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REVISED

CITY OF OMAHA POLICE AND FIRE RETIREMENT SYSTEM

Five Year Experience Study
For Period Ending December 31, 2011

Submitted: September 27, 2013

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September 17, 2013

Board of Trustees
City of Omaha Police and Fire Retirement System
1819 Farnam Street
Omaha, NE 68183

Dear Trustees:

It is a pleasure to submit this report of our investigation of the experience of the City of Omaha Police and Fire Retirement System (System) for the period of January 1, 2007 through December 31, 2011. This report was delayed at the request of the Board until negotiations with the fire union had been completed, which occurred in January, 2013.

The purpose of this report is to communicate the results of our review of the actuarial methods and the economic and demographic assumptions to be used in the completion of the next actuarial valuation. In some cases, we recommend changes from the prior assumptions that are designed to better anticipate the emerging experience of the Plan. Actual future experience, however, may still differ from these assumptions.

In preparing this report, we relied without audit on information supplied by the City for the annual actuarial valuations. Some of this data was provided by the prior actuarial firm, Milliman, Inc. If any data or other information is inaccurate or incomplete, our analysis and recommendation may be impacted and a revised report may need to be issued.

We hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board (ASB) and the Code of Professional Conduct and Qualification Standards for Public Statements of Actuarial Opinion of the American Academy of Actuaries.

We further certify that the assumptions developed in this report satisfy ASB Standards of Practice, in particular, No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations* and No. 35, *Selection of Demographic and Other Non-economic Assumptions for Measuring Pension Obligations*.

We look forward to our discussions and the opportunity to respond to your questions and comments.

I, Patrice A. Beckham, am a member of the American Academy of Actuaries, an Enrolled Actuary and a Fellow of the Society of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

I, Brent A. Banister, am a member of the American Academy of Actuaries, an Enrolled Actuary and a Fellow of the Society of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,

Patrice A. Beckham, FSA, EA, FCA, MAAA
Principal & Consulting Actuary

Brent A. Banister, PhD, FSA, EA, FCA, MAAA
Chief Pension Actuary

The purpose of an actuarial valuation is to provide a timely best estimate of the ultimate costs of a retirement system. Actuarial valuations of the City of Omaha Police and Fire Retirement System (COPFRS or the System) are prepared annually to determine the actuarial contribution rate to fund the System on an actuarial reserve basis, i.e. the current assets plus future contributions, along with investment earnings will be sufficient to provide the benefits promised by the System. The valuation requires the use of certain assumptions with respect to the occurrence of future events, such as rates of death, disability, termination of employment, retirement age and salary changes to estimate the obligations of the System.

The basic purpose of an experience study is to determine whether the actuarial assumptions currently in use have accurately anticipated actual emerging experience. This information, along with the professional judgment of the Board, its advisors, and the actuary, is used to evaluate the appropriateness of continued use of the current actuarial assumptions. When analyzing experience and assumptions, it is important to realize that actual experience is reported short term while assumptions are intended to be long term estimates of experience. Therefore, no single experience study period should be given full credibility in setting actuarial assumptions. If significant differences exist between what is expected from our assumptions and actual experience, our strategy is usually to recommend a change in assumptions that would produce results somewhere between the actual and expected experience.

Our Philosophy

Similar to an actuarial valuation, the calculation of actual and expected experience is a fairly mechanical process. From one actuary to another, there should be very little difference in numerical results. However, the setting of assumptions is a different story, as it is more art than science. In this report, we have recommended a few changes to certain assumptions. To allow a better understanding of our thought process, we offer a brief summary of our philosophy:

- **Don't Overreact**: When we see significant differences in actual versus expected experience, we generally do not adjust our rates to reflect the entire difference. If the experience is credible and we believe it reflects future expectations, we will typically recommend rates somewhere between the old rates and the new experience. If the experience during the next study period shows the same result, we will probably recognize the trend at that point in time or at least move further in the direction of the observed experience. On the other hand, if actual experience in the next study is closer to its prior level, we will not have overreacted, possibly causing volatility in the actuarial contribution rates.

- **Anticipate Trends**: If there is an identified trend that is expected to continue, we believe that this should be recognized. An example is the retiree mortality assumption. It is an established trend that people are living longer. Therefore, we believe the best estimate of liabilities in the valuation should reflect the expected increase in life expectancy.

- **Simplify**: In general, we attempt to identify which factors are significant and eliminate or ignore the ones that do not materially improve the accuracy of the liability projections.

At the request of the Board of Trustees, Cavanaugh Macdonald Consulting, LLC performed a study of the experience of the City of Omaha Police and Fire Retirement System for the period January 1, 2007 through December 31, 2011. This report presents the results and recommendations of our study which, if approved, will be implemented in the January 1, 2014 actuarial valuation of the System.

These assumptions have been developed in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the applicable Standards of Practice adopted by the Actuarial Standards Board of the American Academy of Actuaries.

SCOPE OF THIS REPORT

The actuarial valuation utilizes various actuarial methods and two different types of assumptions: economic and demographic. Economic assumptions are related to the general economy and its impact on the System. Demographic assumptions are based on the emergence of the specific experience of the Systems' members.

All of the major actuarial assumptions that will be used in the January 1, 2014 Actuarial Valuation have been reviewed in this Study. The remainder of this report is divided as follows:

SECTION 2 EXECUTIVE SUMMARY
SECTION 3 ACTUARIAL METHODS
SECTION 4 ECONOMIC ASSUMPTIONS
SECTION 5 DEMOGRAPHIC ASSUMPTIONS
SECTION 6 MORTALITY
SECTION 7 RETIREMENT
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A brief summary of the results of our findings and recommendations is shown below:

Actuarial Methods

Asset Valuation Method

COPFRS values assets, for actuarial valuation purposes, based on the principle that the difference between actual and expected investment returns should be subject to partial recognition to smooth out fluctuations in the total return achieved by the fund from year to year. This philosophy is consistent with the long-term nature of a retirement system. Under the COPFRS method, the actuarial value of the assets is the expected value of assets plus 33% of the difference between market value and expected value, where the expected value is last year's actuarial value and subsequent cash flows into and out of the fund accumulated with interest at the valuation rate (8%). This is mathematically equivalent to using a weighted average of 2/3^{rds} of the expected value and 1/3rd of actual market value.

Although the current method is a reasonable method and it meets actuarial standards we believe moving to a different weighting of actual and expected values will provide more smoothing of market returns. Therefore, we recommend the current asset valuation method be retained, but that 25% of the difference between actual and market value of assets be recognized, rather than 33%. This is equivalent to using a weighted average of 75% of the expected value and 25% of actual market value.

Amortization of Unfunded Actuarial Liability (UAL)

COPFRS currently develops the actuarial contribution rate using a closed 30 year period for amortizing the UAL as determined on the valuation date. As of the January 1, 2013 valuation, 20 years remain in the current amortization period. Under the current approach, changes in the UAL (experience gains/losses, assumption changes and plan changes) will be spread over a shorter and shorter number of years as time passes and the years to amortize decline. By the time the next experience study is performed there will be fifteen years remaining in the initial amortization period. This will increase the volatility of the actuarial contribution rate.

There is a different approach for the amortization of the unfunded actuarial liability (UAL) that would eliminate this concern. Rather than in each valuation calculating one single amortization base equal to the UAL and amortizing that single base over the remaining years in the amortization period, we recommend creating a new amortization base each year that is equal to the unscheduled change in the UAL and then amortizing each of the new bases over a closed 20-year period. This approach results in multiple amortization bases which, when added together, are equal to the System's total UAL. The total UAL amortization payment would then be the sum of the scheduled payments for that year for all of the amortization bases. The advantage of this approach is that it creates a more stable contribution rate for the payments on the UAL. The disadvantage is that the method is more complex than the current method and harder to communicate, especially to lay persons.

Significant changes have been made in both the police and fire contracts to address the concerns about COPFRS' long term funding. As a result of increased contributions and benefit reductions for both current and future employees, the System is projected to be 100% funded in 2055, if all actuarial assumptions are met. Over time the amount of the total contributions available to pay off the UAL increases significantly. Recognizing that the current financing plan in place is very long term in nature, it

is reasonable to reset the amortization period so the calculation of the Actuarial Contribution Rate reflects the long term nature of the funding plan for the System. Under current Governmental Accounting Standards, the maximum number of years to amortize the UAL is 30 years. Therefore, we recommend the existing UAL on January 1, 2014 be amortized over a closed 30-year period and new bases, as described earlier, be established in each subsequent valuation (January 1, 2015 and beyond) and amortized over a closed 20-year period. This change should make the Actuarial Contribution Rate more meaningful when used as a benchmark for evaluating the sufficiency of the actual contribution rates.

Economic Assumptions

The following set of economic assumptions is recommended:

	Current	Proposed
• Investment Return:	8.00%	8.00%
• Inflation Assumption:	3.50%	3.25%
• General Wage Increase:	4.00%	4.00%

Please note that although the general wage increase remains 4.00%, the components of that assumption have changed. The inflation assumption was lowered from 3.50% to 3.25%, while the productivity component was increased from 0.50% to 0.75%.

Given the current economic conditions, we believe it is unlikely that general wage increases of 4.0% will be granted to governmental employees until the economy fully recovers and tax revenues improve. To the extent that actual salary increases are below the 4.0% assumption in the short term, actuarial liabilities will be lower than expected and an actuarial gain will occur. This approach provides some conservatism in the valuation process as it results in higher liabilities and only recognizes the impact of lower salary increases as they actually occur.

Demographic Assumptions

The demographic information gathered in this experience study had limited credibility due to a number of factors. The study period (calendar years 2007 through 2011) included one year (2007) where significant increases in the benefit formula were effective. It also included several years during a severe economic downturn. In addition, during this period significant pension changes were implemented for Police members and labor negotiations occurred for Fire members. These factors likely impacted the actual, observed experience for certain events such as retirement, termination of employment, and salary increases. Thus, we believe it is appropriate to be cautious in making significant adjustments to the current assumptions based on the results of this study period alone. Having said that, we are recommending three changes to the current demographic assumptions:

- The number of actual disabilities in this study period was much lower than expected based on the current actuarial assumption. This experience is consistent with that observed in the prior experience study. Therefore, we recommend the disability rates be reduced by 20% across the board. This reduction still provides for a reasonable margin of conservatism in the new rates.

- We are recommending the mortality rates used to anticipate the duration of benefit payments for disabled members be changed to reflect better mortality than the current assumption. Our recommendation is to use the same mortality table as is used for service retirements, but apply a five year age set forward to reflect the shorter life expectancy of disabled members.

- A review of the current pay scales indicates that structural changes have occurred since the last experience study. As a result, we recommend the merit salary scale be modified to reflect the current pay scales. Because different pay scales apply to Police and Fire members, we recommend separate salary increase assumptions for each group.

It is very difficult to evaluate the appropriateness of the actuarial assumptions in use when changes to the benefit provisions are occurring or are expected to occur. The situation in 2010 and 2011 limited the credibility of the data observed in the current study period. Hopefully, the actual experience observed in the next experience study, covering calendar years 2012 to 2016, can be given more credibility. That will depend on the overall economic conditions as well as whether pension changes are part of the labor negotiations that occur during that time period. To the extent any of the pension plan provisions are changed or expected to change, it may impact the behavior of the members and reduce the reliability of the experience in setting long term assumptions.

Financial Impact

The estimated financial impact of the proposed changes, based on results of the January 1, 2013 actuarial valuation, is summarized on the following page. The actual impact, which will be reflected in the January 1, 2014 actuarial valuation, will vary from the numbers shown on the exhibit on the following page.

Estimate of Financial Impact of Assumption Changes
Based on January 1, 2013 Valuation

	Baseline (Current Assumptions)	Proposed Assumptions Only	Proposed Assumptions/Methods
1. Present Value of Future Benefits	$1,367,743,210	$1,364,942,418	$1,364,942,418
2. Present Value Future Normal Costs	258,868,432	261,962,139	261,962,139
3. Actuarial Accrued Liability (1) – (2)	1,108,874,778	1,102,980,279	$1,102,980,279
4. Actuarial Value of Assets	495,847,234	495,847,234	496,603,121
5. Unfunded Actuarial Accrued Liability (UAAL) (3) – (4)	613,027,544	607,133,045	606,377,158
6. Normal Cost Rate	23.525%	23.434%	23.434%
7. UAAL Payment	38.747%	36.973%	30.510%
8. Actuarial Contribution Rate (6) + (7)	62.272%	60.407%	53.944%

Note: The actual impact of the assumption change on the January 1, 2014 valuation results will vary from that shown in this table which are based on the January 1, 2013 actuarial valuation.

