City of Plano, Texas Retirement Security Plan

Actuarial Experience Study
As of December 31, 2016

DRAFT

GRS

August 9, 2017

Ms. Andrea Cockrell
Administrative Services Manager
City of Plano
1520 Ave. K, Ste. 130
Plano, TX 75074

**Subject:** **Results of 2017 Actuarial Experience Study**

Dear Andrea:

We are pleased to present our report on the results of the 2017 Actuarial Experience Study for the City of Plano, Texas Retirement Security Plan ("RSP").   It includes our recommendations for new actuarial assumptions and methods to be effective for the December 31, 2017 actuarial valuation, and it describes the actuarial impact produced by these recommendations as though they had been effective for the most recent actuarial valuation as of December 31, 2015.

With the Retirement Committee's approval of the recommendations in this report, we believe the actuarial condition of the RSP will be more accurately portrayed. The Retirement Committee's decisions should be based on the appropriateness of each recommendation individually, not on their collective effect on the City's contribution requirement or the unfunded liability.

This study was conducted in accordance with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board. The undersigned are independent of the plan sponsor. Mr. White is an Enrolled Actuary, Fellow of the Society of Actuaries, and Member of the American Academy of Actuaries, and meets the Qualification Standards of the American Academy of Actuaries. Finally, both of the undersigned are experienced in performing valuations for large public retirement systems.

Respectfully submitted,
Gabriel, Roeder, Smith & Company
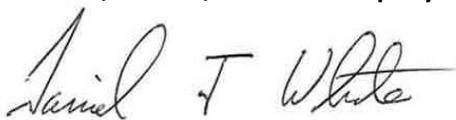
Daniel J. White, FSA, EA, MAAA
Senior Consultant & Actuary
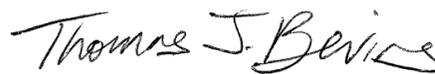
Thomas J. Bevins
Senior Analyst

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SECTION A

EXECUTIVE SUMMARY

Summary of Recommendations

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

Economic Assumptions

1. We recommend decreasing the nominal investment return assumption from 7.50% to no greater than 7.00%, with the consideration of a decrease to 6.75%. Cost impacts are shown in this report at both 6.75% and 7.00%.

2. We recommend decreasing the price inflation assumption from 2.75% to 2.50%.

3. We recommend minor decreases to the step/promotional rates in the individual salary increase assumption for most participants. We recommend including a productivity component above the 2.50% inflation assumption of 0.25% for all participants.

4. We recommend decreasing the Cost of Living Adjustment (COLA) assumption from 2.70% to 2.50% to correspond with the new 2.50% price inflation assumption.

5. We recommend decreasing the payroll growth assumption from 3.25% to 2.75%. This assumption does not have an impact on the actuarial accrued liability, but is only used in the development of the cost of amortizing the unfunded actuarial accrued liability.

Demographic Assumptions

6. We recommend no change to the mortality assumptions (i.e. pre-retirement, disabled retirement, and nondisabled retirees).

7. We recommend using a termination assumption that is based on the employee's age. The recommended assumption also increases the expected number of employees who will leave employment prior to attaining retirement age.

8. We recommend small adjustments in the overall retirement assumption used to model the pattern for City employees to retire and commence their RSP benefit.

9. We recommend reducing the probabilities that employees will become disabled and commence a disability retirement benefit.

Other Assumptions and Methods

10. We recommend no change to the asset smoothing method.

11. We recommend no change to the actuarial cost method. The method currently used is the Individual Entry Age (IEAN) actuarial cost method.

12. We recommend no change to the RSP's current funding policy.

Cost Impact

Item	Actuarial Valuation results as of December 31, 2015	All Proposed Changes with 7.00%	All Proposed Changes with 6.75%
Normal Cost Rate	3.56%	3.21%	3.42%
Actuarial Accrued Liability (AAL)	$ 123.0	$ 126.0	$ 130.4
Unfunded AAL (UAAL)	$ 0.9	$ 4.0	$ 8.4
Funded Ratio	99.2%	96.8%	93.6%
Projected 2017 Payroll	$ 134.7	$ 134.0	$ 134.0
Funding Cost as % of pay	3.62%	3.44%	3.90%
FY 2017 Funding Cost $	$ 4.9	$ 4.6	$ 5.2

$ in Millions

Cost impact based on the Actuarial Value of Assets of $122,044,321 as of December 31, 2015.

SECTION B

INTRODUCTION

Introduction

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

A single set of assumptions is typically not expected to be suitable forever. As the actual experience unfolds or the future expectations change, the assumptions should be reviewed and adjusted accordingly.

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

Using this strategic mindset, each assumption was analyzed compared to the actual experience of the RSP and general experience of other large public employee retirement systems. Changes in certain assumptions and methods are suggested upon this comparison to remove any bias that may exist and to perhaps add in a slight margin for future adverse experience where appropriate. Next, the assumption set as a whole was analyzed for consistency and to ensure that the projection of liabilities was reasonable and consistent with historical trends.

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

Summary of Process

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

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

For some of these assumptions, such as the mortality rates, past experience provides important evidence about the future. For others, such as the investment return assumption, the link between past and future results is much weaker. In either case, actuaries should review the plan's assumptions periodically and

determine whether these assumptions are consistent with actual past experience and with anticipated future experience.

The last actuarial experience investigation was completed in November 2010 and first utilized to prepare the actuarial valuation as of December 31, 2009. However, the mortality assumptions as well as the price inflation assumption and investment return assumption were updated for use in the most recent actuarial valuation as of December 31, 2015.

For this experience study, we have reviewed the experience of employees and retirees for the five-year period from December 31, 2011 through December 31, 2016. For the purpose of determining salary increase rates, we reviewed RSP's experience for the ten-year period from December 31, 2006 through December 31, 2016. The City only provides us census data on RSP plan participants every other year. Since GRS is the actuary for the Texas Municipal Retirement System (TMRS), of which the City is a participating employer, we have used the City's census data in TMRS, which we have reconciled annually, as a substitution to the data available on the RSP to review the demographic behavior for City employees earning benefits in the RSP. While part-time City employees do not earn retirement benefits in the RSP, we believe this data is reasonable for reviewing the demographic assumptions used in the valuation of the RSP. On the other hand, since we do receive salary information on an annual basis for RSP participants, we have utilized this information for the purpose of reviewing and developing recommended rates of salary increases for employees earning benefits in the RSP.

In an experience study, we first determine the number of deaths, retirements, etc. that occurred during the period. Then we determine the number expected to occur, based on the current actuarial assumptions. The number of "expected" decrements is determined by multiplying the probability of the occurrence at the given age, by the "exposures" at that same age. For example, let's consider a rate of retirement at age 60. The number of exposures can only be those participants who are age 60 and eligible for retirement at that time. Thus, they are considered "exposed" to that assumption. Finally, we calculate the A/E ratio, where "A" is the actual number (of retirements, for example) and "E" is the expected number. If the current assumptions were "perfect", the A/E ratio would be 100%. When it varies much from this figure, it is a sign that new assumptions may be needed. (However, in some cases we prefer to set our assumptions to produce an A/E ratio a little above or below 100%, in order to introduce some conservatism.) Of course we not only look at the assumptions as a whole, but we also review how well they fit the actual results by gender, by age, and by service.

If the analysis leads us to conclude that new assumptions are needed, we may "graduate" or smooth the results, since the raw results can be quite uneven from age to age or from service to service. Please bear in mind that, while the recommended assumption set represents our best estimate, there are other reasonable assumptions sets that could be supported. Some reasonable assumption sets would show higher or lower liabilities or costs.

Section E Exhibits

The exhibits in Section E should generally be self-explanatory. The exhibits illustrate a graphical representation comparing the actual experience to both the current and proposed rate tables that have been updated as a result of this experience study: retirement rates, rates of withdrawal (termination), and salary increase rates. Tables in which the assumption was set to match that of TMRS are not shown.

