protective With Social Security Normal Retirement Experience

Male and Female Age-Based Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
50	103	1,158	0.0889	0.0735	0.0575	0.0600	67	69
51	101	1,055	0.0957	0.0862	0.0700	0.0800	74	84
52	120	1,002	0.1198	0.1061	0.0900	0.1000	90	100
53	251	934	0.2687	0.2810	0.2300	0.2500	215	234
54	231	1,108	0.2085	0.2658	0.1900	0.2000	211	222
55	183	917	0.1996	0.2474	0.1900	0.2000	174	183
56	148	749	0.1976	0.2421	0.1900	0.2000	142	150
57	94	614	0.1531	0.1902	0.1900	0.2000	117	123
58	101	528	0.1913	0.2449	0.1750	0.2000	92	106
59	79	464	0.1703	0.2073	0.1600	0.2000	74	93
60	74	398	0.1859	0.2078	0.2000	0.2000	80	80
61	64	347	0.1844	0.2151	0.2000	0.2000	69	69
62	77	275	0.2800	0.3156	0.2200	0.3000	61	83
63	51	198	0.2576	0.3355	0.2600	0.3000	51	59
64	44	144	0.3056	0.3131	0.1700	0.3000	24	43
65	50	114	0.4386	0.4265	0.3000	0.4000	34	46
66	33	69	0.4783	0.4346	0.2500	0.4000	17	28
67	16	40	0.4000	0.5394	0.3000	0.4000	12	16
68	8	22	0.3636	0.4109	0.3000	0.4000	7	9
69	6	17	0.3529	0.3664	0.3000	0.4000	5	7
70	4	8	0.5000	0.6759	1.0000	1.0000	8	8
71	2	6	0.3333	0.4838	1.0000	1.0000	6	6
72	2	3	0.6667	0.6583	1.0000	1.0000	3	3
73	1	4	0.2500	0.6055	1.0000	1.0000	4	4
74	1	3	0.3333	0.4847	1.0000	1.0000	3	3
Totals	1,844	10,177	0.1812	0.1945	0.1538	0.1702	1,640	1,828
75 & Over	1	14	0.0714	0.0769			14	14
Total	1,845	10,191	0.1810	0.1944			1,654	1,842

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.1812	0.1945	0.1702
Previous Investigation Results			
2012-2014	0.1502	0.1683	0.1552
2009-2011	0.1468		0.1534
2006-2008	0.1220		0.1579
2003-2005	0.1447		0.1619

Protective Without Social Security Normal Retirement Experience

Male and Female Age-Based Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
50	3	182	0.0165	0.0102	0.0350	0.0200	6	4
51	9	224	0.0402	0.0449	0.0375	0.0400	8	9
52	8	229	0.0349	0.0348	0.0450	0.0400	10	9
53	39	228	0.1711	0.1776	0.1700	0.1700	39	39
54	40	205	0.1951	0.2176	0.2500	0.2300	51	47
55	40	170	0.2353	0.2761	0.2100	0.2500	36	43
56	30	129	0.2326	0.2582	0.2700	0.2500	35	32
57	20	89	0.2247	0.2583	0.3000	0.2500	27	22
58	22	65	0.3385	0.3691	0.3000	0.3300	20	21
59	16	45	0.3556	0.3678	0.3000	0.3300	14	15
60	6	32	0.1875	0.2085	0.2600	0.2000	8	6
61	9	32	0.2813	0.2866	0.1500	0.2000	5	6
62	11	26	0.4231	0.4424	0.2000	0.4000	5	10
63	6	14	0.4286	0.4807	0.4000	0.4000	6	6
64	3	7	0.4286	0.4184	0.4000	0.4000	3	3
65	-	2	0.0000	0.0000	0.4000	0.4000	1	1
66	-	1	0.0000	0.0000	0.4000	1.0000	-	1
67	-	-	N\A	N\A	0.4000	1.0000	-	-
68	-	-	N\A	N\A	0.4000	1.0000	-	-
69	-	-	N\A	N\A	0.4000	1.0000	-	-
70	-	-	N\A	N\A	1.0000	1.0000	-	-
71	-	-	N\A	N\A	1.0000	1.0000	-	-
72	-	-	N\A	N\A	1.0000	1.0000	-	-
73	-	-	N\A	N\A	1.0000	1.0000	-	-
74	-	-	N\A	N\A	1.0000	1.0000	-	-
Totals	262	1,680	0.1560	0.1719	0.1650	0.1658	274	274
75 & Over	-	-	N\A	N\A			-	-
Total	262	1,680	0.1560	0.1719			274	274

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.1560	0.1719	0.1658
Previous Investigation Results			
2012-2014	0.1485	0.1630	0.1626
2009-2011	0.1196		0.1632
2006-2008	0.1487		0.1766
2003-2005	0.1372		0.1606