ACTUARIAL COST METHOD

The systematic financing of a pension plan requires that contributions be made in an orderly fashion while a member is actively employed, so that the accumulation of these contributions, together with investment earnings should be sufficient to provide promised benefits and cover administration expenses. The actuarial valuation is the process used to determine when money should be contributed; i.e., as part of the budgeting process.

The actuarial valuation will not impact the amount of benefits paid or the actual cost of those benefits. In the long run, actuaries cannot change the costs of the pension plan, regardless of the funding method used or the assumptions selected. However, actuaries **will** influence the incidence of costs by their choice of methods and assumptions.

The valuation or determination of the present value of all future benefits to be paid by the System reflects the assumptions that best seem to describe anticipated future experience. The choice of a funding method does not impact the determination of the present value of future benefits. The funding method, determines only the incidence of cost. In other words, the purpose of the funding method is to allocate the present value of future benefits determination into annual costs. In order to perform this allocation, it is necessary for the funding method to "break down" the present value of future benefits into two components: (1) that which is attributable to the past (2) and that which is attributable to the future. The excess of that portion attributable to the past over the plan assets is then amortized over a period of years. Actuarial terminology calls the part attributable to the past the "past service liability" or the "actuarial liability". The portion of the present value of future benefits allocated to the future is commonly known as "the present value of future normal costs", with the specific piece of it allocated to the current year being called "the normal cost". The difference between the plan assets and actuarial liability is called the "unfunded actuarial liability".

Two key points should be noted. First, there is no single "correct" funding method. Second, the allocation of the present value of future benefits and hence cost to the past for amortization and to the future for annual normal cost payments is not necessarily in a one-to-one relationship with service credits earned in the past and future service credits to be earned.

There are various actuarial cost methods, each of which has different characteristics, advantages and disadvantages. A brief summary of the main cost methods is included below.

- Entry-Age-Normal Cost Method

  The rationale of the entry age normal (EAN) funding method is that the cost of each member's benefit is determined to be a level percentage of his salary from date of hire to the end of his employment with the employer. This level percentage multiplied by the member's annual salary is referred to as the normal cost and is that portion of the total cost of the employee's benefit which is allocated to the current year. The portion of the present value of future benefits allocated to the future is determined by multiplying this percentage times the present value of the member's assumed earnings for all future years including the current year. The entry age normal actuarial liability is then developed by subtracting from the present value of future benefits that portion of costs allocated to the future. To determine the unfunded actuarial liability, the value of plan assets is subtracted from the entry age normal actuarial liability. The current year's cost to amortize the unfunded actuarial liability is developed by applying an amortization factor.

It is to be expected that future events will not occur exactly as predicted by the actuarial assumptions in each year. Actuarial gains/losses from experience under this actuarial cost method can be directly calculated and are reflected as a decrease/increase in the unfunded actuarial liability. Consequently, the gain/loss results in a decrease/increase in the amortization payment, and therefore the contribution rate.

- Projected Unit Credit

  The projected unit credit (PUC) funding method defines the actuarial liability to be the value of the employee's accrued benefit based upon his service as of the valuation date and his estimated final average earnings at the time he retires or otherwise exits. The normal cost is the present value of benefits accruing during the year with projected salary increases. The unfunded actuarial liability is determined by subtracting the actuarial value of assets from the actuarial liability. The current year's cost to amortize the unfunded actuarial liability is developed by applying an amortization factor.

  As with the entry age normal funding method, the actuarial gains and losses that accrue each year modify the unfunded actuarial liability and the payment thereon.

- Aggregate

  This cost method does not develop individual normal costs, but calculates a normal cost rate for the entire plan. The total value of future normal costs is found by subtracting the actuarial value of assets from the present value of future benefits. This amount is then spread as a level percentage of future payroll for the entire group. Gain/losses are included in the present value of future benefits and thereby incorporated into the normal cost percentage for future years. The basic premise of the aggregate cost method is to develop a normal cost which, from the valuation date forward, will fund the whole unfunded portion of the plan's future benefits as a level percentage of payroll.

  This method does not differentiate between past service costs and current costs. Therefore, no actuarial liability exists under the aggregate cost method and actuarial gains and losses are not directly calculated as in the other cost methods.

- Frozen Entry Age

  The frozen entry age cost method is a blend of the entry age normal and aggregate cost methods. The unfunded actuarial liability is initially determined using the entry age normal funding method. Each year the unfunded actuarial liability (UAL) is set equal to the expected unfunded actuarial liability. Actuarial gains and losses are not reflected in the amount of the unfunded actuarial liability, but rather are reflected in the normal cost. The frozen actuarial liability is changed only to reflect plan amendments and changes in the actuarial assumptions. The amortization payments for the current and all future years are fixed at the time the unfunded actuarial liability is determined. The normal cost is developed similarly to that under the aggregate cost method. The present value of all future benefits is determined and then reduced by the valuation assets and the unfunded frozen actuarial liability. The resulting amount is then spread as a level percentage of future payroll.

COPFRS currently uses the Entry Age Normal cost method, which is popular with governmental plans because it develops a normal cost rate that tends to be stable and less volatile. It is used by about 85% of all public sector plans. **We recommend the Entry Age Normal actuarial cost method be retained.**

ACTUARIAL VALUE OF ASSETS

In preparing an actuarial valuation, the actuary must assign a value to the assets of the fund. An adjusted market value (called the actuarial value of assets) is often used to smooth out the volatility in the market value. This is because most plan sponsors would prefer to have annual costs remain relatively level, as a percentage of payroll or in actual dollars, rather than a cost pattern that is extremely volatile.

The actuary does not have complete freedom in assigning this value. GASB has certain requirements related to the calculations prepared under GASB Number 25. The American Academy of Actuaries (AAA) also has basic principles regarding the calculation of a smoothed value, *Actuarial Standard of Practice No. 44 (ASOP 44), Selection and Use of Asset Valuation Methods for Pension Valuations*.

ASOP 44 provides that the asset valuation method should bear a reasonable relationship to the market value. Furthermore, the asset valuation method should be likely to satisfy both of the following:

- Produce values within a reasonable range around market value AND
- Recognize differences from market value in a reasonable amount of time.

In lieu of both of the above, the standard will be met if either of the following requirements is satisfied:

- There is a sufficiently narrow range around the market value OR
- The method recognizes differences from market value in a sufficiently short period.

These rules or principles prevent the asset valuation methodology from being used to distort annual funding patterns. No matter what asset valuation method is used, it is important to note that, like a cost method or actuarial assumptions, the asset valuation method does not affect the true cost of the plan; it only impacts the incidence of cost.

COPFRS values assets, for actuarial valuation purposes, based on the principle that the difference between actual and expected investment returns should be subject to partial recognition to smooth out fluctuations in the total return achieved by the fund from year to year. This philosophy is consistent with the long-term nature of a retirement system. Under this method, the actuarial value of the assets is the expected value of assets plus 33% of the difference between market value and expected value, where the expected value is last year's actuarial value and subsequent cash flows into and out of the fund accumulated with interest at the valuation rate (8%). This is mathematically equivalent to using a weighted average of $2/3^{rds}$ of the expected value and $1/3^{rd}$ of actual market value.

The current asset valuation method for COPFRS also includes what is known as a "corridor", which provides that once the initial determination of the actuarial value of assets is made it is compared to a corridor around market value (80% of market value to 120% of market value). If the initial actuarial value lies outside the corridor, the final actuarial value of assets is set equal to the corresponding corridor value. For example, if the initial calculation of the actuarial value of assets is 132% of market value, the actuarial value is set equal to 120% of market value. We believe the corridor is necessary to ensure actuarial standards are met.

An asset valuation method is used to "smooth out" the volatility that occurs in the measurement of assets using pure market value. Although the current method, with the corridor adopted in 2007, is a reasonable

method and it meets actuarial standards we believe moving to a different weighting of actual and expected values will provide more smoothing of market returns. **Therefore, we recommend the current asset valuation method be retained, but that 25% of the difference between actual and market value of assets be recognized, rather than 33%.**

AMORTIZATION OF UAL

As described above, actuarial liabilities are the portion of the actuarial present value of future benefits that are not included in future normal costs. Thus it represents the liability that, in theory, should have been funded through normal costs for past service. Unfunded actuarial liabilities (UAL) exist when actuarial liabilities exceed plan assets. These deficiencies can result from (i) plan improvements that have not been completely paid for, (ii) experience that is less favorable than expected, (iii) assumption changes that increase liabilities or (iv) contributions that are less than the actuarial contribution rate. If the actuarial value of assets (AVA) exceeds the actuarial liability (AL), "surplus" exists.

There are a variety of different methods that can be used to amortize the UAL. Each method results in a different payment stream and, therefore, has cost implications. For each methodology, there are three basic characteristics:

- The period over which the UAL is amortized,
- The rate at which the amortization amount increases, and
- The number of components of UAL with separate amortization bases.

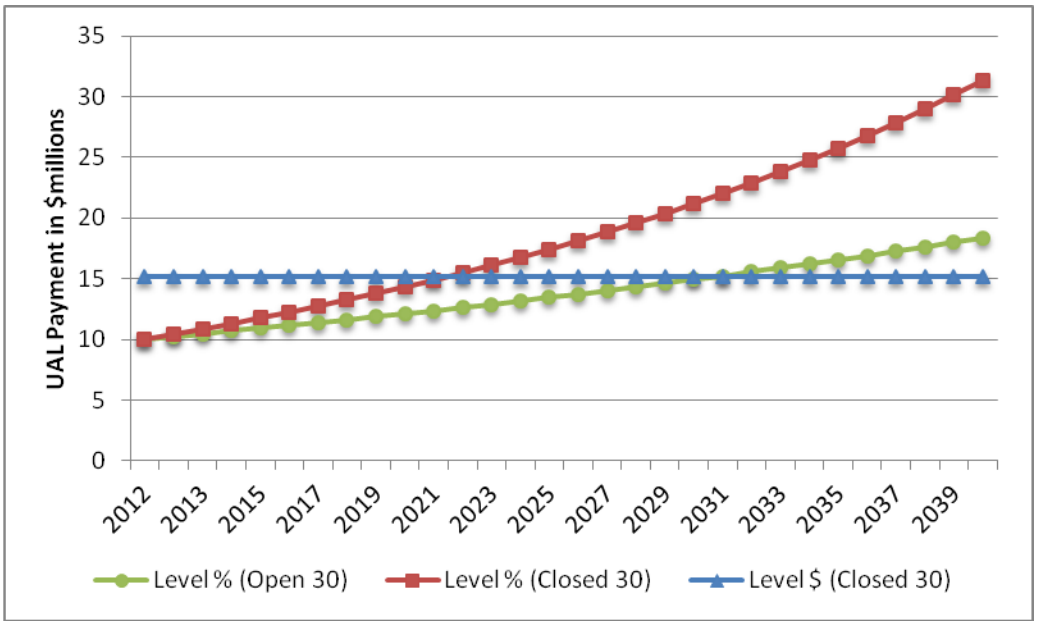
The parameters in Governmental Accounting Standard Board Statement No. 25 (GASB 25) have evolved as a *de facto* funding standard for governmental plans. GASB 25 sets parameters for all of these characteristics. The maximum amortization period permitted is 30 years. The annual amortization amount can be either a level dollar amount or a level percentage of payroll. The UAL may be amortized as one amount or components may be amortized separately. New GASB standards for Pension Reporting (GASB 67 and 68), effective in the next two years, eliminate any link between the funding and accounting numbers. However, it is still useful to recognize the impact that the current GASB standards have had on funding policies in the recent past.

