Montana
Public Employees' Retirement Administration

Experience Study Results and Recommendations

For the period covering July 1, 2003 – June 30, 2009

Produced by Cheiron

June 2010

CHEIRON Classic Values, Innovative Advice

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Letter of Transmittal i

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June 15, 2010

Public Employees' Retirement Board
100 North Park Avenue, Suite 200
Helena, Montana 59620

Dear Members of the Board:

At your request, we have completed an experience study of the Montana Public Employees' Retirement Administration (PERA). Our study compared assumed versus actual experience with respect to mortality, membership turnover, disability, retirement, salary increases and investment returns between July 1, 2003 and June 30, 2009.

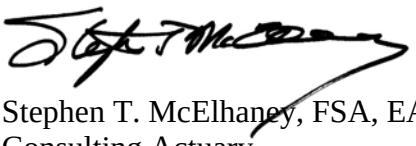
All findings and recommendations in this study, unless otherwise stated, are related to all eight systems administered by PERA:

Public Employees' Retirement System (PERS)
Judges' Retirement System (JRS)
Highway Patrol Officers' Retirement System (HPORS)
Sheriffs' Retirement System (SRS)
Game Wardens' and Peace Officers' Retirement System (GWPORS)
Municipal Police Officers' Retirement System (MPORS)
Firefighters' Unified Retirement System (FURS)
Volunteer Firefighters' Compensation Act (VFCA)

This report presents the results of our study as well as recommendations for changes to many of the actuarial assumptions to be employed in future actuarial valuations of these systems.

In conclusion, we certify that, to the best of our knowledge, 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 Code of Professional Conduct and applicable actuarial standards set out by the Actuarial Standards Board and Actuarial Standards of Practice (ASOPs) Nos. 4, 27 and 35. In preparing our report, we relied without audit, on information supplied by Montana PERA's staff. This information includes, but is not limited to, plan provisions, employee data, and financial information. As Members of the American Academy of Actuaries, we meet the Qualifications Standards to render the opinions contained in this report.

Sincerely,
Cheiron



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SECTION I
BOARD SUMMARY

At the request of the Board of Administration, Cheiron has performed a study of the experience of the Systems administered by the Montana Public Employees' Retirement Administration. This experience study examines the Systems' experience during the six year period July 1, 2003 through June 30, 2009, "The Study Period". This report presents the results of our study as well as recommendations for changes to several of the actuarial assumptions to be employed in future valuations of the eight systems administered by Montana PERA.

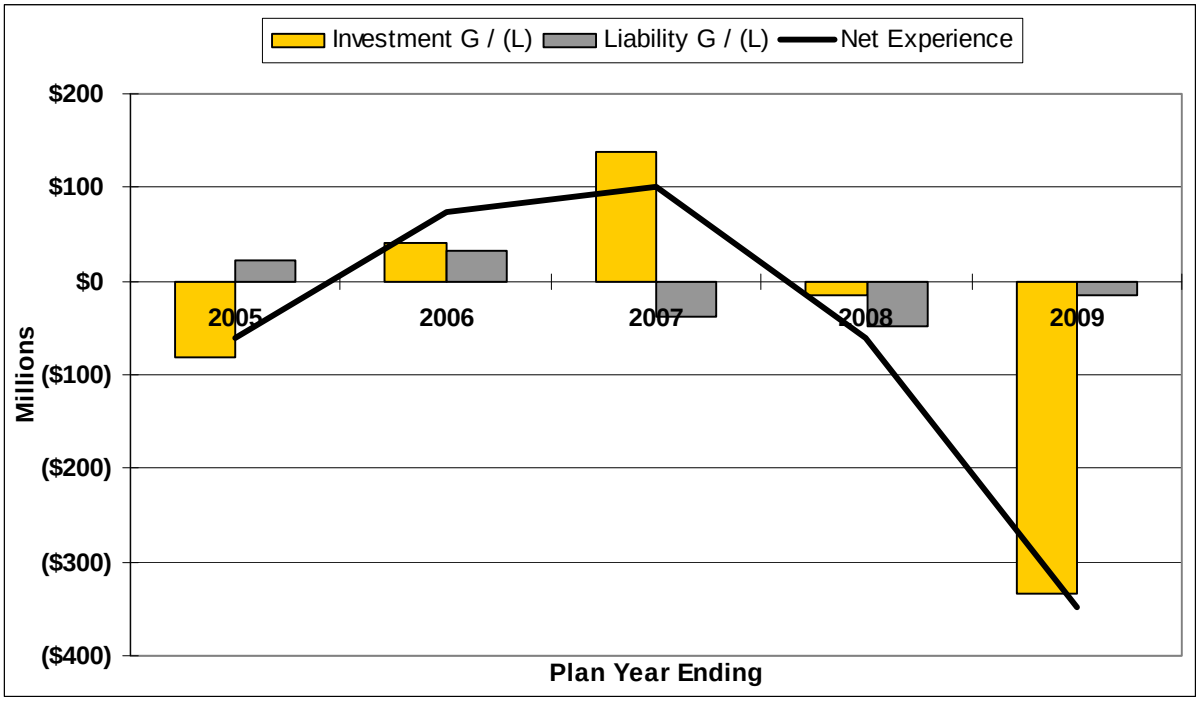
We studied the Systems' experience with respect to both "demographic" and "economic" assumptions. Demographic assumptions deal with expected membership behavior. These include the retirement rates, termination rates, disability rates, mortality, and miscellaneous assumptions including martial status. Economic assumptions deal with common system elements such as investment returns, inflation, and administrative expenses. Salary increases can be considered either demographic (membership oriented) or economic (given the inflation component). For this study we included salary experience under the economic portion of the study.

Before summarizing the key results of our experience study, we present in the charts on the next page historical reviews that compare the emergence of gains and losses in recent actuarial valuations. The first chart combines experience for PERS and JRS and the second combines experience for the six uniformed systems. The gold bars in the chart represent annual investment experience gains or losses (G/(L)), and the gray bars represent the annual liability (demographic) experience gains or losses (G/(L)).

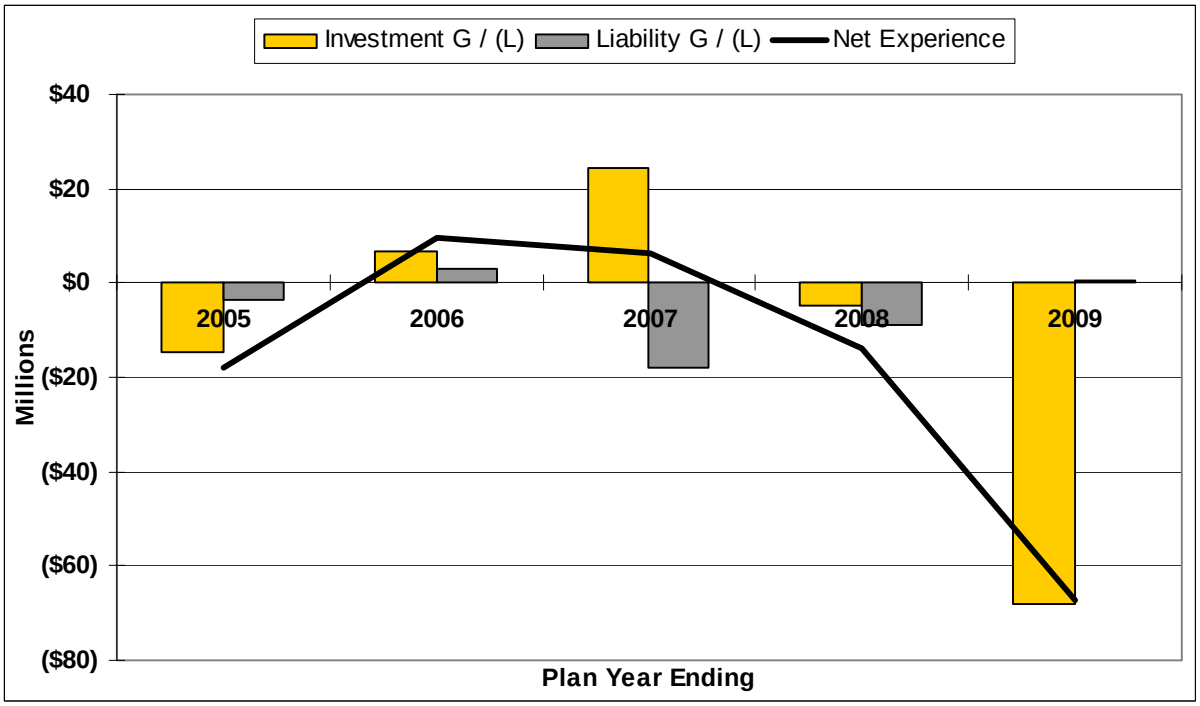
The black line represents the net experience, investment (G/(L)) plus demographic (G/(L)). The movement of the net experience above and below the zero mark is to be expected. We would be concerned if this black line remained always above or always below.

SECTION I
BOARD SUMMARY

Aggregate Experience Results for PERS and JRS



Aggregate Experience Results for Uniformed Systems



SECTION I
BOARD SUMMARY

These charts indicate that for three of the last five years, the demographic assumptions employed in each year's actuarial valuation produced a liability experience loss, which means that the assumptions underestimated liabilities. However, there were two years in which the assumptions overestimated liabilities.

On the investment side, the investment experience exceeded the assumed rate of return (8%) for years ending 2006 and 2007 and was less than the assumed rate of return in other years. For the year ending in 2009 the actual return was substantially less than the assumed rate.

Summary of principal experience study results and recommendations:

1. Investment returns were significantly less than the assumed rate of 8.00%. The current assumption is considered to be reasonable but is no longer considered a conservative assumption. As a result, we recommend that the current 8.00% return, be lowered to 7.75%. Lowering the discount rate assumption increases Montana PERA's liabilities and costs.

2. Inflation averaged 2.6% over the past decade. We recommend that the current assumption of 3.25% be reduced to 3.0%. Because reducing the inflation assumption to 3.0% also reduces the salary projection scales, the change will decrease liabilities and costs (except for VFCA).

3. We recommend no change is recommended in the current real wage base and merit increase assumptions.

4. During the study period, actual retirements for PERS were slightly lower than expected compared to anticipated retirements. Actual retirements for most uniformed groups were lower than expected. For PERS we recommend retaining the current retirement rates, but changing how the rates are applied for participants who have attained age 60 and 25 years of service. For other systems we are recommending changes to the retirement rates to more closely correspond with the experience. The impact of the retirement rate changes will either decrease or have a minimal impact on Montana PERA's liabilities and costs for all systems other than FURS where we expect an increase to liabilities.

5. Actual withdrawals during the period were higher than assumed. We recommend increasing the assumed termination rates. The impact of increasing termination rates will generally reduce liabilities and costs.

6. Disability incidence was lower than expected for the study period for PERS and higher than expected for the uniformed groups. We recommend decreasing the disability rates for the PERS group and increasing the disability rates for some of the uniformed groups. Reducing the disability rates for PERS will decrease the plan liabilities while the uniformed groups, with an increase to the disability rates, may show an increase the plan liabilities or a minimal change.

SECTION I
BOARD SUMMARY

7. Pensioner mortality was reasonably close to the expected mortality. However, we recommend that the mortality table be updated to reflect anticipated mortality improvements. The revised mortality assumption will result in a slight increase in the liabilities and costs.

The financial impact of all recommended changes will be determined after the June 30, 2010 actuarial valuation is completed

On the following page we present a table summarizing our best estimate of the impact of the demographic changes on the plan's liabilities and costs.

The balance of this report presents the rationale for our recommendations. In Section II, we present detailed analysis and exhibits supporting the various changes to the economic assumptions. In Section III, we present similar information with respect to the demographic assumptions. Appendix A presents additional graphic information on the results of this experience study. The current assumptions are shown in Appendix B and the proposed assumptions can be found in Appendix C.

SECTION I
BOARD SUMMARY

The chart below summarizes the effect of the recommended demographic changes on plan liabilities.

System	Retirement Rates	DROP	Spousal Age Difference	Termination Rates	Refund	Disability Rates	Mortality
PERS							
JRS							
HPORS							
SRS							
GWPORS							
MPORS							
FURS							
VFCA							

Increase liabilities
Minimal or not determinable
Decrease liabilities
No change in liabilities
Not applicable

SECTION II
ANALYSIS OF ECONOMIC ASSUMPTIONS

Economic actuarial assumptions are intended to be long-term in nature, and should be both individually reasonable, as well as consistent in the aggregate. The purpose of this portion of the experience analysis is to evaluate whether or not the current economic assumptions in place adequately reflect the long-term expectations for the systems administered by the Montana Public Employees' Retirement Administration (PERA). It is important to note that frequent or significant changes in these assumptions from year-to-year are not normally recommended or desirable, unless there are known fundamental changes in expectations of the economy, or with respect to PERA's membership or assets, that would warrant such frequent or significant change.

The specific economic assumptions analyzed in this section are:

1. **Inflation** – as it impacts:
   - *Salary growth* other than individual merit increases, and
   - *Investment return* net of the real return

2. **Salary growth** – which includes both long-term salary growth rate as well as the merit salary scales.

3. **Investment returns** – reflecting long-term asset growth rate and the rate used to discount future cash flows in calculating the liabilities and costs of the Administration.

4. **Interest on member contributions** – reflecting the real rate of return on short term Treasury instruments and the rate of inflation.

