



# ACTUARIAL EXPERIENCE REVIEW

## January 1, 2010 – December 31, 2014

### Dallas Police and Fire Pension System

May 2016

 Segal Consulting



2018 Powers Ferry Road SE Suite 850 Atlanta, GA 30339-7200  
T 678.306.3100 www.segalco.com

May 31, 2016

Board of Trustees  
Dallas Police and Fire Pension System  
4100 Harry Hines Boulevard, Suite 100  
Dallas, TX 75219-3207

Dear Board Members:

We are pleased to present this report on our actuarial experience investigation of the Pension System covering the period from January 1, 2010 to December 31, 2014.

Based on our analysis of the System's actuarial experience for the period, certain changes in the actuarial assumptions were adopted by the Board following our presentation on April 14, 2016. We welcome the Board's comments and input on this study as we document the actuarial assumptions used to value the System.

In setting these assumptions, it was presumed that the System will be viable going forward. To the extent that changes in plan provisions cause changes in behavior among the participants and/or lead Segal to believe that assumed investment returns cannot be achieved, further changes in actuarial assumptions will be recommended.

This study was performed under our supervision, with the assistance of Bryan Clubb, Actuarial Analyst.

To the best of our knowledge, this report is complete and accurate and the calculations were performed in accordance with generally accepted actuarial principles and practices. The signing actuaries are members of the Society of Actuaries, the American Academy of Actuaries, and other professional actuarial organizations and collectively meet their "General Qualification Standards for Prescribed Statements of Actuarial Opinions" to render the actuarial opinion contained herein.

Sincerely,

A black rectangular redaction box covering the signature of Leon F. (Rocky) Joyner, Jr.

Leon F. (Rocky) Joyner, Jr., FCA, ASA, MAAA, EA  
Vice President and Actuary

A black rectangular redaction box covering the signature of Deborah K. Brigham.

Deborah K. Brigham, FCA, ASA, MAAA, EA  
Vice President and Actuary

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January 1, 2010 – December 31, 2014

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# I. Executive Summary

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## A. Introduction

The annual actuarial valuation for the Dallas Police and Fire Pension System (“Dallas,” “the Plan” or “the System”) provides a projection of future benefit payments for all current participants, based upon actuarial assumptions adopted by the Board, that are discounted to the valuation date. The actuarial valuation methods are tools that develop long-term budget patterns to assure necessary contributions are systematically deposited in the Plan so that funds are available to pay promised benefits as they come due. The methods and assumptions must comply with generally accepted actuarial principles and practices, GASB accounting standards and state law.

The assumptions and methods used in the annual actuarial valuations are adopted by the Board of Trustees, based on recommendations of the actuary and the findings of actuarial experience studies. Pursuant to current industry standards, an actuarial experience study should be prepared at least every five years. This report is for the five-year period ending December 31, 2014. The purpose of the study is to modify current assumptions to reflect emerging experience as well as expected experience in future years.

The experience study includes a complete review of all assumptions and methods used in the valuation. The assumptions can be broken down into two categories: economic and demographic assumptions. Economic assumptions include inflation, investment rate of return (or discount rate), salary scale, payroll growth rates, and administrative expenses. Demographic assumptions include mortality, turnover (or withdrawal), retirement, disability, DROP utilization, overtime loads, marriage percentage and spousal age difference.

The methods studied include the base actuarial cost method for determining allocation of liabilities to past and future years, the asset smoothing method, and the amortization of unfunded liability.

Following the Executive Summary are three additional sections, which include detailed analysis, address specific issues and provide recommendations related to the following:

- Economic assumptions;
- Demographic assumptions; and
- Actuarial methods.

An appendix at the end of the report details all of the proposed decrement rates.

A summary of the key points of our review and our recommendations follows on the next few pages.

## B. Data Used in the Study

The period under analysis is the five-year period from January 1, 2010 through December 31, 2014. Segal Consulting was retained in January 2016 to become the System’s actuary. A five-year study requires six complete years of member and financial data. This study is based on

reconciled valuation provided by Buck Consultants, the System’s prior actuary. Segal has not independently verified the accuracy of this data. It is assumed that Buck completed appropriate reasonableness checks to ensure that the data was sufficient for actuarial valuation purposes.

**C. Recommendations**

At the direction of the Dallas Police and Fire Pension System Board of Trustees (“the Board”), Segal Consulting has performed a review of System experience.

The experience review affords an opportunity for the Board, staff and actuary to consider how specific assumptions or methods may be affecting contribution rates and the proper funding of the Pension System. We have reviewed both economic and demographic experience of the System as it relates to the expected actuarial experience based on the current plan assumptions. Included are recommendations for changes in assumptions and methods that we believe will more accurately reflect the future experience of the System and will help to stabilize annual cost requirements from year to year.

The detailed analysis of each individual assumption is discussed later in this report.

**Economic Assumptions**

Economic assumptions include inflation, investment rate of return (or discount rate), DROP interest, salary scale, payroll growth rate and administrative expenses.

With the January 1, 2015 actuarial valuation, the Board changed the net investment rate of return from 8.50% to 7.25% and the inflation component of the investment return to 2.75%. The assumption for the DROP interest rate was updated to reflect plan changes adopted in April 2015, with a long-term ultimate rate of 5.00%.

*Inflation*

Inflation continues at relatively low levels from a historical perspective, as shown in the following table.

Average Annual Change in CPI-U, Through 2015	
Last 5 Years	1.62%
Last 10 Years	1.92%
Last 20 Years	2.22%
Last 30 Years	2.66%
Last 40 Years	3.77%

**We recommend maintaining the 2.75% inflation assumption implemented in the most recent actuarial valuation.**

Segal utilized the “building block” approach to develop economic assumptions. Under the “building block” approach, inflation is the basis for all economic assumptions. The investment return assumption is comprised of inflation and the expected risk premium for each asset class.

The underlying salary scale assumption is composed of inflation, a merit increase and productivity increases. Finally, payroll growth is a function of the inflation and productivity components of salary scale.

### *Investment Return*

Much of the Plan's assets are invested in real estate and private equity. Valuations for many of these assets were reduced in the past year or two to reflect current market conditions. These valuations changes mean that prior reported investment returns were likely overstated.

With the January 1, 2015 actuarial valuation, the Board opted to lower the investment return assumption from 8.50% to 7.25%. The Board has also adopted a new investment policy with revised target asset allocations. Staff has indicated that it may take three to five years to fully implement the new asset allocation. Based on this information as well as a review of projected returns by class of asset, **we recommend maintaining the assumed rate of 7.25%**. We will continue to monitor national trends as well as the System's experience.

### *Salary Scale*

The current salary assumption is service-based, with the highest rates of increase in the early years of employment. The salary assumption was not changed when the Board adopted the 7.25% investment return assumption. The rates are the same for Firefighters and Police Officers.

The actual salary experience was examined for the Police and Fire groups separately, and was discussed with Dallas's HR Director. We also reviewed the current Meet and Confer agreement. While the two groups have similar salary experience, the data and the agreement indicate that Fire has a longer select period. Based on the salary experience during the five-year period, the Meet and Confer agreement and taking into account change in assumed inflation, **we recommend separate service-based salary assumptions for Police and Fire.**

The proposed salary scale table is shown in *Appendix A*.

### *Payroll Growth Rate*

The payroll growth rate is used for determining the amortization amount of the unfunded actuarial accrued liability (UAAL) when the recommended contribution is determined as a level percentage of payroll. The current assumption is 4.00%. The average payroll increase over the study period was 0.87%, and **we recommend this assumption be lowered to equal the assumed inflation rate of 2.75%**.

### *Administrative Expenses*

The investment return assumption for the System is net of both investment expenses and administrative expenses. This means that the actual return must be sufficiently above the assumed rate to cover all expenses. We recommend an explicit assumption for administrative expenses, to be added to the normal cost. This assumption will be monitored and updated each year in conjunction with the valuation. Expected 2016 expenses for the System are about \$10 million. **We recommend that the assumed administrative expenses be \$10 million for the January 1, 2016 valuation.**

## Demographic Assumptions

Demographic assumptions include mortality, turnover (or withdrawal), retirement, disability, DROP utilization, overtime loads, marriage percentage and spousal age difference.

### *Mortality*

The current assumed mortality assumption for employees and non-disabled annuitants is the RP-2000 Combined Healthy Table projected ten years beyond the valuation date using Scale AA. For disabled annuitants, the assumption is the RP-2000 Combined Healthy Table, set forward one year with no projection.

During the five-year study period, there were 18% more non-disabled annuitant deaths than anticipated by the mortality tables, with the majority of the margin coming from females. The Society of Actuaries released new mortality tables in 2014, and **we recommend using the RP-2014 Blue Collar Annuitant Mortality tables as the mortality assumption going forward, with no adjustment for males and set forward two years for females.**

There were fewer employee deaths than expected by the tables during the study period. Going forward, **we recommend that pre-retirement mortality be based on the RP-2014 Employee Mortality Table, set back two years for males, with no adjustment for females.**

Although the number of exposures is small and not significantly credible, the number of deaths among the disabled retiree group was close to the number anticipated. **For disabled annuitants, we recommend using the RP-2014 Disabled Retiree Table set back three years for males and females.**

Actuarial Standards of Practice require mortality assumptions to allow for improvements in life expectancy. Recently, many plans have begun introducing generational mortality projection, whereby mortality rates vary by year of birth with younger participants having longer life expectancies. **We further recommend that all of the above adjusted RP-2014 tables be projected generationally using the MP-2015 improvement scale.**

The proposed mortality tables are shown in *Appendix B*.

### *Turnover*

The assumed rates of turnover (withdrawal) differ by employee group, with higher rates assumed for Police than for Fire. Even so, the assumed rates for both Police and Fire are fairly low, which is consistent with national trends for public safety.

The number of Police terminating employment during the study period was lower than expected (447 versus 522), while actual turnover for Fire was higher than expected (119 versus 100). **We recommend that the rates for each group be modified to reflect recent experience.**

The proposed turnover tables are shown in *Appendix C*.

### *Retirement Rates and DROP Utilization*

The current table of assumed retirement rates is age-based, beginning at age 38 for employees with 20 years of service. The rates anticipate when an employee will cease employment, *not*

when they enter DROP. The rates are low prior to age 55, and all employees are anticipated to be retired by age 65. There is no differentiation based on the tier of benefits in which an employee participates.

The number of retirements during the study period was less than expected (6% less for Police, and 31% for Fire). The number of retirements below age 50 was significantly less than expected. Firefighters, on average, retired two years later than Police Officers. **We are proposing separate tables of retirement rates for the Police Officers and Firefighters that capture the observed experience.**

The current assumption for DROP election is that 100% of employees will elect to enter the DROP at first eligibility for unreduced benefits. The data during the study period indicates that 95% of eligible Police and 98% of eligible Fire employees opted to enter DROP. **We suggest maintaining the DROP utilization assumption of 100% at first eligibility.**

The proposed retirement tables are shown in *Appendix D*.

### *Disability*

The assumed disability rates vary by employee group, and are quite low, but the actual number of disabilities was about one third of the expected number. There were three Police disabilities and one from Fire in the study period. **We recommend lower rates for both the Firefighters and Police Officers. The new rates are the same for both groups.** The proposed disability tables are shown in *Appendix E*.

### *Other Demographic Assumptions*

Other demographic assumptions that impact the valuation are the percent married at retirement, the age differential between spouses and the overtime load for City contributions.

The current assumption is that 80% of active employees are married with the male spouse three years older. During the study period, 76% of those retiring were married. **We recommend changing the married percent to 75% and keeping the three-year age differential.**

The current valuation includes an 11% load on computation pay to reflect the City's additional contribution on overtime pay. Segal had limited data to analyze this assumption, but in the most recent financial year it appears that City contributions were about 16% greater than what would have been anticipated using computation pay. **We are not recommending a change to the overtime load in this study.** We will work with Plan Staff to analyze this further.

Note that overtime pay is not included in benefit calculations, and therefore the load for overtime pay has no impact on liabilities.

### **Methods**

Actuarial methods used in the valuation include the asset valuation method, the actuarial cost method, and the amortization of the unfunded actuarial accrued liability (UAAL).