SECTION C

ANALYSIS OF EXPERIENCE AND RECOMMENDATIONS

Analysis of Experience and Recommendations

We will begin by discussing the economic assumptions: inflation, the investment return rate, the salary increase assumption for individuals, cost-of-living increases, and the payroll growth rate used for projecting total contributions. Then we will discuss the demographic assumptions: mortality, disability, termination, and retirement. Finally we will discuss the actuarial methods used.

Inflation and Investment Return Assumptions

Actuarial Standards of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries on giving advice on selecting economic assumptions for measuring obligations for defined benefit plans.

As no one knows what the future holds, it is necessary for an actuary to estimate possible future economic outcomes. Recognizing that there is not one right answer, the current standard calls for an actuary to develop a reasonable economic assumption. A reasonable assumption is one that is:

1. appropriate for the purpose of the measurement,
2. reflects the actuary's professional judgment,
3. takes into account historical and current economic data that is relevant as of the measurement date,
4. is an estimate of future experience; an observation of market data; or a combination thereof,
5. and has no significant bias except when provisions for adverse deviation or plan provisions that are difficult to measure are included.

However, the standard explicitly advises an actuary not to give undue weight to recent experience.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period. Generally, the economic assumptions are much more subjective in nature than the demographic assumptions.

Inflation Assumption

Since the RSP has a cost of living adjustment that is based on the change in the "Consumer Price Index for Urban Wage Earners and Clerical Workers", or CPI-W, we mean price inflation as measured by annual change in CPI-W. However, for the purpose of this analysis, reviewing expected changes in CPI-U can also be useful as changes in CPI-U and CPI-W track closely with each other. The annual inflation assumption used in the December 31, 2015 actuarial valuation was 2.75%, which was 0.25% lower than the 3.00% inflation used in the December 31, 2013 actuarial valuation.

The following chart shows the average annual inflation, as measured by the increase in the Consumer Price Index (CPI-W), in each of the ten consecutive five-year periods over the last fifty years.

Average Annual Inflation
CPI-W, Five-Year Averages
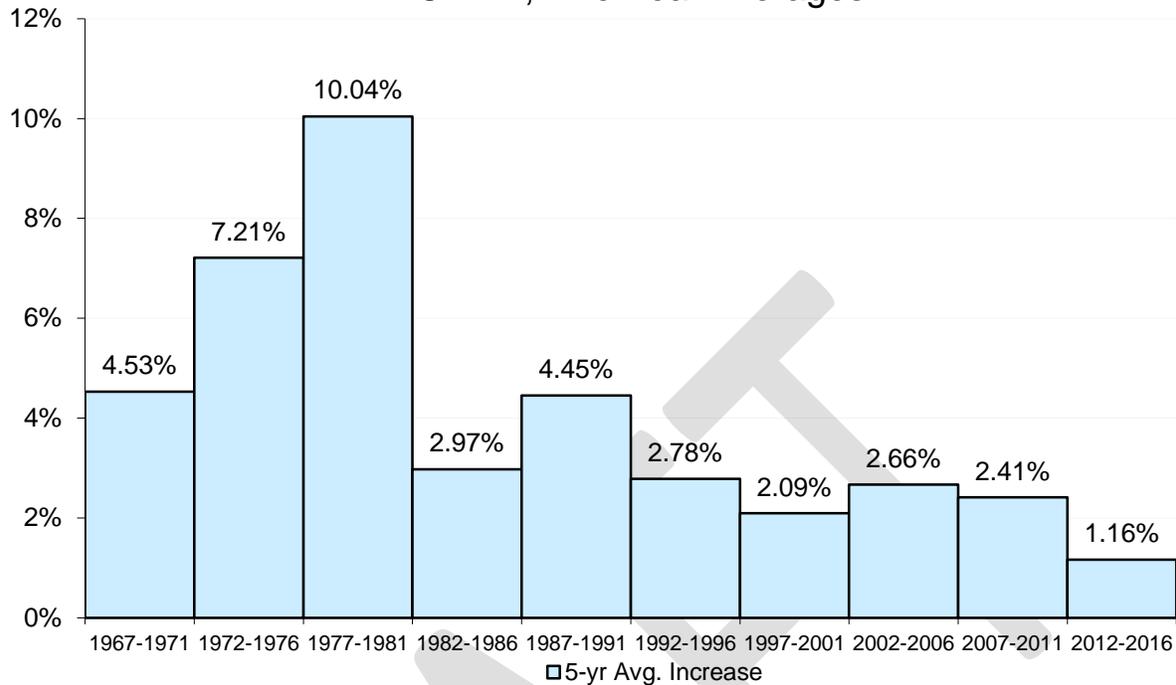
Source: Bureau of Labor Statistics, CPI-W, not seasonally adjusted, Calendar Years

The table below shows the average inflation over various periods, ending December 2016.

Periods Ending Dec. 2016	Average Annual Increase in CPI-W
Last five (5) years	1.16%
Last ten (10) years	1.79%
Last fifteen (15) years	2.08%
Last twenty (20) years	2.08%
Last twenty-five (25) years	2.22%
Last thirty (30) years	2.59%
Since 1913 (first available year)	3.11%

Source: Bureau of Labor Statistics, CPI-W, not seasonally adjusted, Calendar Years

As you can see, inflation has been relatively low over the last twenty-five years, and historically so over the past ten years.

Forecasts from Investment Consulting Firms

We examined the 2017 capital market assumption sets for five investment consulting firms, one of which is RV Kuhns, the RSP's current Investment Consultant. RV Kuhns' inflation assumption is 2.50%. The average of the other four firms is 2.29%, with an overall average of 2.33% among the five firms. We should note that

the expectations developed by most investment consulting firms is for a 7 to 10 year period, which is much shorter than the duration of the liability and benefits provided by the RSP.

Expectations Implied in the Bond Market

Another source of information about future inflation is the market for US Treasury bonds. Simplistically, the difference in yield between non-indexed and indexed treasury bonds should be a reasonable estimate of what the bond market expects on a forward looking basis for inflation. As of the end of April, the difference for 20-year bonds implies that inflation over the next twenty years would average 2.06%. The difference in yield for 30-year bonds implies 2.23% inflation over the next 30 years. The chart below shows the historical market implied inflation from January 1, 2003 through April 30, 2017.

Market Implied Inflation - US Treasury Bond Market

Legend: - - - Implied Inflation 20-year Bonds   —— Implied Inflation 30-Year Bonds
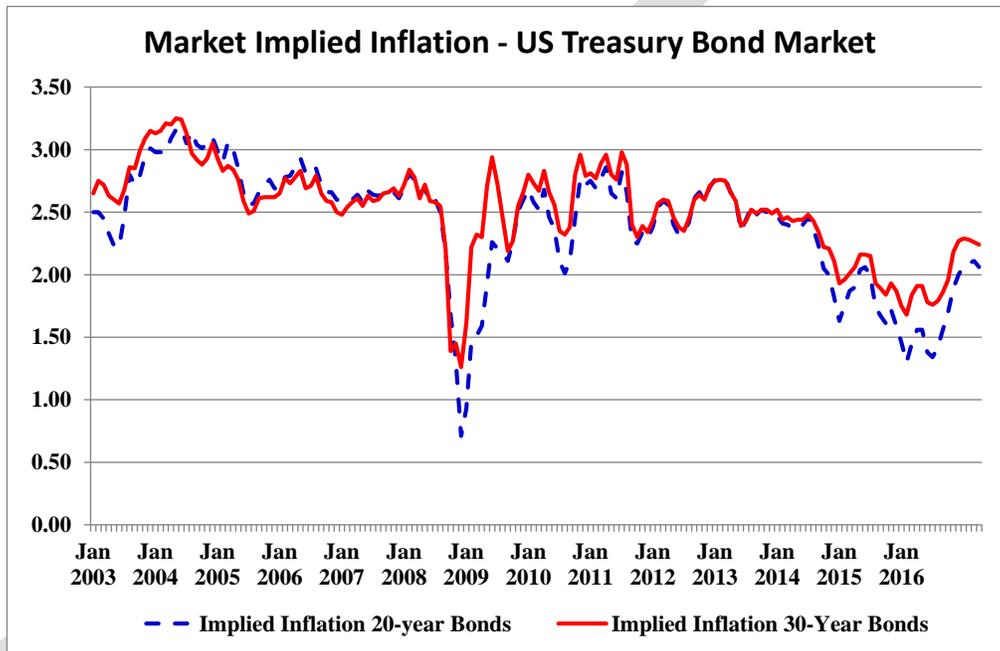
However, this analysis is known to be imperfect as it ignores the inflation risk premium that buyers of US Treasury bonds often demand as well as possible differences in liquidity between US Treasury bonds and TIPS. Also, notice the strong increase in this spread since the election.