The amortization period can be either closed or open. If it is a closed amortization period, the number of years remaining in the amortization period declines each year. Alternatively, if the amortization period is an open or rolling period, the amortization period does not decline but is reset to the same number each year. This approach essentially "refinances" the System's debt (UAL) every year, pushing off the payment of the UAL to future years. While the funded ratio may possibly increase over time under the open amortization period, the System is not expected to reach a funded ratio of 100%. The open amortization policy is especially of concern when the amortization period is very long (i.e. 25 or 30 years) due to the negative amortization that occurs (UAL payment is less than the interest on the UAL so the dollar amount of the UAL continually increases).

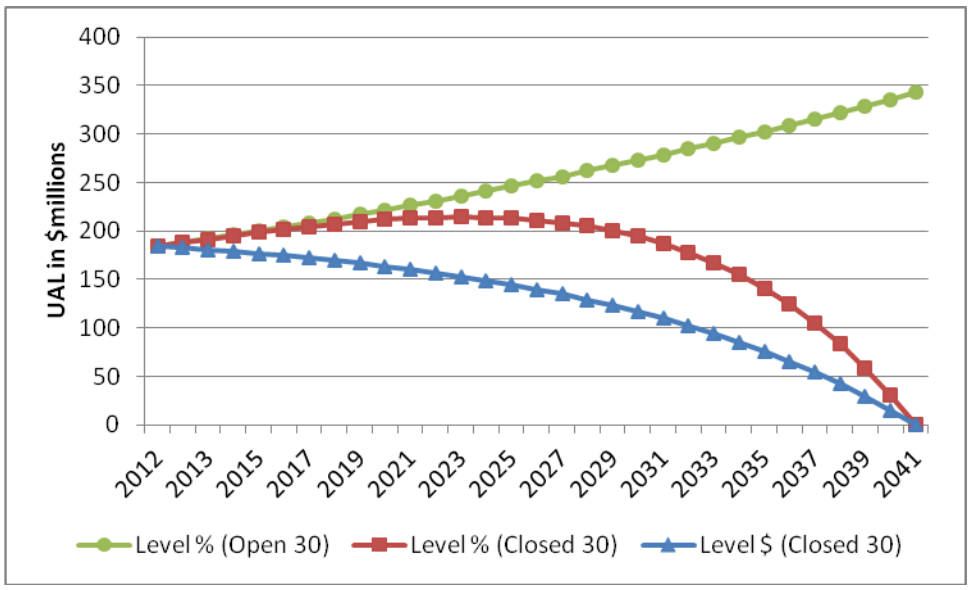
The level dollar amortization policy is similar to the method in which a home owner pays off a mortgage. The liability, once calculated, is financed by a constant fixed dollar amount, based on a predetermined number of years, until the liability is extinguished. This results in the amount of the liability steadily decreasing while the payments, though remaining level in dollar terms, in all probability decrease as a percentage of payroll. (Even if a plan sponsor's population is not growing or even slightly diminishing, inflationary increases will usually be sufficient to increase the aggregate covered payroll).

The rationale behind the level percentage of payroll amortization method is that since normal costs are calculated to be a constant percentage of pay, unfunded actuarial liabilities should be paid off in the same manner. This is also consistent with funding the benefits with contributions that are calculated as a percentage of payroll. When this method of amortizing the unfunded actuarial liability is adopted, the initial amortization payments are lower than they would be under a level dollar amortization payment method, but the payments increase at a fixed rate so that ultimately the annual payment far exceeds the level dollar payment. The expectation is that total payroll will increase as rapidly so that the amortization payments will remain constant, as a percentage of payroll. In the initial years, the level percentage of payroll amortization payment is often less than the interest accruing on the unfunded actuarial liability meaning that even if there are no experience losses, the dollar amount of the unfunded actuarial liability will grow (called negative amortization). This is particularly true if the plan sponsor is paying off the unfunded actuarial liability over a long period, such as 30 years.

The following graph shows the pattern of amortization payments under the three different amortization methods, discussed earlier:



Use of the level percentage of payroll amortization has its advantages and disadvantages. From a budgetary standpoint, it makes sense to develop UAL contribution rates that are level as a percentage of payroll, since contributions to fund the Plan are made as a percent of payroll and normal cost is developed as a level percent of payroll. However, if payroll doesn't grow as expected the UAL payment, determined as a percent of payroll, will increase rather than remain level. In addition, this approach clearly results in slower funding of the UAL, as illustrated in the following graph:



COPFRS currently develops the actuarial contribution rate using a closed 30 year period for amortizing the UAL as determined on the valuation date. As of the January 1, 2013 valuation, 20 years remain in the current amortization period. Under the current approach, changes in the UAL (experience gains/losses, assumption changes and plan changes) will be spread over a shorter and shorter number of years as time passes and the years to amortize decline. By the time the next experience study is performed there will be fifteen years remaining in the initial amortization period. This will increase the volatility of the actuarial contribution rate.

There is a different approach for the amortization of the unfunded actuarial liability (UAL) that would eliminate this concern. Rather than in each valuation calculating one single amortization base equal to the UAL and amortizing that single base over the remaining years in the amortization period, we recommend creating a new amortization base each year that is equal to the unscheduled change in the UAL and then amortizing each of the new bases over a closed 20-year period. This approach results in multiple amortization bases which, when added together, are equal to the System's total UAL. The total UAL amortization payment would then be the sum of the scheduled payments for that year for all of the amortization bases. The advantage of this approach is that it creates a more stable contribution rate for the payments on the UAL. The disadvantage is that the method is more complex than the current method and harder to communicate, especially to lay persons.

As you know, significant changes have been made in both the police and fire contracts to address the concerns about the Retirement System's long term funding. As a result of increased contributions and benefit reductions for both current and future employees, the System is projected to be 100% funded in 2055, if all actuarial assumptions are met. Over time the amount of the total contributions available to pay off the UAL increases significantly. Recognizing that the current financing plan in place is very long term in nature, it is reasonable to reset the amortization period so the calculation of the Actuarial Contribution Rate reflects the long term nature of the funding plan for the System. Under current Governmental Accounting Standards, the maximum number of years to amortize the UAL is 30 years. Therefore, we recommend the existing UAL on January 1, 2014 be amortized over a closed 30-year

period and new bases, described above, be established in each subsequent valuation (January 1, 2015 and beyond) and amortized over a closed 20-year period. This change should make the Actuarial Contribution Rate more meaningful when used as a benchmark for evaluating the sufficiency of the actual contribution rates.

We would note that, given the low salary increases being granted to public employees in the current economic environment, it should be expected that covered payroll will not increase as much as the assumed increase in the short term. Under these circumstances, the UAL contribution, as a percentage of payroll, is expected to increase rather than remain level. A lower payroll growth assumption for amortizing the UAL would introduce some conservatism into the amortization of the UAL. It would, however, result in a higher, but likely more stable contribution rates. Because the actuarial contribution rates are not used to set contribution rates from year to year such a change would not impact the actual contributions to the System. We would be happy to discuss this further with the Board if they desire.

ECONOMIC ASSUMPTIONS

Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations* provides guidance to actuaries giving advice on the selection of economic assumptions for measuring obligations under defined benefit plans, such as COPFRS. A new draft of ASOP 27 has been published, but has not yet been adopted so our discussion in this report reflects the current ASOP 27 standard.

Because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

Recognizing that there is not one "right answer", the standard calls for the actuary to develop a best estimate range for each economic assumption, and then recommend a specific point within that range. Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with all other economic assumptions over the measurement period.

An actuary's best-estimate range with respect to a particular measurement of pension obligations may change from time to time due to changing conditions or emerging plan experiences. The actuary may change assumptions frequently in certain situations, even if the best-estimate range has not changed materially, and less frequently in other situations. Even if assumptions are not changed, the actuary needs to be satisfied that each of the economic assumptions selected for a particular measurement complies with the Actuarial Standard of Practice No. 27.

The remainder of this section will discuss the relevant types of economic assumptions used in the actuarial valuation to determine the obligations of COPFRS. In our opinion, the economic assumptions recommended in this report have been developed in accordance with ASOP No. 27. The following table summarizes the economic assumptions:

	Current Assumptions	Recommended Assumptions
A. Consumer Price Inflation	3.50%	3.25%
B. Investment Return	8.00%	8.00%
C. Payroll Growth	4.00%	4.00%

CONSUMER PRICE INFLATION

Use in the Valuation: Future price inflation has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment return and general wage growth.

The long-term relationship between price inflation and investment return has long been recognized by economists. The basic principle is that the investor demands a more or less level "real return" – the excess of actual investment return over price inflation. If inflation rates are expected to be high, investment return rates are also expected to be high, while low inflation rates will result in lower expected investment returns, at least in the long run.

The long term inflation rate cannot be predicted with a significant degree of confidence. This uncertainty would present severe problems in funding a retirement plan were it not for the fact that the effects of inflation on investment return and salary level are, in part, offsetting at least for active members. Salaries increasing faster than expected produce unexpected liabilities. Investment returns which exceed the assumed rate result in unanticipated assets. Although not directly equal in amount, it is expected that these additional assets and liabilities will have some offset on one another over the long term.

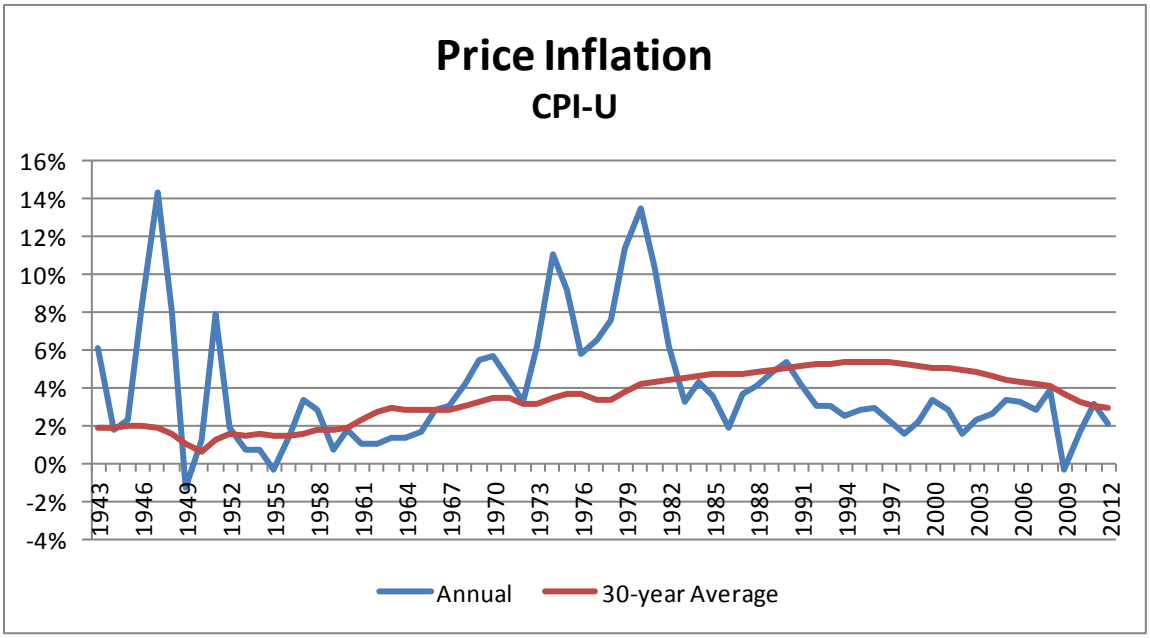
The current assumption for price inflation is 3.50% per year.

Past Experience: Although economic activities, in general, and inflation in particular, do not lend themselves to prediction on the basis of historical analysis, historical patterns and long term trends are factors to be considered in developing the inflation assumption. The Consumer Price Index, US City Average, All Urban Consumers, CPI (U), has been used as the basis for reviewing historical levels of price inflation. The table below provides historical annualized rates and annual standard deviation of the CPI-U over periods ending December 31st.

Period	Number of Years	Annualized Rate of Inflation	Annual Standard Deviation
1922 – 2012	90	2.95%	3.96%
1952 – 2012	60	3.65	2.80
1962 – 2012	50	4.14	2.82
1972 – 2012	40	4.35	2.99
1982 – 2012	30	2.93	1.25
1992 – 2012	20	2.49	0.90
2002 - 2012	10	2.47	1.16

The following graph illustrates the historical annual change in price inflation, measured as of December 31 of each year, as well as the thirty year rolling average.