### Asset Valuation Method

Actuarial valuation methods include “smoothing” investment returns over a period of time to provide a more stable (or level) actuarial rate of return and more predictable pension costs. The current asset valuation method includes a ten-year smoothing period and a 20% corridor of the difference between that expected value and the actual market value. As of January 1, 2015, the actuarial value of assets was 120% of market. Based on discussions with System staff, declines in market value in recent years have more to do with updated valuations of assets than with actual market losses. **We recommend moving from ten-year smoothing to five-year smoothing prospectively, with a resetting of the value to market value as of January 1, 2016.**

### Actuarial Cost Method

The actuarial cost method is a mechanism to provide orderly funding of plan benefits over a participant’s lifetime. The actuarial cost method allocates liability for service already accrued (i.e. Actuarial Accrued Liability) and future service (i.e. Normal Cost). The current actuarial cost method is the Entry Age Normal actuarial cost method, using assumed salary rates to develop the normal cost. Under this method, a normal cost is calculated for each employee which is the level annual contribution as a percent of pay required to be made from the employee’s date of hire for as long as he/she remains active so that sufficient assets will be accumulated to provide his/her benefit. **We recommend continuation of the current method.**

### Amortization Method

The effective amortization period for the Plan is developed using a level percent of pay, with pay assumed to increase at the payroll growth rate. **We recommend continuance of this policy.**

## D. Impact of Assumption Changes on Valuation Results

The following table details the impact of the change in assumptions on the January 1, 2015 actuarial valuation results for illustrative purposes. The changes in normal cost (NC) and actuarial accrued liability (AAL) are shown. Note that the normal cost rate is a percentage of computation pay. Computation pay is used to develop benefit liabilities and employee contributions. City contributions of 27.5% are based on computation pay plus overtime and other non-computation pay, and these extra amounts are currently assumed to be 11% additional.

	Current Plan	Mortality	Retirement	Turnover	Disability	Percent Married	Salary Scale
<b>% Change in NC</b>	N/A	1.94%	-0.87%	3.82%	-0.57%	-0.28%	-23.69%
<b>Change in NC as a % of Computation Pay</b>	N/A	0.52%	-0.24%	1.04%	-0.16%	-0.08%	-6.61%
<b>Active AAL% change</b>	N/A	2.01%	-1.16%	-0.42%	0.17%	-0.22%	2.06%
<b>Inactive AAL% change</b>	N/A	2.78%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Funding Ratio AVA</b>	64.75%	63.49%	63.81%	63.92%	63.87%	63.93%	63.38%
<b>Funding Ratio MVA</b>	53.96%	52.91%	53.17%	53.27%	53.23%	53.28%	52.81%

The 'Current Plan' column above displays results as of January 1, 2015 produced by Segal Consulting. The corresponding Funding Ratio from the prior actuary's valuation was 63.80% on an actuarial value of assets basis and 53.16% on a market value basis.

The following chart provides the estimated impact of the assumption changes, based on the January 1, 2015 valuation results for the main plan. The contribution rates shown are total rates, and are not net of expected member contributions.

	Current Plan	Mortality	Retirement	Turnover	Disability	Percent Married	Salary Scale (including Payroll Growth)	Include \$10 million Admin. Expenses
30-year contribution rate as a % of Computation Pay	54.17%	56.23%	55.60%	56.49%	56.39%	56.24%	54.77%	57.48%
40-year contribution rate as a % of Computation Pay	50.10%	51.93%	51.36%	52.28%	52.17%	52.03%	50.84%	53.54%
Deficit as a % of Computation Pay (30-Year)	-16.75%	-18.81%	-18.18%	-19.07%	-18.97%	-18.82%	-17.35%	-20.06%
Deficit as a % of Computation Pay (40-Year)	-12.68%	-14.51%	-13.94%	-14.86%	-14.75%	-14.61%	-13.42%	-16.12%

*Note: Employee contributions of 8.50% for non-DROP participants and 4.00% for DROP participants are based on computation pay. As noted previously, City contributions of 27.5% are based on computation pay plus overtime and other non-computation pay. This additional pay is assumed to be 11% on top of computational pay. The above percentages reflect a blending of these rates for comparison purposes.*

In addition to the assumption changes noted above, we recommend resetting the actuarial value of assets to market value. As of January 1, 2015, the actuarial value of assets was \$3.7 billion and the market value of assets was \$3.1 billion. Preliminary estimates from System staff put the expected asset value for January 1, 2016 at \$2.7 billion. The chart below begins with the last column in the table above and displays the calculated contribution rates if the assets had equaled \$2.7 billion as of January 1, 2015.

	Current Plan with Assumption Changes	Results with Estimated Market Value of \$2.7 Billion
30-year contribution rate as a % of Computation Pay	57.48%	72.97%
40-year contribution rate as a % of Computation Pay	53.54%	67.22%
Deficit as a % of Computation Pay (30-Year)	-20.06%	-35.55%
Deficit as a % of Computation Pay (40-Year)	-16.12%	-29.80%

The resetting of the asset value is the most significant recommended change, and provides a more realistic picture of the System's position. The resultant funded ratio is 46.43%.

## II. Economic Assumptions

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The economic assumptions have a significant impact on the development of plan liabilities. Changes to these assumptions can substantially alter the results determined by the actuary. The goal of an experience study is to produce a consistent set of economic assumptions that appropriately reflect expected future economic trends.

The primary economic assumptions that affect the Plan's funding are:

- Inflation;
- Investment Rate of Return (or Discount Rate);
- Salary Scale (Merit Increases);
- Payroll Growth Rate; and
- Administrative Expenses.

The Actuarial Standards Board (ASB) has adopted Actuarial Standard of Practice No. 27 (ASOP 27 - *Selection of Economic Assumptions for Measuring Pension Obligations*) to provide actuaries guidance in developing economic assumptions. A key feature of the ASB's guidance is the "building block" approach in developing economic assumptions.

The "building block" approach uses the actuary's best estimate for key components of economic assumptions. The actuary begins with reasonable range of each component, then selects a specific point within the range based on historical data, plan specific data and future economic environment.

The inflation component is included in all economic assumptions, and therefore is key to developing a consistent set of actuarial assumptions. Under the "building block" approach, we consider the investment rate of return assumption as the combination of an inflation component and a real rate of return component. The components of the salary increase assumption are inflation, productivity, and merit increases.

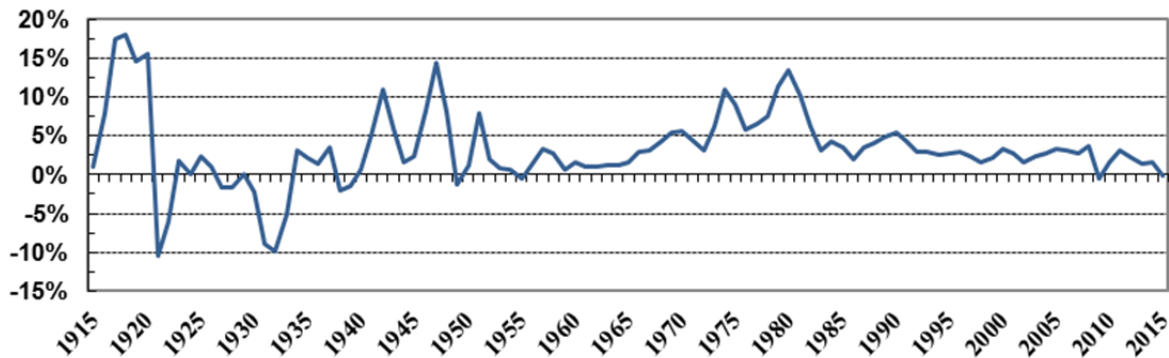
### A. Inflation

In developing the recommendation for the assumed inflation component, actuarial standards of practice suggest the actuary review appropriate inflation data. This data may include consumer price indexes, the implicit price deflator, forecasts of inflation, and yields on government securities of various maturities. For this study, we reviewed a commonly referenced historical measure of inflation, the Consumer Price Index for all urban consumers (CPI-U).

The table below shows how recent inflation experience is below the longer-term average rate. The following table is based on calendar years, ending with 2015.

Average Annual Change in CPI-U, Through 2015	
Last 5 Years	1.62%
Last 10 Years	1.92%
Last 20 Years	2.22%
Last 30 Years	2.66%
Last 40 Years	3.77%

The average annual rate of increase in the CPI-U in the last 20 years has been the lowest since the early 1960s.



Historical trend is an important consideration for the assumed rate of inflation, but is not the sole indicator in determining the reasonable bounds of expected inflation.

The typical range of expected inflation for actuarial assumptions in recent years is between 2.50% and 3.00%. A recent National Association of State Retirement Administrators (NASRA) survey of public plans indicated an average of 3.00%. Considering this trend, as well as the bond market's current low future expectation, we have determined the current reasonable range to be between 2.50% and 3.00%.

Once the reasonable range is set, we determine the specific point in the range, which is the best estimate of long-term future inflation rates. Given the System's salary history and the reasonable ranges above, we recommend maintaining the current inflation assumption of 2.75%.

## B. Investment Rate of Return

The discount rate is used to determine the present value of expected future plan payments. Generally, the appropriate discount rate is the same as the investment return assumption. The current assumption is 7.25%, net of investment and administrative fees, as adopted by the Board last year for the January 1, 2015 actuarial valuation. (Prior to that change, the assumption was 8.50%.)

Plan market returns for the last ten years as reported in the January 1, 2015 actuarial valuation are shown below.

Year Ended December 31	Market Value Investment Return
2005	10.81%
2006	14.64
2007	8.85
2008	-24.80
2009	13.78
2010	10.72
2011	-1.78
2012	9.92
2013	7.70
2014	-5.35

*NOTE: It is our understanding that underlying assets have been revalued since the above returns were presented, resulting in significantly lower market returns than previously reported.*

The investment rate of return assumption is developed using the “building block” approach as outlined in ASOP 27. Under this approach, the investment rate of return assumption is made up of two components; the inflation component and the real investment rate of return component. The reasonable range of the inflation component determined above is combined with the reasonable range of the real rate of return component. This reasonable range is then evaluated and refined. The final recommendation is a specific point in this best-estimate range.

In developing the reasonable range for the real rate of return, we consider the historical returns of the Plan’s major asset classes (as revised) as well as assumptions used by other large governmental retirement systems. NASRA published a study in February of 2016 indicating that the average rate of return assumption for over 100 of the nation’s largest governmental retirement systems was 7.62%.

We also reviewed the newly adopted investment policy. We understand that it may take three to five years to fully-implement the target asset allocations. Based on the target asset allocation and with the proposed inflation assumption of 2.75%, the System can reasonably anticipate returning 7.25% over the next 20 to 30 years. Short-term returns may fall short of this assumption, but since the valuation is measuring the long-term liabilities of the System, we recommend maintaining the current 7.25% assumption for valuation purposes.

### C. Salary Scale

The salary scale is used to determine participants’ ultimate benefits in the System. Generally, a participant’s salary will change over the long term in accordance with inflation, productivity growth and merit scale. The actuary should review available compensation data when selecting this assumption, including: Plan sponsor’s current compensation practices and any anticipated

changes; historical compensation increases and practices of the plan sponsor and other sponsors in the same industry or geographic area; and historical national wage and productivity increases.

The current salary assumption is service-based, with the highest rates of increase in the early years of employment. The assumed increases ultimately level off at 4.00%. The rates are the same for Firefighters and Police Officers.

The actual salary experience was examined, for the Police and Fire groups separately, and was discussed with Dallas's HR Director. It was determined that the two groups have similar salary experience but Fire has a longer period before leveling out to the ultimate rate. We reviewed the current Meet and Confer agreement and this confirmed what we observed in the data. Based on the salary increases during the five-year period, and taking into the Meet and Confer agreement, we recommend modifying the salary assumption to conform to recent experience and future expectations.

Graphs 1A and 1B display the actual experience against the current assumption for Firefighters and Police Officers. *A complete table of current and proposed salary scales is shown in Appendix A.*

#### D. Payroll Growth

The payroll growth rate is used for determining the amortization amount of the unfunded actuarial accrued liability (UAAL) when the recommended contribution is determined as a level percentage of payroll. The current assumption is 4.00%. The average payroll increase over the study period was 0.87%, and we recommend this assumption be lowered to equal the inflation assumption of 2.75%.