Forecasts from Social Security Administration

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

Survey of Professional Forecasters and Federal Policy

The Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters. Their most recent forecast (second quarter of 2017) was for inflation over the next ten years (2017 to 2026) to average 2.30%. This value has increased by 0.20% over the survey conducted two quarters ago.

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

Recommendation

As a result, we find a reasonable range for this assumption to be between 2.00% to 2.75% and recommend decreasing the inflation assumption to 2.50%. This change will bring it closer to recent inflation levels and closer to the levels expected in the financial markets. While the recommended inflation assumption is towards the upper end of what we believe is a reasonable range for this assumption, this is intentional as the RSP has an automatic cost of living provision that provides an increase based on the change in CPI-W and there is greater financial risk if the inflation assumption is set too low.

Investment and Administrative Expenses

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

In regards to investment expenses, investment consulting firms periodically issue reports that describe their capital market assumptions. The estimates for core investments (i.e., fixed income, equities, and real estate) are generally based on anticipated returns produced by passive index funds that are net of investment related fees. The investment return expectations for the alternative asset class such as private equity and hedge funds are also net of investment expenses. Therefore, we did not make any adjustments to account for investment related expenses. Some of the retirement systems may also employ active management investment strategies that result in higher investment expenses compared to strategies that invest in passive index funds. We have assumed that active management strategies would result in the same returns, net of investment expenses, as passive management strategies.

Generally, actuarial valuations will reflect administrative expenses either as a percentage of the plan's normal cost or similarly as an investment related expense and a net offset to the investment return assumption. Historically, the administrative expenses have been a net of the investment return and are not recommending a change at this time.

Investment Return Rate

The investment return assumption is one of the principal assumptions used in any actuarial valuation of a retirement plan. It is used to discount future expected benefit payments to the valuation date in order to determine the liabilities of the plan. Even a small change to this assumption can produce significant changes to the liabilities and contribution rates. Currently, it is assumed that future investment returns will average 7.50% per year, net of investment and administrative expenses.

The chart below shows the history of annualized RSP market returns from calendar year 2002 through calendar year 2016. The average annual return for the last 5, 10, and 15 years was 8.8%, 6.0%, and 5.7%, respectively. Clearly, market returns have also fluctuated significantly over this time period.
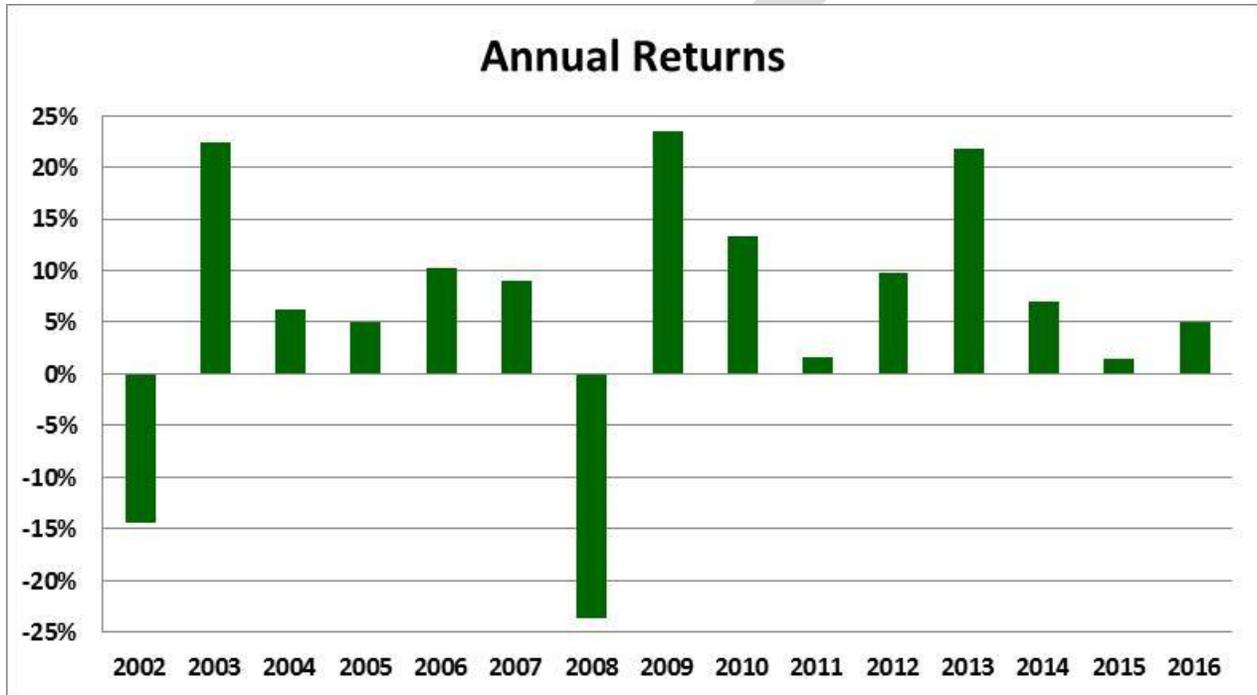
However, for this assumption, past performance is not a reliable indicator of future performance. The actual asset allocation of the trust fund will significantly impact the overall performance, so returns achieved under a different allocation are not meaningful. More importantly, there are strong reasons to believe that future investment returns will be different than historical experience, in large part because current bond yields are lower.

Capital Market Expectations

We believe a more appropriate approach to selecting an investment return assumption is to identify expected returns given the funds' asset allocation mapped to forward-looking capital market assumptions.

Below is a summary of the current allocation of plan assets to certain asset classes for the RSP as of December 31, 2016.

CURRENT ASSET ALLOCATION	
ASSET CLASS	2016
Cash and short-term investments	2%
U.S. Government obligations	23%
Corporate bonds	13%
Common stocks	57%
Foreign equities	5%
Total	100%

To validate the returns produced in the asset allocation study, we have utilized the forward-looking return expectations developed by several investment consulting firms and industry surveys, including RV Kuhns, who is RSP's investment consultant.

We also have 20 to 30 year capital market assumptions that were developed by Aon Hewitt, Mercer Consulting, Principal, and NEPC. As you will see, the return expectations for RV Kuhns are about 1.00% lower than the average return expectation developed by the other investment consulting firms. This would lead us to believe that RV Kuhns' return expectations are based on a shorter time horizon than that used by the other consulting firms.