Annual Rate of CPI (U) Increases



Over more recent periods, measured from December 31, 2012, the average annual rate of increase in the CPI-U has been 3.00% or lower. The period of high inflation from 1973 to 1982 has a significant impact on the averages over periods which include these years. Further, the average rate of 2.95% over the entire 90 year period is close to the average rate of 2.93% for the prior 30 years (1982 to 2012), but the volatility of the annual rates in the more recent years has been markedly lower as indicated by the significantly lower annual standard deviations (see earlier table). Many experts attribute the lower average annual rates and lower volatility to the increased efforts of the Federal Reserve since the early 1980's to stabilize price inflation. As the Fed's efforts to promote stability in price inflation are expected to continue, we feel greater weighting should be given to the last 30-year historical period in our analysis.

Forecasts of Inflation

Additional information to consider in formulating this assumption is obtained from measuring the spread on Treasury Inflation Protected Securities (TIPS) and from the prevailing economic forecasts. The spread between the nominal yield on treasury securities (bonds) and the inflation indexed yield on TIPS of the same maturity is referred to as the "breakeven rate of inflation" and represents the bond market's expectation of inflation over the period to maturity. The following table provides the calculation of the breakeven rate of inflation as of December 31, 2012.

Years to Maturity	Nominal Bond Yield	TIPS Yield	Breakeven Rate of Inflation
10	1.78	-0.67%	2.45%
20	2.54	0.15	2.39
30	2.95	0.41	2.54

Although many economists forecast lower inflation than the current assumption, they are generally looking at a shorter time period than is appropriate for a pension valuation. To consider a longer, similar timeframe, we looked at the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the May 2012 report, the projected average annual increase in the CPI over the next 75 years was estimated to be 2.80%, under the intermediate cost assumptions. The lower cost assumption used a forecast of 1.80% and the high cost assumption was 3.8%, indicating a reasonable range for their projections of 1.8% to 3.8%.

The COPFRS investment consultant, DeMarche Associates also provided a long term assumption for inflation of 3.1% as part of their capital market assumptions.

Reasonable Range and Recommendation: Given the longer term perspective for pension funding, we believe that a range between 2.5% and 4.0% is reasonable for an actuarial valuation of a retirement system. Based on the information presented above, we would prefer to reduce the inflation assumption by making a small adjustment now and then evaluating whether another adjustment is appropriate in the next experience study. **Therefore, we recommend that the long-term price inflation assumption be lowered from 3.50% to 3.25%.**

Consumer Price Inflation	
Current Assumption	3.50%
Reasonable Range	2.50% - 4.00%
Recommended Assumption	3.25%

INVESTMENT RETURN

Use In The Valuation: The investment return assumption is one of the primary determinants in the allocation of the expected cost of the System's benefits, providing a discount of the estimated future benefit payments to reflect the time value of money. Generally, the investment return assumption should represent the long-term rate of return on the plan assets, considering the asset allocation policy, expected long term real rates of return on the specific asset classes, the underlying inflation rate, and investment expenses.

The current investment return assumption is 8.0% per year, net of all investment-related expenses. Administrative expenses are paid directly by the City so no adjustment to the gross rate of return is necessary for this item.. The 8.0% rate of return is referred to as the nominal rate of return and is composed of two components. The first component is price inflation (previously discussed). Any excess return over price inflation is referred to as the real rate of return. The real rate of return, based on the current set of assumptions, is 4.5% (8.0% nominal return less 3.5% inflation).

The Actuarial Standards Board Statement Number 27 provides guidance to actuaries on selecting economic assumptions. It lists specific factors that can be considered in constructing the best-estimate investment return range and/or selecting an investment return assumption within the range. Such factors are:

1. **The purpose of the measurement.** The measurement of obligations for an ongoing plan will differ from those of a terminating, closed or frozen plan. An ongoing plan will typically reflect a longer time horizon and a more diversified investment portfolio.

2. **Investment policy.** This usually refers to the plan's current asset allocation, the types of securities the system is eligible to invest in, and the target allocation, if different. It may also reflect the investment philosophy regarding risk tolerance and social investing.

3. **Reinvestment Risk**. This should reflect the reinvestment of moneys not immediately required to pay plan benefits.

4. **Investment Volatility.** If a system is required to liquidate assets at depressed values to meet benefit obligations, a higher risk is present.

5. **Investment Manager Performance.** Few investment managers consistently outperform the market. Those who consistently underperform may be replaced.

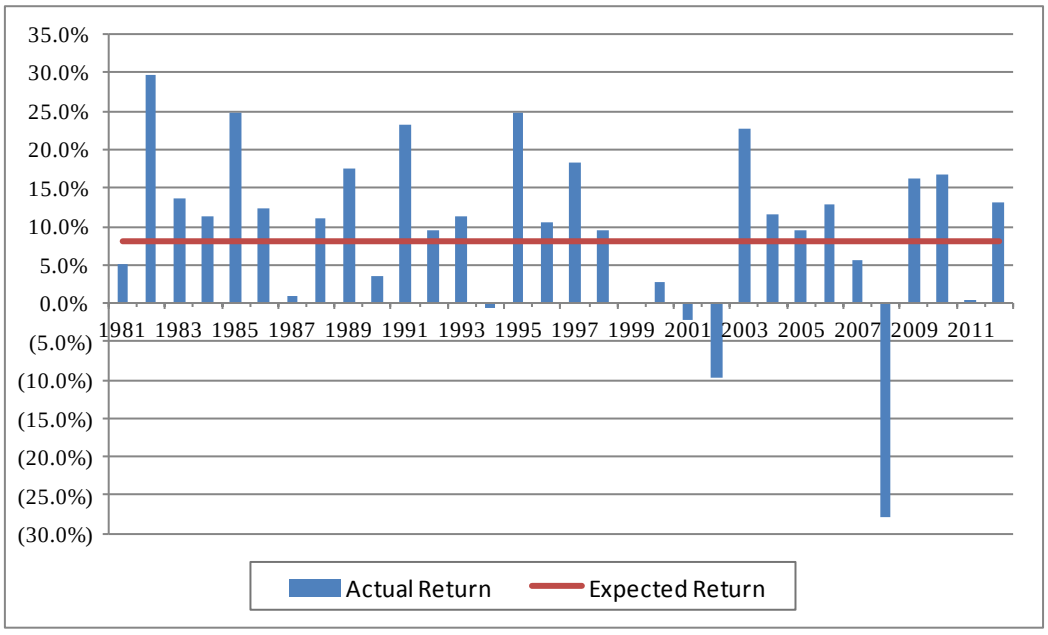
6. **Investment Expenses.** Investment returns can be assumed both with and without expenses. Actual expenses are measured periodically and taken into account when setting the investment return assumption.

7. **Cash Flow Timing.** The expected stream of contributions and benefit payments may affect the liquidity of a plan's investment opportunities.

8. **Benefit Volatility.** This is typically a consideration for small plans, plans with full lump sum payment options and supplemental benefits. The concern with these factors is a need to liquidate securities at depressed values.

Historical Perspective: One of the inherent problems with analyzing historical data is that the results can look significantly different depending on the time frame used if the year-to-year results vary widely. Even though history provides a valuable perspective for setting this assumption, the economy of the past is not necessarily the economy of the future. In addition, asset allocations may have changed over the period so returns may not be directly comparable.

The System's actual investment return on the market value of assets is shown in the graph below (the return for 2012 was included since it was available when the report was prepared):



The geometric average return has varied significantly when viewed over different time periods. For example, the rate of return over the ten year period ending December 31, 2012 was around 7%, but over the entire thirty-two year period ending December 31, 2012 the compound return was about 9%.

Forward Looking Analysis

A more dynamic forward looking analysis of the expected investment return is also an appropriate analysis to perform in setting this assumption. In assessing the future expectation of investment returns, we prefer to utilize the capital market assumptions of the investment professionals assisting the Board in determining its investment policies and asset allocation. This approach is referred to as the building block method in ASOP No. 27. The current asset allocation of the fund, which is shown below, was used in our forward looking analysis of expected returns:

Asset Category	Asset Allocation	Expected Rate of Return (Arithmetic)	Standard Deviation
Large Cap Equity	16.0%	9.0%	18.5%
Small Cap Equity	12.0%	10.3%	24.0%
International Developed Equity	7.0%	9.2%	20.0%
International Small Cap	6.5%	10.5%	24.7%
Emerging Markets	6.5%	12.0%	29.0%
Intermediate Fixed Income	5.0%	6.6%	6.7%
High Yield Fixed Income	15.0%	8.4%	11.0%
Real Estate	17.0%	8.6%	7.5%
Commodities	3.0%	10.0%	20.0%
Private Equity	5.0%	15.0%	30.0%
Total	100.0%		

The full set of the current capital market assumptions, as provided by the Board's investment consultant, DeMarche Associates, is shown in Appendix C. Using the target asset allocation as shown in the table above, we assumed that investment returns approximately follow a lognormal distribution with no correlation between years. The results below provide an expected range of rates of return over a 50 year time horizon using DeMarche's capital market assumptions, including price inflation of 3.1%. Looking at one year's results produces an expected return (mean) of 9.57% but also has a high standard deviation or measurement of volatility illustrated by the range of results, i.e. -10.76% to 32.60%. By expanding the time horizon, the average return does not change much, but the volatility declines significantly (range for 50 year time span is 5.78% to 11.87%). The following table provides a summary of the results.

Time Span In Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5th	25th	50th	75th	95th
1	9.57%	13.24%	-10.76%	0.30%	8.78%	17.98%	32.60%
5	8.94	5.87	-0.44	4.90	8.78	12.80	18.85
10	8.86	4.15	2.18	6.02	8.78	11.61	15.81
20	8.82	2.93	4.07	6.82	8.78	10.77	13.71
30	8.81	2.39	4.92	7.18	8.78	10.41	12.79
50	8.79	1.51	5.78	7.54	8.78	10.04	11.87

Based on this analysis, there is 50% likelihood that the average rate of return over a 50-year period will be 8.78%. It can also be inferred that for the 10 year time span, 5% of the resulting real rates of return were below 2.18% and 95% were above that. As the time span increases, the expected results narrow. Over a 50 year time span, the results indicate there is a 25% chance that returns will be below 7.54% and a 25% chance they will be above 10.04%. In other words, there is a 50% chance the returns will be between 7.54% and 10.04%.

From the table above, an 8.00% average annual return over the 50 year period ranks at the 40th percentile. In other words, there is approximately a 60% likelihood that the long term average rate of return over a 50 year period will be at least 8.00%. DeMarche uses a different set of capital market assumptions for purposes of asset allocation, called their strategic assumptions. The timeframe for use of these assumptions is three to five years. On that basis, the median return (50th percentile) is 6.77%. This means that returns in later years (beyond the next five years) are expected to exceed 8.78% in order for the compound return over the 50 years to be 8.78%. The use of an 8.0% investment return assumption recognizes that short term experience is expected to be below 8.0% even if experience in the long term is expected to be higher than 8.0%.

Typically, using the building block approach of ASOP No. 27 and the projection results outlined above, a range for the investment return assumption is determined as the 25th to 75th percentile real returns over the 50 year time span plus an adjustment if the underlying inflation assumption is different than the actuarial inflation assumption. Because the DeMarche's capital market assumptions reflect an inflation assumption close to our recommended inflation assumption no further adjustment for the difference in the inflation assumptions has been made.