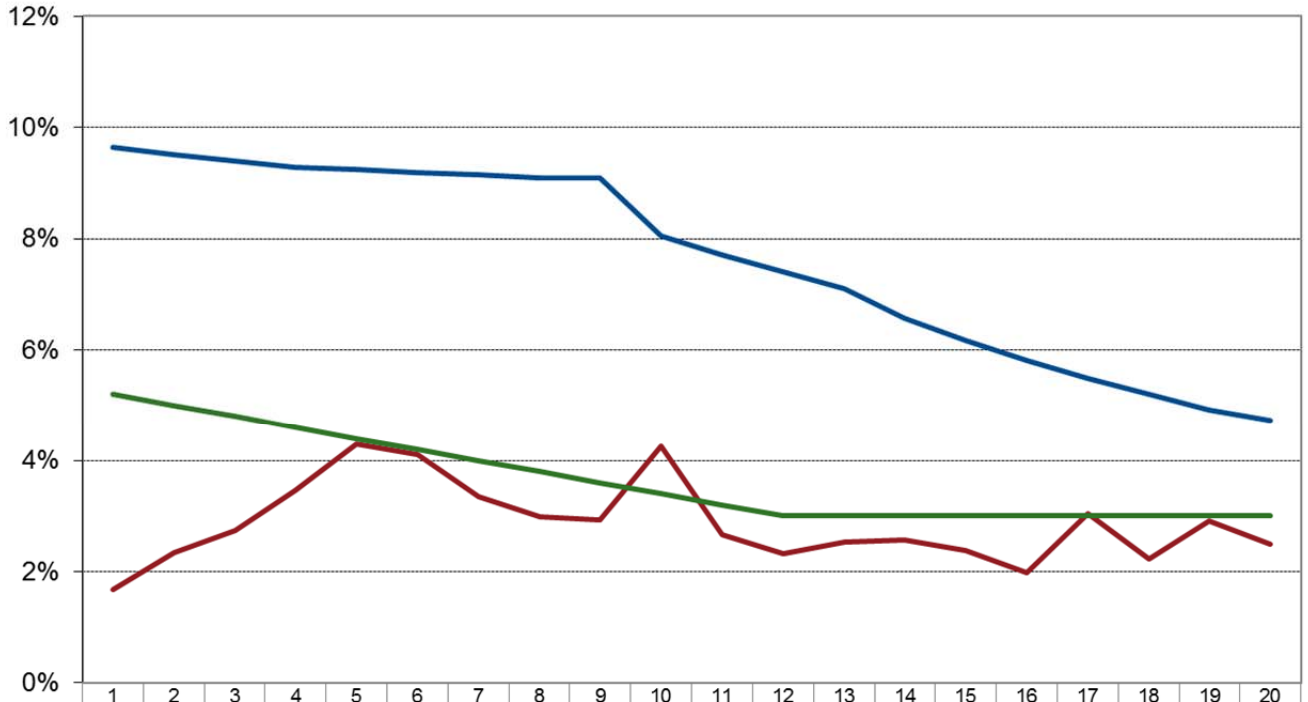
#### E. Administrative Expenses

The investment return assumption for the System is net of both investment expenses and administrative expenses. This means that the actual return must be sufficiently above the assumed rate to cover all expenses. We recommend an explicit assumption for administrative expenses instead, to be added to the normal cost. The administrative expenses are therefore directly accounted for in the System's cost, and the investment return is net of investment fees only.

This assumption will be monitored and updated each year in conjunction with the valuation. Expected 2016 expenses for the System are about \$10 million. We recommend that the assumed administrative expenses be \$10 million for the January 1, 2016 valuation.

**GRAPH 1A:  
SALARY SCALE EXPERIENCE  
FOR THE PERIOD JANUARY 1, 2010 THROUGH DECEMBER 31, 2014**

*Police*

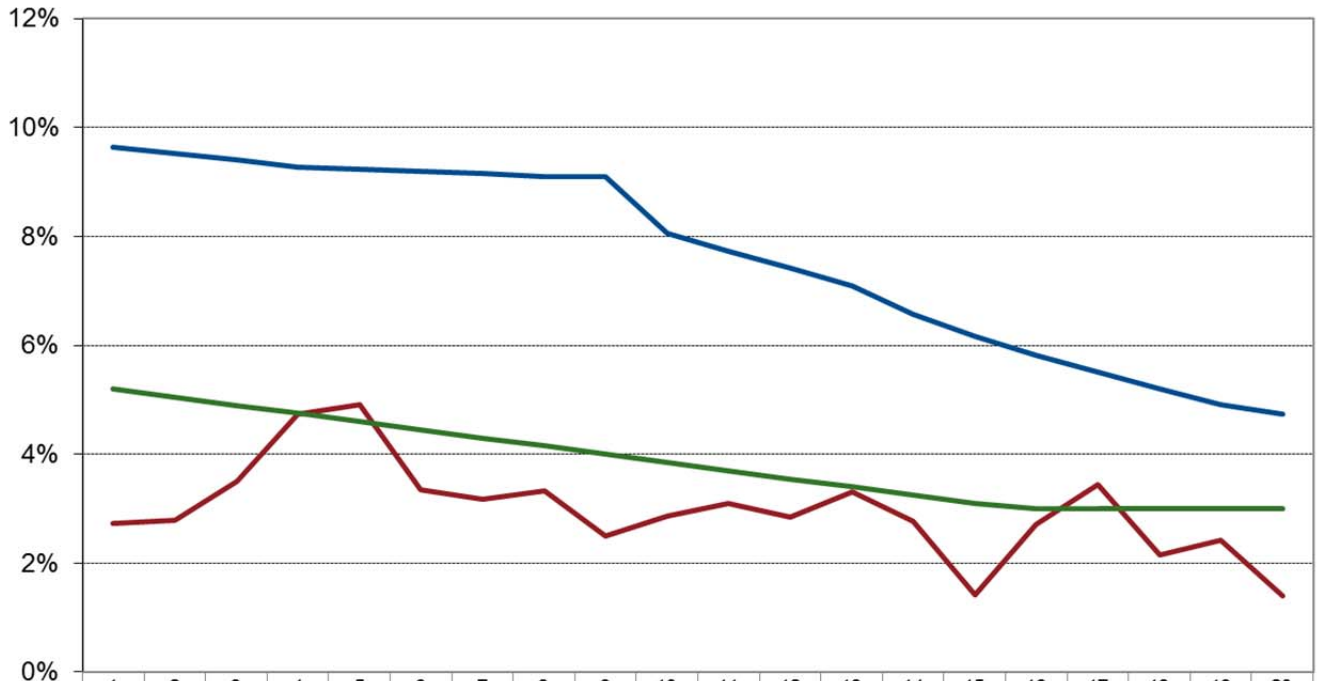


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Actual	1.68%	2.34%	2.75%	3.45%	4.30%	4.11%	3.36%	2.99%	2.93%	4.26%	2.67%	2.33%	2.53%	2.57%	2.38%	1.98%	3.05%	2.23%	2.91%	2.50%
Expected	9.64%	9.52%	9.40%	9.28%	9.24%	9.19%	9.15%	9.10%	9.10%	8.05%	7.72%	7.41%	7.10%	6.57%	6.17%	5.82%	5.50%	5.20%	4.92%	4.74%
Proposed	5.20%	5.00%	4.80%	4.60%	4.40%	4.20%	4.00%	3.80%	3.60%	3.40%	3.20%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%

**Years of Service**

**GRAPH 1B:  
SALARY SCALE EXPERIENCE  
FOR THE PERIOD JANUARY 1, 2010 THROUGH DECEMBER 31, 2014**

*Fire*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Actual	2.73%	2.78%	3.50%	4.73%	4.90%	3.35%	3.18%	3.33%	2.50%	2.86%	3.09%	2.85%	3.30%	2.76%	1.41%	2.71%	3.44%	2.16%	2.42%	1.39%
Expected	9.64%	9.52%	9.40%	9.28%	9.24%	9.19%	9.15%	9.10%	9.10%	8.05%	7.72%	7.41%	7.10%	6.57%	6.17%	5.82%	5.50%	5.20%	4.92%	4.74%
Proposed	5.20%	5.05%	4.90%	4.75%	4.60%	4.45%	4.30%	4.15%	4.00%	3.85%	3.70%	3.55%	3.40%	3.25%	3.10%	3.00%	3.00%	3.00%	3.00%	3.00%

**Years of Service**



### III. Demographic Assumptions

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The demographic assumptions used to value the Plan reflect the expected occurrences of various events among participants of the Plan. The assumptions should reflect specific characteristics of the plan and produce reasonable results. A reasonable assumption is one that is expected to model the contingency being measured and not expected to produce significant gains or losses over time. The types of demographic assumptions used to measure pension obligations include, but are not limited to, the following:

- Mortality;
- Termination of Employment (Withdrawal);
- Retirement (including DROP utilization);
- Disability; and
- Others, including Marriage Percentages, Spousal Age Difference, and Overtime Loads for City Contributions.

The Actuarial Standards Board (ASB) has adopted Actuarial Standard of Practice No. 35 (ASOP 35 - *Selection of Demographic and Other Non-Economic Assumptions for Measuring Pension Obligations*) to provide actuaries guidance in developing demographic assumptions. The standard recommends the actuary follow a general process for selecting demographic assumptions. The first step of the general procedure is to identify the types of assumptions to use. The actuary should consider relevant plan provisions that will affect timing and value of any potential benefit payments, all contingencies that give rise to benefits or loss of benefits and the characteristics of the covered group. The next step is to identify the relevant assumption universe. The assumption universe may include prior experience studies or general studies of trends relevant to the type of demographic assumption in addition to plan experience to the extent that it is credible. The third step is to consider the assumption format. The format may include different tables for different segments of the covered population (i.e. different mortality tables for males/females, or different turnover for public safety/general employees). The final step is to select the specific assumption and evaluate the reasonableness of each assumption. The specific experience of the plan should be incorporated but not given undue weight to past experience if some of that experience is attributable to a phenomenon that is unlikely to continue. For example, if recent rates of termination were due to a one-time reduction in workforce it may be unreasonable to assume that such rates will continue.

## A. Mortality Rates

One of the most basic actuarial assumptions is the probability of death. The mortality assumption takes the form of a mortality table which contains for each age in the table a probability of a person dying between that age and the next.

There are two sets of mortality tables currently in use for Dallas Police and Fire. There are different mortality assumptions for non-disabled lives (which include pre-retirement and healthy post-retirement participants) and for disabled retirees. Mortality rates are based on the RP-2000 Combined Healthy Table projected ten years beyond the valuation date using Scale AA, for participants prior to retirement and for non-disabled retirees and beneficiaries. The RP-2000 Combined Healthy Table set forward one year with no projection is used to determine mortality for disabled retirees.

The Society of Actuaries (SOA) released new mortality tables in 2014. Many actuaries are updating their assumptions to use some version of these new tables. Please note that no public sector plan experience was used in developing the new rates but the SOA is currently working on a public sector version targeted for release in 2017. When plans are sufficiently large, tables may be adjusted to reflect actual plan experience.

### 1. Pre-Retirement Mortality

Although the probabilities of death at younger ages are relatively low, the mortality experience of active members is important for several reasons. First, in combination with withdrawal and disability rates, the pre-retirement mortality table enables the actuary to estimate the number of individuals who will eventually be eligible for a retirement benefit, and thereby estimate the liability for those surviving individuals. In addition, the death of a member before retirement may result in a benefit payable to a beneficiary, and the liability for these benefits must be taken into account in the valuation.

For the Plan's active population as a whole, the experience analysis indicates significantly fewer male deaths than are currently being assumed. The following table provides a summary of pre-retirement mortality experience by gender for the study period:

Pre-Retirement Mortality	Exposures	Actual Deaths	Expected Deaths	Ratio of Actual Deaths to Expected Deaths
Male	24,044	22	31.2	71%
Female	3,749	3	2.9	103%
<b>Total</b>	<b>27,793</b>	<b>25</b>	<b>34.1</b>	<b>73%</b>

As shown above, the actual overall rates of pre-retirement death for the study period were below what the table predicted. We recommend updating the tables to the RP-2014 sex-distinct Employee Mortality Table, set back two years for males, with no adjustment for females.