Executive and Elective Normal Retirement Experience

Male and Female Age-Based Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
57	2	33	0.0606	0.0110	0.1200	0.0800	4	3
58	1	36	0.0278	0.0334	0.1200	0.0800	4	3
59	3	38	0.0789	0.0395	0.1200	0.0800	5	3
60	10	35	0.2857	0.2481	0.1200	0.2000	4	7
61	5	37	0.1351	0.1402	0.1200	0.1200	4	4
62	13	147	0.0884	0.1220	0.1200	0.1200	18	18
63	16	157	0.1019	0.1397	0.1200	0.1200	19	19
64	18	150	0.1200	0.1960	0.1200	0.1500	18	23
65	17	133	0.1278	0.1392	0.1200	0.1500	16	20
66	20	114	0.1754	0.1834	0.2000	0.1500	23	17
67	8	86	0.0930	0.0864	0.1500	0.1500	13	13
68	8	79	0.1013	0.1617	0.1500	0.1500	12	12
69	14	77	0.1818	0.2225	0.1000	0.2000	8	15
70	16	61	0.2623	0.4900	0.1000	0.2000	6	12
71	6	38	0.1579	0.2464	0.1000	0.2000	4	8
72	4	37	0.1081	0.2961	0.1500	0.2000	6	7
73	2	34	0.0588	0.1062	0.1500	0.2000	5	7
74	4	39	0.1026	0.2892	0.1500	0.2000	6	8
Totals	169	1,331	0.1270	0.1717	0.1298	0.1483	175	199
75 & Over	10	116	0.0862	0.1026			116	116
Total	179	1,447	0.1237	0.1678			291	315

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.1270	0.1717	0.1483
Previous Investigation Results			
2012-2014	0.0967	0.1151	0.1307
2009-2011	0.1341		0.1408
2006-2008	0.0892		0.1278
2003-2005	0.1204		0.1299

Executive and Elective Reduced Retirement Experience

Male and Female Age-Based Reduced Retirement Experience

Age	Retirements	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
55	5	126	0.0397	0.0264	0.0300	0.0300	4	4
56	5	132	0.0379	0.0413	0.0300	0.0300	4	4
57	2	101	0.0198	0.0038	0.0300	0.0300	3	3
58	6	96	0.0625	0.0830	0.0300	0.0300	3	3
59	2	99	0.0202	0.0148	0.0300	0.0300	3	3
60	6	79	0.0759	0.1073	0.0500	0.0500	4	4
61	9	82	0.1098	0.1319	0.0500	0.0500	4	4
62	-	37	0.0000	0.0000	0.0200	0.0200	1	1
63	-	31	0.0000	0.0000	0.0200	0.0200	1	1
64	1	26	0.0385	0.0047	0.0200	0.0200	1	1
Totals	36	809	0.0445	0.0542	0.0347	0.0347	28	28

	<u>Actual Experience</u>		<u>Proposed Assumption</u>
Current	0.0445	0.0542	0.0347
Previous Investigation Results			
2012-2014	0.0245	0.0309	0.0361
2009-2011	0.0459		0.0449
2006-2008	0.0517		0.0537
2003-2005	0.0595		0.0551

SECTION E

MORTALITY EXPERIENCE

Male Retired-Life Mortality Experience Population-Weighted (Normal Retirement, Original Annuitants Only)

Age	Life Years Exposure	Post - Retirement Death			Post - Retirement Death Rates			A/E Ratio	
		Actual Experience	Expected		Actual	Expected		Present	Proposed
			Present	Proposed		Present	Proposed		
55-59	16,640	85	81	78	0.0051	0.0048	0.0046	1.0494	1.0897
60-64	37,408	241	250	241	0.0064	0.0063	0.0061	0.9640	1.0000
65-69	57,772	535	620	594	0.0093	0.0106	0.0102	0.8629	0.9007
70-74	46,392	722	807	767	0.0156	0.0173	0.0164	0.8947	0.9413
75-79	31,191	961	949	899	0.0308	0.0301	0.0285	1.0126	1.0690
80-84	21,866	1,267	1,245	1,180	0.0579	0.0574	0.0544	1.0177	1.0737
85-89	13,105	1,383	1,346	1,276	0.1055	0.1064	0.1008	1.0275	1.0839
90-94	5,189	944	886	840	0.1819	0.1758	0.1668	1.0655	1.1238
95-99	1,077	328	308	291	0.3045	0.3121	0.2955	1.0649	1.1271
Totals	233,097	6,474	6,499	6,173	0.0278	0.0279	0.0265	0.9962	1.0488

Current	0.0278	0.0265
Previous Investigation Results		
2012-2014	0.0273	0.0271
2009-2011	0.0286	0.0264
2006-2008	0.0280	0.0281
2003-2005	0.0296	0.0296
2000-2002	0.0322	0.0356
1997-1999	0.0352	
1994-1996	0.0375	
1991-1993	0.0365	

Male Retired-Life Mortality Experience Benefits-Weighted (Normal Retirement, Original Annuitants Only)

Age	Benefit Weighted Exposure	Post - Retirement Death			Post - Retirement Death Rates			A/E Ratio	
		Actual Experience	Expected		Actual	Expected		Present	Proposed
			Present	Proposed		Present	Proposed		
55-59	37,456,555	133,361	183,612	175,727	0.0036	0.0048	0.0046	0.7263	0.7589
60-64	89,640,562	490,696	599,795	576,566	0.0055	0.0063	0.0061	0.8181	0.8511
65-69	138,889,253	1,175,334	1,490,569	1,429,473	0.0085	0.0106	0.0102	0.7885	0.8222
70-74	113,393,797	1,620,588	1,973,791	1,877,232	0.0143	0.0173	0.0164	0.8211	0.8633
75-79	77,133,994	2,082,173	2,347,309	2,224,147	0.0270	0.0301	0.0285	0.8870	0.9362
80-84	55,420,361	2,868,903	3,160,573	2,993,662	0.0518	0.0574	0.0544	0.9077	0.9583
85-89	34,261,629	3,335,852	3,514,670	3,331,811	0.0974	0.1064	0.1008	0.9491	1.0012
90-94	13,189,117	2,213,130	2,245,962	2,130,294	0.1678	0.1758	0.1668	0.9854	1.0389
95-99	2,491,860	660,048	709,680	672,028	0.2649	0.3121	0.2955	0.9301	0.9822
Totals	567,344,033	14,592,321	16,241,859	15,426,181	0.0257	0.0279	0.0265	0.8984	0.9459