In developing recommendations for these assumptions, the following factors were considered:

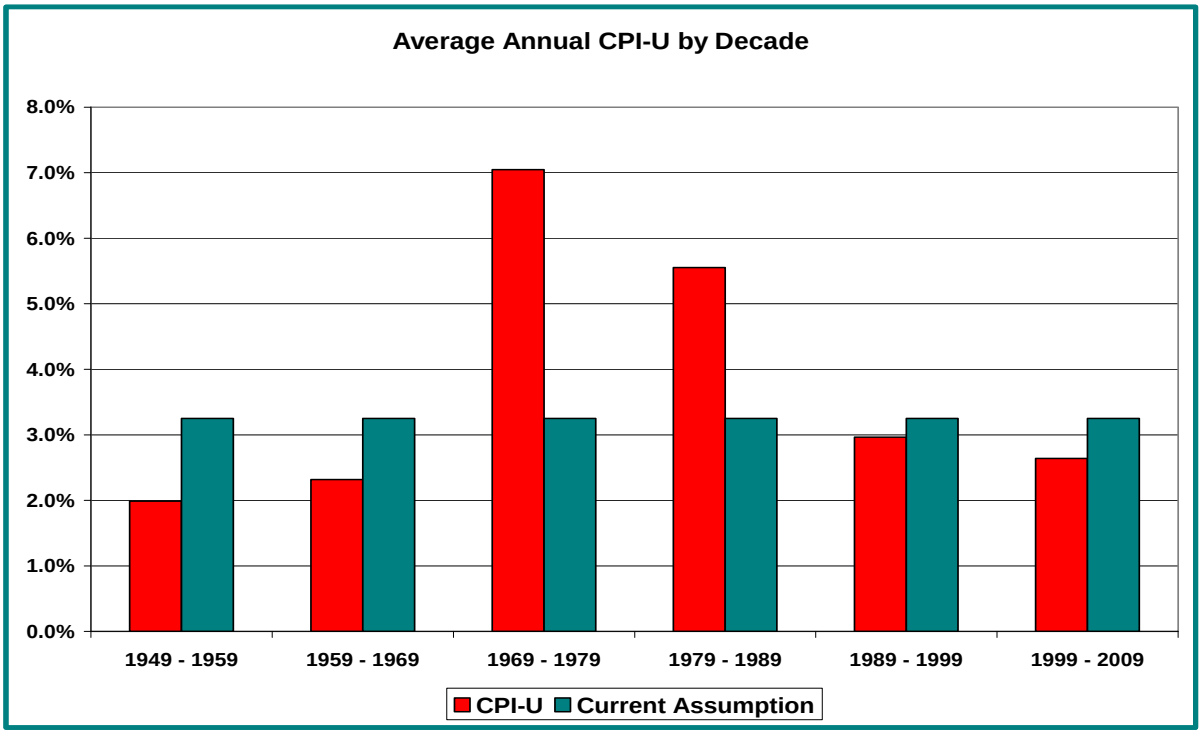
- historical data in general (i.e. the markets),
- historical experience of the plan,
- expectations for the future based on the current target asset allocation and general economic conditions,
- assumptions used by other similar large public sector pension plans, and
- the Board's risk preference regarding conservatism in assumptions

1. Inflation

Long-term inflation rates are the foundation of other economic assumptions. In a growing economy, wages and investments are expected to grow at the underlying inflation rate plus some additional *real growth rate* whether it reflects productivity in terms of wages or risk premiums in terms of investments.

SECTION II
ANALYSIS OF ECONOMIC ASSUMPTIONS

The current inflation assumption is 3.25%. The table below shows the average annual inflation rate for each of the last six decades as measured by CPI-U compared to the current assumption.



During the last ten years (1999-2009) the inflation rate averaged 2.6% per year and in the ten years prior (1989-1999) averaged just under 3.0% per year. In fact, for four out of the six decades shown the inflation rate was under 3.0%. Only the decades from 1969 to 1989 were in excess of 3.0%, and these decades included several years of double-digit inflation.

A measure of the market consensus of expected future inflation rates is the difference in yield between conventional treasury bonds and treasury inflation protection securities (TIPS) at the same maturity. The table below shows the yields on both types of bonds and the implied inflation expectation as of June 30, 2009.

Bond Yields

Time to Maturity	Conventional Yield	TIPS Yield	Implied Inflation
5 years	2.54%	1.20%	1.34%
10 years	3.53%	1.78%	1.75%
20 years	4.30%	2.12%	2.18%

Data Source Federal Reserve, Constant Maturity Yields, Business Day Series

SECTION II
ANALYSIS OF ECONOMIC ASSUMPTIONS

As can be seen, the implied inflation rate reflected in government bond yields over the next twenty years is about 2.2%, which is slightly less than the actual inflation rate for the last ten years of 2.6%. Both are well below the current assumption of 3.25%.

It is true that some economists forecast higher inflation rates due to the growing national debt and the current policies of the federal government to stimulate the economy. However, other economists point to continued unused capacity in the economy and feel that even deflation is still a possibility.

Taking into account the empirical data shown, as well as the differing views of economists, we recommend reducing the assumed inflation rate by 0.25% from 3.25% to 3.0%.

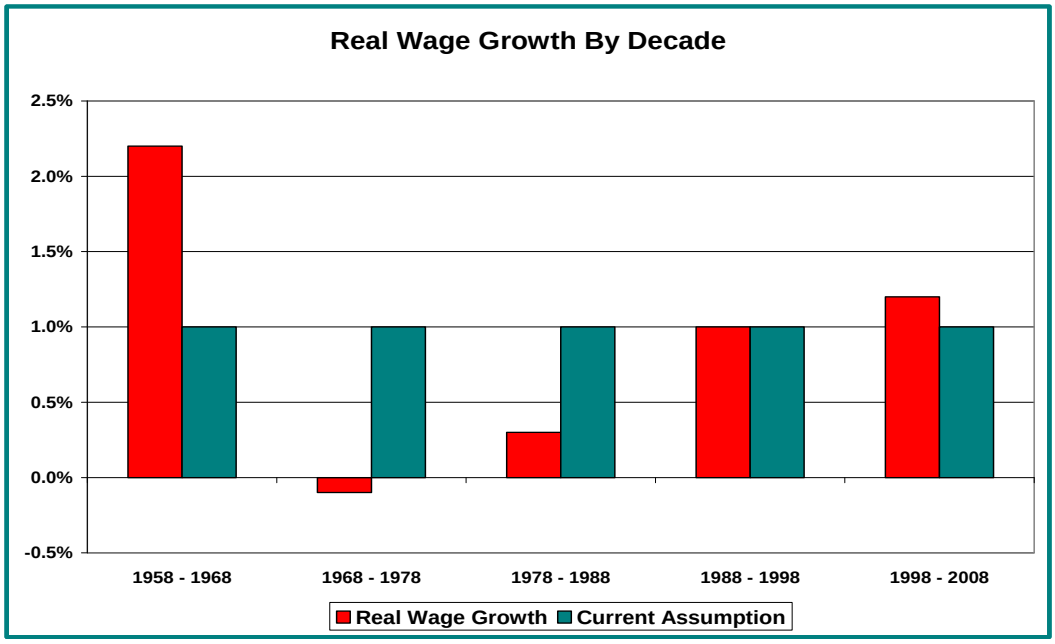
2. Salary Growth

The current assumptions for salary growth are based on the sum of the following components:

- The inflation rate (currently at 3.25%, but recommended to be decreased to 3.00%)
- The rate of real wage growth in excess of inflation (currently 1.00%)
- Merit/seniority increases based upon service

Real Wage Growth

With regard to the real wage growth, the following chart shows the average real wage growth by decade by subtracting the amount of inflation (CPI-U) from the growth rate of national average earnings provided by the Social Security Administration and then comparing this difference to the current actuarial assumption of 1.00%.



SECTION II
ANALYSIS OF ECONOMIC ASSUMPTIONS

For the past ten years, the real wage growth has risen slightly above 1.00% from almost exactly 1.00% during the preceding ten years. Given the current excess capacity in the labor market, we recommend that the current assumption of 1.00% be retained.

Merit/Seniority Increases

For JRS, there is a zero assumption for merit/seniority increases. The following are the current merit/seniority assumptions (excluding amount for inflation and real wage growth) for PERS and for the five uniformed systems (excludes VFCA where the benefits are not based on salary).

Service	PERS	Uniformed Systems
1	6.0%	7.3%
2	4.9	5.6
3	3.9	4.4
4	3.1	3.5
5	2.4	2.8
6	1.8	2.2
7	1.4	1.7
8	1.0	1.3
9	0.7	1.0
10	0.5	0.7
11-15	0.3	0.4
16-20	0.1	0.2
21 & over	0.0	0.0

SECTION II
ANALYSIS OF ECONOMIC ASSUMPTIONS

The following table shows the salary experience from 2003-2009 based upon the ratio of actual salaries to the expected salaries derived from the salary assumptions.

Salary Experience – Actual to Expected Ratios

Service	PERS	JRS	All Uniformed Systems
1-5	101%	103%	103%
6-10	101%	99%	102%
11-15	101%	99%	102%
16-20	101%	99%	102%
21 & over	100%	99%	101%
Total	101%	100%	102%

For PERS, the actual experience was about 1% in excess of the assumption for all service periods. For JRS, the overall increases were about as expected; although somewhat higher for earlier service and a little lower for later service. For the uniformed systems, experience was about 2% higher than expected. A case could be made from this experience to increase the merit/seniority scales for PERS and the uniformed systems, especially given the low levels of inflation which existed during this time period. However, given the current budgetary expectations of lower than historical pay increases over the next several years, we recommend that the current merit seniority tables be retained.

More detailed salary experience is shown in graphs in Appendix A.

SECTION II
ANALYSIS OF ECONOMIC ASSUMPTIONS

3. Investment Return

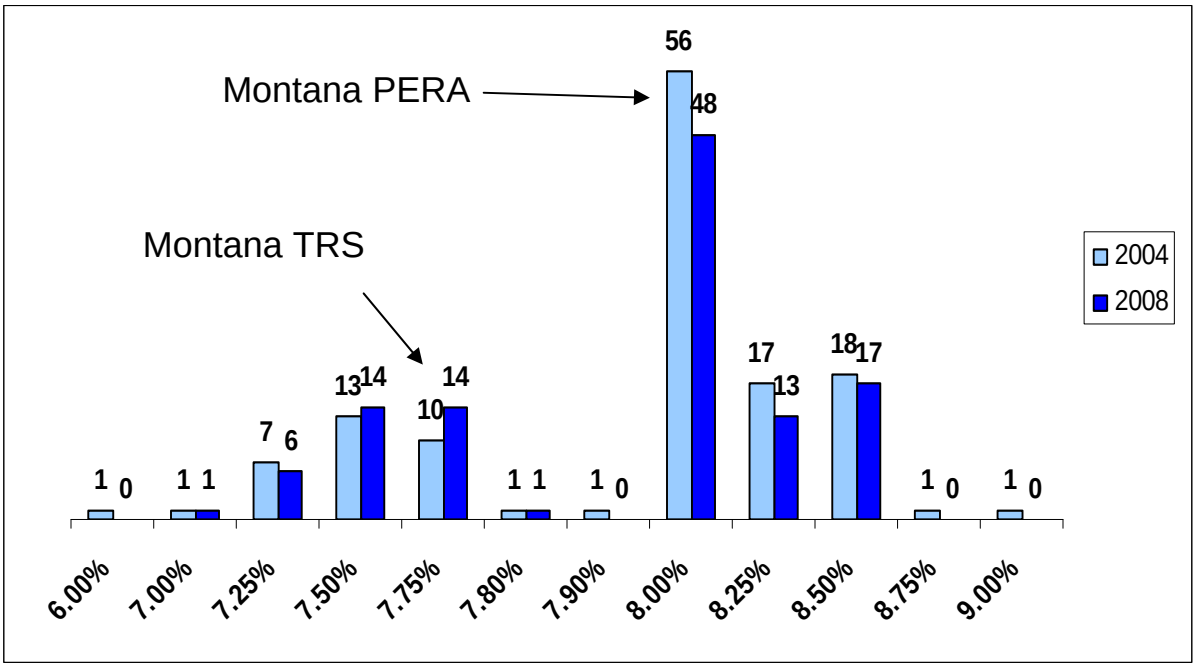
The assumption for investment return is generally the most significant of all the assumptions employed in the actuarial valuation. Setting it appropriately is of paramount importance. Over the long-term, the investment return depends on factors such as the underlying rate of inflation, the economic conditions in the U.S. and abroad, the time horizon of the investments, and the particular mix of asset classes in the Fund's portfolio.

In recommending an investment assumption for PERA we considered the following factors:

- Assumptions used by other public sector plans
- Recent experience of the administration, and
- Future expectations of investment consultant to the Board of Investments.

Other Public Sector Plans

The Public Fund Survey database maintained by the National Association of State Retirement Administrators (NASRA) indicates that the median investment return used by public sector plans was 8.0% for the 117 plans reporting a valuation as of June 30, 2008. However, over the past several years, there has been a downward trend in the investment assumption used by many large public sector plans as noted in the chart below which compares survey results from 2004 to 2008.



Source: Public Fund Survey Summary of Findings for FY2004 and FY2008, NASRA

SECTION II
ANALYSIS OF ECONOMIC ASSUMPTIONS

The current assumption for PERA matches the median rate of 8% for all systems within the survey. However, the assumption for Montana TRS, where the asset allocation is essentially the same as for the PERA systems is 7.75%.

PERA Investment Returns

The table below shows the annual rates of return for PERS during the six years ending June 30, 2009 on both the market value and actuarial value of assets.

Annual Rates of Return (PERS Only)		
Year Ending June 30	**Market Value**	**Actuarial Value**
2004	13.35%	1.27%
2005	8.03%	5.32%
2006	8.98%	9.25%
2007	17.92%	11.94%
2008	-4.91%	7.62%
2009	-20.85%	-0.16%
Average Geometric Return	2.86%	5.79%

For the total six year period, both the market and actuarial rates of return were well below the current assumption of 8.00%. It is also important to note that the difference between the market value of assets and the actuarial value of assets on June 30, 2009 is in excess of $1 billion. This difference is due to the deferred recognition of the significant market investment losses from July 1, 2007 through June 30, 2009. Over the next several years these currently unrecognized investment losses will become recognized and serve to deflate the return on the actuarial value of assets.

While the recent historical rates of return are important in understanding the current funded status of the plan, we believe that future expectations of return are more important in setting the investment return assumption.