Forward-looking Capital Market Assumptions (20 to 30 year horizon)

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of exceeding 7.50%	Probability of exceeding 7.25%	Probability of exceeding 7.00%	Probability of exceeding 6.75%	Probability of exceeding 6.50%
	40th	50th	60th					
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	5.4%	6.1%	6.8%	30%	33%	37%	40%	44%
2	5.5%	6.2%	6.8%	31%	34%	38%	41%	45%
3	5.7%	6.3%	7.0%	33%	36%	40%	44%	47%
4	5.8%	6.4%	7.1%	34%	38%	41%	45%	49%
Average	5.6%	6.3%	6.9%	32%	35%	39%	43%	46%

Short Term Assumptions

RV Kuhns	4.5%	5.2%	5.8%	18%	21%	24%	27%	30%

Based on the average of the four sets of long-term expectations (not including RV Kuhns), and the proposed 2.50% inflation assumption, the expected 50th percentile compound return over the next 20 years under the current portfolio is 6.3% and the average 40th and 60th percentiles were 5.6% and 6.9%, respectively.

Recommendation

Based on this analysis, we are recommending the Retirement Committee reduce the investment return assumption from 7.50% to no greater than 7.00%, with the consideration of a decrease to 6.75%. While the recommendation is above the average of the 50th percentiles of the forward-looking return expectations of the four investment consulting firms with long-term assumptions, we believe it is still reasonable under current actuarial standards of practice.

Cost-of-Living Increase Assumption

The RSP provides an automatic post-retirement cost of living adjustment (COLA) to retired participants. It is determined annually based on the average annual increase in Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W). However, the annual COLA provided by the Plan is capped at 4.00%. The current COLA assumption is 2.70%, slightly less than the current inflation assumption of 2.75%. This spread is to account for the possibility that the increase in CPI-W exceeds 4.00% and the cap is in effect. However, we believe the likelihood of the annual increase in CPI-W exceeding the 4.00% cap is very small and we recommend setting the COLA assumption equal to the recommended inflation assumption of 2.50%.

Salary Increase Rates

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

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

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

Note, this is a different assumption than the assumed overall increase in payroll, as payroll will grow at a rate different from the average pay increase for individual participants. There are two reasons for this. First, when older, longer-service employees terminate, retire, or die, they are generally replaced with new employees who have a lower salary. Because of this, in most populations that are not growing in size, the growth in total payroll is smaller than the average pay increase for participants. Second, payroll can change due to an increase or decrease in the size of the group. Therefore, to analyze salary increases, we examine the actual increase in salary for each year and for each participant who is active in two consecutive fiscal years.

We looked at the salaries provided for all participants who were active in the start and the end of an experience year, over a ten year study period. The following table shows the average increase over the last ten years.

Year Ending December 31,	% Increase
2007	4.66%
2008	3.77%
2009	1.51%
2010	0.55%
2011	2.69%
2012	4.49%
2013	3.90%
2014	5.33%
2015	4.60%
2016	5.79%
Average	**3.72%**

Salary increase assumptions typically include an element that depends on the participant's age or service where larger pay increases are assumed for younger or shorter-service employees. This occurs because younger employees typically receive larger pay increases because they are associated with changes in job responsibility, promotions, demonstrated merit, additional training or degrees, etc. For the RSP, we recommend continued use of an age related salary assumption, as this reflects the expected salary increases they expect to receive in their personal career, not just during their service with the City.

The following table shows the average increase over the five-year period by quinquennial age groups:

Average Salary Increase By Age Group	
Age	Average Increase
21 to 25	7.3%
26 to 30	5.8%
31 to 35	4.4%
36 to 40	3.9%
41 to 45	3.5%
46 to 50	3.2%
51 to 55	3.1%
56 to 60	3.0%
61 to 65	2.9%

The salary scale is composed of three pieces: price inflation, a productivity/merit component, and an age or service based step-rate or promotional piece. Generally, all employees receive the same increase due to the effects of price inflation and merit. Our recommended price inflation assumption is 2.50%, as discussed earlier. The productivity/merit component would include the general productivity included. The City has indicated to us that the City has budgeted 3% increases for inflation and merit for each of the next three years. As a result, we believe it is reasonable (in practice and in theory) to use a 2.50% for a price inflation assumption and a 0.25% component for the productivity/merit component of the salary increase assumption. The step-rate promotional component is the expected salary increase that is above this level.

The following table shows the recommended step rates for some select ages.

Age	Step-Rate Component	Inflation and Productivity Components	Total Salary Increase
20	5.25%	2.75%	8.00%
25	4.00%	2.75%	6.75%
30	3.00%	2.75%	5.75%
35	2.00%	2.75%	4.75%
40	1.50%	2.75%	4.25%
45	1.20%	2.75%	3.95%
50	0.95%	2.75%	3.70%
55	0.70%	2.75%	3.45%
60	0.50%	2.75%	3.25%
65	0.00%	2.75%	2.75%

Payroll Growth Rate

The salary increase rates discussed above are assumptions applied to individuals. Typically, the payroll growth rate is used in determining the contributions needed to amortize the unfunded actuarial accrued liability. The amortization payments are calculated to be a level percentage of payroll, so as payroll increases over time, these contributions also increase. Thus, the amortization percentage is dependent on the rate at which payroll is assumed to increase. Note, this is a minor assumption since the amortization cost, as a percentage of payroll, is small.

Over the last 10 years, covered payroll has increased by 3.0% per year, however, the number of employees increased by 0.6% per year, resulting in a 2.4% increase in payroll on a constant employee basis. Similarly, over the last 20 years, covered payroll has increased by 5.4% per year and the number of employees increased by 2.3% per year, resulting 3.1% increase in payroll on a constant employee basis. For the last 10 year and 20 year periods, price inflation increased by an average annual rate of 1.79% and 2.08%, respectively.

We are recommending a decrease in the payroll growth assumption from 3.25% to 2.75% to correspond with a 0.25% decrease in the price inflation assumption along with other adjustments made to the individual salary increase assumption.

Demographic Assumptions

Actuaries are guided by the Actuarial Standards of Practice (ASOP) adopted by the Actuarial Standards Board (ASB). One of these standards is ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. This standard provides guidance to actuaries giving advice on selecting noneconomic assumptions for measuring obligations under defined benefit plans. We believe the recommended assumptions in this report were developed in compliance with this standard.

Mortality Assumptions

RSP's actuarial liabilities and contribution rates depend in part on how long retirees live. If participants live longer than expected, benefits will be paid for a longer period of time and the liability and ultimate contribution rates will be larger than expected.

The mortality tables currently being used for non-disabled retirees and for beneficiaries receiving benefits are the gender-distinct RP2000 Combined Healthy Mortality Tables with Blue Collar Adjustment, with male rates multiplied by 109% and female rates multiplied by 103%. The rates are projected on a fully generational basis by Scale BB to account for future mortality improvements. This is the same assumption used in the actuarial valuation of the Texas Municipal Retirement System (TMRS), of which the City is a participating employer.

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

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

We first measured the credibility of the dataset to determine whether statistical analysis of RSP specific data was warranted. Based on a practice note issued by the American Academy of Actuaries, a dataset needs 1,082 expected deaths for each gender to be within +/- 5% of the actual pattern with 90% confidence. We believe +/- 5% is a reasonable confidence range to consider the experience to be fully credible. The following table gives the number of deaths needed by gender to have a given level of confidence that the data is +/- X% of the actual pattern.

Number of Deaths Needed for a Given Confidence Level					
Confidence	99%-101%	97-103%	95%-105%	90%-110%	80%-120%
75%	4,543	505	182	45	11
80%	16,435	1,826	657	164	41
90%	27,060	3,007	1,082	271	68
95%	38,416	4,268	1,537	384	96
99%	66,358	7,373	2,654	664	166

During the experience period, the RSP only experienced 33 male and 14 female retiree deaths. This indicates that there is not enough credibility in the group to use actual experience as the basis for setting this assumption. Although it may be true that City of Plano RSP retirees may exhibit different mortality patterns than retirees of TMRS as a whole, the above exercise demonstrates there is little statistical confidence to justify that.