Female Retired-Life Mortality Experience Population-Weighted (Normal Retirement, Original Annuitants Only)

Age	Life Years Exposure	Post - Retirement Death			Post - Retirement Death Rates			A/E Ratio	
		Actual Experience	Expected		Actual	Expected		Present	Proposed
			Present	Proposed		Present	Proposed		
55-59	21,871	87	65	64	0.0040	0.0028	0.0028	1.3385	1.3594
60-64	57,694	221	243	243	0.0038	0.0041	0.0041	0.9095	0.9095
65-69	84,800	484	550	544	0.0057	0.0063	0.0063	0.8800	0.8897
70-74	59,889	665	677	666	0.0111	0.0113	0.0111	0.9823	0.9985
75-79	40,785	909	851	837	0.0223	0.0207	0.0204	1.0682	1.0860
80-84	29,388	1,194	1,173	1,155	0.0406	0.0394	0.0388	1.0179	1.0338
85-89	20,947	1,696	1,653	1,630	0.0810	0.0817	0.0806	1.0260	1.0405
90-94	10,487	1,533	1,412	1,393	0.1462	0.1364	0.1346	1.0857	1.1005
95-99	3,585	894	834	822	0.2494	0.2489	0.2451	1.0719	1.0876
Totals	329,446	7,683	7,458	7,354.0	0.0233	0.0226	0.0223	1.0302	1.0447

Current	0.0233	0.0223
Previous Investigation Results		
2012-2014	0.0234	0.0230
2009-2011	0.0256	0.0239
2006-2008	0.0267	0.0267
2003-2005	0.0271	0.0271
2000-2002	0.0320	0.0314
1997-1999	0.0330	
1994-1996	0.0321	
1991-1993	0.0302	

Female Retired-Life Mortality Experience Benefits-Weighted (Normal Retirement, Original Annuitants Only)

Age	Benefit Weighted Exposure	Post - Retirement Death			Post - Retirement Death Rates			A/E Ratio	
		Actual Experience	Expected		Actual	Expected		Present	Proposed
			Present	Proposed		Present	Proposed		
55-59	35,345,651	126,046	104,801	104,583	0.0036	0.0028	0.0028	1.2027	1.2052
60-64	109,762,070	368,704	463,618	463,010	0.0034	0.0041	0.0041	0.7953	0.7963
65-69	156,811,885	845,970	1,013,788	1,002,589	0.0054	0.0063	0.0063	0.8345	0.8438
70-74	99,093,544	1,009,305	1,112,705	1,094,238	0.0102	0.0113	0.0111	0.9071	0.9224
75-79	62,154,602	1,257,146	1,295,568	1,274,145	0.0202	0.0207	0.0204	0.9703	0.9867
80-84	46,145,709	1,823,754	1,849,643	1,822,290	0.0395	0.0394	0.0388	0.9860	1.0008
85-89	34,246,530	2,669,006	2,698,754	2,662,251	0.0779	0.0817	0.0806	0.9890	1.0025
90-94	16,372,791	2,230,270	2,204,298	2,175,100	0.1362	0.1364	0.1346	1.0118	1.0254
95-99	5,076,643	1,205,564	1,165,312	1,147,934	0.2375	0.2489	0.2451	1.0345	1.0502
Totals	565,009,425	11,535,765	11,908,487	11,746,140.0	0.0204	0.0211	0.0208	0.9687	0.9821

Male Retired-Life Mortality Experience (Disabled Retirement, Original Annuitants Only)

Age	Life Years Exposure	Post - Retirement Death			Post - Retirement Death Rates			A/E Ratio	
		Actual Experience	Expected		Actual	Expected		Present	Proposed
			Present	Proposed		Present	Proposed		
50-54	421	11	2	2	0.0261	0.0054	0.0052	5.5000	5.5000
55-59	895	26	7	7	0.0291	0.0082	0.0078	3.7143	3.7143
60-64	1,519	42	21	21	0.0276	0.0140	0.0135	2.0000	2.0000
65-69	1,490	37	35	33	0.0248	0.0234	0.0225	1.0571	1.1212
70-74	1,222	67	51	49	0.0548	0.0420	0.0400	1.3137	1.3673
75-79	854	56	67	64	0.0656	0.0790	0.0748	0.8358	0.8750
80-84	589	61	81	77	0.1036	0.1380	0.1307	0.7531	0.7922
85-89	324	35	75	71	0.1080	0.2316	0.2195	0.4667	0.4930
90-94	106	21	37	35	0.1981	0.3444	0.3267	0.5676	0.6000
95-99	16	4	6	6	0.2500	0.3845	0.3640	0.6667	0.6667
100 & Up	8	0	3	3	0.0000	0.3945	0.3727	0.0000	0.0000
Totals	7,444	360	385.0	368.0	0.0484	0.0517	0.0494	0.9351	0.9783

Female Retired-Life Mortality Experience (Disabled Retirement, Original Annuitants Only)