	25th Percentile	50th Percentile	75th Percentile
Rate of Return	7.54%	8.78%	10.04%

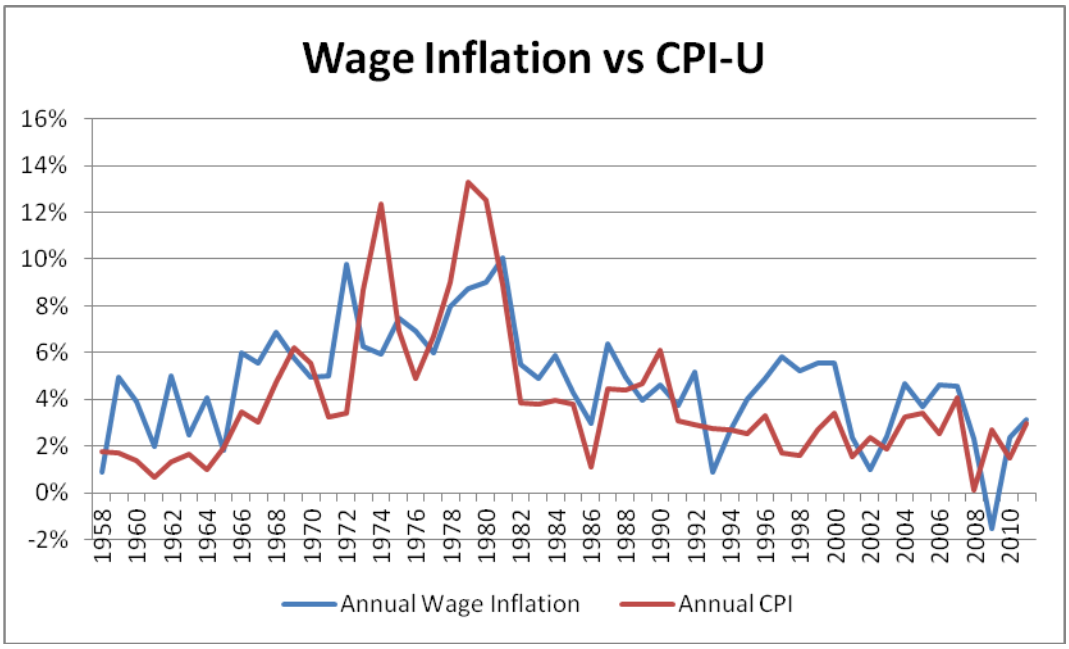
Given the results of the forward looking analysis using the investment consultant's long term assumption, the 8% assumption remains a reasonable estimate of long term returns.

WAGE GROWTH

Use in the Valuation: The assumed future increases in salaries consist of a wage inflation component and a component for promotion and longevity, often called merit increases. The latter are generally age and/or service related, and will be dealt with in the demographic assumption section of the report. Wage inflation normally is greater than price inflation as a reflection of the overall return on labor in the economy. The rate of wage inflation above price inflation is called the real wage growth (or productivity) and is the focus of our analysis.

The current wage growth assumption is 4.0% per year, which is composed of a 3.50% inflation assumption and a 0.50% productivity component.

The National Average Wage (utilized by Social Security to index the historical wages used in determining benefits) is often used for historical analysis of the overall wage growth in the United States. A graph of wage inflation, as measured by the change in the National Average Wage Growth, and price inflation, as measured by CPI-U, is shown in the following graph. As can be seen, there are a few periods where price inflation is above wage inflation, but in general, wage inflation exceeds price inflation so we believe that expectation should be reflected in the actuarial assumptions.



Past Experience: The Social Security Administration publishes data on wage growth in the United States. As with our analysis of price inflation, data on wage inflation along with a comparison to price inflation over various time periods is presented in the table below. If the rate of price inflation is subtracted from the data for each year, the result is the historical real wage growth or productivity.

Period	Wage Inflation	Price Inflation	Real Wage Growth
2001-2011	2.70%	2.48%	0.22%
1991-2001	4.20	2.51	1.69
1981-1991	4.70	3.91	0.79
1971-1981	7.80	8.62	-0.82
1961-1971	4.75	3.20	1.55
1991-2011	3.45%	2.49%	0.96%
1981-2011	3.87	2.96	0.91
1971-2011	4.84	4.35	0.49
1961-2011	4.82	4.12	0.70

Thus over the last 50 years, annual real wage growth has averaged 0.70%. Over the last 20 years, the National Average Wage increased 3.45% on average while price inflation averaged 2,49%, resulting in real wage growth of 0.96%. Wage increases for public sector employment have fallen below private sector wage increases in recent years, a trend which may continue in the short term, but should not persist indefinitely.

Forecasts of Future Wages: The wage index used for the historical analysis has been projected forward by the Office of the Chief Actuary of the Social Security Administration. In a report in May of 2012, the annual increase in the National Average Wage Index over the next 30 years under the intermediate cost assumptions was 4.0%, 1.2% higher than the Social Security intermediate inflation assumption. The low cost assumption was 3.6%, or 1.8% above the inflation assumption of 1.8%. The high cost assumption was 4.4%, 0.6% above the inflation assumption of 3.8%. The resulting range for real wage growth is 0.6% to 1.2%.

Reasonable Range and Recommendation: Based on our recommended inflation assumption of 3.25%, we believe that a range between 3.50% and 4.50% is reasonable for the actuarial valuation**. We recommend that the long-term assumed wage inflation rate remain at 4.0%, which implies a productivity component of 0.75%.** However, given the current economic conditions, we believe it is unlikely that general wage increases of 4.0% are likely to be granted to governmental employees until the economy fully recovers and tax revenues improve. To the extent that actual salary increases are below the 4.0% assumption, actuarial liabilities will be lower than expected and an actuarial gain will occur. This approach provides some conservatism in the valuation process as it results in higher liabilities and only recognizes lower salaries as they actually occur.

A summary of the reasonable range and our recommended assumption are shown below:

	Wage Growth
Current Assumption	4.0%
Reasonable Range	3.50% - 4.50%
Recommended Assumption	4.00%*

*Although the assumption did not change, the components of the assumption did change. The price inflation assumption was lowered from 3.5% to 3.25% and the productivity assumption was increased from 0.50% to 0.75%.

DEMOGRAPHIC ASSUMPTIONS

Actuarial Standard of Practice (ASOP) No. 35 provides guidance to actuaries regarding the selection of demographic and other non-economic assumptions for measuring pension obligations. A revised edition of this standard was adopted by the Actuarial Standards Board of the American Academy of Actuaries in September 2010, effective for actuarial valuations with a measurement date on or after June 30, 2011.

ASOP 35 General Considerations and Application

Each individual demographic assumption should satisfy the criteria of ASOP 35. In selecting demographic assumptions the actuary should also consider: the internal consistency between the assumptions, materiality, cost effectiveness, and the combined effect of all assumptions. At each measurement date the actuary should consider whether the selected assumptions continue to be reasonable, but the actuary is not required to do a complete assumption study at each measurement date. In our opinion, the demographic assumptions recommended in this report have been developed in accordance with ASOP 35.

Overview of Analysis

The purpose of a study of demographic experience is to compare what actually happened to the individual members of the System during the study period (calendar years 2007 through 2011) with what was expected to happen based on the actuarial assumptions. A single five year period is still a relatively short observation period, particularly given the size of the group. In addition, the study period includes the economic downturn in 2008 and 2009. Therefore, some of the experience observed in the study may not be representative of long term trends. In addition, the System's size limits the credibility of the findings. Our recommendations were made after taking these factors into account.

Studies of demographic experience generally involve three steps:

- First, the number of members changing membership status, called decrements, during the study is tabulated by age, duration, gender, group, and membership class (active, retired, etc.).

- Next, the number of members expected to change status is calculated by multiplying certain membership statistics, called exposure, by the expected rates of decrement.

- Finally, the number of actual decrements is compared with the number of expected decrements. The comparison is called the actual to expected ratio (A/E Ratio), and is expressed as a percentage.

In general, if the actual experience differs significantly from the overall expected results, or if the pattern of actual decrements, or rates of decrement, by age, sex, or duration deviates significantly from the expected pattern, new assumptions are considered. Recommended revisions are normally not an exact representation of the experience during the observation period. Judgment is required to anticipate future experience from past trends and current evidence, including a determination of the amount of weight to assign to the most recent experience.

SECTION 5 – DEMOGRAPHIC ASSUMPTIONS

It takes a fair amount of data to provide experience study results that are fully credible for demographic assumptions. Because the membership or certain subsets of the membership are relatively small, some assumptions have been selected based more on our professional judgment of reasonable future outcomes than actual experience.

ASOP 35 states that the actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations, and select assumptions based upon application of that professional judgment. The actuary should select reasonable demographic assumptions in light of the particular characteristics of the defined benefit plan that is the subject of the measurement. A reasonable assumption is one that is expected to appropriately model the contingency being measured and is not anticipated to produce significant cumulative actuarial gains or losses over the measurement period.

Pursuant to ASOP 35 the actuary should follow the following steps in selecting the demographic assumptions:

1. Identify the types of assumptions. Types of demographic assumptions include but are not limited to retirement, mortality, termination of employment, disability, election of optional forms of payment, administrative expenses, family composition, and treatment of missing or incomplete data. The actuary should consider the purpose and nature of the measurement, the materiality of each assumption, and the characteristics of the covered group in determining which types of assumptions should be incorporated into the actuarial model.

2. Consider the relevant assumption universe. The relevant assumption universe includes experience studies or published tables based on the experience of other representative populations, the experience of the plan sponsor, the effects of plan design, and general trends.

3. Consider the assumption format. The assumption format includes whether assumptions are based on parameters such as gender, age or service. The actuary should consider the impact the format may have on the results, the availability of relevant information, the potential to model anticipated plan experience, and the size of the covered population.

4. Select the specific assumptions. In selecting an assumption the actuary should consider the potential impact of future plan design as well as the factors listed above.

5. Evaluate the reasonableness of the selected assumption. The assumption should be expected to appropriately model the contingency being measured. The assumption should not be anticipated to produce significant cumulative actuarial gains or losses over the measurement period.

MORTALITY

One of the most important demographic assumptions is mortality because this assumption predicts when retirement payments will stop. The life expectancies of current and future retirees are predicated on the assumed rates of mortality at each age. It is commonly known that rates of mortality have been declining, which means people, in general, are living longer.

ASOP 35 states that the actuary should consider the effect of mortality improvement both prior to and subsequent to the valuation date. This implies the need to make a specific assumption with respect to future improvements in mortality (beyond the valuation date), even if that assumption is no future improvement. It is an established trend that people are living longer and we believe that trend will continue. Therefore, we believe it is appropriate to reflect future mortality improvements in the mortality assumption. Sometimes this is accomplished by including a "margin" in the rates (predicting fewer deaths than are actually occurring in the present experience). Under this approach the resulting ratio of actual to expected deaths (A/E ratio) is over 100%. Another way to reflect the trend in long term mortality improvements is to use generational mortality where the probability of death at a given age is projected to be lower each year in the future thereby reflecting greater mortality improvement for younger members.

Healthy Retirees: The valuation currently uses separate mortality assumptions for male and female members. The RP-2000 Healthy Annuitant Mortality Table for Males and Females, with generational mortality using Projection Scale AA to anticipate mortality improvements in future years, with ages set forward one year (e.g. an individual who is age 65 is assumed to exhibit the mortality of a 66-year old) is used to predict the probability of death for members receiving benefits.

In examining the results of the Experience Study, if the A/E Ratio is greater than 100% the assumptions have predicted fewer deaths than actually occurred and with an A/E Ratio less than 100% the assumptions have predicted more deaths than have actually occurred. Sometimes a mortality table is selected with the explicit purpose of anticipating fewer deaths so there is room for mortality improvements in the future (called "margin"). However, using the RP-2000 Mortality Table with generational mortality, the A/E Ratio should be around 100% as mortality improvements in future years are directly reflected in the valuation process by projecting lower mortality rates in future years so no margin is needed.

The aggregate observed experience for healthy (not disabled) male retirees during the study period is shown in the following chart. There is an insufficient number of female retirees to provide any reasonable analysis for the group so that information is not shown.

	Healthy Male Retirees		
	Observations		A/E Ratio
	Actual	Expected	Current
Police	30	32	94%
Fire	31	37	84%
Total	61	69	88%

Actual deaths for healthy males were lower than the number expected (61 compared to 69 over a five year study period) based on the current assumption with a resulting A/E ratio of 88%. We also analyzed the data by year as shown in the following table. Due to the small size of the group, there is considerable volatility in results from year to year. A similar pattern was observed in the last experience study.