SECTION II
ANALYSIS OF ECONOMIC ASSUMPTIONS

Future Expectations of Return

Our approach in developing the expected future rate of return was as follows:

- We obtained the December 31, 2009 asset allocation assumptions used by RV Kuhns, the investment consultant for the Board of Investments. These assumptions included expected rates of return and risk for each asset class as well as the correlation matrix for how the returns of the various asset classes interact.

- The RV Kuhns asset allocation assumptions were applied to the PERA asset allocation as of June 30, 2009

- The results were then adjusted for the difference between the RV Kuhns assumed inflation rate and the PERA assumed inflation rate

- Since the rate of return was determined prior to payment of fund expenses, it was then reduced by the assumed expenses.

- In order to evaluate the results with respect to risk preferences, the projected returns were expressed within a probability distribution.

With regard to the expense assumption, it is noted that this assumption as of the last experience study was set at 0.20% of assets. However, for the year ending June 30, 2003, total investment expenses were $4.0 million. For the year ended June 30, 2009, total investment expenses were $21.6 million. In analyzing the current level of investment expenses, we obtained the following data from the Board of Investments showing the expense associated with each asset class as a percentage of assets.

System Expenses	Percent of Assets
Retirement Funds Bond Pool (RFBP)	0.05%
Montana Domestic Equity Pool (MDEP)	0.35%
Montana International Equity Pool (MTIP)	0.42%
Montana Private Equity Pool (MPEP)	1.75%
Montana Real Estate Pool (MTRP)	2.50%
Short Term Investment Pool (STIP)	0.03%
Direct Real Estate/Mortgages	0.27%
Weighted Average	0.52%
Average excluding MPEP and MTRP	0.26%
Administrative Expenses	0.08%
Total	0.34%

SECTION II
ANALYSIS OF ECONOMIC ASSUMPTIONS

It can be seen that much of the increase in investment expense is due to expenses related to Private Equity and Real Estate. Since these higher expenses are presumably incurred with the expectation of higher returns, we calculated the average expense rate for the fund excluding these two asset classes. We then added the administrative expenses which are at .08% of assets to get a total equal to 0.34% of assets. Based on this analysis, we recommend using 0.35% as the expenses assumption for developing the assumed rate of return.

The next step is to develop the expected one year rate of return (sometimes known as the "arithmetic return") using the RV Kuhns asset allocation assumptions and the asset allocation of PERS as of June 30, 2009. The development of the total expected rate of return is shown in the table below:

Expected Return (Arithmetic) RV Kuhns Asset Allocation Assumptions	6/30/2009 Allocation	Expected Return
STIP	0.9%	3.00%
Montana mortgages	0.8%	5.25%
Bond Pool	29.4%	5.00%
Total Fixed Income	**30.2%**	
Domestic equity pool	35.8%	8.15%
International pool	16.6%	8.60%
Private equity pool	11.2%	12.25%
Total Equities	**63.6%**	
Real Estate Pool	4.9%	7.50%
Real Estate Investments	0.3%	7.00%
Structured Investment vehicles	0.1%	5.00%
Total Alternatives	**5.3%**	
Total Nominal Rate of Return	**100.0%**	**7.65%**

SECTION II
ANALYSIS OF ECONOMIC ASSUMPTIONS

The total nominal rate of return is then adjusted for the difference between the RV Kuhns inflation assumption (2.50%) and the PERA recommended inflation assumption (3.00%), and then reduced by the recommended expense rate of 0.35%.

Expected Return (Arithmetic) RV Kuhns Asset Allocation Assumptions	6/30/2009 Allocation	Expected Return
Total Nominal Rate of Return	100.0%	7.65%
Less: RVK assumed inflation		-2.50%
Total Real Rate of Return		5.15%
Plus: PERA assumed inflation		3.00%
Less: PERA assumed expenses		-.035%
Total Net Rate of Return		**7.80%**

The net result of 7.80% represents the median expected return over a one year period. However, to project this return forward for many years also involves taking the risk (or volatility) of the investments into account. For example, if an investment earned 28% one year and negative 12% the next year, the average return would be 8% (i.e. 28% minus 12%, divided by 2). However the actual total return over two years would be 12.6% (1.28 times .88, minus 1), and the average annual compounded return for the two years would be only 6.1%.

Developing the long term median rate of return (sometimes known as the "geometric return") involves adjusting the arithmetic return by the amount of standard deviation (or risk). For the PERA investment allocation we have determined the standard deviation using the RV Kuhns assumptions to be 12.40%. This results in a long term expected geometric return of 7.05%.

SECTION II
ANALYSIS OF ECONOMIC ASSUMPTIONS

In order to assist in translating this result into risk preferences, the table below shows the likely range of average annual returns over various time periods based on these expectations. For example, the table shows that there is a 25 percent probability that the average annual return over a 20-year period will be less than 5.2% and a 25 percent probability that it will be greater than 8.9%. For the current assumption of 8.0%, the table shows that there is a 63% probability that the average return will be less than 8.0%, meaning a 37% probability that the average return will exceed 8.0%.

Expected Distribution of Annual Returns*

	Years				
Percentile**	**1**	**5**	**10**	**20**	**30**
5%	-13.3%	-2.1%	0.6%	2.5%	3.3%
25%	-1.3%	3.3%	4.4%	5.2%	5.5%
50%	7.1%	7.1%	7.1%	7.1%	7.1%
63%	11.2%	8.9%	8.4%	**8.0%**	7.8%
75%	15.4%	10.8%	9.7%	8.9%	8.6%
95%	27.4%	16.2%	13.5%	11.6%	10.8%

* Inflation: 3.00%
Expenses: 0.35%

** Percentile represents the probability that the actual return will be less than the return shown.

We recommend that the current investment return assumption of 8.0% be reduced for the following reasons:

- Public fund survey data show a subtle decrease in assumed rates as more funds are moving below the median assumption of 8.0%.
- The forward-looking return analysis developed an expected long term rate of return of 7.05% with the current assumption having only a 37% probability of being attained.
- The assumed rate of return for Montana TRS is 7.75% and has been at this level for several years.

However, we do not recommend reducing the assumed return all the way to 7.05%. For one thing, the assumptions used in the preceding analysis were based on index returns and do not reflect any anticipated advantages of active fund management. Also, different investment consultants will have different assumptions. Using the assumptions developed by another consultant would either increase or decrease the rates used.

SECTION II
ANALYSIS OF ECONOMIC ASSUMPTIONS

Taking all of these considerations into account we recommend setting the investment return assumption at 7.75%. It should be noted that this return would fall with a "reasonable range" as required by Actuarial Standard of Practice No. 27.

4. Interest on member contributions

Currently the assumed rate is 5%.

This rate is established based upon Policy No. BOARD Admin 03. According to this policy, the interest rate is to be set based upon the average variation in short term interest rates. The specific rates analyzed are three and six-month Treasury Bills and one-year Treasury Notes. The rate was set at 0.25% for the fiscal year beginning July 1, 2010.

In determining a long term assumption for this rate, we referred to the asset allocation assumptions of R. V. Kuhns as of December 31, 2009. For cash equivalents, R.V. Kuhns developed an assumption of 0.50% in excess of their assumed inflation rate. In setting this assumption, they analyzed historical real returns on short term Treasury Bills. Therefore, we recommend that the member credited interest rate assumption be set at 3.5%, which is 0.50% in excess of the recommended long term inflation assumption of 3.0%.

We recognize that the current rate is significantly below our recommended assumption. However, in the near term, short term Treasury rates are controlled by Federal Reserve monetary policy, which in turn is affected by current economic conditions.

Summary

The following summarizes our recommendations for economic actuarial assumptions.

- Inflation
  - Decrease assumed rate from 3.25% to 3.00%

- Salary Increases
  - No change in the real wage growth rate of 1.00%
  - No changes to merit scales

- Investment return rate
  - Decrease from 8.00% to 7.75%

- Interest on member contributions
  - Decrease from 5.00% to 3.50%

SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS

In this section, we present the key findings of our experience review of the demographic assumptions used by Montana PERA, including our recommended changes for each assumption. The demographic assumptions included in this review were:

1. Retirement (Rates, Drop Election and Spousal Age Difference)
2. Termination from Active Employment (Rates and Probability of Refund)
3. Disability (Rates and Percent Duty-Related)
4. Mortality (Rates and Percent Duty-Related)

For each of the assumptions noted above, we determined an actual to expected occurrence ratio at each age (sometimes further segregated by service or gender). For example, if during the study period there were 1,000 General employees at age 50, and of that group six became disabled, we would compare that result to the number of disablements expected under our disability assumption. If the expected value was five members, the ratio of actual to expected would be 1.2 (i.e. 6/5).

If the actual to expected ratio is greater than one, our assumption is too low; if it is less than one, the assumption is too high.

1. Retirement

A. Experience

The table below is split by employee group and compares the number of actual to expected retirements over the study period. The table also includes the number of expected retirees that would have resulted if the proposed assumptions had been in place during the study period. The ratio reflects how well the assumption performed as the closer the ratio is to 100% the more accurate it was in predicting participant retirement behavior.

	Retirement				
	Actual	**Expected**	**Ratio**	**Proposed**	**Ratio**
PERS	5,962	7,178	83%	7,206	83%
JRS	6	40	15%	14	44%
HPORS	30	30	100%	32	95%
SRS	79	131	60%	95	94%
GWPORS	44	89	49%	53	83%
MPORS	53	95	56%	61	87%
FURS	89	96	93%	91	98%
VFCA	262	1,024	26%	379	69%

The current assumption is based on age and service and is different for all groups. The actual retirement experience was lower than expected for all groups.

SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS

B. Recommendations

- PERS
  For participants over age 60 with 25 years of service, we recommend that the rates be changed to use the same rates as for participants with over 30 years of service. All other assumptions will remain unchanged.
- JRS
  We recommend removing the 15 year split on retirement rates of service. In addition, we recommend that the retirement rates will be set closer to the actual experience for ages less than 70 rather than the current rates which are either 0% or 100% at all ages.
- HPORS
  We recommend that there be a slight increase in the retirement rates from the current assumptions.
- SRS
  We recommend that retirement rates be generally lowered and flattened at ages below 65.
- GWPORS
  We recommend that retirement rate of 100% be extended from age 60 to age 65 and that retirement rates for ages below 65 should be set closer to the actual experience. In addition, we recommend that a separate table of rates should apply after age 55 with five years of service.
- MPORS
  We recommend that the full 100% rate assumption start at age 62 instead of age 65 and that retirement rates be decreased for participants who are younger than age 55. In addition, for the DROP assumption, we recommend that it be changed such that 15% of members will be assumed to enter DROP for each of the first six years following DROP eligibility.
- FURS
  We recommend that the retirement assumption be changed to go to full 100% retirement at age 63 rather than age 65 and that rates below age 63 be increased.
- VFCA
  We recommended that the retirement rates at age 55 and 20 years or at 60 and 10 years, which are currently 100%, be replaced with lower rates to reflect actual experience.

Spousal Age Difference Assumption

We reviewed spousal age differences for current retirees. The following summarizes our review and recommendations:

- PERS
  - The current assumption is that male spouses are three years older than female spouses
  - The average age difference for current retirees is 2.4 years
  - We recommend no change in the assumption

SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS

- JRS
  - The current assumption is that male spouses are four years older than female spouses
  - The average age difference for retirees is 5.2 years
  - We recommend no change in the assumption

- Uniformed Systems
  - The current assumption is that male spouses are four years older than female spouses
  - The following is the average age differences for retirees by system:
    - HPORS: 3.8 years
    - SRS: 3.0 years
    - GWPORS: 2.6 years
    - MPORS: 2.9 years
    - FURS: 3.3 years
  - We recommend changing the assumption for all uniformed systems to a three years age difference.

SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS

2. Termination from Active Employment

A. Experience

The results of the study of termination rates are summarized in the table below.

	Termination				
	Actual	**Expected**	**Ratio**	**Proposed**	**Ratio**
PERS	14,758	9,467	156%	11,298	131%
JRS	2	0	N/A	N/A	N/A
HPORS	46	50	92%	46	100%
SRS	498	330	151%	414	120%
GWPORS	527	368	143%	473	111%
MPORS	240	110	218%	174	138%
FURS	52	25	211%	41	125%
VFCA	2,832	1,136	249%	2,032	139%

The current termination assumptions for PERS vary by gender, age and service. The other systems vary only by service except for VFCA which is an age based assumption. The actual termination experience was significantly higher than the expected experience for the majority of the groups.

B. Recommendations

- PERS
  We recommend that the termination rates be increased slightly compared to the current assumptions and that the termination assumption be changed from a gender, age and service based assumption to a unisex table based solely on service.
- JRS
  There is currently no termination assumption for this system and we recommend no change.
- HPORS
  We recommend that the termination rates be flattened for participants with less than five years of service.
- SRS
  We recommend that the termination rates for participants with less than five years of service be increased.
- GWPORS
  We recommend that the termination rates for participants with less than 10 years of service be increased and the rates be decreased for participants with more than 10 years of service.

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- MPORS
  We recommend that the termination rates be increased for participants with less than 15 years of service.
- FURS
  We recommend that the termination rates be increased for participants with more than 5 years of service.
- VFCA
  We recommend that the termination rates be increased and changed from being based on age to being based on service.

Percentage of Refunds

We recommend that the percentage of refunds assumption be changed for all systems in order to better correlate with actual experience as shown in the graphs in Appendix A.

SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS

3. Disability

A. Experience

There is an assumption for rate of disability and an assumption for the probability that the disability is duty-related. The following table shows the overall disability experience.

	Disability				
	Actual	Expected	Ratio	Proposed	Ratio
PERS	169	325	52%	252	67%
JRS	0	1	0%	1	0%
HPORS	4	3	136%		
SRS	16	12	134%		
GWPORS	3	11	28%		
MPORS	16	7	214%	12	134%
FURS	10	7	148%	8	123%
VFCA		N/A			

The actual disability experience was lower than expected for PERS and higher than expected for the uniformed systems. Each system with a disability assumption uses a gender distinct assumption.