Actuarial Standards of Practice require mortality assumptions to allow for improvements in life expectancy. A generational mortality table provides dynamic projections of mortality experience for each cohort. For example, the life expectancy for someone who is 65 this year will be slightly less than someone who is 65 next year. In general, adding generational mortality (or other

mortality improvements) increases the cost of the Plan as participants' life expectancies are projected to increase.

We recommend that the above adjusted RP-2014 Employee tables be projected generationally using the MP-2015 improvement scale.

## 2. Post-Retirement Mortality

The mortality experience among Dallas retirees and beneficiaries determines the durations over which retirement benefits are paid. Lower mortality rates mean longer benefit payment periods and, therefore, higher benefit costs.

The experience analysis for the past five years reveals there were significantly more post-retirement deaths than anticipated by the current mortality tables. The actual number of deaths for non-disabled annuitants was about 18% more than expected.

The following table provides a summary of non-disabled retiree and beneficiary mortality experience by gender for the study period:

Post-Retirement Mortality	Exposures	Actual Deaths	Expected Deaths	Ratio of Actual Deaths to Expected Deaths
Male	12,115	296	264.0	112%
Female	5,013	198	156.3	127%
<b>Total</b>	<b>17,128</b>	<b>494</b>	<b>420.3</b>	<b>118%</b>

Table 2 and Graphs 2A & 2B illustrate this information for males and females, by age.

The number of deaths among disabled retirees was close to expected. The following table summarizes the disabled annuitant mortality experience:

Disabled Annuitant Mortality	Exposures	Actual Deaths	Expected Deaths	Ratio of Actual Deaths to Expected Deaths
Male	751	32	30.6	105%
Female	113	0	0.6	0%
<b>Total</b>	<b>864</b>	<b>32</b>	<b>31.6</b>	<b>101%</b>

For non-disabled annuitants, we recommend using the RP-2014 sex-distinct Blue Collar Annuitant Mortality Tables, with no adjustment for males and a two-year set-forward for females. When these rates are applied to the exposures for the System during the study period, they anticipate a number of deaths close to what actually occurred.

We recommend using the sex-distinct RP-2014 Disabled Retiree Table, set back three years for both males and females, for disabled mortality.

As with the pre-retirement mortality, we recommend that the above tables be projected generationally using the MP-2015 improvement scale.

*A complete table of current and proposed mortality rates is shown in Appendix B.*

**Table 2:**  
**POST-RETIREMENT HEALTHY MORTALITY EXPERIENCE**  
**For the Period January 1, 2010 through December 31, 2014**

*Male*

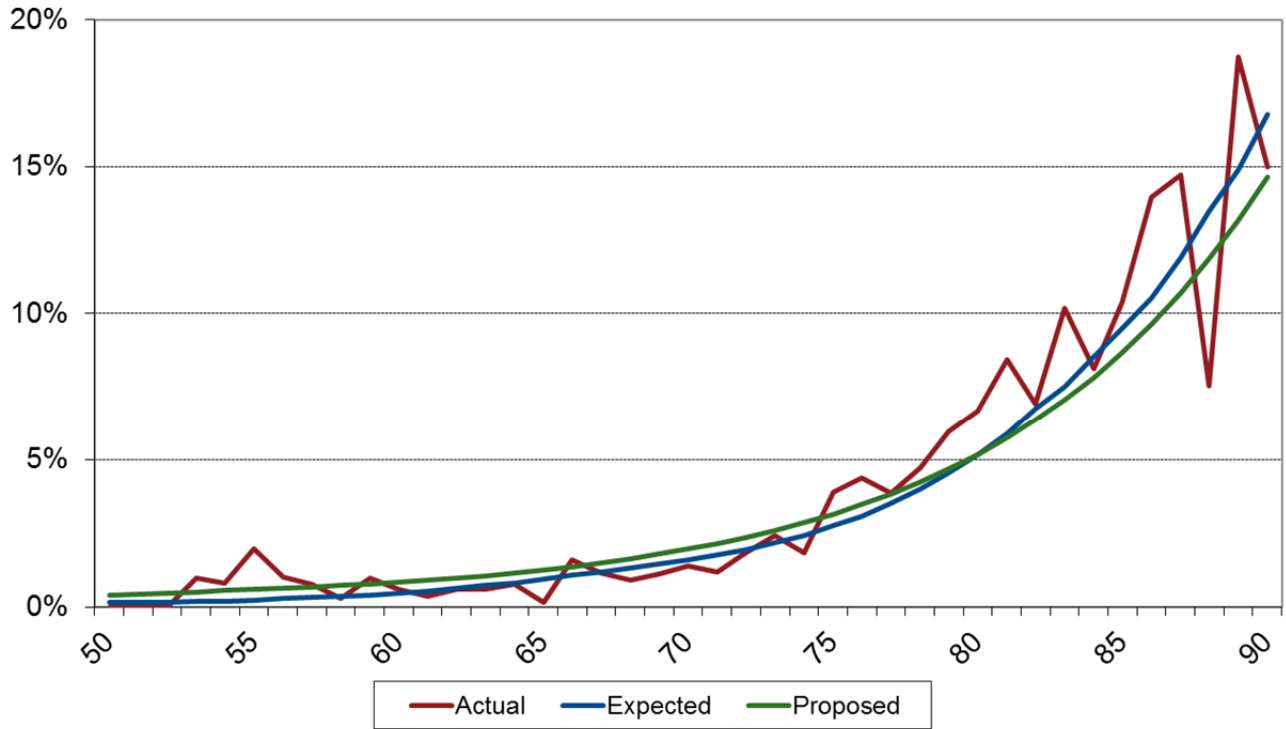
Age	Total Exposures	Actual Deaths	Actual Mortality Rate	Expected Deaths	Current Assumed Rate	Ratio of Actual Rate to Expected Rate	Proposed Mortality Rate
Under 50	109	1	0.92%	0.14	0.13%	707.81%	0.41%
50-54	440	2	0.45%	0.79	0.18%	254.54%	0.49%
55-59	1,360	12	0.88%	4.72	0.35%	254.23%	0.71%
60-64	2,988	18	0.60%	19.51	0.65%	92.25%	1.00%
65-69	2,554	25	0.98%	30.02	1.18%	83.27%	1.49%
70-74	1,914	33	1.72%	37.45	1.96%	88.11%	2.36%
75-79	1,345	61	4.54%	47.66	3.54%	127.99%	3.84%
80-84	932	74	7.94%	60.62	6.50%	122.08%	6.22%
85-89	361	46	12.74%	41.51	11.50%	110.81%	10.36%
90-94	107	23	21.50%	20.25	18.93%	113.57%	16.65%
95 & Over	5	1	20.00%	1.34	26.84%	74.50%	24.02%
<b>Total</b>	<b>12,115</b>	<b>296</b>	<b>2.44%</b>	<b>264.02</b>	<b>2.18%</b>	<b>112.11%</b>	<b>2.41%</b>

*Female*

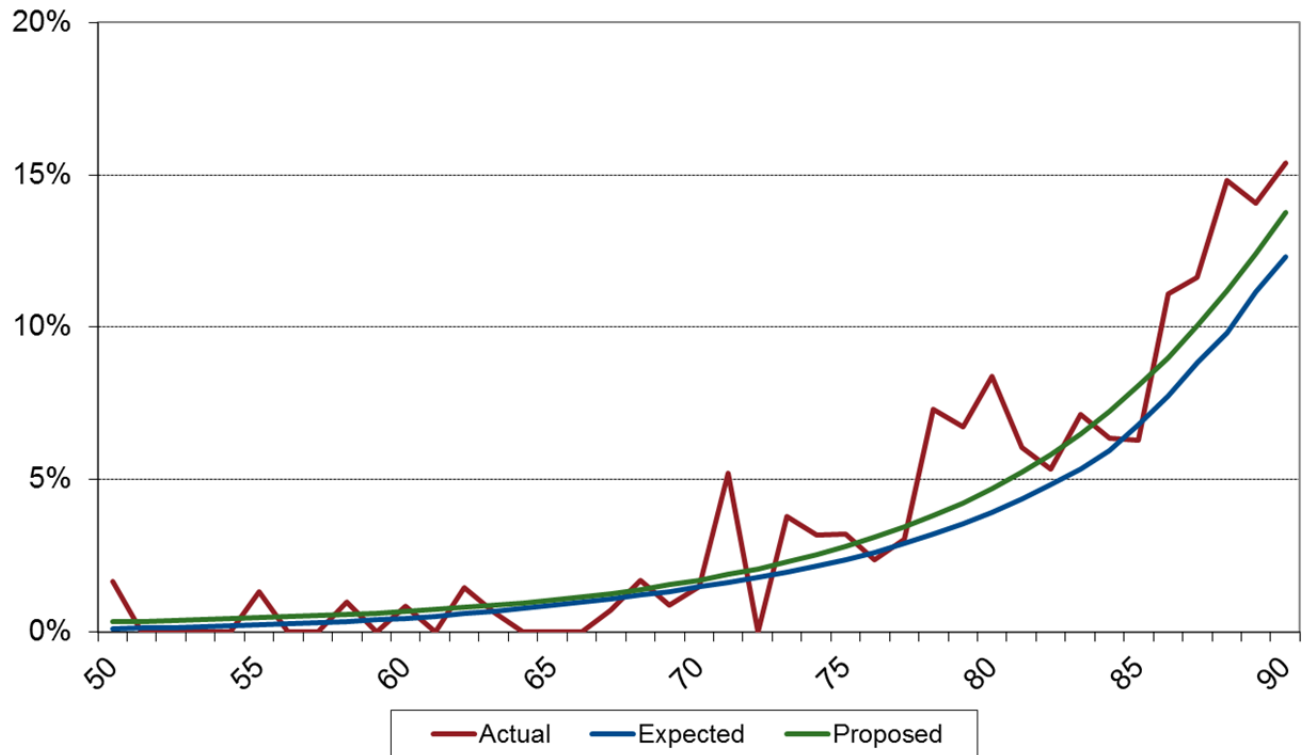
Age	Total Exposures	Actual Deaths	Actual Mortality Rate	Expected Deaths	Current Assumed Rate	Ratio of Actual Rate to Expected Rate	Proposed Mortality Rate
Under 50	115	0	0.00%	0.11	0.09%	0.00%	0.29%
50-54	371	1	0.27%	0.57	0.15%	175.72%	0.38%
55-59	466	2	0.43%	1.49	0.32%	134.09%	0.54%
60-64	695	4	0.58%	4.29	0.62%	93.26%	0.82%
65-69	669	4	0.60%	7.21	1.08%	55.45%	1.26%
70-74	656	18	2.74%	11.89	1.81%	151.35%	2.09%
75-79	654	30	4.59%	19.25	2.94%	155.87%	3.50%
80-84	648	43	6.64%	31.74	4.90%	135.47%	5.93%
85-89	499	55	11.02%	42.63	8.54%	129.02%	9.82%
90-94	195	27	13.85%	28.29	14.51%	95.45%	16.26%
95 & Over	45	14	31.11%	8.84	19.65%	158.33%	23.14%
<b>Total</b>	<b>5,013</b>	<b>198</b>	<b>3.95%</b>	<b>156.31</b>	<b>3.12%</b>	<b>126.67%</b>	<b>3.68%</b>

<b>Grand Total</b>	<b>17,128</b>	<b>494</b>	<b>2.88%</b>	<b>420.33</b>	<b>2.45%</b>	<b>117.53%</b>	<b>2.78%</b>
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**Graph 2A:  
POST-RETIREMENT HEALTHY MORTALITY RATES – MALE**



**Graph 2B:  
POST-RETIREMENT HEALTHY MORTALITY RATES – FEMALE**



## B. Turnover Rates

The assumed turnover rates used in annual actuarial valuations project the percentage of employees at each age or service duration who will terminate employment with Dallas's Police and Fire Departments before retirement. These rates take into account possible terminations from all causes other than retirement, disability or death. They include both voluntary and involuntary withdrawals from service.