	Healthy Male Retirees		
	Observations		A/E Ratio
Year	Actual	Expected	Current
2007	8	11	73%
2008	9	13	69%
2009	11	14	79%
2010	22	15	147%
2011	11	16	69%
Total	61	69	88%

The current mortality assumption uses a one year age set forward, i.e. a member is assumed to exhibit the mortality of a person one year older. The results of the experience study indicate that mortality during the study period was better than expected (i.e. there were fewer deaths than expected). However, in the prior experience study the current assumption produced an actual to expected ratio of 116% indicating the number of deaths was higher than expected using this assumption (actual deaths were 46 and expected deaths were 40). If the experience of both studies is combined the resulting A/E ratio is 98% (107 actual deaths and 109 expected).

We would note that the Society of Actuaries is in the process of developing a new mortality table that will replace the RP-2000 Table. In the interim, they have issued a new mortality improvement projection scale table, Scale BB, to replace the existing Scale AA. For the ages of the COPFRS retirees, Scale BB generally projects more mortality improvement in the future, and thus would predict fewer deaths. While we are not recommending a change in the mortality table at this time, the Board may wish to adopt Scale BB at this time because it reflects broader trends in mortality that cannot be detected in a smaller group of retirees such as the COPFRS retirees.

We recommend the postretirement mortality assumption remain the same as the current assumption, i.e. the RP-2000 Healthy Annuitant Mortality Table for males and females (ages set forward one year) with generational mortality improvements anticipated by Projection Scale AA.

Beneficiaries: The mortality of beneficiaries applies to the survivors of members who received benefits under a joint and survivor form of payment. There is typically little data on the mortality experience of beneficiaries prior to the death of the member because there is no requirement that the death be reported. **Therefore, we recommend that standard convention be followed and mortality for beneficiaries be set on the same basis as is used for retired members.**

Disabled Members: The valuation assumes that disabled members, in general, will not live as long as retired members who met the regular service retirement eligibility. There is an insufficient number of disabled retirees to provide fully credible results. There were 31 deaths during the study period and 61 were expected based on the current mortality table for disabled retirees. The table currently used is a standard disabled life table, but given that police and fire members are considered disabled if they cannot perform the duties of their job, it seems reasonable to assume their mortality is expected to be better than a disabled retiree in a non-public safety job. **As a result, we recommend the disabled mortality assumption be changed to the RP-2000 Healthy Annuitant Mortality Tables for males and females, set forward 5 years, with generational mortality improvements anticipated by Scale AA**.

Active Members: This assumption predicts eligibility for active member death benefits prior to retirement, rather than the expected lifetime for pension payments. In smaller groups, the mortality rates for active members are often set based on the same assumption as is used for healthy retirees. Given the low probability of death while active, the results cannot be credible on their own without much larger numbers of employees than are in COPFRS. We prefer to keep the mortality assumption for active and retired members on a consistent basis. **Therefore, we recommend the active member mortality be set to the RP-2000 Employee Mortality Table for males and females with a 1 year set forward and Scale AA to anticipate mortality improvements in future years.**

SERVICE RETIREMENT

Service retirement measures the change in status from active membership directly to retirement. This assumption does not include the retirement patterns of members who terminated from active membership years prior to their retirement. A separate assumption addresses that situation.

There were significant changes to the benefit structure during much of the study period and, as a result, the actual experience may be a poor indicator of future rates of retirement. For example, the benefit formula increased to the maximum level of 75% of final average pay on July 1, 2007. There were many active members who delayed retirement until the 75% maximum benefit (with 25 years of service) was effective. This is evidenced by the dramatic spike in service retirements in 2007 (143 actual retirements) compared to other years.

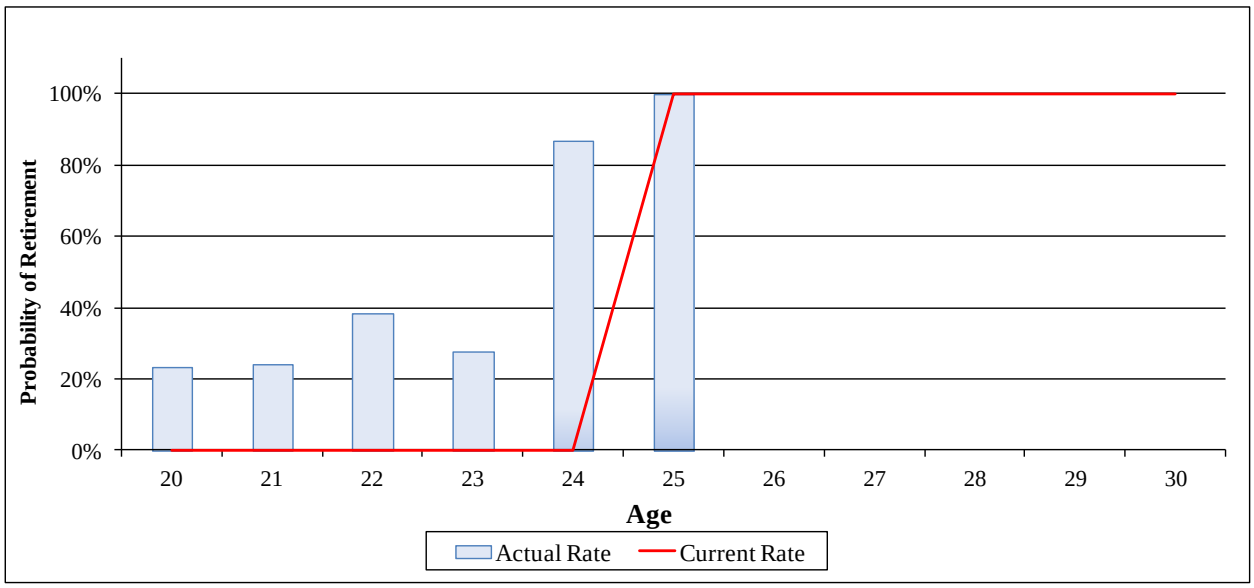
In addition, after the market downturn in 2008 the System faced a significant long term funding issue that was projected to result in the depletion of System assets in about twenty years even if all actuarial assumptions were met. As a result, changes to the retirement system were part of labor negotiations with the police union in 2010 and the fire union in 2011 and 2012. As a result of the negotiations, there were significant changes to the pension provisions in the police contract dated September, 2010. The elimination of the inclusion of lump sum payments of certain bank hours in the determination of final average pay likely impacted the retirement experience in late 2010 because plan changes could have resulted in a lower benefit amount for many members if they did not retire at that time. The contract with the fire union was not settled until December, 2012. However, the issue of pension plan reform may still have impacted the behavior of fire members during the study period. As a result, we do not believe we can rely on the actual retirement experience in this period as a reliable indicator of future rates of retirement. For both the police and fire members, the new contracts create different retirement eligibility criteria and modify the benefit structures for various groups of active members. Those differences vary between the police and fire contracts.

Even though the observed data is not credible for the reasons outlined earlier, we did study the actual retirement rates at which members elected service retirements over the study period,. The current assumption, for both police and fire members, is that they work until they reach 25 years of service and then retire or enter DROP. The following table is a summary of the actual service retirements for the period 2007 through 2011:

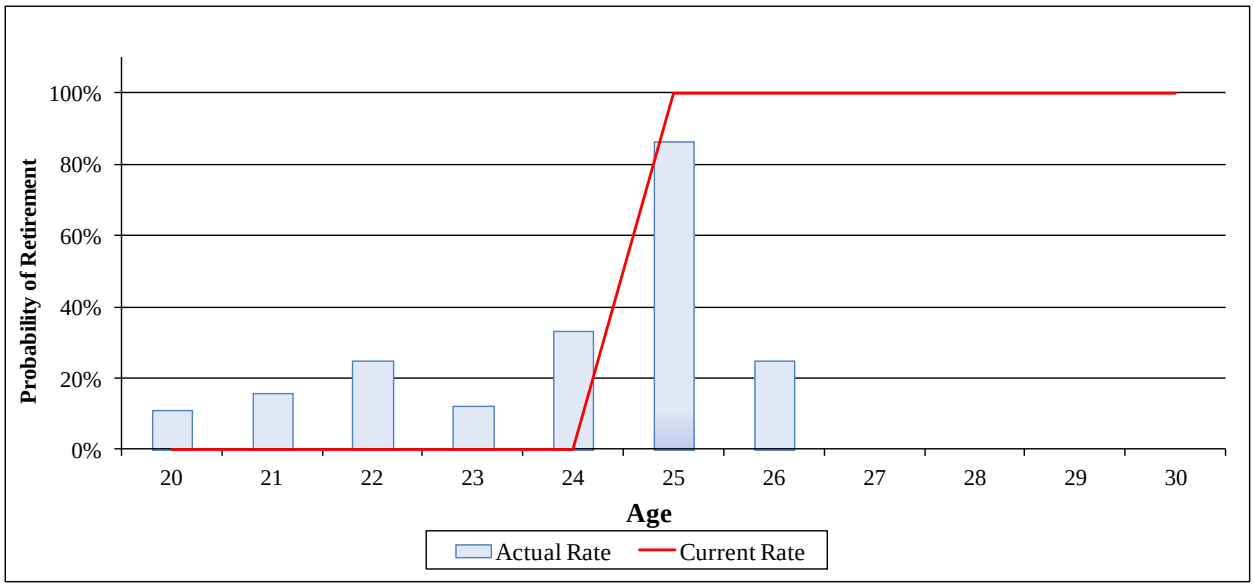
Calendar Year	Retirements		
	Observations		
	Actual	Expected	A/E Ratio
2007	143	60	238%
2008	83	9	922
2009	31	2	1550
2010	42	15	280
2011	12	4	300
Total	311	90	345

Even if the experience in 2007 is eliminated, the actual number of retirements far exceeds the expected number. In addition, the pattern of actual retirements was very different than the current assumption. The assumption reflects no probability (0%) of retirement prior to 25 years of service and 100% probability of retirement at 25 years of service. The actual experience in 2008 through 2011 indicates that while nearly all members retire (or elect DROP) by the time they reach 25 years of service, some members retire with less than 25 years of service. This was evident in the retirement patterns as shown in the graph below of retirement experience for 2008 through 2011. Given the lack of credibility during the current study period, we are not recommending a change be made at this time. However, the retirement pattern should be closely analyzed in the next experience study so a determination can be made as to whether the retirement rates should be modified.

Police



Fire



Given the plan design for current active members, we believe that it is appropriate to have different assumptions for different groups to reflect the expected retirement behavior by members covered under the different benefit structures. A summary of the retirement eligibility and benefit formulas for Police members are summarized below:

	Police Members		
	At least 20 YOS at contract date	**Less than 20 YOS at contract date**	**Hired after January 1, 2010**
Eligible to retire with unreduced benefits	Age 45 and 20 YOS or age 55 and 10 YOS	Age 45 and 20 YOS or age 55 and 10 YOS	Age 50 and 30 YOS or age 55 and 10 YOS
Eligible to retire with reduced benefits	None	None	Age 50, but 7% reduction for each year before age 55 if less than 30 YOS
Benefit formula	10 YOS; 20% 15 YOS: 30% 20 YOS: 50% 25 YOS: 75%	10 YOS: 20% 15 YOS: 30% 20 YOS: 50% 25 YOS: 70% 30 YOS: 75%	10 YOS: 20% 15 YOS: 30% 20 YOS: 50% 25 YOS: 65% 30 YOS: 75%

The benefit structures for Fire members are summarized below:

	Fire Members		
	At least 15 YOS at contract date	**Less than 15 YOS at contract date**	**Hired after January 1, 2013**
Eligible to retire with unreduced benefits	Age 45 and 25 YOS, age 50 and 20 YOS or age 55 and 10 YOS	Age 45 and 25 YOS, age 50 and 20 YOS or age 55 and 10 YOS	Age 50 and 30 YOS or age 55 and 10 YOS
Eligible to retire with reduced benefits	None	None	Age 50, but 7% reduction for each year before age 55 if less than 30 YOS
Benefit formula	10 YOS; 20% 15 YOS: 30% 20 YOS: 55% 25 YOS: 75%	10 YOS: 20% 15 YOS: 30% 20 YOS: 50% 25 YOS: 70% 30 YOS: 75%	10 YOS: 20% 15 YOS: 30% 20 YOS: 45% 25 YOS: 55% 30 YOS: 65%

For the group of active Police officers who were hired prior to January 1, 2010 we believe the current assumption that all members will elect to retire at 25 years of service is still a reasonable assumption. The structure of the benefit formula provides a strong incentive for employees to remain in covered employment for 25 years and less incentive for members to remain working from 25 to 30 years of service. Police members hired after January 1, 2010 receive a pension of 65% of final average pay with 25 years of service and 75% with 30 years of service. The benefit increase from 65% to 75% of final average pay is significant enough that we expect many, but not all, members will delay retirement in order to receive the higher benefit of 75% of final average pay. Therefore, we recommend a different assumption be used for the new tier (post-2010 hires) as shown below:

Years of Service	Probability of Retirement
20 to 24	3%
25	5%
26	5%
27	5%
28	10%
29	10%
30	100%

We believe it is reasonable to use the same assumption for Fire members hired after January 1, 2013. For those hired before January 1, 2013, we believe the current assumption of 100% after 25 years remains reasonable. It will be many years before there is any credible retirement experience for the police members hired after January 1, 2010 and fire members hired after January 1, 2013. Until such time we must rely on our professional judgment in setting this assumption.