Age	Life Years Exposure	Post - Retirement Death			Post - Retirement Death Rates			A/E Ratio	
		Actual Experience	Expected		Actual	Expected		Present	Proposed
			Present	Proposed		Present	Proposed		
50-54	597	10	2	2	0.0168	0.0031	0.0031	5.0000	5.0000
55-59	1,303	34	6	6	0.0261	0.0048	0.0048	5.6667	5.6667
60-64	2,169	46	17	17	0.0212	0.0076	0.0076	2.7059	2.7059
65-69	2,280	55	31	31	0.0241	0.0136	0.0134	1.7742	1.7742
70-74	1,714	36	43	42	0.0210	0.0249	0.0245	0.8372	0.8571
75-79	1,425	70	69	68	0.0491	0.0483	0.0475	1.0145	1.0294
80-84	992	57	95	94	0.0575	0.0959	0.0944	0.6000	0.6064
85-89	578	61	93	92	0.1055	0.1616	0.1594	0.6559	0.6630
90-94	264	34	72	71	0.1288	0.2714	0.2678	0.4722	0.4789
95-99	40	8	12	12	0.2000	0.3099	0.3052	0.6667	0.6667
100 & Up	17	3	6	6	0.1765	0.3379	0.3319	0.5000	0.5000
Totals	11,379	414	446.0	441.0	0.0364	0.0392	0.0388	0.9283	0.9388

SECTION F

COMPLETE LISTS OF PROPOSED DECREMENT ASSUMPTIONS

Actuarial Assumptions Based on 2015-2017 Experience Study

Select and Ultimate Withdrawal

Age	Service	% of Active Participants Withdrawing								
		General		Public Schools		University		Protective		Executive & Elected
		Male	Female	Male	Female	Male	Female	With SS	Without SS	
	0-1	17.0%	20.0%	18.5%	15.0%	16.0%	14.5%	16.0%	4.0%	14.0%
	1-2	12.3%	15.0%	11.0%	11.0%	15.0%	14.0%	9.5%	3.5%	13.0%
	2-3	9.3%	11.5%	8.0%	8.0%	13.0%	13.0%	6.0%	1.5%	12.0%
	3-4	7.6%	10.0%	6.5%	6.0%	11.0%	10.0%	5.0%	1.3%	10.0%
	4-5	7.5%	9.5%	5.5%	5.5%	9.0%	9.5%	4.5%	1.2%	10.0%
	5-6	5.8%	7.8%	4.0%	5.0%	8.0%	9.0%	4.0%	1.1%	5.0%
	6-7	4.8%	7.0%	3.5%	4.0%	7.5%	7.0%	3.8%	1.0%	5.0%
	7-8	4.7%	6.0%	3.2%	3.7%	6.0%	6.0%	3.5%	0.9%	5.0%
	8-9	4.1%	5.7%	3.0%	3.3%	5.5%	5.0%	3.0%	0.8%	5.0%
	9-10	4.0%	5.3%	2.8%	3.0%	5.0%	4.0%	2.5%	0.7%	5.0%
Under 30	10 & Up	3.7%	4.7%	2.2%	2.4%	4.7%	4.0%	2.3%	0.7%	5.0%
	31	3.6%	4.6%	2.1%	2.3%	4.6%	4.0%	2.3%	0.7%	5.0%
	32	3.5%	4.5%	2.0%	2.3%	4.5%	4.0%	2.2%	0.7%	5.0%
	33	3.3%	4.3%	1.9%	2.2%	4.4%	4.0%	2.1%	0.7%	5.0%
	34	3.1%	4.1%	1.8%	2.1%	4.3%	4.0%	2.0%	0.7%	5.0%
	35	3.0%	3.9%	1.8%	1.9%	4.2%	4.0%	2.0%	0.7%	5.0%
	36	2.8%	3.7%	1.7%	1.8%	4.1%	4.0%	1.9%	0.7%	5.0%
	37	2.6%	3.5%	1.6%	1.7%	4.0%	4.0%	1.8%	0.7%	5.0%
	38	2.5%	3.4%	1.6%	1.6%	3.8%	3.9%	1.7%	0.6%	5.0%
	39	2.5%	3.3%	1.6%	1.6%	3.6%	3.8%	1.7%	0.6%	5.0%
	40	2.4%	3.2%	1.5%	1.5%	3.4%	3.7%	1.6%	0.6%	5.0%
	41	2.4%	3.1%	1.5%	1.5%	3.2%	3.6%	1.6%	0.6%	5.0%
	42	2.3%	3.0%	1.5%	1.4%	3.0%	3.5%	1.5%	0.6%	5.0%
	43	2.2%	2.9%	1.5%	1.4%	2.9%	3.4%	1.5%	0.6%	4.9%
	44	2.1%	2.8%	1.5%	1.4%	2.8%	3.3%	1.4%	0.6%	4.8%
	45	2.0%	2.7%	1.4%	1.3%	2.7%	3.2%	1.4%	0.6%	4.7%
	46	1.9%	2.6%	1.4%	1.3%	2.6%	3.1%	1.3%	0.6%	4.6%
	47	1.8%	2.5%	1.4%	1.3%	2.5%	3.0%	1.3%	0.6%	4.5%
	48	1.8%	2.4%	1.4%	1.3%	2.4%	2.9%	1.3%	0.5%	4.4%
	49	1.7%	2.3%	1.4%	1.3%	2.3%	2.8%	1.3%	0.5%	4.3%
	50	1.7%	2.2%	1.3%	1.2%	2.2%	2.7%	1.2%	0.5%	4.2%
	51	1.6%	2.1%	1.3%	1.2%	2.1%	2.6%	1.2%	0.5%	4.1%
	52	1.6%	2.0%	1.3%	1.2%	2.0%	2.5%	1.2%	0.5%	4.0%
	53	1.6%	2.0%	1.3%	1.2%	2.0%	2.5%	1.2%	0.5%	4.0%
	54	1.6%	2.0%	1.3%	1.2%	2.0%	2.5%	1.2%	0.5%	4.0%