The current assumed withdrawal rates are unisex and age-based with low rates for both groups (which is consistent with national trends for public safety). Police are assumed to more likely to terminate employment prior to retirement than Fire employees.

The expected number of terminations was lower than expected for Police and higher than expected for Fire overall. The pattern of terminations more closely correlated to service than age, although most terminations occurred prior to age 45. The Fire terminations were greater in early years of service, and lower after five years. As shown in the table below, the rate of terminations for Police was about 14% less than expected, while the rate for Fire was 19% more than expected.

Turnover	Actual Terminations	Expected Terminations	Ratio of Actual Terminations to Expected Terminations
Police	447	522.4	86%
Fire	119	100.4	119%
<b>Total</b>	<b>566</b>	<b>622.8</b>	<b>91%</b>

The proposed new assumption for both Police and Fire are based on service, and reflect the recent experience of each group individually. Both sets of rates cut off at Normal Retirement Age.

A comparison of the actual experience, current rates and proposed rates are shown in Tables 3A and 3B and Graphs 3A and 3B. *A complete table of current and proposed turnover rates is shown in Appendix C.*

**TABLE 3A**  
**TURNOVER EXPERIENCE**  
**For the Period January 1, 2010 through December 31, 2014**

*Police*

Years of Service	Total Exposures	Actual Turnover	Actual Turnover Rate	Expected Turnover	Current Assumed Rate	Ratio of Actual Rate to Expected Rate	Proposed Turnover Rate
0	879	124	14.11%	54.45	6.19%	227.73%	14.00%
1	923	48	5.20%	56.12	6.08%	85.53%	6.00%
2	1,008	49	4.86%	59.29	5.88%	82.64%	5.50%
3	1,181	62	5.25%	67.59	5.72%	91.73%	5.00%
4	1,032	48	4.65%	56.06	5.43%	85.99%	4.50%
5	802	36	4.49%	42.93	5.35%	83.86%	4.00%
6	609	17	2.79%	30.70	5.04%	55.37%	3.50%
7	509	15	2.95%	23.42	4.60%	64.05%	3.00%
8	453	8	1.77%	19.16	4.23%	41.75%	2.50%
9	425	3	0.71%	16.43	3.87%	18.26%	2.00%
10	408	5	1.23%	14.92	3.66%	33.51%	1.00%
11	409	12	2.93%	14.43	3.53%	83.16%	1.00%
12	352	5	1.42%	12.12	3.44%	41.25%	1.00%
13	323	3	0.93%	10.73	3.32%	27.96%	1.00%
14	318	4	1.26%	10.14	3.19%	39.45%	1.00%
15	288	2	0.69%	8.83	3.07%	22.65%	1.00%
16	218	0	0.00%	6.58	3.02%	0.00%	1.00%
17	180	0	0.00%	5.43	3.02%	0.00%	1.00%
18	216	4	1.85%	6.46	2.99%	61.92%	1.00%
19	220	0	0.00%	6.61	3.00%	0.00%	1.00%
<b>Total</b>	<b>10,744</b>	<b>447</b>	<b>4.16%</b>	<b>522.44</b>	<b>4.86%</b>	<b>85.56%</b>	<b>4.11%</b>

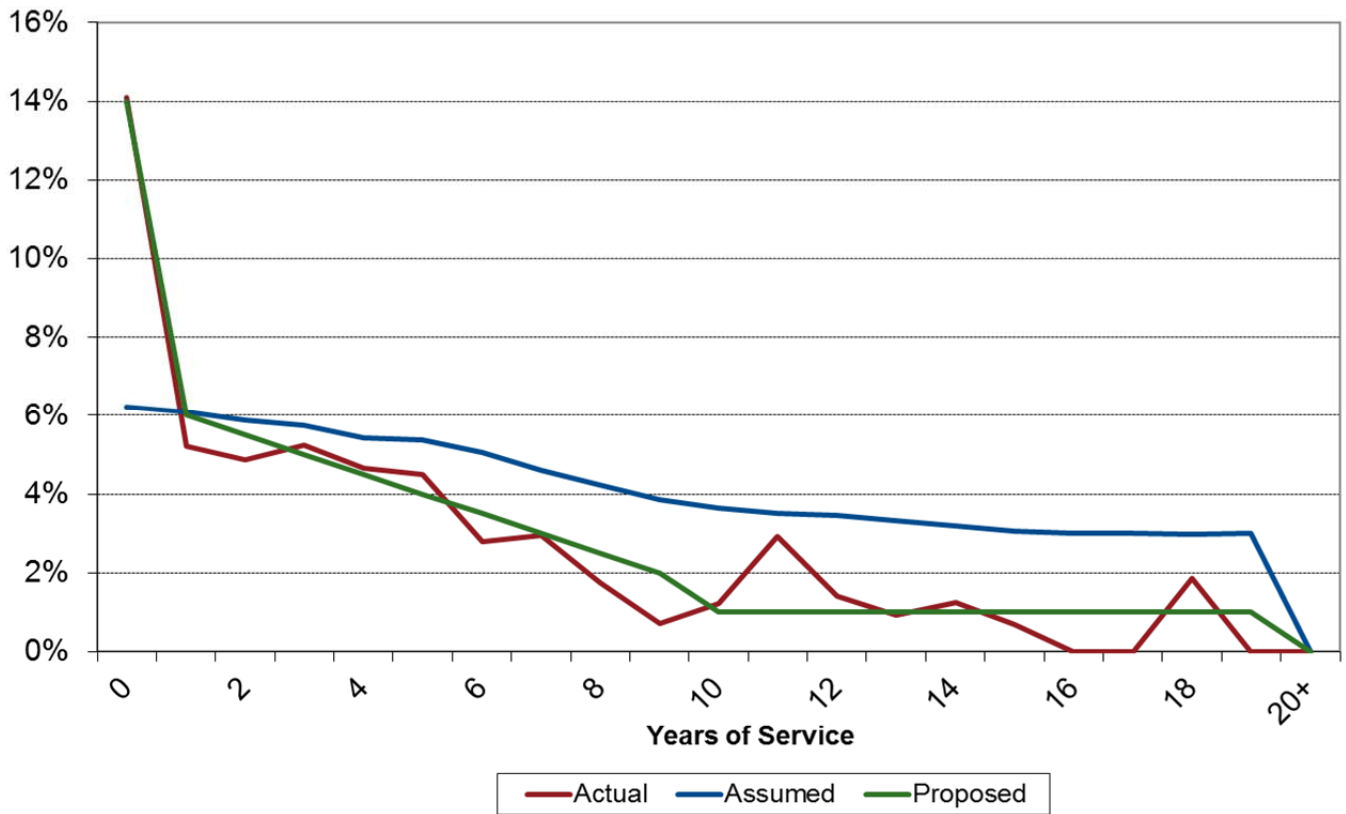
**TABLE 3B**  
**TURNOVER EXPERIENCE**  
**For the Period January 1, 2010 through December 31, 2014**

*Fire*

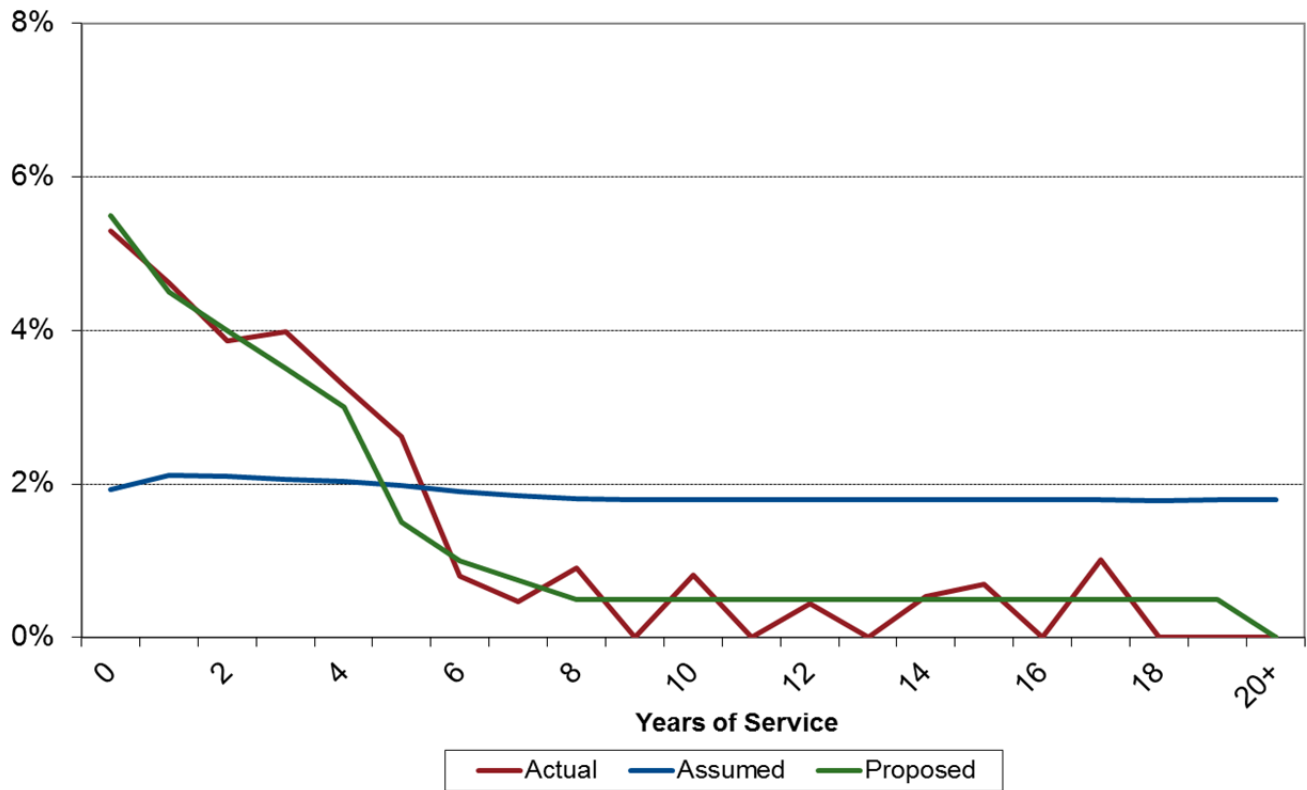
Years of Service	Total Exposures	Actual Turnover	Actual Turnover Rate	Expected Turnover	Current Assumed Rate	Ratio of Actual Rate to Expected Rate	Proposed Turnover Rate
0	491	26	5.30%	10.39	2.12%	250.29%	5.50%
1	519	24	4.62%	10.88	2.10%	220.55%	4.50%
2	518	20	3.86%	10.65	2.06%	187.81%	4.00%
3	401	16	3.99%	8.16	2.03%	196.13%	3.50%
4	396	13	3.27%	7.87	1.98%	165.27%	3.00%
5	343	9	2.62%	6.55	1.91%	137.43%	1.50%
6	249	2	0.80%	4.59	1.84%	43.60%	1.00%
7	214	1	0.47%	3.88	1.81%	25.79%	0.75%
8	221	2	0.90%	3.98	1.80%	50.28%	0.50%
9	243	0	0.00%	4.38	1.80%	0.00%	0.50%
10	244	2	0.82%	4.40	1.80%	45.49%	0.50%
11	249	0	0.00%	4.49	1.80%	0.00%	0.50%
12	224	1	0.45%	4.03	1.80%	24.80%	0.50%
13	206	0	0.00%	3.71	1.80%	0.00%	0.50%
14	186	1	0.54%	3.35	1.80%	29.87%	0.50%
15	143	1	0.70%	2.57	1.80%	38.85%	0.50%
16	130	0	0.00%	2.34	1.80%	0.00%	0.50%
17	99	1	1.01%	1.76	1.78%	56.69%	0.50%
18	84	0	0.00%	1.51	1.80%	0.00%	0.50%
19	49	0	0.00%	0.88	1.80%	0.00%	0.50%
<b>Total</b>	<b>5,210</b>	<b>119</b>	<b>2.28%</b>	<b>100.38</b>	<b>1.93%</b>	<b>118.58%</b>	<b>2.24%</b>



**GRAPH 3A:  
TURNOVER RATES – POLICE**



**GRAPH 3B:  
TURNOVER RATES – FIRE**



## C. Retirement Rates and DROP Utilization

Retirement eligibility for full unreduced benefits is age 50 with at least five years of pension service for active members hired prior to March 1, 2011. These individuals also have access to reduced early retirement benefits at age 45 with five years, or any age with twenty years of service. Members may enter DROP at age 50 or upon reaching twenty years of service.