Inactive Vested Members: The current assumption is that inactive vested members will retire at their first eligible retirement date. There are few such members so no reliable data is available to evaluate this assumption. However, it is reasonable to expect most, if not all, of these members to retire at their earliest retirement date. **We recommend keeping the current assumption that benefits for inactive vested members will commencement at the earliest retirement date. It is a reasonable assumption and provides a conservative estimate of the liability for inactive vested members.**

DISABILITY

The size of the System, coupled with the small probability of disablement at most ages, does not permit credible derivation of disability rates based solely on the System's experience. Nonetheless, the actual to expected ratio was calculated as a general indicator of how well the assumption anticipated actual experience. The following table shows both the experience in the prior and the current study.

	Disabilities		
	Observations		A/E Ratio
	Actual	Expected	
2002-2006	19	29	66%
2007-2011	18	37	49
Total	37	66	56

We also analyzed the actual versus expected experience separately by group, i.e. police and fire. The following table summarizes those results:

	Disabilities (2007-2011)		
	Observations		A/E Ratio
	Actual	Expected	
Police	11	20	55%
Fire	7	17	41
Total	18	37	49

The disability assumption was lowered in the last experience study with rates set so that the actual to expected ratio would increase, but remain well below 100%. This approach increased the probability that actual experience would not result in a higher number of disabled members than assumed. Given that the observed experience in this study period continues to show fewer disabilities than expected, **we are recommending that the current disability rates be reduced by 20%. The A/E ratio using the new assumption is 60% so anticipated disabilities are still above the actual experience, thus providing a margin of conservatism.**

TERMINATION OF EMPLOYMENT

This section of the report summarizes the results of our study of terminations of employment for reasons other than death, retirement, or disability. Rates of termination can vary by both age and years of service. In general, rates of termination tend to be highest at younger ages and in the early years of employment. The current termination of employment rates are age based.

As was noted earlier in this report, the current study period (2007 through 2011) included several years of difficult economic conditions, so the observed experience may not be representative of future experience. Since termination of employment often involves a decision by the member to voluntary leave covered employment, the actual experience can be heavily influenced by economic conditions. However, the impact on public safety groups may be less dramatic than that observed in the general work force.

In the prior experience study, the A/E ratio using the current assumption was 91% (39 actual terminations and 43 expected). As the following table illustrates, the actual number of terminations in this study period was much lower than expected.

	Terminations		
	Observations		A/E Ratio
	Actual	Expected	Current
Police	28	31	90%
Fire	6	25	24%
Total	34	56	61%

During the current study period, the termination rates for Fire members were much lower than for Police members. However, as discussed earlier, the credibility of the data in this study is limited. In addition, actual termination experience was not reported separately for Police and Fire in the prior experience studies. Therefore, we are not comfortable recommending a new assumption at this time. However, the experience should continue to be analyzed separately in the future so the use of different assumptions for each group can be further evaluated. Therefore, **we recommend the current assumption be retained.**

SALARY INCREASE ASSUMPTION

Estimates of future salaries are based on assumptions for two types of increases:

1. Increases in each individual's salary due to promotion or longevity (often called merit scale), and
2. Increases in the general wage level of the membership, which are directly related to price and wage inflation.

Earlier in this report, we recommended that the second of these rates, general wage inflation be left at 4.00% (3.25% price inflation and 0.75% real wage growth).

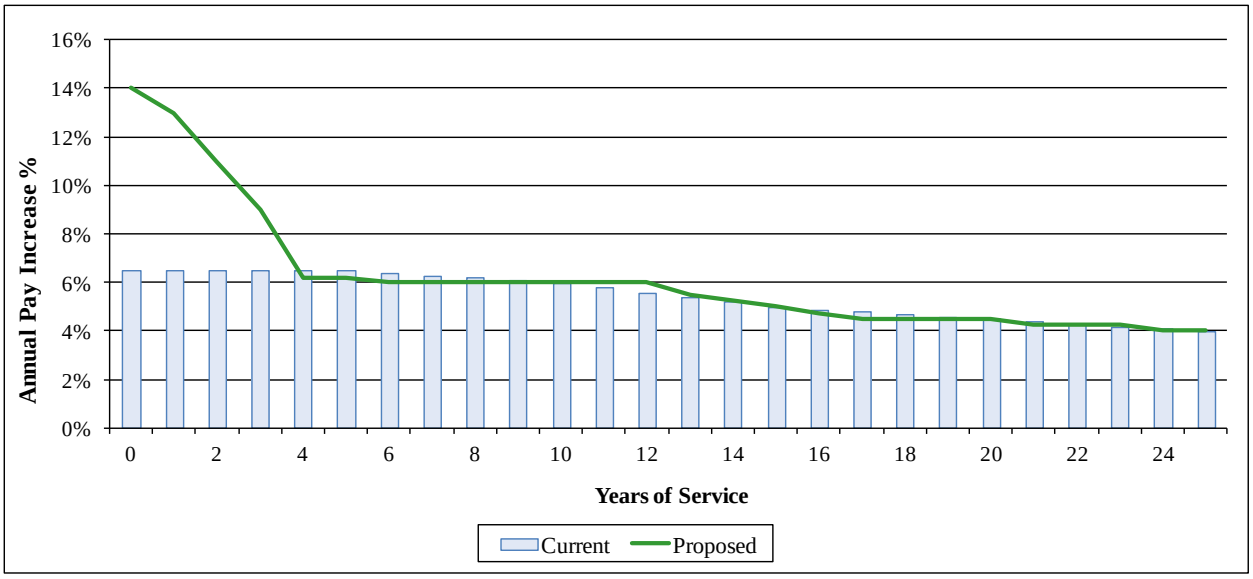
As noted above, future salary increases are the result of two components. Actual salary experience is reported in total, rather than by components, so the experience study reviewed total salary increases for the study period. As has been previously noted, the economic environment during this study period was very atypical. There was considerable pressure on government budgets to reduce expenses as revenues declined. As a result, salary increases for many public employees were very low during the study years. In addition, the union contracts were being negotiated and the salary increases for Fire members were delayed for certain years due with the final determination of wages being set by the Court of Industrial Relations. The inclusion of back pay in the actual salary amounts included in the study created some unusual salary increase patterns. In our study, we compared individual salary increases for any members active in any two consecutive periods (e.g. 2007 and 2008, 2008 and 2009, etc.). The average actual increase during this period was 5.13% while the expected increase was 5.26%.

Recognizing the limitations of the data in the study period, the actual salary experience has very little credibility and it is not appropriate to make significant adjustments to the salary scale based on to the observed data. However, the structure of the pay scales has changed since the last experience study so we felt that further study was needed. We analyzed the pay scales currently in use to determine if, and how, the current merit scale should be modified so it better reflects expected salary increases. The current pay scales for Police and Fire members are different which leads us to recommend that different merit salary scales be developed for each group.

Police: The pay scale for police officers reflects nine steps (A through I) starting with entry as a probationary police officer. Over the nine steps, the pay rate increases vary from a low of 2% to a high of 15%. It is our understanding that the requirement to move from one step to another is dependent on the officer's date of hire. The differences between the requirements for the pre and post-December 27, 2009 groups are minimal. In general, for movement to Steps A through E the requirement is one year. For movement from Step E up to the next Step ultimately reaching Step I, the requirement is two years. Thirteen (13) years after academy graduation, an officer would reach Step I. In addition to reflecting the movement through the various steps, the merit scale should reflect some component of promotion to a higher rank for some members.

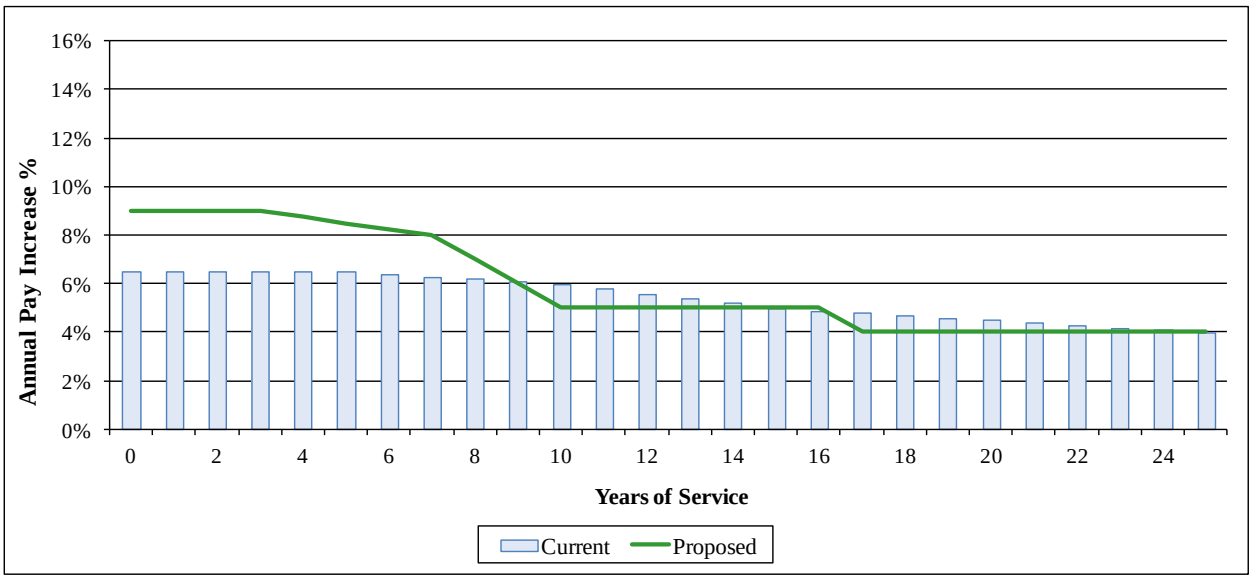
Based on the structure and timing requirements of the current pay scale we believe the salary scale (total of general wage growth of 4% and merit scale) should be modified as shown in the graph below.

Police



Fire: The pay scales for Fire are different than the Police pay scales and thus, we believe a different merit salary scale is appropriate for the fire group. In general, there are seven (7) steps, Steps A though G, for both the firefighters and the fire apparatus engineers. Movement between each step occurs after 12 months other than the movement from Step T (probationary firefighter) to Step A which happens after 6 months. The step increases vary from a low of 4.35% to a high of 5.6%. Again, the merit scale should reflect a component of promotion to a higher rank in addition to movement through the steps of the merit scale. Our recommended salary scale (both 4% general wage growth and merit scale) is shown below:

Fire



MISCELLANEOUS ASSUMPTIONS

Final Year Wage Adjustment

Prior to the most recent union contracts, the final average pay used to determine the member's monthly benefit was based on the highest 26 pay periods over the final five years of employment. The definition of pensionable pay for this purpose included cash payments for regular pay, overtime pay, and lump sum cash payments for hours in a member's "hours bank". Recent experience indicated that the inclusion of the cash payments from the hours bank created a spike in final average pay at retirement and higher benefit amounts. A specific assumption of 10% of active liability was used in the valuation to estimate the impact of the final year spike in pay on system liabilities.