Actuarial Assumptions Based on 2015-2017 Experience Study

Disability Rates

Age	% of Active Participants Withdrawing								
	General		Public Schools		University		Protective		Executive & Elected
	Male	Female	Male	Female	Male	Female	With SS	Without SS	
20	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.01%	0.03%	0.00%
21	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.01%	0.03%	0.00%
22	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.01%	0.03%	0.00%
23	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.01%	0.03%	0.00%
24	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.01%	0.03%	0.00%
25	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.01%	0.03%	0.00%
26	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.01%	0.03%	0.00%
27	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.01%	0.03%	0.00%
28	0.00%	0.01%	0.00%	0.01%	0.00%	0.00%	0.01%	0.03%	0.00%
29	0.00%	0.01%	0.00%	0.01%	0.00%	0.00%	0.01%	0.03%	0.00%
30	0.00%	0.02%	0.00%	0.01%	0.00%	0.00%	0.01%	0.03%	0.00%
31	0.00%	0.02%	0.00%	0.01%	0.00%	0.00%	0.01%	0.03%	0.00%
32	0.00%	0.02%	0.00%	0.01%	0.00%	0.00%	0.01%	0.03%	0.00%
33	0.00%	0.02%	0.00%	0.01%	0.00%	0.01%	0.01%	0.03%	0.00%
34	0.00%	0.02%	0.00%	0.01%	0.00%	0.01%	0.01%	0.03%	0.00%
35	0.01%	0.02%	0.00%	0.01%	0.00%	0.02%	0.01%	0.03%	0.01%
36	0.01%	0.02%	0.00%	0.01%	0.00%	0.02%	0.01%	0.03%	0.01%
37	0.01%	0.02%	0.00%	0.01%	0.00%	0.02%	0.01%	0.03%	0.01%
38	0.01%	0.02%	0.00%	0.01%	0.00%	0.02%	0.01%	0.03%	0.01%
39	0.02%	0.03%	0.01%	0.01%	0.00%	0.02%	0.02%	0.04%	0.01%
40	0.02%	0.03%	0.01%	0.01%	0.00%	0.02%	0.02%	0.04%	0.01%
41	0.03%	0.03%	0.01%	0.02%	0.00%	0.02%	0.02%	0.05%	0.01%
42	0.03%	0.03%	0.01%	0.02%	0.00%	0.03%	0.02%	0.05%	0.01%
43	0.04%	0.04%	0.02%	0.03%	0.01%	0.02%	0.02%	0.06%	0.01%
44	0.04%	0.04%	0.02%	0.03%	0.01%	0.02%	0.02%	0.07%	0.01%
45	0.04%	0.04%	0.02%	0.04%	0.01%	0.02%	0.02%	0.08%	0.01%
46	0.04%	0.04%	0.03%	0.05%	0.01%	0.02%	0.03%	0.09%	0.02%
47	0.04%	0.04%	0.03%	0.06%	0.01%	0.02%	0.03%	0.10%	0.02%
48	0.06%	0.05%	0.04%	0.06%	0.01%	0.03%	0.03%	0.22%	0.02%
49	0.07%	0.06%	0.05%	0.07%	0.01%	0.03%	0.04%	0.34%	0.02%
50	0.09%	0.06%	0.06%	0.07%	0.01%	0.04%	0.04%	0.46%	0.02%
51	0.10%	0.07%	0.08%	0.08%	0.02%	0.05%	0.04%	0.58%	0.03%
52	0.12%	0.08%	0.10%	0.08%	0.02%	0.05%	0.05%	0.70%	0.03%
53	0.13%	0.09%	0.10%	0.09%	0.03%	0.05%	0.23%	0.58%	0.05%
54	0.15%	0.10%	0.11%	0.10%	0.03%	0.06%	0.42%	0.46%	0.08%
55	0.17%	0.12%	0.12%	0.10%	0.04%	0.06%	0.61%	0.34%	0.09%
56	0.19%	0.13%	0.13%	0.12%	0.05%	0.06%	0.79%	0.22%	0.11%
57	0.21%	0.14%	0.13%	0.13%	0.06%	0.07%	0.98%	0.10%	0.12%
58	0.23%	0.15%	0.15%	0.14%	0.06%	0.08%	0.99%	0.10%	0.12%
59	0.25%	0.16%	0.18%	0.15%	0.06%	0.08%	1.01%	0.10%	0.11%
60	0.30%	0.16%	0.19%	0.15%	0.06%	0.09%	1.02%	0.10%	0.11%