Employees hired after February 28, 2011 are eligible for full benefits at age 55 with at least ten years of service; they do not have early retirement options. They may enter DROP upon reaching 55.

An accurate prediction of the ages at which members will retire is essential in order to obtain a realistic assessment of the system's liabilities for retirement benefits. Since retirement accounts for most of the plan's liability, it is important to review this assumption thoroughly in order to predict the relative importance of retirement benefits versus ancillary (i.e., death and disability) benefits, and to properly measure the overall magnitude of retirement liabilities.

The current table of assumed retirement rates is age-based, beginning at age 38 for employees with 20 years of service. The rates anticipate when an employee will cease employment, *not* when they enter DROP. The rates are low prior to age 55, and all employees are anticipated to be retired by age 65. There is no differentiation based on the tier of benefits in which an employee participates.

The number of retirements during the study period was less than expected (6% less for Police, and 31% for Fire). The number of retirements below age 50 was significantly less than expected. Firefighters, on average, retired two years later than Police Officers.

Retirement	Exposures	Actual Retirements	Expected Retirements	Ratio of Actual Retirements to Expected Retirements
Police	7,039	472	500.9	94%
Fire	4,130	287	418.9	69%
<b>Total</b>	<b>11,169</b>	<b>759</b>	<b>919.8</b>	<b>83%</b>

The actual number of retirements is shown in the table above. A total of 472 Police Officers and 287 Firefighters retired during the five-year study period. The average age at retirement for Police was 56.7. For Fire, the average age at retirement was 58.7.

Segal proposes separate tables of retirement rates for the Police Officers and Firefighters that capture the observed experience, with rates extending to age 67.

There is no limit to the number of years that members can remain in the DROP. The current assumption for DROP election is that 100% of employees will elect to enter at first eligibility for unreduced benefits. The data during the study period indicates that 95% of eligible Police and 98% of eligible Fire employees opted to enter DROP. We suggest maintaining the DROP utilization assumption of 100% at first eligibility.

Tables 4A and 4B and Graphs 4A and 4B display the actual, expected and new proposed retirement rates. *A complete table of current and proposed retirement rates is shown in Appendix D.*

**TABLE 4A:  
RETIREMENT EXPERIENCE  
FOR THE PERIOD JANUARY 1, 2010 THROUGH DECEMBER 31, 2014**

*Police*

Age	Total Exposures	Actual Retirements	Actual Retirement Rate	Expected Retirements	Current Assumed Rate	Ratio of Actual Rate to Expected Rate	Proposed Retirement Rate
40	6	1	16.67%	0.12	2.00%	833.33%	1.00%
41	16	0	0.00%	0.32	2.00%	0.00%	1.00%
42	67	0	0.00%	1.34	2.00%	0.00%	1.00%
43	147	5	3.40%	2.94	2.00%	170.07%	1.00%
44	211	1	0.47%	4.22	2.00%	23.70%	1.00%
45	546	3	0.55%	10.92	2.00%	27.47%	1.00%
46	534	3	0.56%	10.68	2.00%	28.09%	1.00%
47	550	5	0.91%	11.00	2.00%	45.45%	1.00%
48	546	9	1.65%	10.92	2.00%	82.42%	1.00%
49	547	6	1.10%	10.94	2.00%	54.84%	1.00%
50	530	13	2.45%	21.20	4.00%	61.32%	3.00%
51	524	18	3.44%	15.72	3.00%	114.50%	3.00%
52	487	19	3.90%	14.61	3.00%	130.05%	3.00%
53	436	24	5.50%	13.08	3.00%	183.49%	7.00%
54	377	31	8.22%	11.31	3.00%	274.09%	7.00%
55	339	49	14.45%	84.75	25.00%	57.82%	15.00%
56	265	55	20.75%	53.00	20.00%	103.77%	20.00%
57	198	39	19.70%	39.60	20.00%	98.48%	20.00%
58	159	39	24.53%	31.80	20.00%	122.64%	25.00%
59	142	40	28.17%	28.40	20.00%	140.85%	25.00%
60	112	31	27.68%	22.40	20.00%	138.39%	25.00%
61	81	20	24.69%	16.20	20.00%	123.46%	25.00%
62	69	21	30.43%	13.80	20.00%	152.17%	25.00%
63	56	13	23.21%	11.20	20.00%	116.07%	25.00%
64	42	12	28.57%	8.40	20.00%	142.86%	25.00%
65+	52	15	28.85%	52.00	100.00%	28.85%	50.00%
<b>Total</b>	<b>7,039</b>	<b>472</b>	<b>6.71%</b>	<b>500.87</b>	<b>7.12%</b>	<b>94.24%</b>	<b>6.67%</b>

Note: The proposed rates end with 100% at age 67.

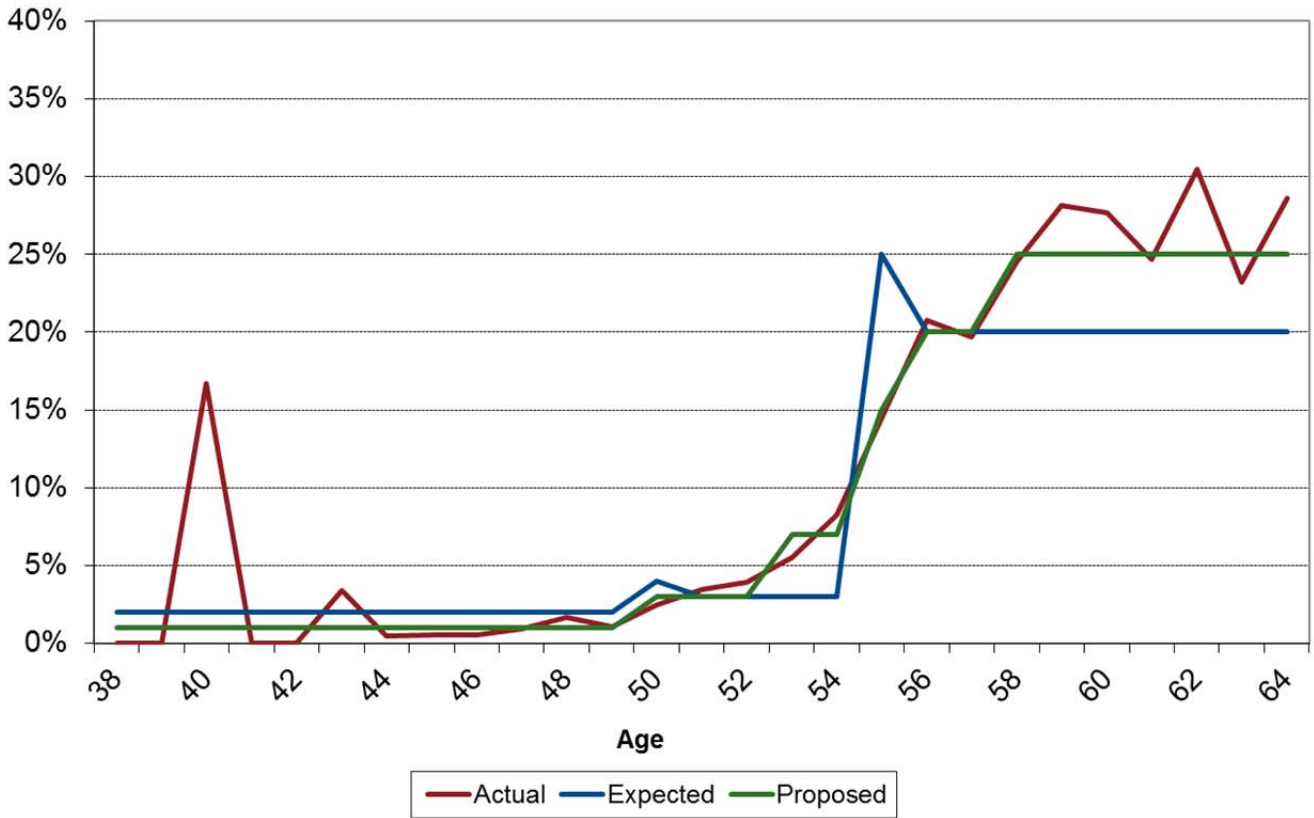
**TABLE 4B:  
RETIREMENT EXPERIENCE  
FOR THE PERIOD JANUARY 1, 2010 THROUGH DECEMBER 31, 2014**

*Fire*

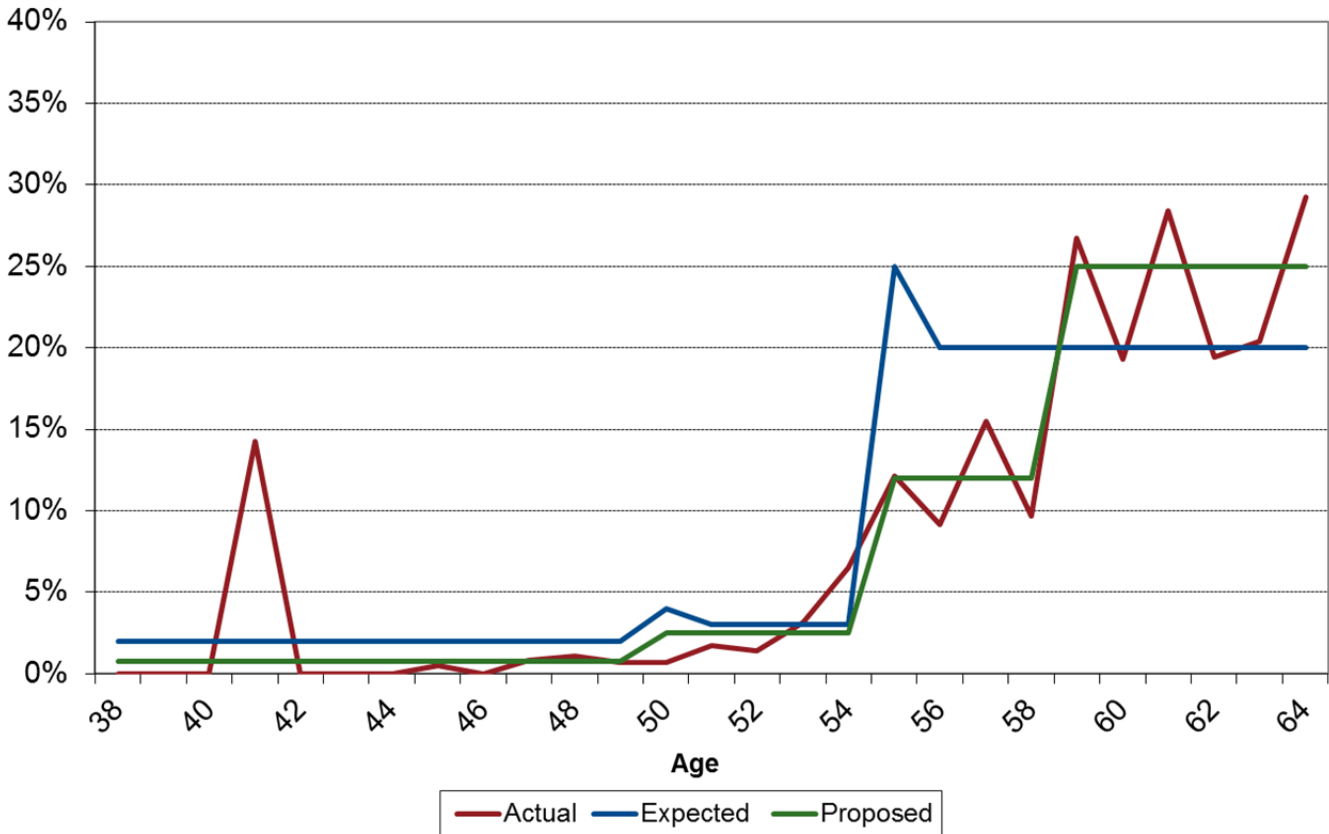
Age	Total Exposures	Actual Retirements	Actual Retirement Rate	Expected Retirements	Current Assumed Rate	Ratio of Actual Rate to Expected Rate	Proposed Retirement Rate
40	1	0	0.00%	0.02	2.00%	0.00%	0.75%
41	7	1	14.29%	0.14	2.00%	714.29%	0.75%
42	17	0	0.00%	0.34	2.00%	0.00%	0.75%
43	28	0	0.00%	0.56	2.00%	0.00%	0.75%
44	53	0	0.00%	1.06	2.00%	0.00%	0.75%
45	196	1	0.51%	3.92	2.00%	25.51%	0.75%
46	220	0	0.00%	4.40	2.00%	0.00%	0.75%
47	245	2	0.82%	4.90	2.00%	40.82%	0.75%
48	271	3	1.11%	5.42	2.00%	55.35%	0.75%
49	291	2	0.69%	5.82	2.00%	34.36%	0.75%
50	287	2	0.70%	11.48	4.00%	17.42%	2.50%
51	286	5	1.75%	8.58	3.00%	58.28%	2.50%
52	280	4	1.43%	8.40	3.00%	47.62%	2.50%
53	288	9	3.13%	8.64	3.00%	104.17%	2.50%
54	261	17	6.51%	7.83	3.00%	217.11%	2.50%
55	247	30	12.15%	61.75	25.00%	48.58%	12.00%
56	208	19	9.13%	41.60	20.00%	45.67%	12.00%
57	187	29	15.51%	37.40	20.00%	77.54%	12.00%
58	165	16	9.70%	33.00	20.00%	48.48%	12.00%
59	157	42	26.75%	31.40	20.00%	133.76%	25.00%
60	114	22	19.30%	22.80	20.00%	96.49%	25.00%
61	95	27	28.42%	19.00	20.00%	142.11%	25.00%
62	67	13	19.40%	13.40	20.00%	97.01%	25.00%
63	49	10	20.41%	9.80	20.00%	102.04%	25.00%
64	41	12	29.27%	8.20	20.00%	146.34%	25.00%
65+	69	21	30.43%	69.00	100.00%	30.43%	30.00%
<b>Total</b>	<b>4,130</b>	<b>287</b>	<b>6.95%</b>	<b>418.86</b>	<b>10.14%</b>	<b>68.52%</b>	<b>7.10%</b>