New plan provisions for both Police and Fire members eliminate spiking by using a high three year average to determine final average pay and averaging overtime hours over a member's entire career (career overtime average referred to as COTA). The COTA hours are provided to the actuary in the data each year. The actual regular pay, as reported, is adjusted to reflect the current COTA hours. As a result, the assumption that was used to anticipate the spike in final average pay at retirement from lump sum payments is no longer needed. This assumption was no longer used for Police members beginning with the January 1, 2011 valuation and was no longer used for Fire members in the January 1, 2013 valuation, except for a few members who maintained the old definition of pay. Discussion is included here to provide documentation for the change in the assumption.

After using the data provided by the city for three valuations, we have a better understanding of the data items including the COTA hours. While we believe the current use of the actual COTA is a reasonable way to estimate the impact of COTA on the ultimate retirement benefit, we believe it merits further study to determine if the current method provides the best estimate of the retirement benefits expected to be paid from the System. This study would be performed as a standalone project sometime in the next year so that any change in the assumption could be reflected in the 2014 valuation.

Other Minor Assumptions

While we did not specifically include the following assumptions in our review of actual experience in the last five years, we believe the current assumptions remain reasonable and should be continued.

	Current Assumption
• % of total disabilities that are service related	85%
• Medical expenses for disabilities in line of duty	5% load on current and future disabled liabilities
• % married at death or retirement	75%
• % with dependents at death of active member	77%
• Average number of children per married member	1
• Age difference if unknown	Females are 3 years younger than males

SECTION 11– MISCELLANEOUS ASSUMPTIONS

Based on data tracked by the city, 86% of all disabilities that occurred in the study period from January 1, 2007 to December 31, 2011 were service related. Therefore, we believe the current assumption is reasonable and should be retained.

There is significant variability in the size of medical payments for disabilities from year to year, but based on the actual experience over the last five years, the current load appears to be a reasonable estimate.

While we did not include the other minor assumptions in our review of actual experience in the study period, we believe the current assumptions are reasonable and should continue to be used. Changes in these assumptions would have a relatively minor impact of the liabilities and costs of the System.

APPENDIX A – CURRENT ACTUARIAL ASSUMPTIONS

Interest:	8.00% per year, (net of investment expenses).
Salary Increases:	Merit increases based on service plus a general wage increase.
Service Retirement Age:	Graduated rates based on service.
Mortality:	
Active Members	RP-2000 Employee Table with generational improvements, set forward one year
Service Pensioners and Beneficiaries	RP-2000 Healthy Annuitant Table with generational improvements, set forward one year
Disabled	RP-2000 Disabled Retiree Mortality Table with generational improvements
Disability:	Graduated rates by age. See table on next page.
Percent of Disabilities in Line of Duty:	85%
Medical Expenses for Disabilities in Line of Duty:	5% load on liability for current and future disabled members.
Percent Married at Death or Retirement:	75%
Turnover	Graduated rates by age. See table on next page.
Assets:	Actuarial value of assets equal to 1/3 of market value, plus 2/3 of expected value. Actuarial value of assets cannot exceed 120% of Market value of assets.
Load on Active Member liability to reflect final wage adjustments	10% for Fire members who were age 45 and had at least 25 years of service or age 50 with at least 20 years of service as of most recent contract date, 0% for all other Fire members and Police members
Increase in total annual payroll	4.0%
Assumed annual rate of inflation	3.5%

SAMPLE RATES

Annual Rates

Age on 1/1/2010	Mortality		Disability	Turnover
	Males	Females		
20	.03%	.02%	.26%	1.41%
30	.05	.03	.30	1.69
40	.10	.07	.52	.63
50	.19	.15	.95	.00
60	.46	.41	1.45	.00

Salary Progression

Years of Service	Inflation	Productivity	Merit & Longevity	Total Increase
1	3.5%	0.5%	2.5%	6.5%
5	3.5%	0.5%	2.5	6.5
10	3.5%	0.5%	2.0	6.0
15	3.5%	0.5%	1.0	5.0
20	3.5%	0.5%	0.5	4.5
25	3.5%	0.5%	0.0	4.0

Service Requirements

Assumed retirement rates are based on the number of years of credited service as follows:

Years of Service	Distribution	Annual Rate
Less than 25	0.0%	0.0%
25	100.0	100.0

If a member was hired after age 37, then it is assumed that member would retire at the later of age 62 or 10 years of service.

APPENDIX B – PROPOSED ACTUARIAL ASSUMPTIONS

Interest:	8.00% per year, (net of investment expenses).
Salary Increases:	Merit increases based on service plus a general wage increase.
Service Retirement Age:	Graduated rates based on service.
Mortality:	
Active Members	RP-2000 Employee Table with generational improvements, set forward one year
Service Pensioners and Beneficiaries	RP-2000 Healthy Annuitant Table with generational improvements, set forward one year
Disabled	RP-2000 Healthy Annuitant Table with generational improvements, set forward five years
Disability:	Graduated rates by age. See table on next page.
Percent of Disabilities in Line of Duty:	85%
Medical Expenses for Disabilities in Line of Duty:	5% load on liability for current and future disabled members.
Percent Married at Death or Retirement:	75%
Turnover	Graduated rates by age. See table on next page.
Assets:	Actuarial value of assets equal to 1/3 of market value, plus 2/3 of expected value. Actuarial value of assets cannot exceed 120% of Market value of assets.
Load on Active Member liability to reflect final wage adjustments	10% for Fire members who were age 45 and had at least 25 years of service or age 50 with at least 20 years of service as of most recent contract date, 0% for other Fire members and all Police members
Increase in total annual payroll	4.0%
Assumed annual rate of inflation	3.25%

SAMPLE RATES
Annual Rates

Age on 1/1/2010	Mortality		Disability	Turnover
	Males	Females		
20	.03%	.02%	.21%	1.41%
30	.05	.03	.24	1.69
40	.10	.07	.42	.63
50	.19	.15	.76	.00
60	.46	.41	1.16	.00

Salary Progression – Police

Years of Service	Inflation	Productivity	Merit & Longevity	Total Increase
1	3.25%	0.75%	9.0%	13.0%
5	3.25%	0.75%	2.2	6.2
10	3.25%	0.75%	2.0	6.0
15	3.25%	0.75%	1.0	5.0
20	3.25%	0.75%	0.5	4.5
25	3.25%	0.75%	0.0	4.0

Salary Progression – Fire

Years of Service	Inflation	Productivity	Merit & Longevity	Total Increase
1	3.25%	0.75%	5.0%	9.0%
5	3.25%	0.75%	4.5%	8.5%
10	3.25%	0.75%	1.0%	5.0%
15	3.25%	0.75%	1.0%	5.0%
20	3.25%	0.75%	0.0%	4.0%

Service Requirements
Assumed retirement rates are based on the number of years of credited service as follows:

Years of Service	Distribution	Annual Rate
Less than 25	0.0%	0.0%
25	100.0	100.0

If a member was hired after age 37, then it is assumed that member would retire at the later of age 62 or 10 years of service.

Model Inputs - 2012

Assumes 3.1% long-term inflation rate.

Asset Class	Expected Return	Standard Deviation	Geometric Return	Asset Class	Expected Return	Standard Deviation	Geometric Return
Large Cap Stocks	9.0	18.5	7.4	Emerging Mkt Debt	8.0	11.2	7.4
Mid Cap Stocks	9.4	20.5	7.5	TIPS	5.1	6.0	4.9
Small Cap Stocks	10.3	24.0	7.7	Cash Equivalents	4.1	1.5	4.1
International Stocks	9.2	20.0	7.4	Private Real Estate	8.6	7.5	8.3
International Small Cap Stocks	10.5	24.7	7.7	Public REITS	9.5	21.0	7.5
Emerging Markets Stocks	12.0	29.0	8.2	Venture	15.0	30.0	11.0
Long Bonds	6.5	11.3	5.9	Buyouts	13.0	18.0	11.6
Intermediate Bonds	6.6	6.7	6.4	Mezzanine	11.0	11.5	10.4
Short Bonds	5.9	4.0	5.8	Distressed Debt	11.0	13.0	10.2
High Yield Bonds	8.4	11.0	7.8	Hedge Funds Conservative	7.2	6.5	7.0
International Bonds	7.0	11.0	6.4	Hedge Funds Strategic	9.0	9.0	8.6
Bank Loans	6.8	8.0	6.5	Commodities	10.0	20.0	8.2

Asset Class Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1. Large Cap Stocks	1.00																							
2. Mid Cap Stocks	0.92	1.00																						
3. Small Cap Stocks	0.88	0.94	1.00																					
4. International Stocks	0.73	0.69	0.62	1.00																				
5. International Small Cap Stocks	0.66	0.66	0.66	0.90	1.00																			
6. Emerging Markets Stocks	0.69	0.71	0.75	0.69	0.72	1.00																		
7. Long Bonds	0.26	0.15	0.18	0.22	-0.07	-0.15	1.00																	
8. Intermediate Bonds	-0.08	-0.13	-0.19	0.27	0.12	-0.18	0.98	1.00																
9. Short Bonds	0.09	0.01	0.04	0.07	-0.33	-0.29	0.81	0.91	1.00															
10. High Yield Bonds	0.62	0.62	0.62	0.56	0.56	0.61	0.14	0.15	-0.04	1.00														
11. International Bonds	-0.08	-0.13	-0.19	0.27	0.12	-0.16	0.51	0.54	0.49	0.04	1.00													
12. Bank Loans	0.55	0.56	0.52	0.55	0.59	0.51	-0.27	-0.23	-0.35	0.84	-0.13	1.00												
13. Emerging Mkt Debt	0.52	0.53	0.52	0.44	0.36	0.61	0.13	0.13	-0.02	0.48	-0.08	0.29	1.00											
14. TIPS	-0.27	-0.20	-0.27	-0.20	-0.07	-0.08	0.40	0.54	0.43	0.13	0.27	0.13	0.134	1.00										
15. Cash Equivalents	-0.03	0.01	-0.07	-0.08	-0.18	-0.04	0.01	0.10	0.39	-0.06	0.05	-0.055	0.016	0.01	1.00									
16. Private Real Estate	0.10	0.06	0.05	0.12	0.09	0.00	-0.13	-0.12	0.00	-0.09	-0.06	0.023	-0.005	0.03	0.43	1.00								
17. Public REITS	0.55	0.58	0.66	0.53	0.56	0.43	0.12	0.08	-0.06	0.59	0.07	0.575	0.389	0.08	-0.04	0.19	1.00							
18. Venture	0.48	0.47	0.49	0.32	0.23	0.35	-0.08	-0.10	-0.11	0.16	-0.18	0.168	0.325	-0.14	0.07	0.14	0.12	1.00						
19. Buyouts	0.63	0.54	0.56	0.49	0.49	0.48	-0.20	-0.25	-0.33	0.29	-0.31	0.422	0.438	-0.12	0.00	0.21	0.40	0.40	1.00					
20. Mezzanine	0.33	0.32	0.34	0.28	0.22	0.30	-0.14	-0.17	-0.23	0.23	-0.11	0.177	0.208	0.01	0.08	0.21	0.26	0.50	0.38	1.00				
21. Distressed Debt	0.71	0.73	0.75	0.70	0.74	0.68	-0.22	-0.26	-0.43	0.75	-0.15	0.692	0.513	0.06	-0.05	0.19	0.66	0.35	0.64	0.30	1.00			
22. Hedge Funds Conservative	0.65	0.66	0.62	0.62	0.52	0.60	-0.15	-0.15	-0.27	0.62	-0.19	0.655	0.507	0.14	0.24	0.34	0.46	0.58	0.67	0.51	0.83	1.00		
23. Hedge Funds Strategic	0.56	0.58	0.55	0.46	0.37	0.57	-0.01	-0.01	-0.06	0.41	-0.08	0.442	0.453	-0.03	0.24	0.05	0.31	0.62	0.44	0.34	0.60	0.76	1.00	
24. Commodities	0.15	0.19	0.14	0.32	0.38	0.29	-0.17	-0.15	-0.25	0.33	0.00	0.492	0.195	0.35	-0.01	0.24	0.32	0.16	0.25	0.27	0.46	0.54	0.25	1.00