The following table shows the percentage of disabilities that were duty-related for those systems where there are different disability benefits for duty-related disabilities.

	Disability – Duty-Related				
	Disabilities	Duty-Related	Actual	Current	Proposed
HPORS	4	4	100%	10%	
SRS	16	12	75%	10%	
GWPORS	3	1	33%	10%	
Total	23	17	74%	10%	75%

The percentage of duty-related disability occurrence was higher than the current assumption.

B. Recommendations

For PERS and JRS, we recommend that the disability assumption be changed to a unisex table. For PERS we recommend general decrease in rates and that JRS use the same rates as PERS. We recommend no changes for GWPORS, HPORS and SRS. We recommend an overall increase in rates for MPORS and an increase in rates for ages over 40 for FURS.

SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS

For the duty-related disability incidence, we recommend a change from 10% to 75% for the systems shown in the table.

4. Mortality

A. Experience

The current mortality assumption tables are as follows:

- Healthy retirees: male and female UP-1994 Mortality Tables set back one year.
- For disabled retirees,
    - For PERS and JRS, the morality tables specified by IRS Revenue Ruling 96-7, set back three years for males and one year for females.
    - For the unformed systems, male and female UP-1994 mortality tables set forward three years for males and two years for females.

In recommending changes to the mortality table, our goals are two-fold: first, to move to a more modern table, and second to produce actual to expected ratios on the new table which exceed 100%. The purpose of second goal is to allow for future mortality improvements.

Mortality – Active and Inactive					
	Actual	**Expected**	**Ratio**	**Proposed**	**Ratio**
Actives and Healthy Retirees					
Male	1,693	1,620	105%	1,511	112%
Female	1,846	1,595	116%	1,741	106%
Disability Retirees					
Male	51	127	40%	65	78%
Female	29	72	40%	34	85%

B. Recommendations

We recommend that all systems update the healthy retiree mortality assumption to RP-2000 Combined Healthy Male and Female Mortality Tables projected to 2015 with scale AA. For disabled mortality the experience study showed very little difference between healthy and disabled mortality experience. However, the numbers of actual and expected disabled deaths were too small to be fully credible and we believe that some differentiation should exist between the healthy and disabled mortality assumptions. Therefore, we recommend that the disabled retiree mortality assumption be updated for all systems toRP-2000 Combined Healthy Male and Female Mortality Tables with no projection.

SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS

C. Duty-related Deaths

The following table shows the percentage of deaths which were duty-related for HPORS, SRS and GWPORS:

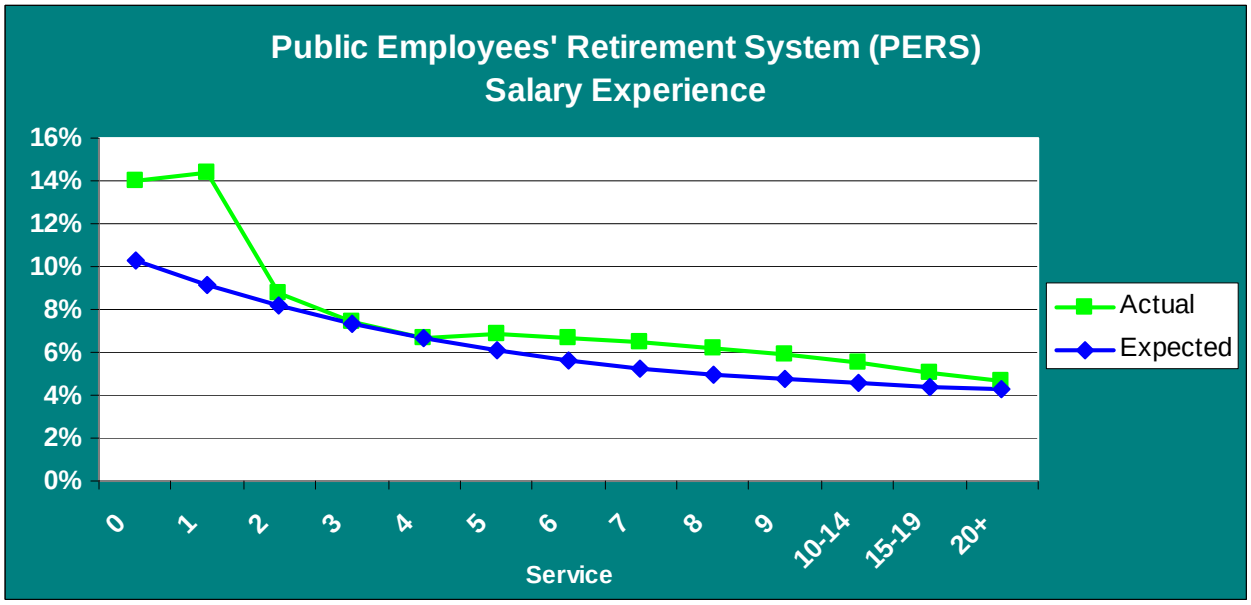
Duty-Related Active Employee Deaths					
	Death	**Duty-Related**	**Actual**	**Current**	**Proposed**
HPORS	4	3	75%	70%	70%
SRS	6	0	0%	70%	10%
GWPORS	7	0	0%	70%	10%

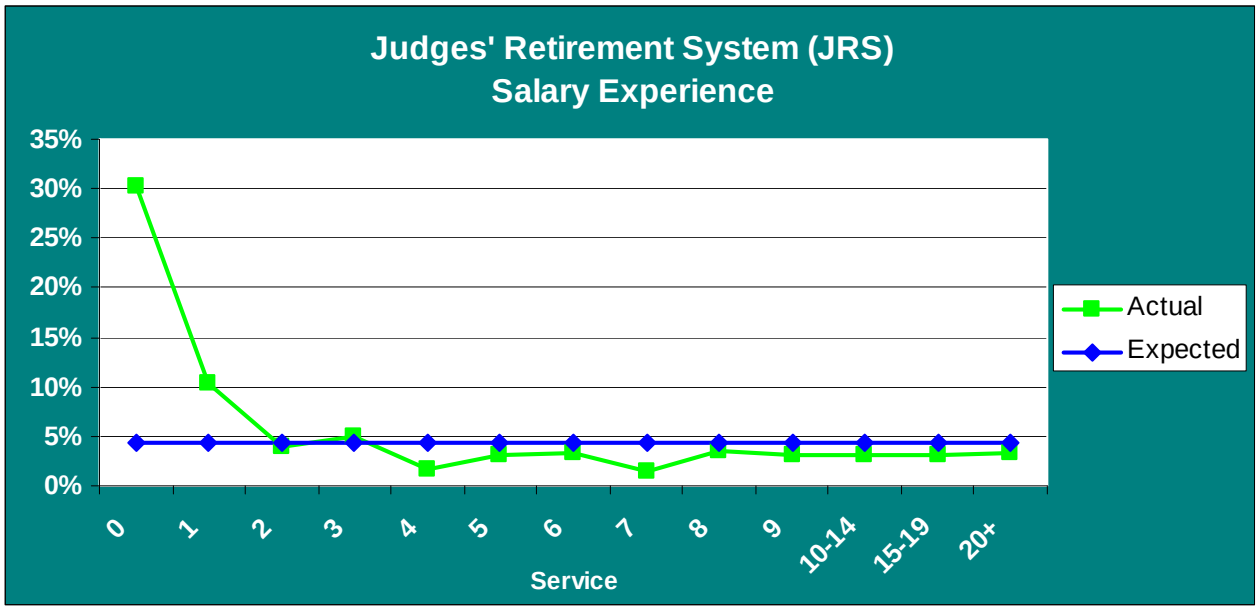
We recommend no change for the current HPORS duty-related mortality assumption. For SRS and GWPORS, there were no duty-related deaths during the study period and we recommend that the percentage be reduced to 10%.

APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

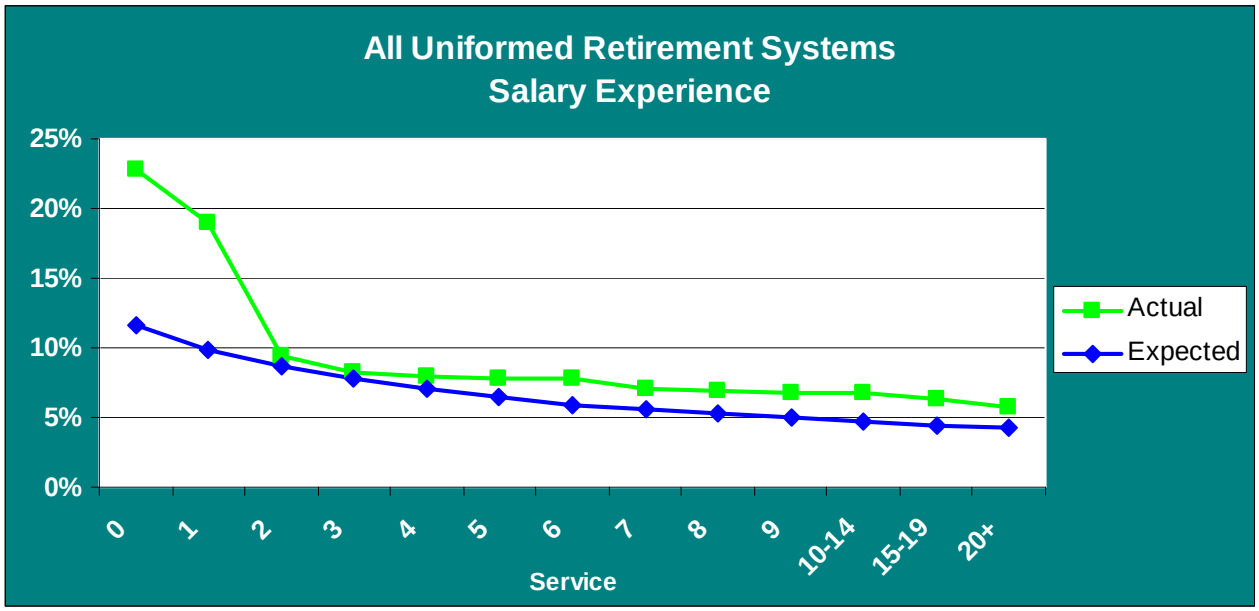
We provide supplemental graphs in addition to those provided in the body of the report in a larger format for ease of viewing in this Appendix A.