Actuarial Assumptions Based on 2015-2017 Experience Study

Salary Scale – Service Based Rates

Service	% Merit Increases in Salaries Next Year					
	General (Not Including Schools)	University Teachers	Public School Teachers	Protective With SS	Protective Without SS	Executive & Elected
1	3.5%	3.0%	5.6%	4.8%	5.5%	2.5%
2	3.5%	3.0%	5.6%	4.8%	5.5%	2.5%
3	3.1%	2.9%	5.2%	4.1%	4.7%	2.0%
4	2.8%	2.8%	4.7%	3.5%	3.8%	1.6%
5	2.5%	2.7%	4.3%	2.8%	3.0%	1.1%
6	2.2%	2.6%	3.8%	2.2%	2.1%	0.7%
7	1.9%	2.5%	3.4%	1.5%	1.3%	0.2%
8	1.8%	2.4%	3.1%	1.4%	1.2%	0.2%
9	1.6%	2.3%	2.9%	1.3%	1.0%	0.2%
10	1.5%	2.2%	2.6%	1.1%	0.9%	0.2%
11	1.4%	2.1%	2.4%	1.0%	0.7%	0.2%
12	1.3%	2.0%	2.1%	0.9%	0.6%	0.2%
13	1.2%	1.9%	1.9%	0.9%	0.6%	0.2%
14	1.2%	1.8%	1.7%	0.9%	0.6%	0.2%
15	1.1%	1.7%	1.4%	0.8%	0.5%	0.2%
16	1.1%	1.6%	1.2%	0.8%	0.5%	0.2%
17	1.0%	1.5%	1.0%	0.8%	0.5%	0.2%
18	1.0%	1.4%	0.9%	0.8%	0.5%	0.2%
19	0.9%	1.3%	0.7%	0.8%	0.5%	0.2%
20	0.9%	1.2%	0.6%	0.7%	0.4%	0.2%
21	0.8%	1.1%	0.5%	0.7%	0.4%	0.2%
22	0.8%	1.0%	0.4%	0.7%	0.4%	0.2%
23	0.7%	0.9%	0.3%	0.7%	0.4%	0.2%
24	0.7%	0.9%	0.3%	0.7%	0.4%	0.2%
25	0.6%	0.9%	0.3%	0.6%	0.3%	0.2%
26	0.6%	0.8%	0.2%	0.6%	0.3%	0.2%
27	0.5%	0.8%	0.2%	0.6%	0.3%	0.2%
28	0.5%	0.8%	0.2%	0.6%	0.3%	0.2%
29	0.4%	0.7%	0.2%	0.6%	0.3%	0.2%
30	0.4%	0.7%	0.2%	0.5%	0.2%	0.2%
31	0.3%	0.6%	0.2%	0.5%	0.2%	0.2%
32	0.3%	0.6%	0.2%	0.5%	0.2%	0.2%
33	0.3%	0.5%	0.1%	0.5%	0.2%	0.2%
34	0.3%	0.4%	0.1%	0.5%	0.2%	0.2%
35	0.2%	0.4%	0.1%	0.4%	0.1%	0.2%
36	0.2%	0.3%	0.1%	0.4%	0.1%	0.2%
37	0.2%	0.2%	0.1%	0.4%	0.1%	0.2%
38	0.2%	0.2%	0.1%	0.4%	0.1%	0.2%
39	0.2%	0.2%	0.1%	0.3%	0.1%	0.2%
40	0.1%	0.1%	0.1%	0.3%	0.1%	0.2%

Actuarial Assumptions Based on 2015-2017 Experience Study

Normal Retirement Pattern

Age	% of Active Participants Retiring								
	General		Public Schools		University		Protective		Executive & Elected
	Male	Female	Male	Female	Male	Female	With SS *	Without SS *	
50	%						6%	2%	
51							8%	4%	
52							10%	4%	
53							25%	17%	
54							20%	23%	
55							20%	25%	
56							20%	25%	
57	19%	17%	33%	27%	12%	15%	20%	25%	8%
58	19%	17%	29%	27%	12%	15%	20%	33%	8%
59	19%	17%	24%	27%	12%	10%	20%	33%	8%
60	19%	17%	25%	27%	12%	12%	20%	20%	20%
61	19%	17%	25%	27%	12%	16%	20%	20%	12%
62	26%	27%	35%	37%	12%	15%	30%	40%	12%
63	29%	27%	32%	30%	12%	20%	30%	40%	12%
64	28%	27%	29%	28%	12%	20%	30%	40%	15%
65	30%	30%	29%	37%	15%	20%	40%	40%	15%
66	35%	35%	35%	39%	20%	24%	40%	100%	15%
67	30%	30%	33%	33%	20%	20%	40%	100%	15%
68	19%	25%	27%	30%	18%	17%	40%	100%	15%
69	19%	25%	23%	28%	16%	17%	40%	100%	20%
70	19%	25%	25%	38%	20%	18%	100%	100%	20%
71	19%	20%	20%	20%	18%	18%	100%	100%	20%
72	19%	20%	15%	20%	16%	18%	100%	100%	20%
73	19%	20%	15%	20%	16%	15%	100%	100%	20%
74	19%	20%	15%	20%	16%	15%	100%	100%	20%
75	100%	100%	100%	100%	100%	100%	100%	100%	100%

* Includes Reduced Retirement.