Recommended Mortality Assumptions

Therefore, we will rely on using a mortality based on a large retirement system with similar type demographics as the retirees of the RSP. Specifically, we recommend the continued use of the mortality assumption (and improvement scale) used in the actuarial valuation of TMRS.

We also recommend using the TMRS mortality assumption for employees and for disabled retirees.

Disability Rates

City employees are not covered by Social Security. Since the disability income benefit provided by TMRS may not be adequate for short service employees, one of the primary purposes of the RSP is to ensure that employees receive an adequate retirement income disability benefit for employees who become disabled. The RSP even coordinates the disability income benefit with that provided by TMRS. As a result, while there are not many disability occurrences, due to the size of the disability benefit a small change in the assumed rate of occurrence can have moderate effect on the contribution requirement.

For the current five-year experience period ending December 31, 2016, the experience showed that there were only eight (male and female combined) observed occurrences of disability in the TMRS data. When we reviewed the RSP experience, we found there were 6 actual disabilities during the same five-year period. The current assumption expected there would be approximately 20 new disabled retirees during this time period.

We reviewed the disability eligibility provisions for each plan. Both plans consider an employee to be disabled if the employee is unable to perform any occupation with the City. However, TMRS only provides a disability benefit to employees with less than 10 years of service if the disability incident occurred on the job. Given the similarities in the eligibility provisions, we believe it is reasonable to use the TMRS disability incidence assumption.

TMRS significantly reduced the disability incidence assumption in 2015 as a result of an experience study. The assumption was also changed from gender distinct to unisex. If this updated assumption would have been used, the valuation would have expected there to be 10 new disabled retirees during the same historical five-year time period.

Given this updated assumption is more consistent with the actual experience for the RSP, we recommend the disability incidence assumption be updated to use the same assumption that is used in the actuarial valuation of TMRS.

Retirement Rates

The valuation currently uses retirement rates that vary by age and gender. In general, there were fewer retirements than expected, with an actual to expected ("A/E") ratio of 81% for males and 90% for females, based on the current tables. We have recalibrated retirement rates at some ages to better reflect recent experience such that the new tables reflect overall A/E ratios of approximately 90% for both males and females. Additionally, the current table of retirement rates included an assumption that 100% of employees would retire at age 70. The experience showed several occurrences of actual retirements after age 70, so we have extended this "maximum" retirement age to age 74. A chart comparing the actual experience to both the current and proposed assumptions is shown in Section E.

Termination Rates

Termination rates reflect participants who leave for any reason other than death, disability, or service retirement. They apply whether the termination is voluntary or involuntary. The current termination rates are based on years of service with the City of Plano.

As previously mentioned, we used the participant data available from our work with TMRS to identify the employee experience. The service information in the TMRS data is the employee's service in the TMRS Retirement System, which will be greater than the employee's service with the City if they have prior employment with another participating employer in TMRS. As a result, we developed a recommended termination assumption that was based on the employee's age, with higher rates of termination at younger ages.

We have developed new gender distinct, age-related termination rates that better reflect actual experience. The overall number of expected terminations are greater under the recommended assumption when compared to the current assumption.

Other Assumptions

There are other assumptions made in the course of a valuation, such as form of payment elections, the percentage of participants who are married, the age difference between husbands and wives, etc. We have recommended what we believe to be the most reasonable assumption.

Optional Forms of Payment
The optional forms of payment for retirement benefits are all generally considered to be the same value (or "actuarial equivalent"). It is assumed that all retirees elect the normal form of payment, which is a single life annuity with five years guaranteed.

Percent Married and Spouse age difference
Since it is assumed that all retirees elect the normal form of payment, an assumption for percent married and spouse age difference is not applicable.

Actuarial Methods

Actuarial Cost Method

The valuation is currently using the Individual Entry Age Normal (IEAN) actuarial cost method. IEAN will generally produce level contribution amounts for each participant as a percentage of salary from year to year, and allocates costs among various generations of taxpayers in a reasonable manner. It is by far the most commonly used actuarial cost method for large public retirement systems and the method used for accounting disclosures under GASB Statement No. 67. We recommend continuing to use this method.

Asset Valuation (Smoothing) Method

The purpose of asset smoothing is to reduce short-term volatility in actuarial valuation results which are intended for long-term decision making and funding. Periods of poor returns are often followed by some amount of recovery or vice versa, and a market value (unsmoothed) approach, may result in overreaction to

short-term market volatility.

Currently, the actuarial value of assets is based on the market value of assets with a five-year smoothing of actual investment return in excess of (less than) expected investment income. Expected investment income is determined using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). In no event will this amount exceed 120% of market value or be less than 80% of market value. We continue to believe this method is appropriate.

Funding Policy

The Retirement Committee's funding policy requires the City of Plano to contribute a rate equal to the sum of the normal cost rate (which pays the current year's cost) and an amortization rate to finance the unfunded actuarial accrued liability. The amortization period is closed, and was 19 years as of the December 31, 2015 actuarial valuation and will be 17 years when the next actuarial valuation is performed on December 31, 2017.

To provide stability in the contribution requirement in future years, new amortization bases will be established and separately maintained for each actuarial valuation on and after December 31, 2021 and amortized over 15 years. Also, since the City's financial risk of funding the RSP is not symmetric, if the net amortization cost is negative, or a credit, then the City's applicable contribution will not be less than the normal cost less the expected earnings on the surplus assets (determined as a percentage of covered payroll). This is intended to preserve the assets in excess of the actuarial accrued liability to offset adverse experience that may incur in a future year.

Under this policy, we expect the objective of maintaining a relatively level contribution rate over time will be achieved in normal conditions such as consistent financial markets. As such, we have no recommended changes to the current funding policy for the RSP.

SECTION D

SUMMARY OF ASSUMPTIONS AND METHODS

Summary of Assumptions and Methods
Incorporating the Recommended Assumptions

The assumptions and methods applied in this actuarial valuation will be adopted by the Retirement Committee based on the experience investigation that covered the five-year period from December 31, 2011 through December 31, 2016.

I.   *Valuation Date*

The valuation date is December 31 of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

II. *Actuarial Cost Method*

The actuarial valuation is used to determine the actuarial determined employer contribution rate and to describe the current financial condition of the RSP.

The actuarial valuation uses the Entry Age Normal actuarial cost method. Under this method, the first step is to determine the contribution rate (level as a percentage of pay) required to provide the benefits to each participant, or the normal cost rate. The total normal cost rate is based on the benefits payable to each individual active participant.

The Unfunded Actuarial Accrued Liability (UAAL) is the liability for future benefits which is in excess of (i) the actuarial value of assets, and (ii) the present value of future normal costs. The employer contribution provided in excess of the employer normal cost is applied to amortize the UAAL.

The Entry Age actuarial cost method is an "immediate gain" method (i.e., experience gains and losses are separately identified as part of the UAAL). However, they are amortized over the same period applied to all other components of the UAAL.

III.   *Actuarial Value of Assets*

The actuarial value of assets is based on the market value of assets with a five-year smoothing of actual investment return in excess of (less than) expected investment income. Expected investment income is determined using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). In no event will this amount exceed 120% of market value or be less than 80% of market value.

IV.   *Actuarial Assumptions*

Investment Return: A range from 6.75% to 7.00% per year, net of administrative and investment-related expenses (composed of an assumed 2.50% inflation rate and a 4.25% to 4.50% real rate of return)

Salary Increases: Pay increases are assumed to occur at the end of the year. The components of the annual increases are Inflation (2.50%), Real Wage Growth or Productivity (0.25%) and Merit, Promotion and Longevity (see sample rates):

Sample Rates:

Age	Merit/Promotional/ Longevity Rates of Increase	Total Annual Rate of Increase Including 2.75% for Inflation and Real Wage Growth
20	5.25%	8.00%
25	4.00%	6.75%
30	3.00%	5.75%
35	2.00%	4.75%
40	1.50%	4.25%
45	1.20%	3.95%
50	0.95%	3.70%
55	0.70%	3.45%
60	0.50%	3.25%
65	0.00%	2.75%

Payroll Growth: 2.75% per year, compounded annually (for projecting valuation payroll).