1. Salary Experience

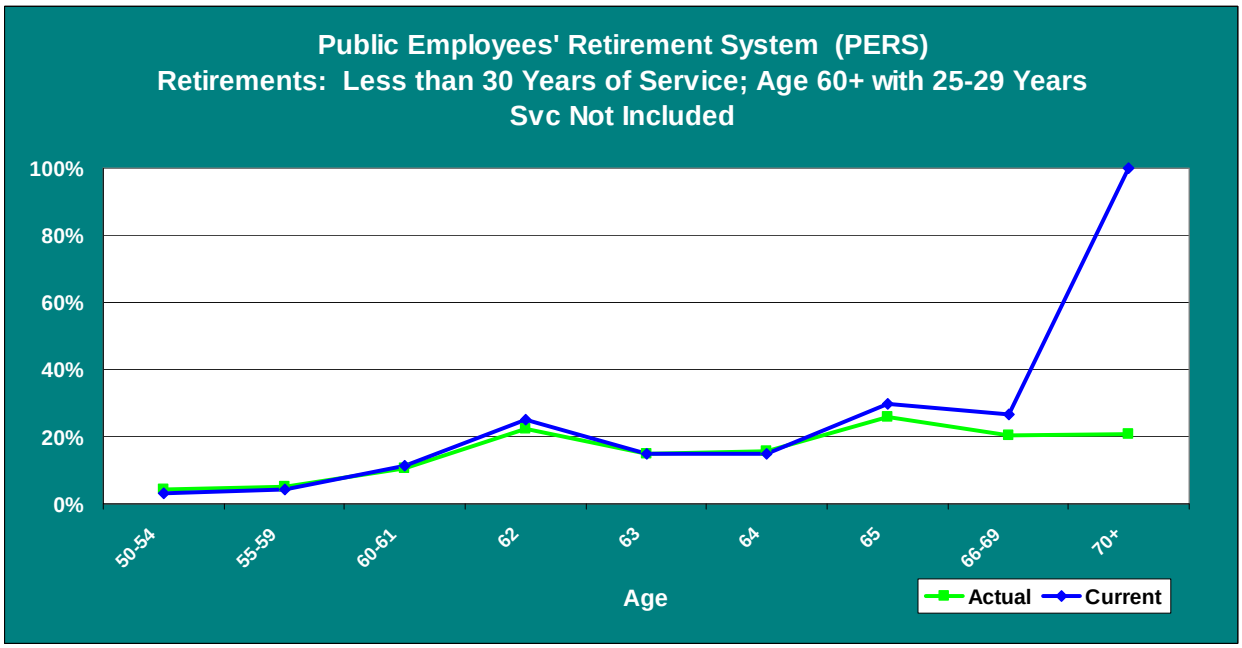




APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

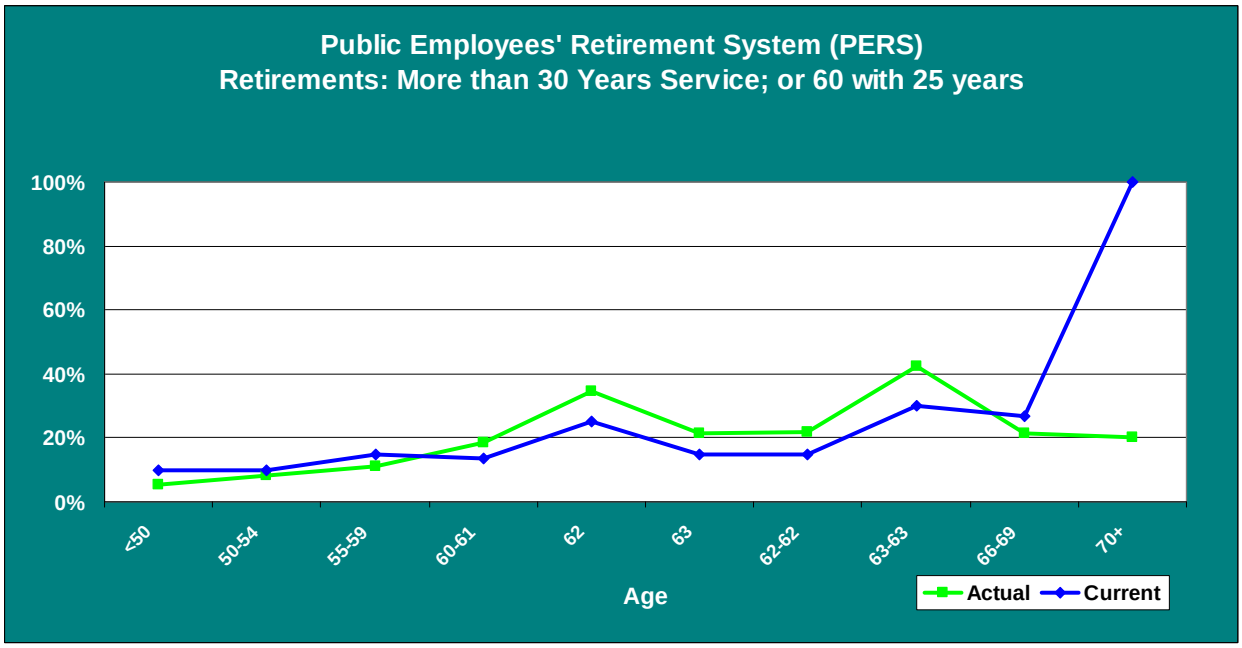


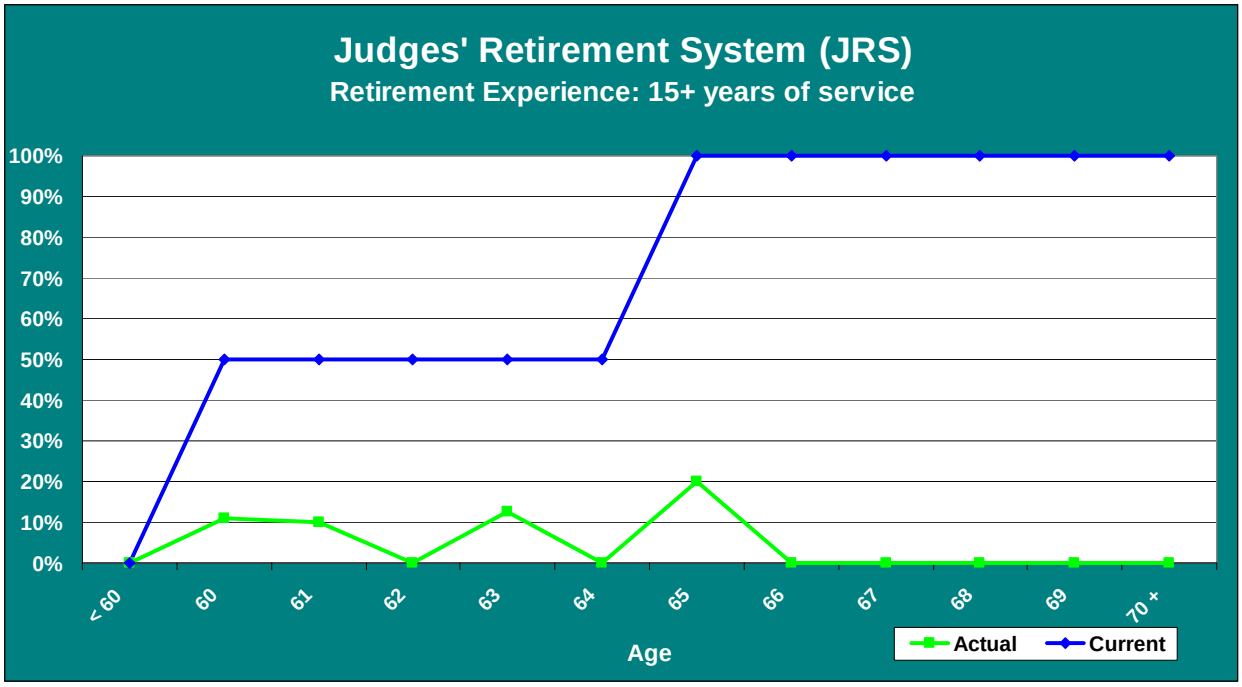
2. Retirement Experience Graphs (Current/Proposed)



APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

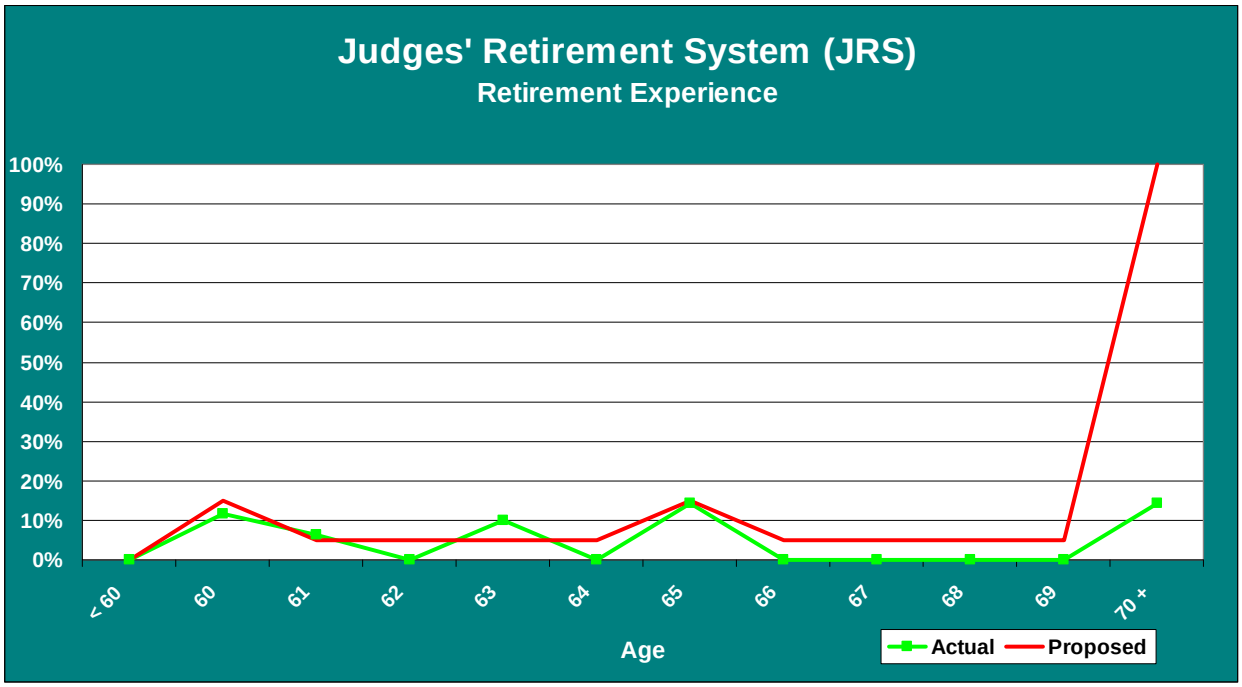
Retirement Experience Graphs (Current/Proposed) ….. continued

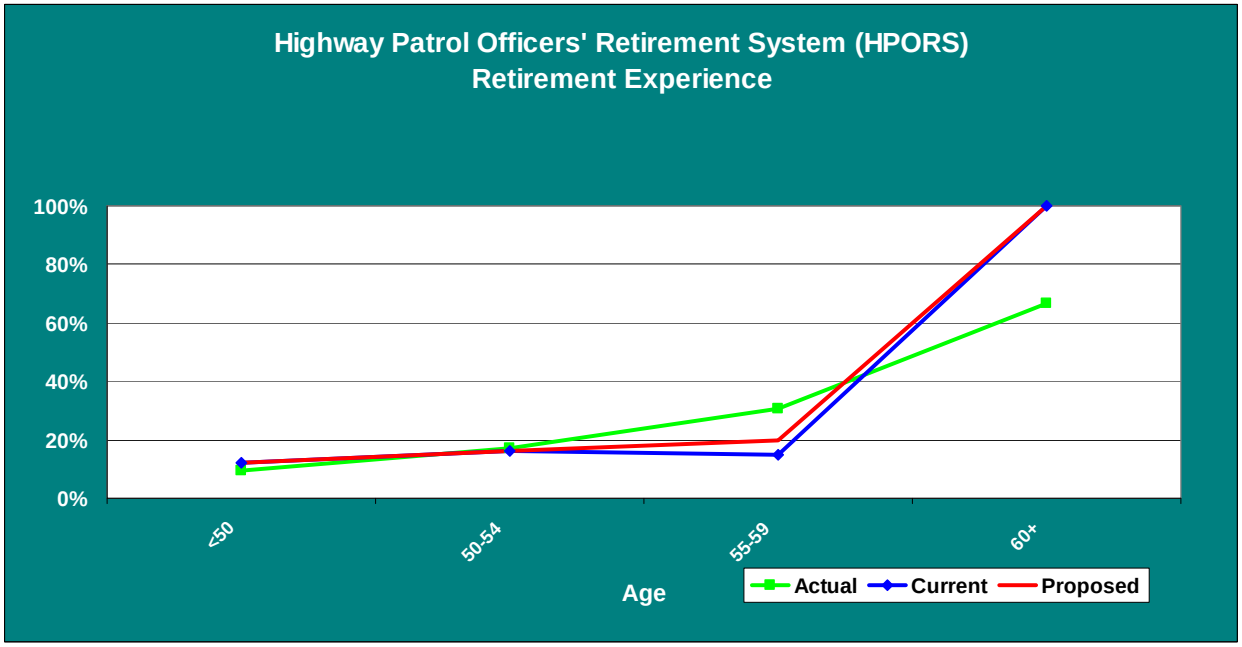




APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

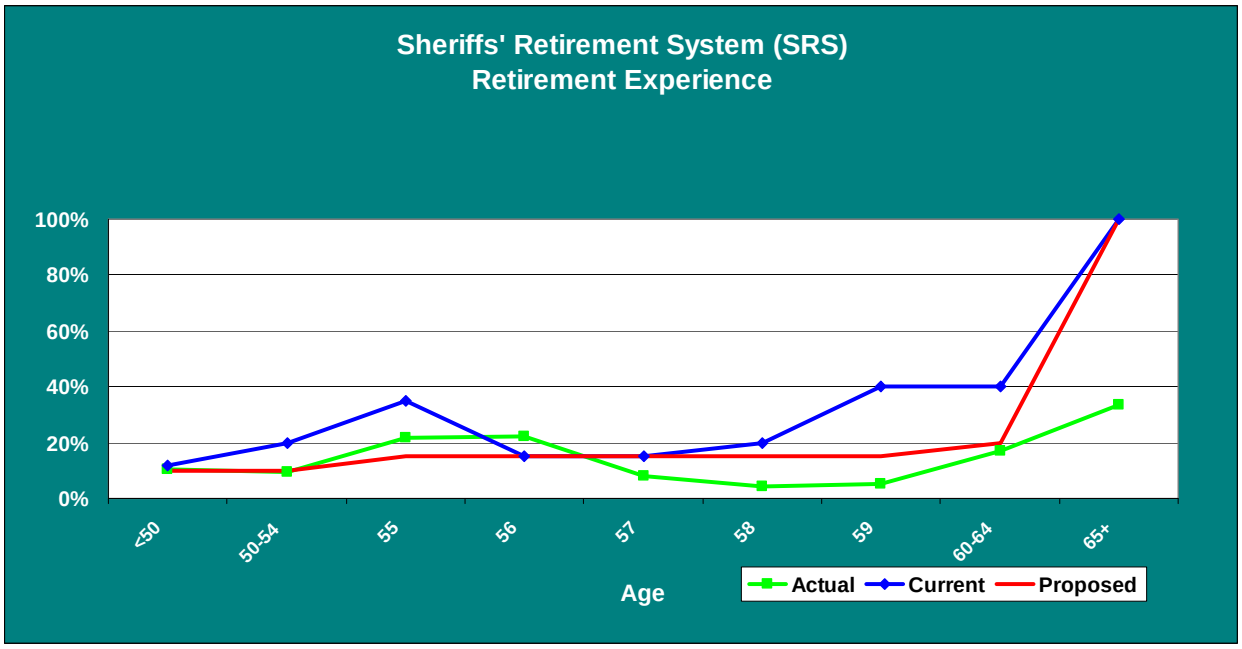
Retirement Experience Graphs (Current/Proposed) ….. continued