Actuarial Assumptions Based on 2015-2017 Experience Study

Reduced Retirement Pattern

Age	% of Active Participants Retiring						Executive & Elected
	General		Public Schools		University		
	Male	Female	Male	Female	Male	Female	
55	8%	7%	13%	12%	3%	5%	3%
56	8%	7%	13%	12%	3%	5%	3%
57	5%	6%	12%	12%	3%	5%	3%
58	6%	7%	13%	12%	3%	5%	3%
59	7%	7%	14%	13%	4%	5%	3%
60	9%	10%	14%	17%	6%	9%	5%
61	9%	10%	15%	17%	6%	9%	5%
62	17%	16%	21%	23%	7%	12%	2%
63	18%	18%	21%	23%	7%	12%	2%
64	17%	18%	21%	23%	10%	15%	2%

Actuarial Assumptions Based on 2015-2017 Experience Study

Post-Retirement Mortality Rates* – Healthy Lives

Age	% Dying Next Year		Age	% Dying Next Year		Age	% Dying Next Year	
	Male	Female		Male	Female		Male	Female
20	0.0268%	0.0161%	60	0.5436%	0.3493%	100	33.1147%	28.6134%
21	0.0281%	0.0160%	61	0.5742%	0.3767%	101	33.7324%	29.1757%
22	0.0290%	0.0161%	62	0.6057%	0.4057%	102	34.2904%	29.7352%
23	0.0305%	0.0166%	63	0.6734%	0.4426%	103	35.5389%	30.4538%
24	0.0315%	0.0171%	64	0.7481%	0.4825%	104	36.3923%	30.8890%
25	0.0326%	0.0178%	65	0.8300%	0.5261%	105	37.1505%	31.6472%
26	0.0344%	0.0189%	66	0.9207%	0.5737%	106	37.3749%	32.0485%
27	0.0352%	0.0199%	67	1.0207%	0.6262%	107	37.3973%	32.6207%
28	0.0365%	0.0210%	68	1.1174%	0.7012%	108	37.4243%	33.2844%
29	0.0384%	0.0222%	69	1.2299%	0.7859%	109	37.4490%	34.1748%
30	0.0415%	0.0242%	70	1.3542%	0.8817%	110	37.4739%	35.4628%
31	0.0469%	0.0288%	71	1.4918%	0.9898%	111	37.5008%	36.6114%
32	0.0529%	0.0329%	72	1.6441%	1.1115%	112	37.5234%	37.5823%
33	0.0595%	0.0367%	73	1.8345%	1.2544%	113	37.5504%	38.3301%
34	0.0663%	0.0400%	74	2.0479%	1.4160%	114	37.5729%	38.8141%
35	0.0728%	0.0432%	75	2.2869%	1.5987%	115	37.6000%	39.0000%
36	0.0791%	0.0462%	76	2.5545%	1.8052%	116	37.6000%	39.0000%
37	0.0848%	0.0491%	77	2.8542%	2.0382%	117	37.6000%	39.0000%
38	0.0891%	0.0522%	78	3.2469%	2.3192%	118	37.6000%	39.0000%
39	0.0929%	0.0557%	79	3.6938%	2.6388%	119	37.6000%	39.0000%
40	0.0964%	0.0603%	80	4.2026%	3.0020%	120	100.0000%	100.0000%
41	0.1002%	0.0655%	81	4.7818%	3.4153%			
42	0.1047%	0.0716%	82	5.4412%	3.8848%			
43	0.1099%	0.0783%	83	6.1495%	4.4967%			
44	0.1160%	0.0854%	84	6.9493%	5.2042%			
45	0.1230%	0.0918%	85	7.8539%	6.0225%			
46	0.1295%	0.0985%	86	8.8772%	6.9677%			
47	0.1370%	0.1055%	87	10.0837%	8.0608%			
48	0.1449%	0.1139%	88	11.1538%	8.9056%			
49	0.1535%	0.1231%	89	12.3364%	9.8384%			
50	0.1627%	0.1346%	90	13.6420%	10.9220%			
51	0.1846%	0.1507%	91	15.0857%	12.1234%			
52	0.2297%	0.1683%	92	16.6770%	13.4577%			
53	0.2769%	0.1886%	93	18.7980%	15.2823%			
54	0.3246%	0.2112%	94	21.1822%	17.3531%			
55	0.3790%	0.2413%	95	23.8658%	19.7033%			
56	0.4209%	0.2642%	96	26.9284%	22.3984%			
57	0.4600%	0.2827%	97	29.5450%	24.5149%			
58	0.4865%	0.2993%	98	31.1689%	26.2368%			
59	0.5145%	0.3235%	99	32.2064%	27.4034%			

* Mortality rates for 2017. With a fully generational mortality table, the mortality rate depends on the year of birth. Later years of birth will correspond to a lower mortality rate at a given age.