Future Cost of Living Adjustments: 2.50% per annum

Decrement Timing: All decrements – mortality, service retirement, disability retirement, and termination of employment for reasons other than death or retirement – are assumed to occur at the middle of the valuation year.

Mortality Decrements:

Service Retirees, Beneficiaries, and Inactive Participants

Gender-distinct RP2000 Combined Healthy Mortality Tables with Blue Collar Adjustment are used with male rates multiplied by 109% and female rates multiplied by 103%. The rates are projected on a fully generational basis by Scale BB to account for future mortality improvements.

Active Participants

Gender-distinct RP2000 Combined Healthy Mortality Tables with Blue Collar Adjustment are used with male rates multiplied by 54.5% and female rates multiplied by 52%. The rates are projected on a fully generational basis by Scale BB to account for future mortality improvements.

Disability Retirees

Gender-distinct RP2000 Combined Healthy Mortality Tables with Blue Collar Adjustment are used with male rates multiplied by 109% and female rates multiplied by 103% with a 3 year set-forward for both males and females. In addition, a 3% minimum mortality rate will be applied to reflect the impairment for younger participants who become disabled. The rates are projected on a fully generational basis by Scale BB to account for future mortality improvements subject to the 3% floor.

Service Retirement Decrements: Graded tables based on RSP experience.

Age	Male	Female
45-49	0.05	0.04
50-52	0.05	0.06
53	0.08	0.06
54	0.08	0.10
55-56	0.12	0.12
57	0.12	0.15
58-59	0.14	0.20
60	0.16	0.25
61	0.20	0.25
62-63	0.25	0.25
64-65	0.30	0.30
66	0.25	0.20
67-70	0.20	0.20
71	0.20	0.25
72	0.20	0.50
73	0.50	0.50
74	1.00	1.00

Disability Retirement Decrements: Graded Tables Based on Experience of the Texas Municipal Retirement System (TMRS).

Sample rates shown below

Age	Male and Female
20	0.000004
25	0.000025
30	0.000099
35	0.000259
40	0.000494
45	0.000804
50	0.001188
55	0.001647
60	0.002180

Termination Decrements for Reasons Other Than Death or Retirement: Graded Tables Based on RSP Experience.

Rates of termination are zero for participants eligible for service retirement.
Rates for participants not eligible for service retirement:

| Age	Male	Female
20	0.3000	0.3500
21	0.2800	0.3300
22	0.2600	0.3100
23	0.2400	0.2900
24	0.2200	0.2700
25	0.2000	0.2500
26	0.1750	0.2400
27	0.1500	0.2300
28	0.1250	0.2200
29	0.1000	0.2100
30	0.0950	0.2000
31	0.0900	0.1900
32	0.0850	0.1800
33	0.0800	0.1700
34	0.0750	0.1600
35	0.0675	0.1500
36	0.0600	0.1400
37	0.0525	0.1300
38	0.0450	0.1200
39	0.0400	0.1100
40	0.0400	0.1000
41	0.0400	0.0900
42	0.0400	0.0800
43	0.0400	0.0700
44+	0.0400	0.0600

SECTION E

SUMMARY OF DATA AND EXPERIENCE

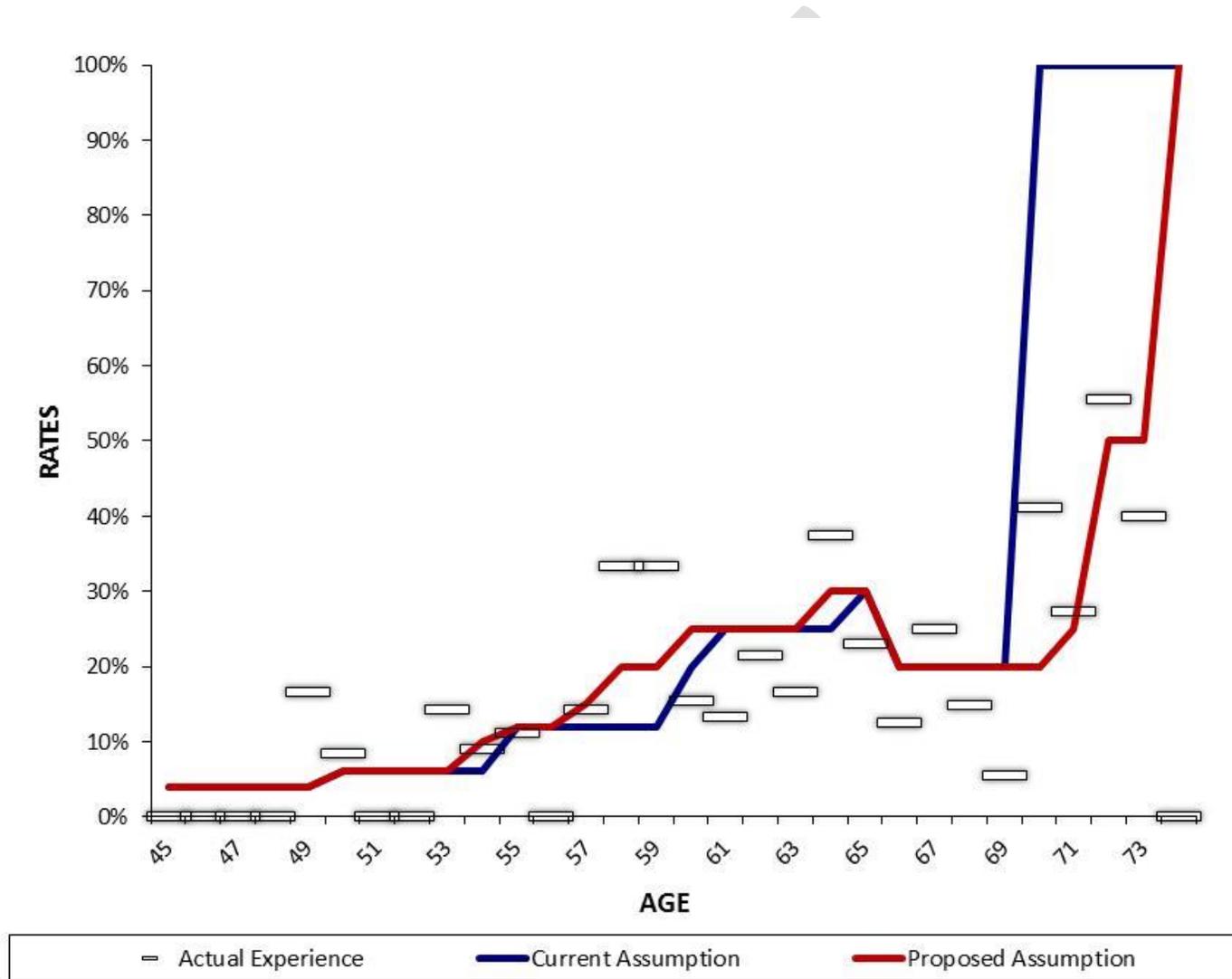# Retirement Experience for the Five-Year Period Ending December 31, 2016
Male Employees
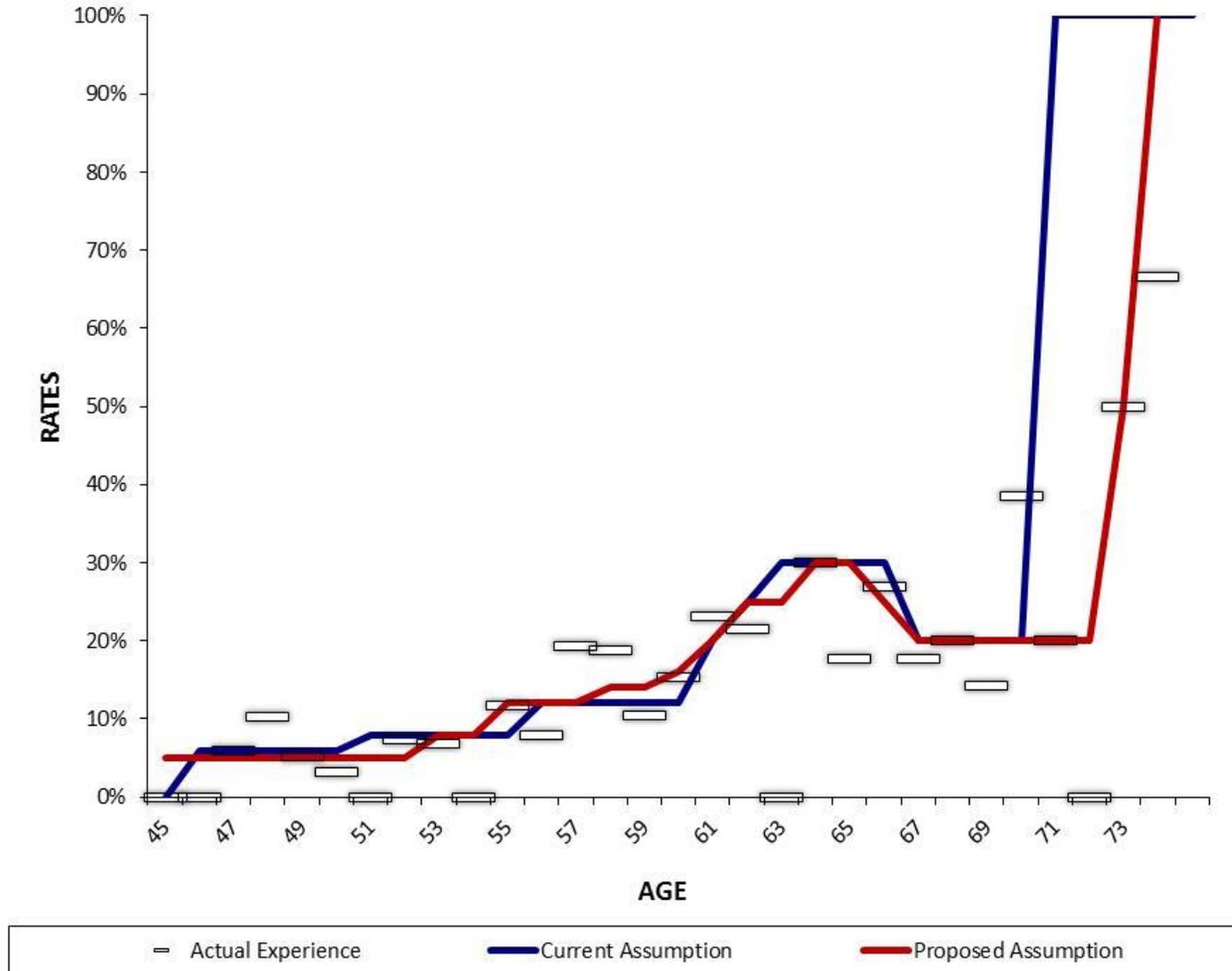
Note: Discontinuity in the "current assumption" line represents overlap in which the proposed assumption was unchanged