Note: The proposed rates end with 100% at age 67.

**GRAPH 4A:  
RETIREMENT RATES – POLICE**



**GRAPH 4B:  
RETIREMENT RATES – FIRE**



## D. Disability Rates

Disability rate tables function in the same way as mortality tables. The rate at each age indicates the probability of becoming disabled before the next age. Disability rates add liability for the value of the disability benefits, but lessen the value of retirement benefits ultimately payable, since anyone who becomes disabled is not projected to receive retirement benefits other than the disability benefit.

Dallas pension participants are eligible for disability benefits immediately upon membership. The disability rates are quite low, and the assumed rates for Fire are double those for Police. There were three Police disabilities in the study period, vs. 7.9 expected. There was one disability from the Fire group, vs. 7.4 expected. We recommend lower rates for both the Firefighters and Police Officers, and we further recommend a single table for both groups. The proposed disability tables are shown in *Appendix E*.

## E. Other Demographic Assumptions

It is assumed that 80% of members will be married at the time that they leave the plan. During the study period, 76% of those retiring were married. We recommend changing the assumed married percent to 75%.

The valuation calculations assume that female spouses will be three years younger than males. Based on the actual data on retirees, this assumption is reasonable, and no change is recommended.

The current valuation includes an 11% load on computation pay to reflect the City's additional contribution on overtime pay. Segal had limited data to analyze this assumption, but in the most recent financial year it appears that City contributions were about 16% greater than what would have been anticipated using computation pay. We are not recommending a change to the overtime load in this study. We will work with Plan Staff to analyze this further.

Note that overtime pay is not included in benefit calculations, and therefore the load for overtime pay has no impact on liabilities.

## IV. Actuarial Methods

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### A. Asset Smoothing

Actuarial Standard of Practice No. 44 (ASOP 44 - *Selection and Use of Asset Valuation Methods for Pension Valuations*) sets guidelines for selection of asset smoothing methods. This ASOP provides guidance in helping the actuary determine a “reasonable” smoothing period and corridor. In the text of this ASOP, it is stated that an actuary should select an asset valuation method that is designed to produce actuarial values of assets that bear a reasonable relationship to the corresponding market values.

The current asset valuation method is a ten-year smoothed value of assets, staying within a 20% corridor around market value. This method was adopted effective January 1, 2013, and was implemented retroactively to January 1, 2005. As of January 1, 2015, the actuarial value is equal to 120% of market value, with almost \$616 million in deferred losses yet to be recognized.

The advantage of an actuarial valuation method that recognizes investment returns over a period is a more stable (or level) actuarial rate of return and more predictable pension cost. Although ten-year smoothing is permissible, five-year smoothing is more common.

The System is implementing a new investment policy and asset allocation as part of strategic planning for the future. There have been significant write-downs in some of the asset holdings. Since these adjustments are not truly annual market losses, and are expected to be one-time events, we believe that they should be recognized immediately rather than lingering into the future.

We recommend that the System reset the actuarial value of assets to market value as of January 1, 2016, and implement a five-year smoothing method prospectively. Market gains and losses will be recognized at a rate of 20% each year. The actuarial value of assets will remain within a corridor of 80% to 120% of market value.

### B. Actuarial Cost Method

Actuarial cost methods (also sometimes called "funding methods") are techniques for budgeting the cost of a retirement program over the working lifetime of the covered population.

All actuarial cost methods produce a calculation called the *normal cost*. The normal cost represents the portion of the total present value of the retirement benefits allocated to the current valuation year by the particular method. For all actuarial cost methods, the accumulated value of the normal costs over the employees' careers will equal the present value of the retirement benefits. The key differences among the methods therefore relate to how the normal cost is determined.

The normal cost calculation can focus on one of two concepts:

- Budget the cost of benefits in relation to how the benefits actually accrue to the participant over time, or
- Budget the cost as a relatively level amount over the participant's career.

*Actuarial accrued liability* is the accumulated prior normal costs of the plan, adjusted for benefit payments and actuarial gains and losses. The *unfunded actuarial accrued liability* is the portion of the actuarial accrued liability not covered by the actuarial value of assets.

The Dallas Police and Fire Pension System's costs are currently calculated using the Entry Age Normal (EAN) method, which is the most commonly used method for public sector plans.

EAN is an individual cost method, and required contributions under this method are determined as the sum of the normal cost plus the amortization of the unfunded actuarial accrued liability. The normal cost is determined such that a discrete piece of the retirement benefit is allocated to each year of service of a plan participant, and the present value of that piece of benefit is separately computed and assigned to the year in which it is accrued or presumed to have accrued. The benefit values and allocations are determined with respect to each individual participant, and the resulting values are summed to determine the liability and cost of the plan as a whole.

Under EAN, the normal cost is determined by projecting the retirement benefit and the salary at retirement, and dividing the projected benefit by the projected salary. This percentage is multiplied by the current salary to obtain a dollar amount of normal cost. Under this method, an individual's cost should remain level as a percentage of payroll as he/she ages, provided that the actuarial assumptions are met. Any deviation from one year to the next is recognized as a source of gain or loss.

Under this method, a normal cost is calculated for each employee which is the level annual contribution as a percent of pay required to be made from the employee's date of hire for as long as he/she remains active so that sufficient assets will be accumulated to provide his/her benefit. The current actuarial cost method uses assumed salary rates to develop the normal cost. Each individual is valued using their own tier of benefit provisions under the plan.

We recommend continuation of the current method.

### C. Amortization of Unfunded Actuarial Accrued Liability

The amortization method for amortizing the unfunded actuarial accrued liability (UAAL) is based on a level percent-of-pay methodology, and we do not recommend a change in this policy.

In prior valuations, the recommended contribution was calculated using a rolling 30-year amortization period. The effective amortization period changes each year since the City and members contribute a percentage of total salary set by statute rather than the calculated cost.

Following the 125 basis-point change in the assumed discount rate last year, the effective amortization period for the System increased from 26 years to an infinite period. Resetting the actuarial value of assets to market value for the 2016 valuation will significantly increase the System's unfunded actuarial accrued liability, and further highlight the need to address the imbalance between the benefit levels in the System and the resources available to pay for them.

Under the guidelines set by the Texas Pension Review Board (PRB), the amortization period should not exceed 40 years. We suggest that the recommended contributions for the System be shown on a 40-year, level percent-of-pay amortization basis, and that the effective period derived from actual contributions into the System continue to be monitored.



# V. Appendices

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## Appendix A. Current and Proposed Salary Scale Rates

Service	Police		Fire	
	Current	Proposed	Current	Proposed
1	9.64%	5.20%	9.64%	5.20%
2	9.52%	5.00%	9.52%	5.05%
3	9.40%	4.80%	9.40%	4.90%
4	9.28%	4.60%	9.28%	4.75%
5	9.24%	4.40%	9.24%	4.60%
6	9.19%	4.20%	9.19%	4.45%
7	9.15%	4.00%	9.15%	4.30%
8	9.10%	3.80%	9.10%	4.15%
9	9.10%	3.60%	9.10%	4.00%
10	8.05%	3.40%	8.05%	3.85%
11	7.72%	3.20%	7.72%	3.70%
12	7.41%	3.00%	7.41%	3.55%
13	7.10%	3.00%	7.10%	3.40%
14	6.57%	3.00%	6.57%	3.25%
15	6.17%	3.00%	6.17%	3.10%
16	5.82%	3.00%	5.82%	3.00%
17	5.50%	3.00%	5.50%	3.00%
18	5.20%	3.00%	5.20%	3.00%
19	4.92%	3.00%	4.92%	3.00%
20	4.74%	3.00%	4.74%	3.00%
21	4.56%	3.00%	4.56%	3.00%
22	4.38%	3.00%	4.38%	3.00%
23	4.20%	3.00%	4.20%	3.00%
24	4.16%	3.00%	4.16%	3.00%
25	4.12%	3.00%	4.12%	3.00%
26	4.08%	3.00%	4.08%	3.00%
27	4.04%	3.00%	4.04%	3.00%
28	4.00%	3.00%	4.00%	3.00%
29	4.00%	3.00%	4.00%	3.00%
30 & over	4.00%	3.00%	4.00%	3.00%