Actuarial Assumptions Based on 2015-2017 Experience Study

Mortality Rates* – Disabled Lives

% Dying Next Year			% Dying Next Year			% Dying Next Year		
Age	Male	Female	Age	Male	Female	Age	Male	Female
20	0.0347%	0.0189%	60	1.1042%	0.6246%	100	37.2223%	31.9524%
21	0.0358%	0.0189%	61	1.2213%	0.6824%	101	37.2492%	32.5247%
22	0.0376%	0.0208%	62	1.3496%	0.7636%	102	37.2738%	33.1885%
23	0.0407%	0.0220%	63	1.4896%	0.8540%	103	37.2985%	34.0724%
24	0.0461%	0.0241%	64	1.6426%	0.9546%	104	37.3209%	35.3586%
25	0.0521%	0.0286%	65	1.8095%	1.0670%	105	37.3479%	36.5038%
26	0.0588%	0.0328%	66	2.0161%	1.1932%	106	37.3749%	37.4719%
27	0.0658%	0.0367%	67	2.2453%	1.3409%	107	37.3973%	38.2175%
28	0.0728%	0.0402%	68	2.5003%	1.5081%	108	37.4243%	38.7000%
29	0.0795%	0.0436%	69	2.7847%	1.6977%	109	37.4490%	38.8854%
30	0.0859%	0.0469%	70	3.1026%	1.9128%	110	37.4739%	38.9042%
31	0.0910%	0.0501%	71	3.5208%	2.1565%	111	37.5008%	38.9229%
32	0.0957%	0.0536%	72	3.9972%	2.4511%	112	37.5234%	38.9438%
33	0.1003%	0.0575%	73	4.5402%	2.7871%	113	93.8760%	38.9626%
34	0.1051%	0.0627%	74	5.1593%	3.1699%	114	93.9323%	97.4474%
35	0.1106%	0.0686%	75	5.8651%	3.6058%	115	100.0000%	100.0000%
36	0.1168%	0.0754%	76	6.6238%	4.1022%	116	100.0000%	100.0000%
37	0.1240%	0.0827%	77	7.4823%	4.7503%	117	100.0000%	100.0000%
38	0.1319%	0.0903%	78	8.4536%	5.5011%	118	100.0000%	100.0000%
39	0.1389%	0.0970%	79	9.5516%	6.3706%	119	100.0000%	100.0000%
40	0.1466%	0.1037%	80	10.7935%	7.3768%	120	100.0000%	100.0000%
41	0.1544%	0.1106%	81	11.8777%	8.5418%			
42	0.1625%	0.1188%	82	13.0725%	9.4449%			
43	0.1709%	0.1274%	83	14.3874%	10.4418%			
44	0.1922%	0.1384%	84	15.8335%	11.5423%			
45	0.2370%	0.1536%	85	17.4261%	12.7575%			
46	0.2832%	0.1700%	86	19.5601%	14.0970%			
47	0.3293%	0.1892%	87	21.9527%	15.9382%			
48	0.3819%	0.2119%	88	24.6365%	18.0178%			
49	0.4219%	0.2423%	89	27.6468%	20.3676%			
50	0.4615%	0.2663%	90	30.1649%	23.0195%			
51	0.4894%	0.2865%	91	31.8017%	25.0458%			
52	0.5192%	0.3054%	92	32.6663%	26.7824%			
53	0.5513%	0.3333%	93	33.5532%	27.8031%			
54	0.5859%	0.3637%	94	33.9611%	28.9977%			
55	0.6227%	0.3968%	95	34.4730%	29.3824%			
56	0.6985%	0.4327%	96	35.5497%	29.9460%			
57	0.7834%	0.4751%	97	36.4035%	30.5184%			
58	0.8787%	0.5211%	98	36.9765%	30.9525%			
59	0.9853%	0.5709%	99	37.1976%	31.5541%			

* Mortality rates for 2017. With a fully generational mortality table, the mortality rate depends on the year of birth. Later years of birth will correspond to a lower mortality rate at a given age.

Actuarial Assumptions Based on 2015-2017 Experience Study

Mortality Rates* – Death-in-Service

Age	% Dying Next Year		Age	% Dying Next Year	
	Male	Female		Male	Female
20	0.0134%	0.0080%	60	0.2718%	0.1747%
21	0.0141%	0.0080%	61	0.2871%	0.1884%
22	0.0145%	0.0080%	62	0.3029%	0.2028%
23	0.0152%	0.0083%	63	0.3367%	0.2213%
24	0.0157%	0.0085%	64	0.3740%	0.2413%
25	0.0163%	0.0089%	65	0.4150%	0.2631%
26	0.0172%	0.0095%	66	0.4604%	0.2868%
27	0.0176%	0.0099%	67	0.5103%	0.3131%
28	0.0182%	0.0105%	68	0.5587%	0.3506%
29	0.0192%	0.0111%	69	0.6149%	0.3930%
30	0.0208%	0.0121%	70	0.6771%	0.4408%
31	0.0235%	0.0144%	71	0.7459%	0.4949%
32	0.0265%	0.0164%	72	0.8220%	0.5558%
33	0.0298%	0.0183%	73	0.9173%	0.6272%
34	0.0331%	0.0200%	74	1.0239%	0.7080%
35	0.0364%	0.0216%	75	1.1435%	0.7994%
36	0.0396%	0.0231%	76	1.2773%	0.9026%
37	0.0424%	0.0246%	77	1.4271%	1.0191%
38	0.0446%	0.0261%	78	1.6234%	1.1596%
39	0.0464%	0.0278%	79	1.8469%	1.3194%
40	0.0482%	0.0301%	80	2.1013%	1.5010%
41	0.0501%	0.0328%	81	2.3909%	1.7077%
42	0.0524%	0.0358%	82	2.7206%	1.9424%
43	0.0549%	0.0391%	83	3.0747%	2.2484%
44	0.0580%	0.0427%	84	3.4747%	2.6021%
45	0.0615%	0.0459%	85	3.9269%	3.0112%
46	0.0648%	0.0492%			
47	0.0685%	0.0527%			
48	0.0724%	0.0569%			
49	0.0768%	0.0616%			
50	0.0814%	0.0673%			
51	0.0923%	0.0754%			
52	0.1149%	0.0841%			
53	0.1385%	0.0943%			
54	0.1623%	0.1056%			
55	0.1895%	0.1207%			
56	0.2105%	0.1321%			
57	0.2300%	0.1414%			
58	0.2433%	0.1497%			
59	0.2572%	0.1618%			

* Mortality rates for 2017. With a fully generational mortality table, the mortality rate depends on the year of birth. Later years of birth will correspond to a lower mortality rate at a given age.