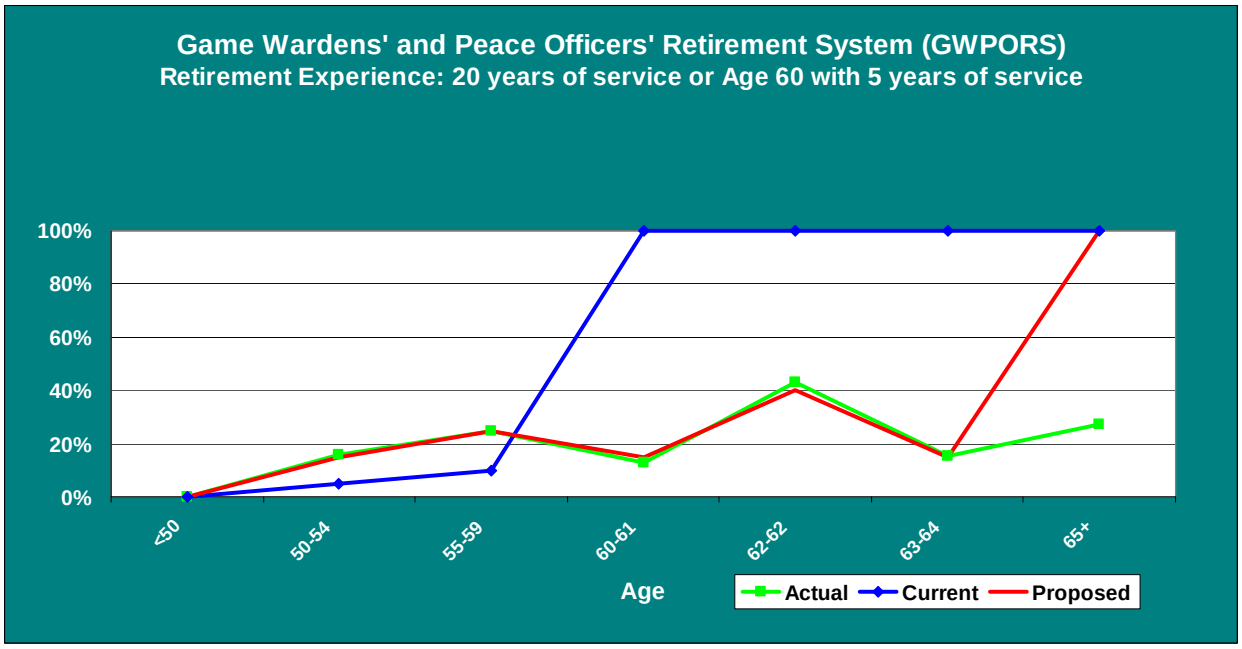




APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

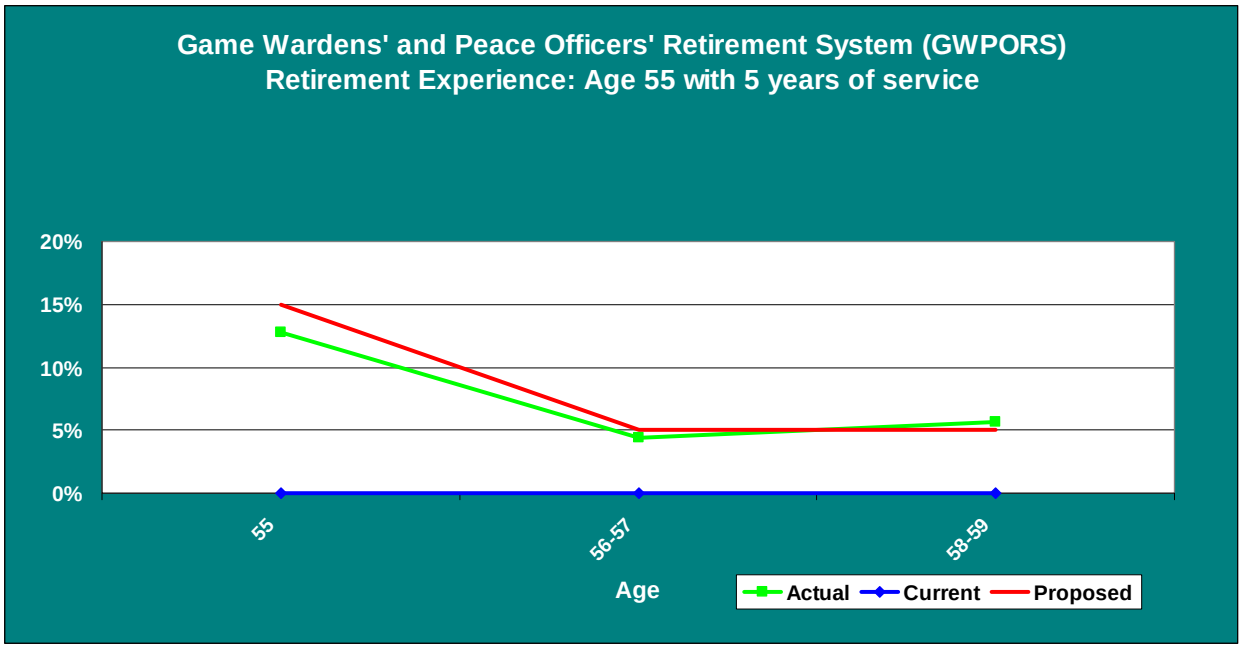
Retirement Experience Graphs (Current/Proposed) ….. continued

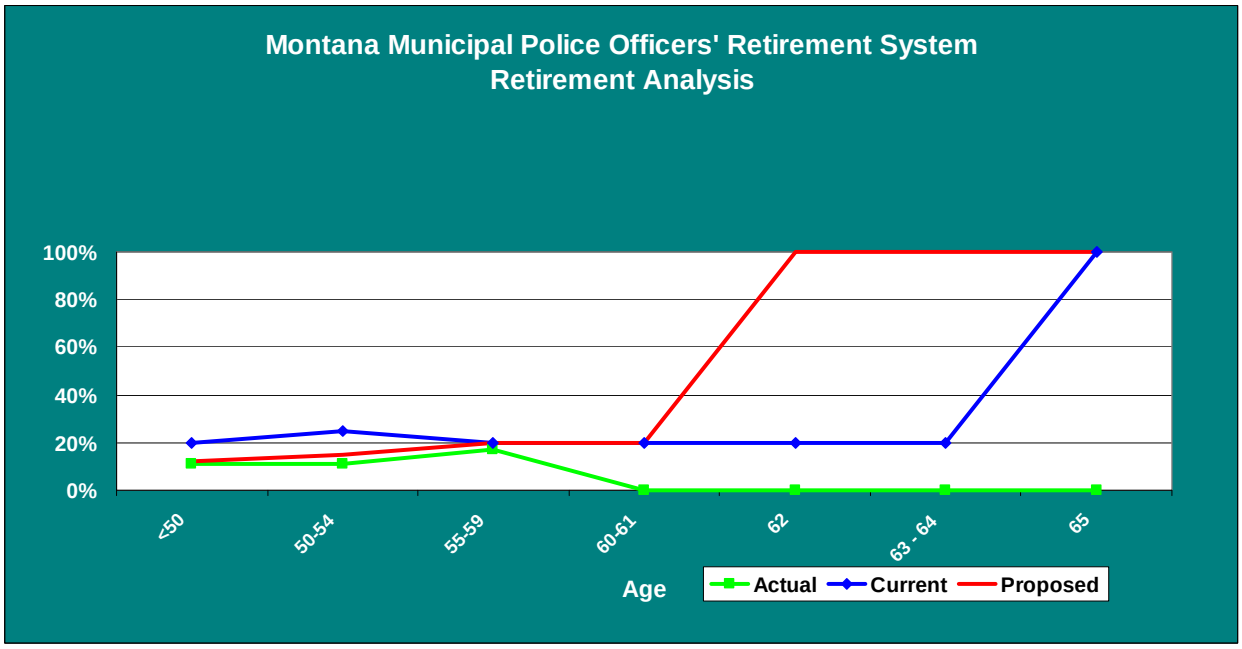




APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

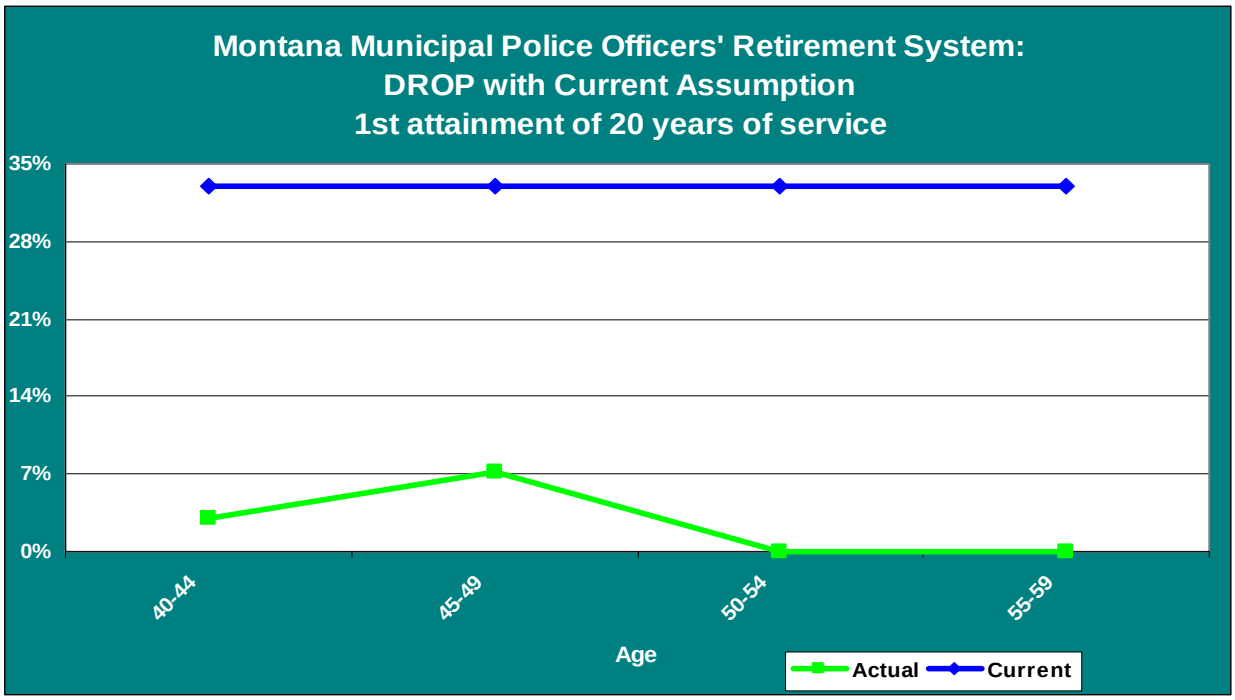
Retirement Experience Graphs (Current/Proposed) ….. continued

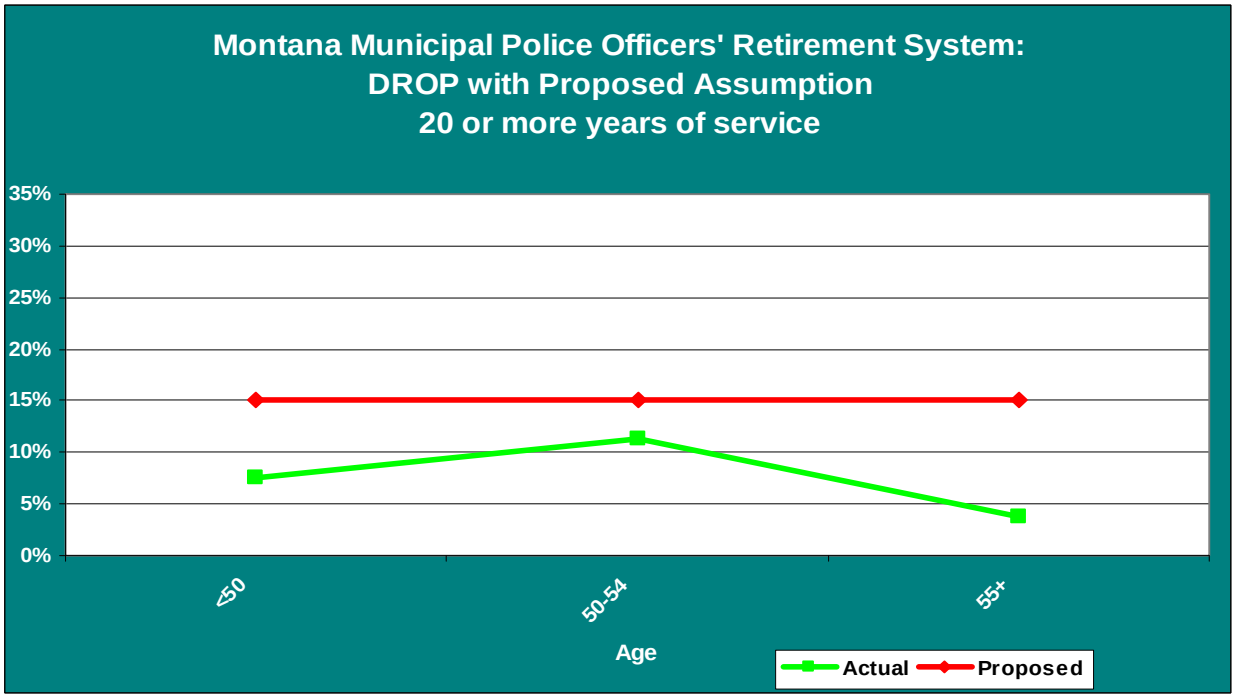




APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

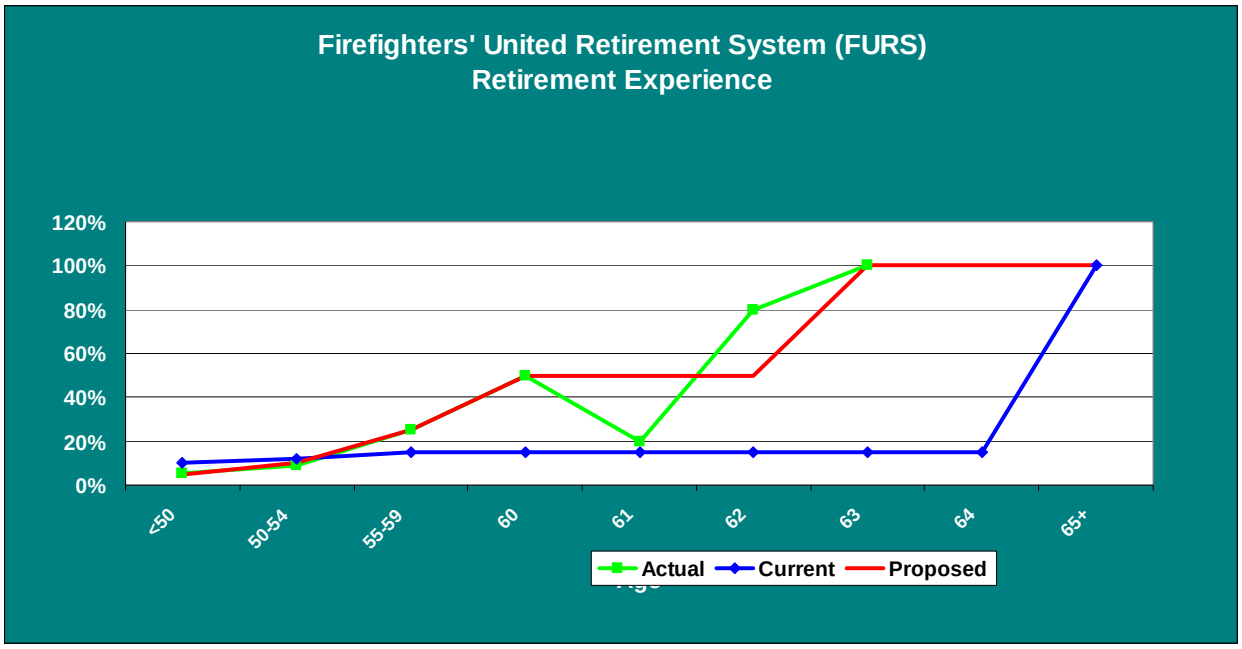
Retirement Experience Graphs (Current/Proposed) ….. continued