## Appendix B. Current and Proposed Mortality Rates

Pre-Retirement Mortality <sup>1</sup>					Post-Retirement Healthy Mortality <sup>2</sup>					Disabled Annuitant Mortality <sup>3</sup>				
Age	Current		Proposed		Age	Current		Proposed		Age	Current		Proposed	
	Male	Female	Male	Female		Male	Female	Male	Female		Male	Female	Male	Female
20	0.02%	0.01%	0.03%	0.02%	45	0.11%	0.08%	0.41%	0.28%	40	0.11%	0.08%	0.96%	0.44%
21	0.02%	0.01%	0.04%	0.02%	46	0.12%	0.08%	0.41%	0.28%	41	0.12%	0.09%	1.00%	0.47%
22	0.03%	0.01%	0.04%	0.02%	47	0.12%	0.09%	0.41%	0.28%	42	0.13%	0.09%	1.04%	0.50%
23	0.03%	0.01%	0.04%	0.02%	48	0.13%	0.10%	0.41%	0.28%	43	0.14%	0.10%	1.10%	0.55%
24	0.03%	0.01%	0.05%	0.02%	49	0.14%	0.10%	0.41%	0.30%	44	0.15%	0.11%	1.18%	0.60%
25	0.03%	0.02%	0.05%	0.02%	50	0.14%	0.11%	0.41%	0.33%	45	0.16%	0.12%	1.27%	0.66%
26	0.03%	0.02%	0.05%	0.02%	51	0.16%	0.13%	0.44%	0.35%	46	0.17%	0.13%	1.39%	0.73%
27	0.03%	0.02%	0.05%	0.02%	52	0.17%	0.15%	0.47%	0.38%	47	0.19%	0.14%	1.53%	0.81%
28	0.04%	0.02%	0.05%	0.02%	53	0.19%	0.17%	0.52%	0.40%	48	0.20%	0.16%	1.70%	0.90%
29	0.04%	0.02%	0.04%	0.02%	54	0.20%	0.19%	0.56%	0.43%	49	0.21%	0.17%	1.77%	0.96%
30	0.04%	0.02%	0.04%	0.02%	55	0.24%	0.23%	0.60%	0.46%	50	0.24%	0.19%	1.84%	1.02%
31	0.04%	0.03%	0.04%	0.02%	56	0.28%	0.27%	0.64%	0.49%	51	0.27%	0.20%	1.91%	1.08%
32	0.05%	0.03%	0.05%	0.02%	57	0.32%	0.31%	0.69%	0.53%	52	0.29%	0.22%	1.98%	1.14%
33	0.06%	0.03%	0.05%	0.03%	58	0.37%	0.35%	0.74%	0.57%	53	0.32%	0.24%	2.04%	1.19%
34	0.06%	0.03%	0.05%	0.03%	59	0.42%	0.40%	0.79%	0.62%	54	0.36%	0.27%	2.10%	1.25%
35	0.07%	0.04%	0.05%	0.03%	60	0.47%	0.45%	0.85%	0.67%	55	0.42%	0.31%	2.16%	1.30%
36	0.08%	0.04%	0.05%	0.03%	61	0.55%	0.52%	0.91%	0.73%	56	0.47%	0.35%	2.22%	1.35%
37	0.08%	0.04%	0.05%	0.03%	62	0.63%	0.60%	0.98%	0.80%	57	0.53%	0.39%	2.28%	1.40%
38	0.08%	0.04%	0.05%	0.03%	63	0.73%	0.69%	1.07%	0.87%	58	0.59%	0.44%	2.34%	1.45%
39	0.09%	0.05%	0.06%	0.04%	64	0.83%	0.77%	1.16%	0.96%	59	0.67%	0.51%	2.40%	1.50%
40	0.09%	0.05%	0.06%	0.04%	65	0.93%	0.87%	1.26%	1.05%	60	0.77%	0.58%	2.46%	1.54%
41	0.09%	0.06%	0.06%	0.04%	66	1.08%	0.98%	1.38%	1.15%	61	0.88%	0.67%	2.52%	1.59%
42	0.10%	0.06%	0.06%	0.05%	67	1.21%	1.09%	1.50%	1.27%	62	1.00%	0.76%	2.59%	1.64%
43	0.10%	0.07%	0.07%	0.05%	68	1.31%	1.20%	1.64%	1.40%	63	1.13%	0.86%	2.66%	1.70%
44	0.11%	0.07%	0.07%	0.06%	69	1.45%	1.33%	1.80%	1.54%	64	1.27%	0.97%	2.74%	1.76%
45	0.11%	0.08%	0.08%	0.07%	70	1.59%	1.50%	1.97%	1.70%	65	1.44%	1.10%	2.83%	1.83%
46	0.12%	0.08%	0.09%	0.07%	71	1.76%	1.63%	2.16%	1.88%	66	1.61%	1.22%	2.93%	1.90%
47	0.12%	0.09%	0.10%	0.08%	72	1.96%	1.81%	2.37%	2.08%	67	1.79%	1.34%	3.04%	1.99%
48	0.13%	0.10%	0.11%	0.09%	73	2.18%	1.97%	2.60%	2.30%	68	1.98%	1.49%	3.17%	2.09%
49	0.14%	0.10%	0.12%	0.10%	74	2.43%	2.18%	2.86%	2.54%	69	2.22%	1.67%	3.31%	2.20%
50	0.14%	0.11%	0.14%	0.11%	75	2.77%	2.36%	3.15%	2.81%	70	2.46%	1.86%	3.46%	2.33%
51	0.16%	0.13%	0.15%	0.12%	76	3.09%	2.60%	3.47%	3.11%	71	2.73%	2.07%	3.64%	2.47%
52	0.17%	0.15%	0.17%	0.13%	77	3.52%	2.92%	3.83%	3.44%	72	3.04%	2.30%	3.83%	2.63%
53	0.19%	0.17%	0.19%	0.14%	78	4.00%	3.22%	4.24%	3.82%	73	3.39%	2.55%	4.03%	2.82%
54	0.20%	0.19%	0.21%	0.15%	79	4.54%	3.56%	4.69%	4.24%	74	3.78%	2.81%	4.26%	3.03%
55	0.24%	0.23%	0.23%	0.17%	80	5.16%	3.93%	5.19%	4.71%	75	4.22%	3.10%	4.52%	3.26%
56	0.28%	0.27%	0.25%	0.18%	81	5.90%	4.35%	5.74%	5.24%	76	4.69%	3.41%	4.79%	3.51%
57	0.32%	0.31%	0.28%	0.19%	82	6.74%	4.82%	6.36%	5.83%	77	5.21%	3.76%	5.10%	3.80%
58	0.37%	0.35%	0.31%	0.21%	83	7.52%	5.36%	7.06%	6.50%	78	5.79%	4.15%	5.43%	4.10%
59	0.42%	0.40%	0.34%	0.23%	84	8.55%	5.96%	7.83%	7.25%	79	6.44%	4.59%	5.79%	4.44%
60	0.47%	0.45%	0.38%	0.24%	85	9.49%	6.78%	8.68%	8.08%	80	7.20%	5.08%	6.19%	4.81%
61	0.55%	0.52%	0.42%	0.26%	86	10.52%	7.74%	9.64%	9.00%	81	8.05%	5.63%	6.64%	5.21%
62	0.63%	0.60%	0.47%	0.29%	87	11.92%	8.82%	10.70%	10.04%	82	8.97%	6.25%	7.12%	5.64%
63	0.73%	0.69%	0.52%	0.31%	88	13.49%	9.82%	11.88%	11.19%	83	9.98%	6.95%	7.66%	6.10%
64	0.83%	0.77%	0.59%	0.34%	89	14.90%	11.15%	13.19%	12.43%	84	11.08%	7.74%	8.26%	6.61%
65	0.93%	0.87%	0.66%	0.37%	90	16.79%	12.33%	14.64%	13.76%	85	12.28%	8.64%	8.91%	7.15%
66	1.08%	0.98%	0.74%	0.41%	91	18.29%	13.54%	16.18%	15.16%	86	13.60%	9.63%	9.64%	7.74%
67	1.21%	1.09%	0.83%	0.46%	92	20.28%	14.75%	17.77%	16.63%	87	15.06%	10.73%	10.44%	8.37%
68	1.31%	1.20%	0.92%	0.51%	93	21.87%	16.31%	19.38%	18.16%	88	16.64%	11.92%	11.33%	9.04%
69	1.45%	1.33%	1.02%	0.57%	94	23.47%	17.49%	21.02%	19.75%	89	18.34%	13.17%	12.31%	9.77%
70	1.59%	1.50%	1.13%	0.63%	95	25.60%	18.61%	22.67%	21.40%	90	19.98%	14.46%	13.39%	10.55%

<sup>1</sup> Pre-retirement mortality rates are based on the RP-2014 Employee Mortality table, with male rates set back two years.

<sup>2</sup> Post-retirement mortality rates are based on the RP-2014 Blue Collar Healthy Annuitant Mortality table, with female rates set forward two years.

<sup>3</sup> Disabled mortality rates are based on the RP-2014 Disabled Annuitant Mortality table, set back three years for males and females.

NOTE: Proposed rates shown above do not include generational projections.

## Appendix C. Current and Proposed Turnover Rates

Age	Police	Fire
	Current	Current
20	7.00%	2.30%
21	7.00%	2.30%
22	7.00%	2.30%
23	7.00%	2.30%
24	7.00%	2.30%
25	7.00%	2.30%
26	7.00%	2.30%
27	7.00%	2.30%
28	7.00%	2.30%
29	7.00%	2.30%
30	7.00%	1.80%
31	6.00%	1.80%
32	5.00%	1.80%
33	4.00%	1.80%
34	4.00%	1.80%
35	4.00%	1.80%
36	4.00%	1.80%
37	4.00%	1.80%
38	3.00%	1.80%
39	3.00%	1.80%
40	3.00%	1.80%
41	3.00%	1.80%
42	3.00%	1.80%
43	3.00%	1.80%
44	3.00%	1.80%
45	2.00%	1.80%
46	2.00%	1.80%
47	2.00%	1.80%
48	2.00%	1.80%
49	2.00%	1.80%

Service	Police	Fire
	Proposed	Proposed
0	14.00%	5.50%
1	6.00%	4.50%
2	5.50%	4.00%
3	5.00%	3.50%
4	4.50%	3.00%
5	4.00%	1.50%
6	3.50%	1.00%
7	3.00%	0.75%
8	2.50%	0.50%
9	2.00%	0.50%
10	1.00%	0.50%
11	1.00%	0.50%
12	1.00%	0.50%
13	1.00%	0.50%
14	1.00%	0.50%
15	1.00%	0.50%
16	1.00%	0.50%
17	1.00%	0.50%
18	1.00%	0.50%
19	1.00%	0.50%

## Appendix D. Current and Proposed Retirement Rates

Age	Police		Fire	
	Current	Proposed	Current	Proposed
45 or less	2.00%	1.00%	2.00%	0.75%
46	2.00%	1.00%	2.00%	0.75%
47	2.00%	1.00%	2.00%	0.75%
48	2.00%	1.00%	2.00%	0.75%
49	2.00%	1.00%	2.00%	0.75%
50	4.00%	3.00%	4.00%	2.50%
51	3.00%	3.00%	3.00%	2.50%
52	3.00%	3.00%	3.00%	2.50%
53	3.00%	7.00%	3.00%	2.50%
54	3.00%	7.00%	3.00%	2.50%
55	25.00%	15.00%	25.00%	12.00%
56	20.00%	20.00%	20.00%	12.00%
57	20.00%	20.00%	20.00%	12.00%
58	20.00%	25.00%	20.00%	12.00%
59	20.00%	25.00%	20.00%	25.00%
60	20.00%	25.00%	20.00%	25.00%
61	20.00%	25.00%	20.00%	25.00%
62	20.00%	25.00%	20.00%	25.00%
63	20.00%	25.00%	20.00%	25.00%
64	20.00%	25.00%	20.00%	25.00%
65	100.00%	50.00%	100.00%	30.00%
66	100.00%	50.00%	100.00%	30.00%
67	100.00%	100.00%	100.00%	100.00%

## Appendix E. Current and Proposed Disability Rates

Age	Police		Fire	
	Current	Proposed	Current	Proposed
20	0.035%	0.100%	0.070%	0.100%
21	0.035%	0.110%	0.071%	0.110%
22	0.036%	0.120%	0.072%	0.120%
23	0.036%	0.130%	0.073%	0.130%
24	0.037%	0.140%	0.074%	0.140%
25	0.037%	0.150%	0.075%	0.150%
26	0.038%	0.160%	0.076%	0.160%
27	0.039%	0.170%	0.078%	0.170%
28	0.040%	0.180%	0.080%	0.180%
29	0.041%	0.190%	0.082%	0.190%
30	0.042%	0.200%	0.084%	0.200%
31	0.043%	0.210%	0.085%	0.210%
32	0.044%	0.220%	0.088%	0.220%
33	0.045%	0.230%	0.090%	0.230%
34	0.046%	0.240%	0.093%	0.240%
35	0.048%	0.250%	0.096%	0.250%
36	0.050%	0.260%	0.099%	0.260%
37	0.051%	0.270%	0.103%	0.270%
38	0.053%	0.280%	0.107%	0.280%
39	0.055%	0.290%	0.111%	0.290%
40	0.057%	0.300%	0.115%	0.300%
41	0.059%	0.310%	0.118%	0.310%
42	0.064%	0.320%	0.128%	0.320%
43	0.069%	0.330%	0.138%	0.330%
44	0.074%	0.340%	0.148%	0.340%
45	0.079%	0.350%	0.158%	0.350%
46	0.084%	0.360%	0.168%	0.360%
47	0.089%	0.370%	0.178%	0.370%
48	0.094%	0.380%	0.188%	0.380%
49	0.099%	0.390%	0.198%	0.390%

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