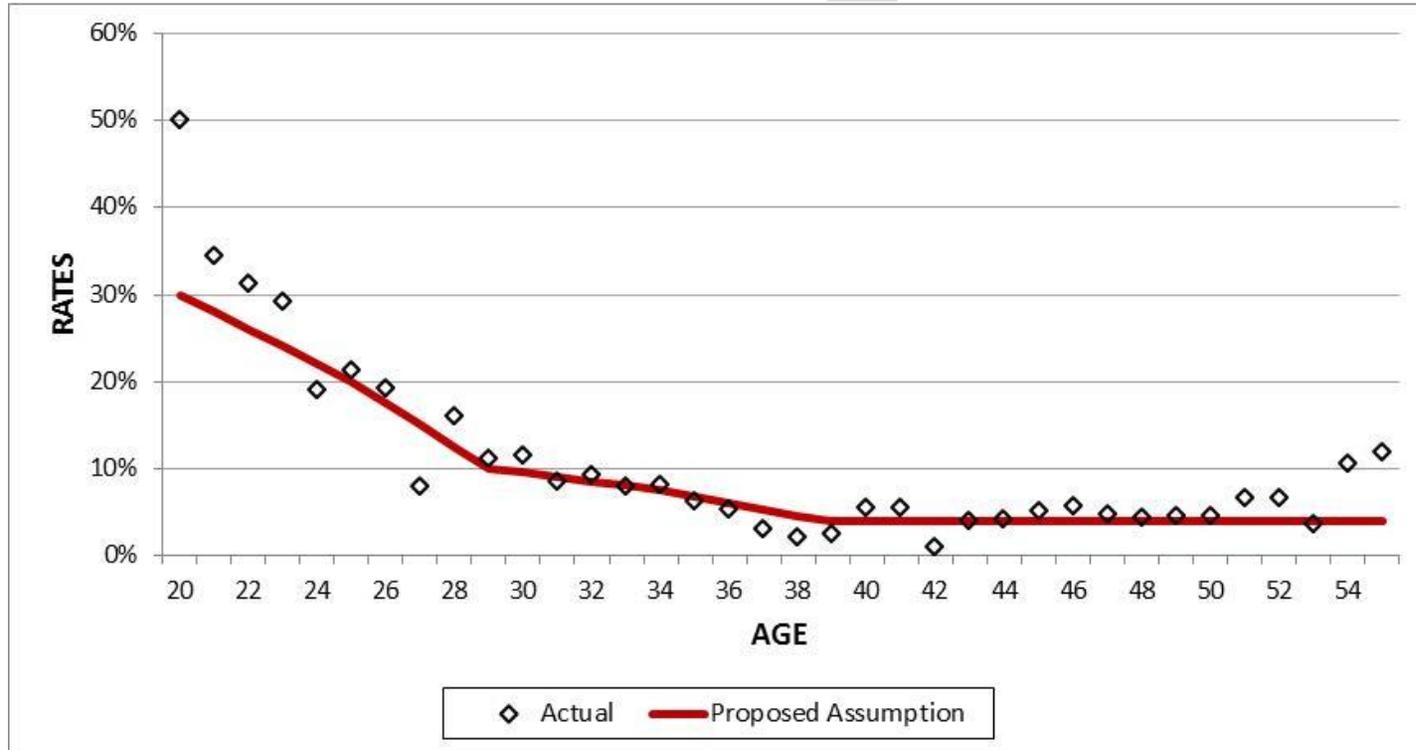# Retirement Experience for the Five-Year Period Ending December 31, 2016
Female Employees

Note: Discontinuity in the "current assumption" line represents overlap in which the proposed assumption was unchanged

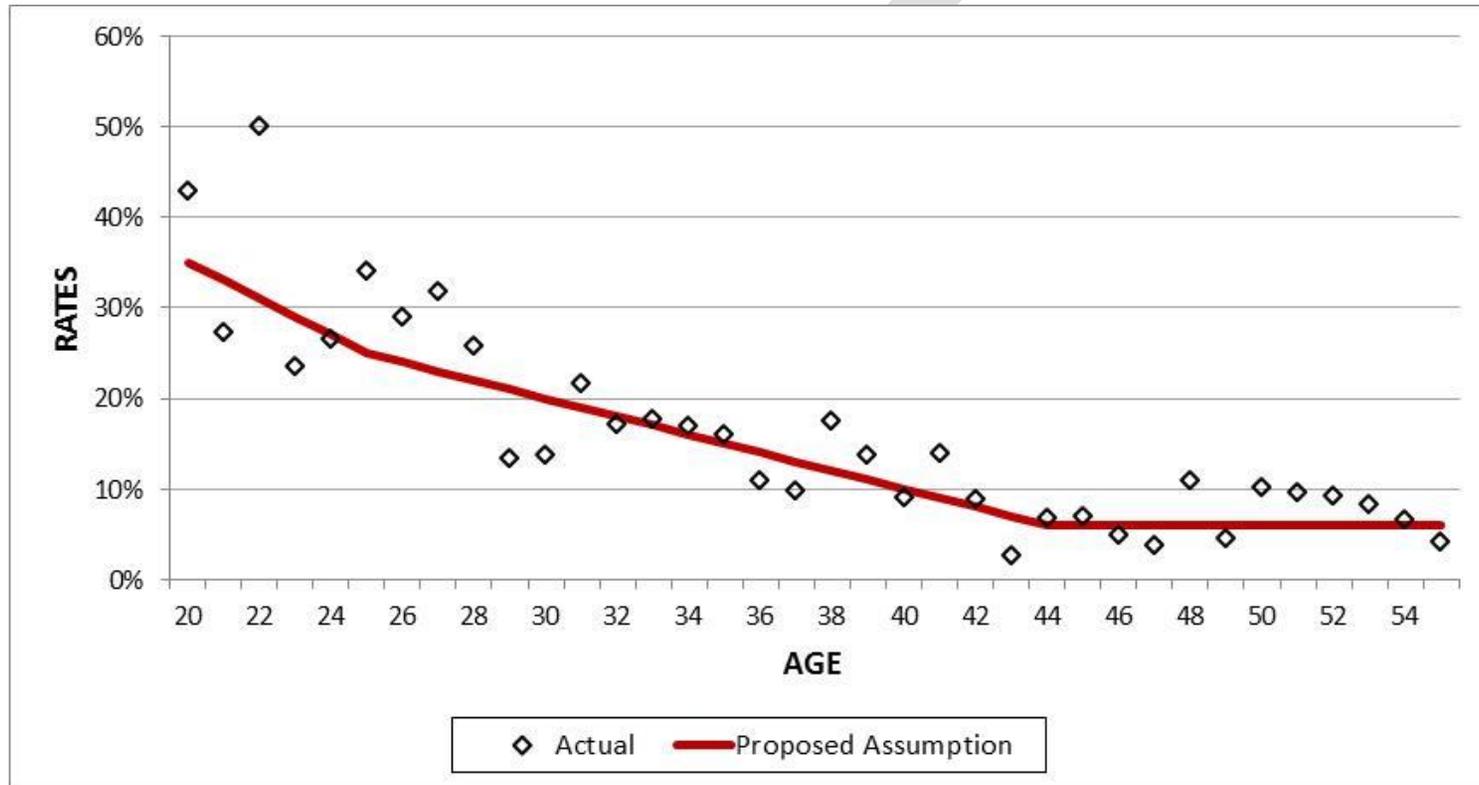# Withdrawal Experience for the Five-Year Period Ending December 31, 2016
Male Employees

Note: Current assumption is based on service and purposely not shown in this chart

Withdrawal Experience for the Five-Year Period Ending December 31, 2016
Female Employees

Note: Current assumption is based on service and purposely not shown in this chart

Age-Based Salary Increase Rates* for the Ten-Year Period Ending December 31, 2016
Male and Female Employees
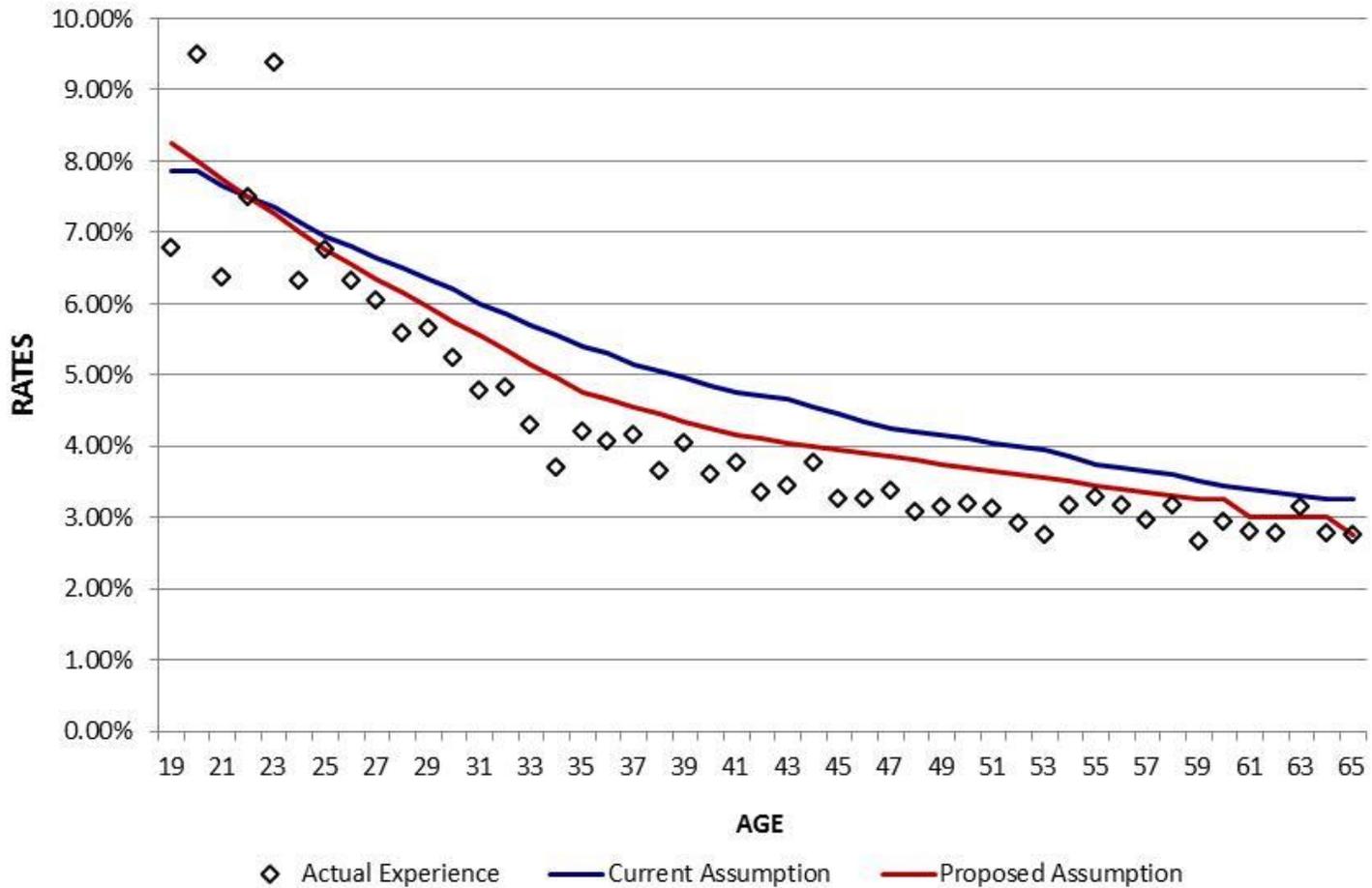
*Proposed assumption includes 2.50% inflation component and 0.25% productivity component
Current assumption includes 2.75% inflation component and 0.00% productivity component