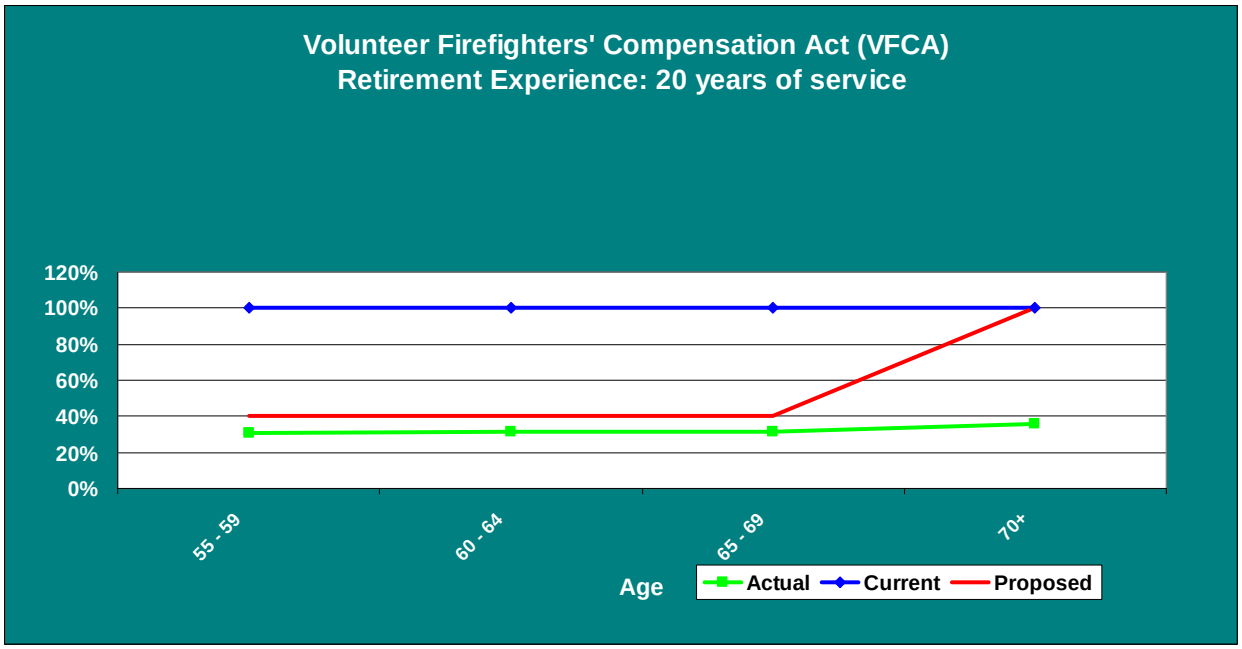




APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

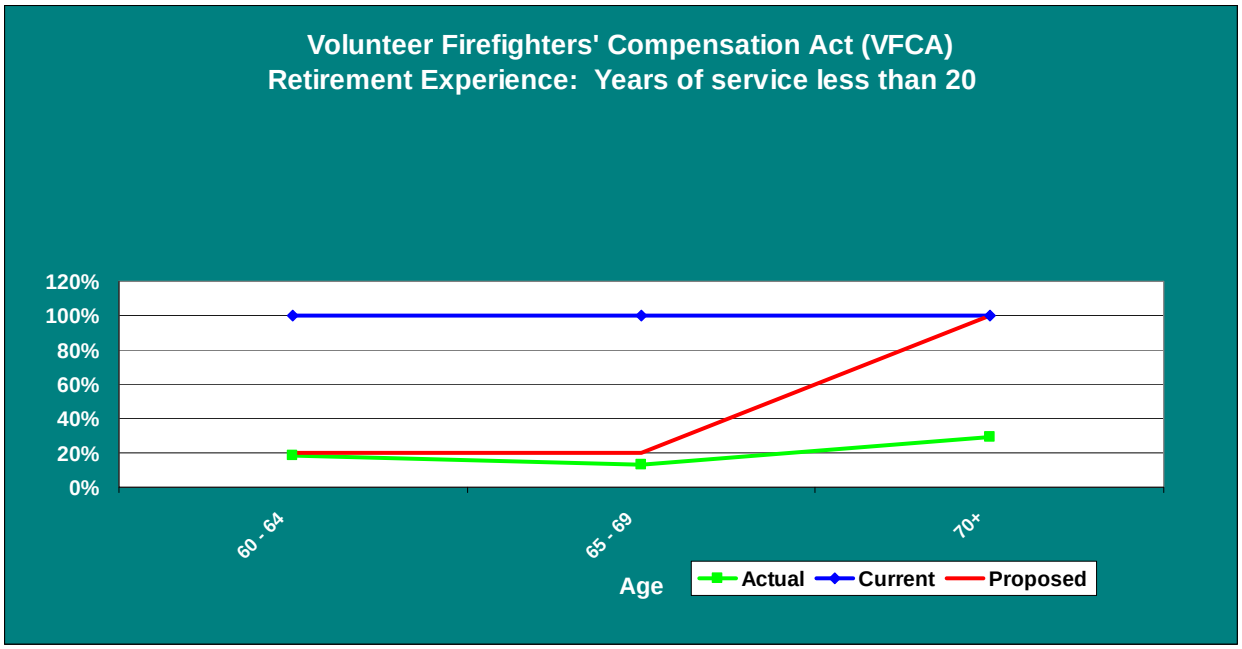
Retirement Experience Graphs (Current/Proposed) ….. continued



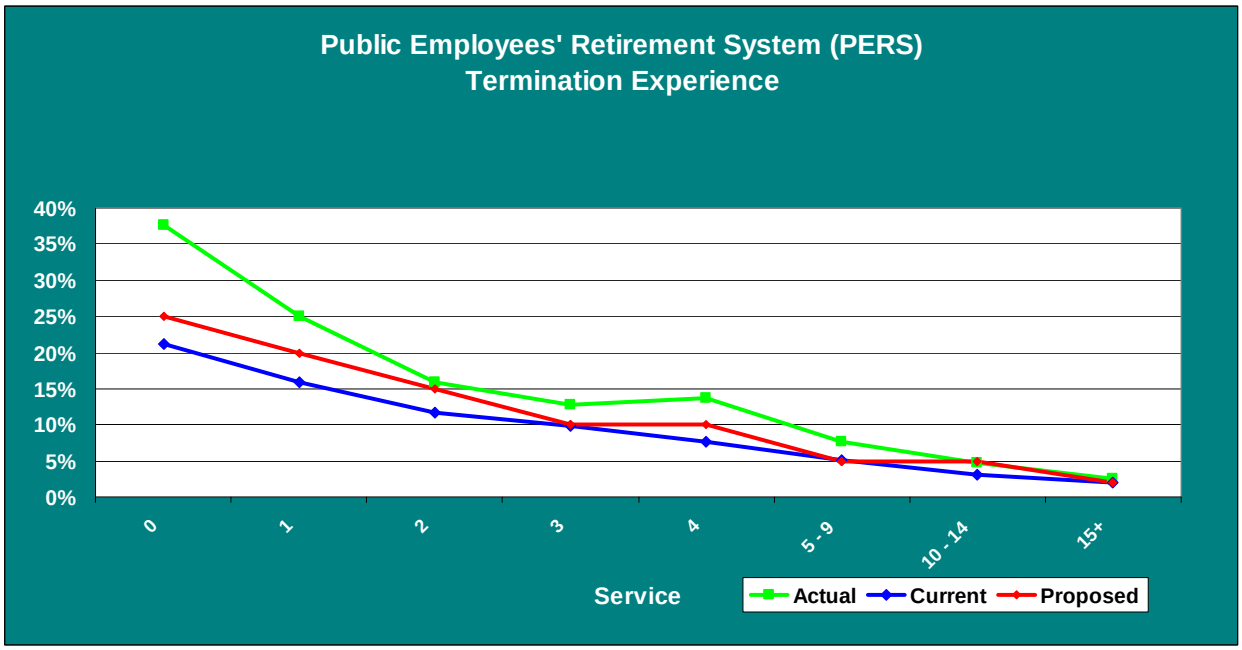


APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

Retirement Experience Graphs (Current/Proposed) ….. continued

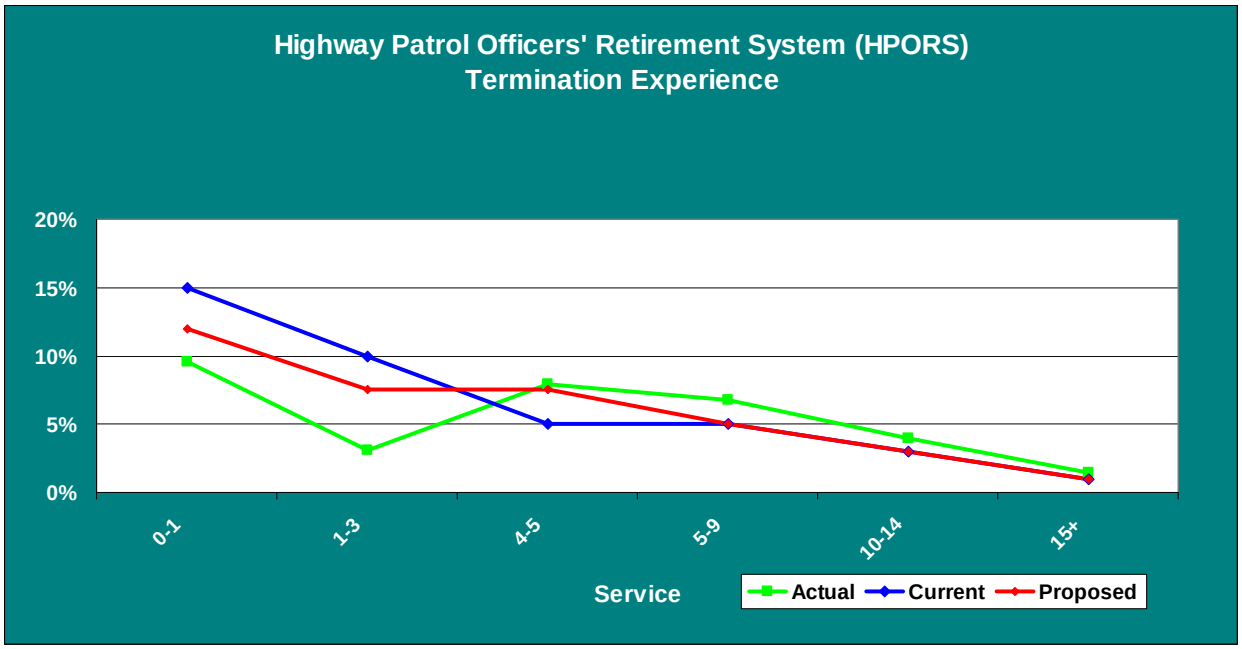


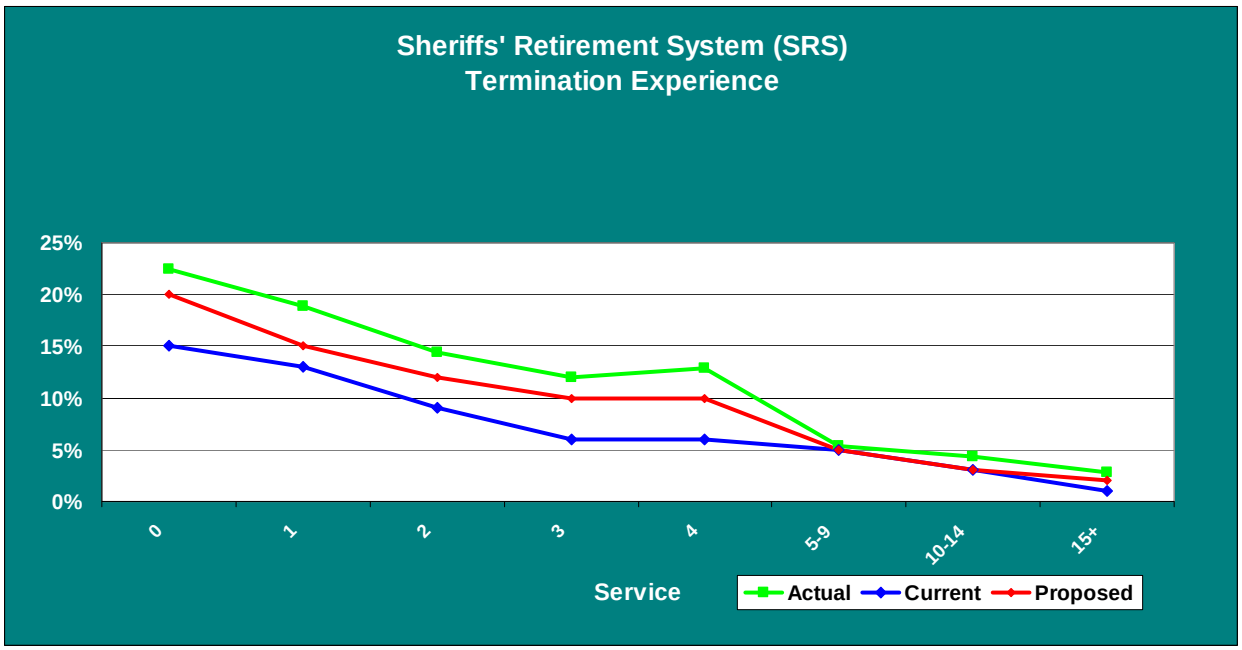
3. Termination and Refund Experience Graphs (Current/Proposed)



APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

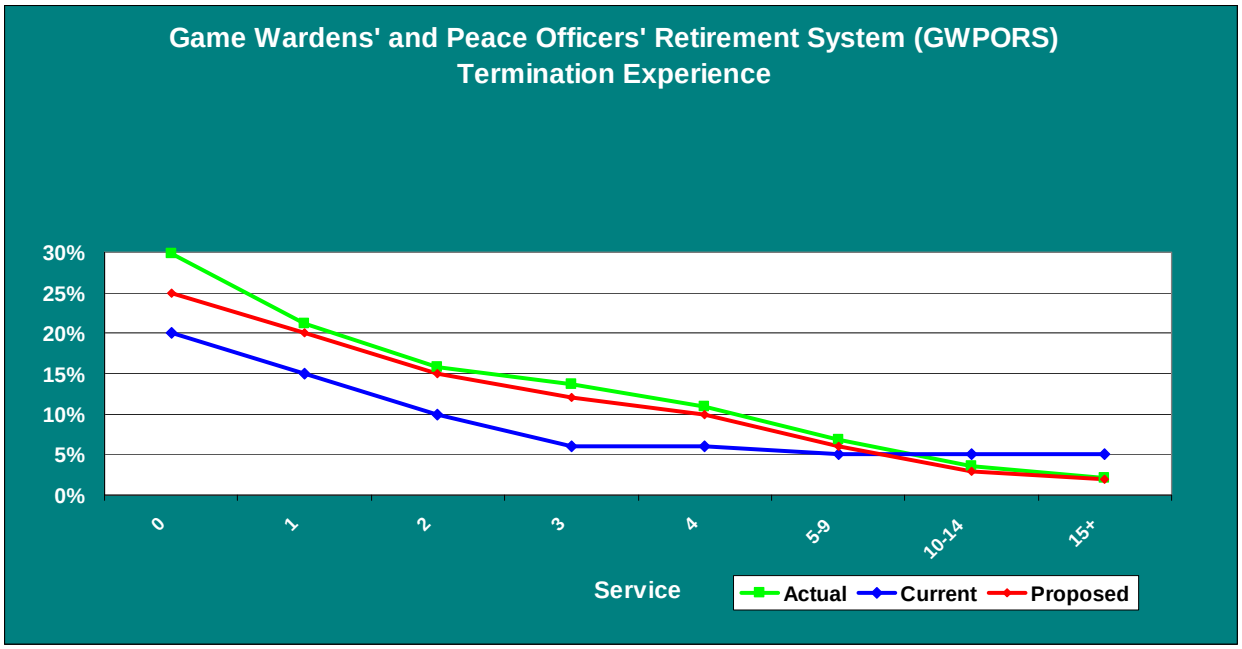
Termination and Refund Experience Graphs (Current/Proposed) ….. continued

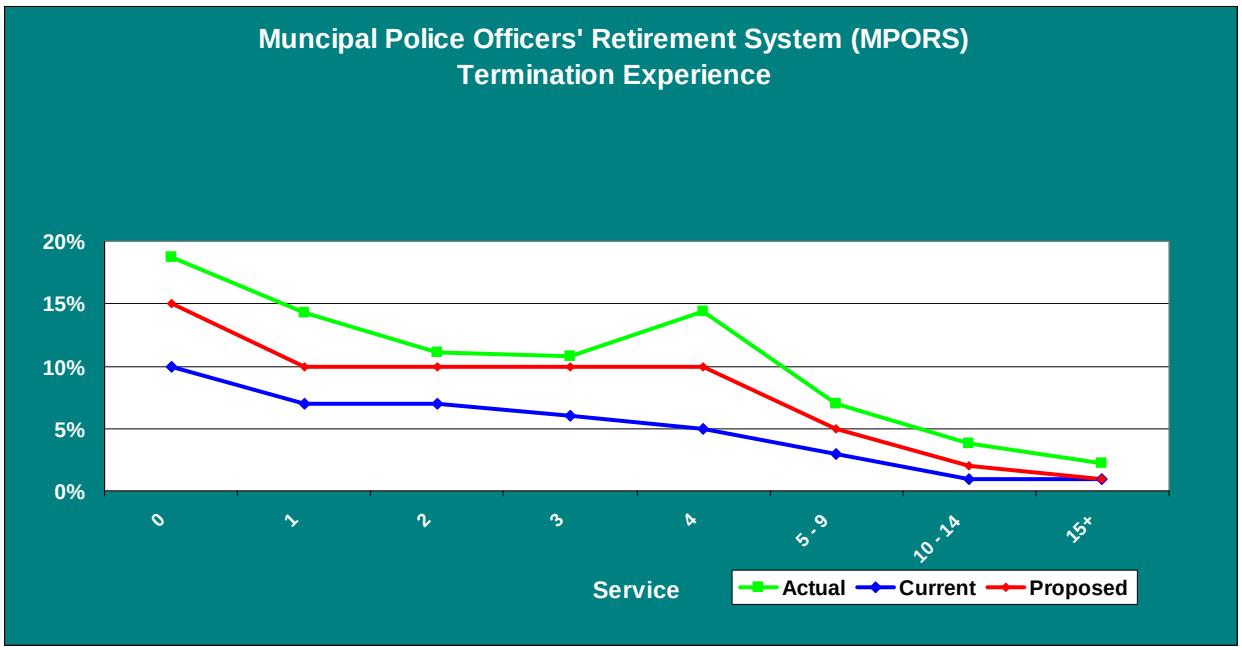




APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

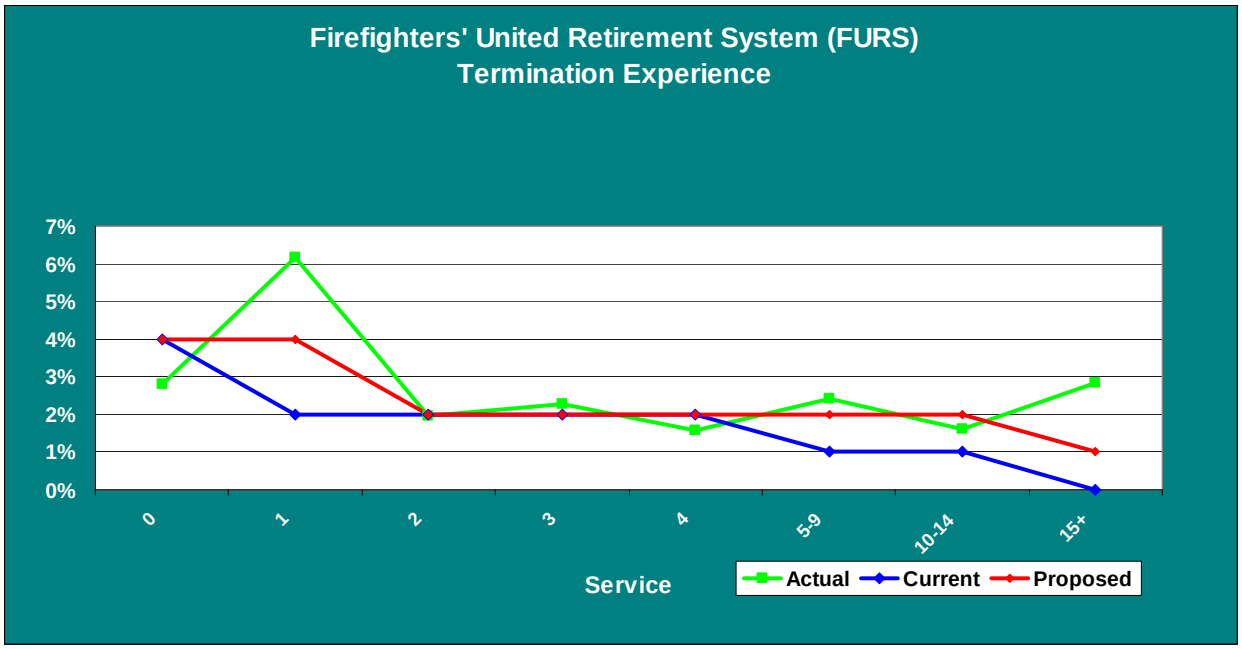
Termination and Refund Experience Graphs (Current/Proposed) ….. continued

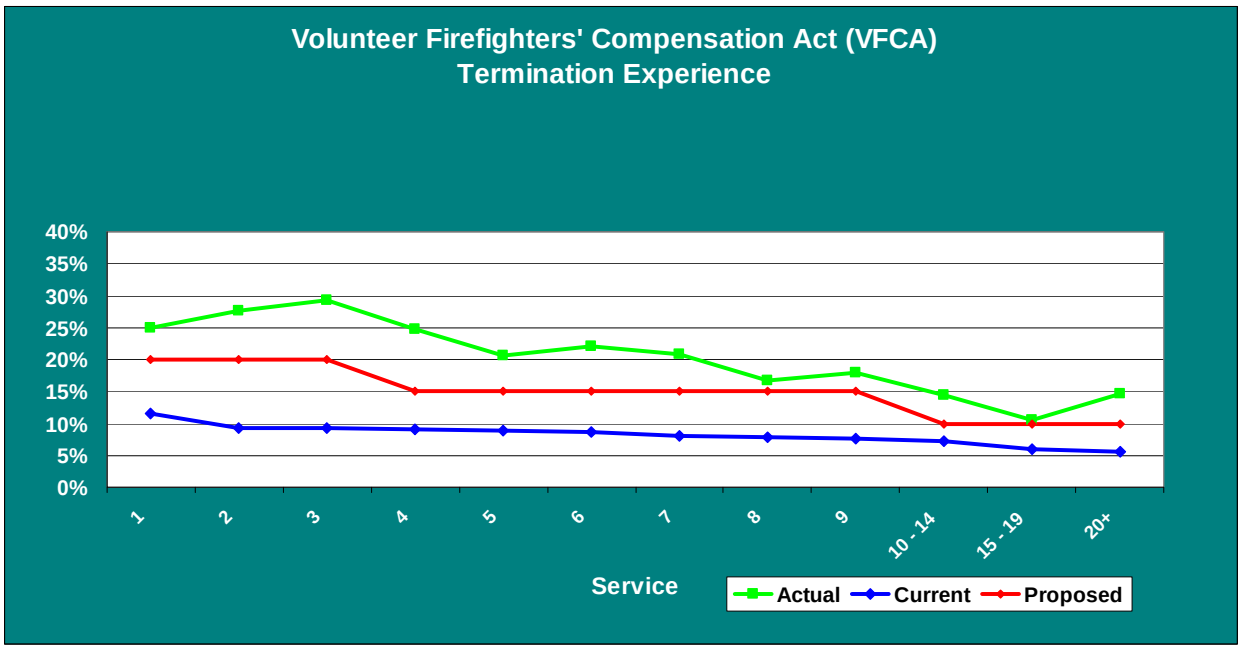




APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

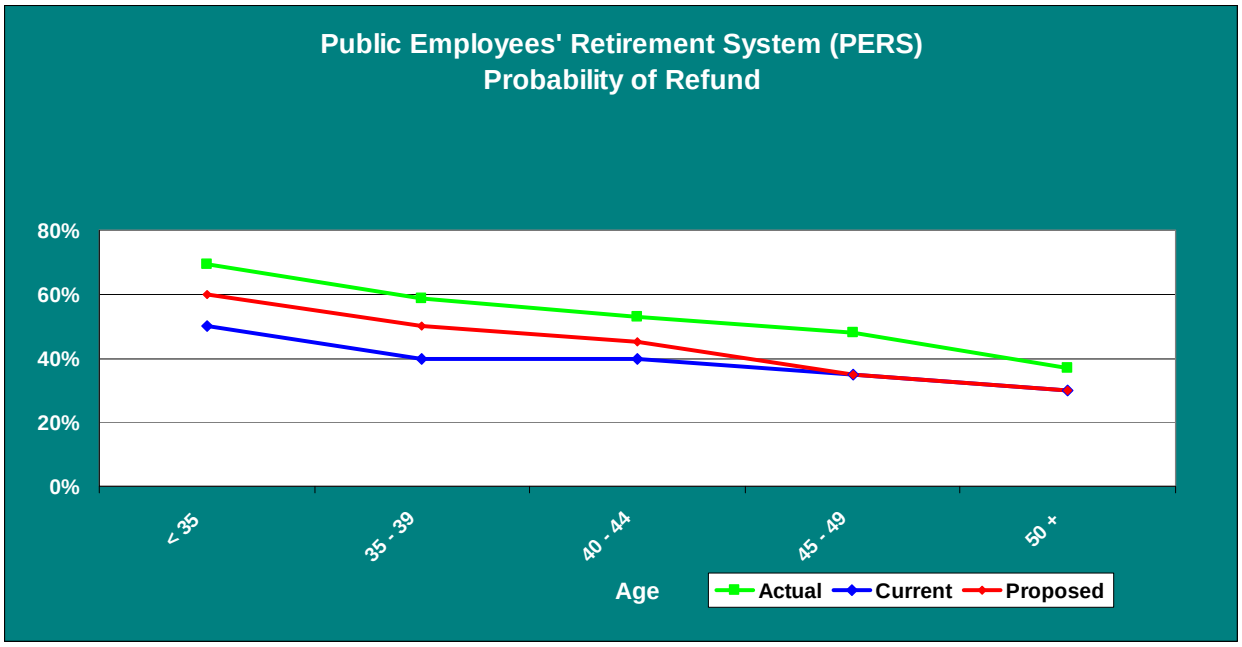
Termination and Refund Experience Graphs (Current/Proposed) ….. continued

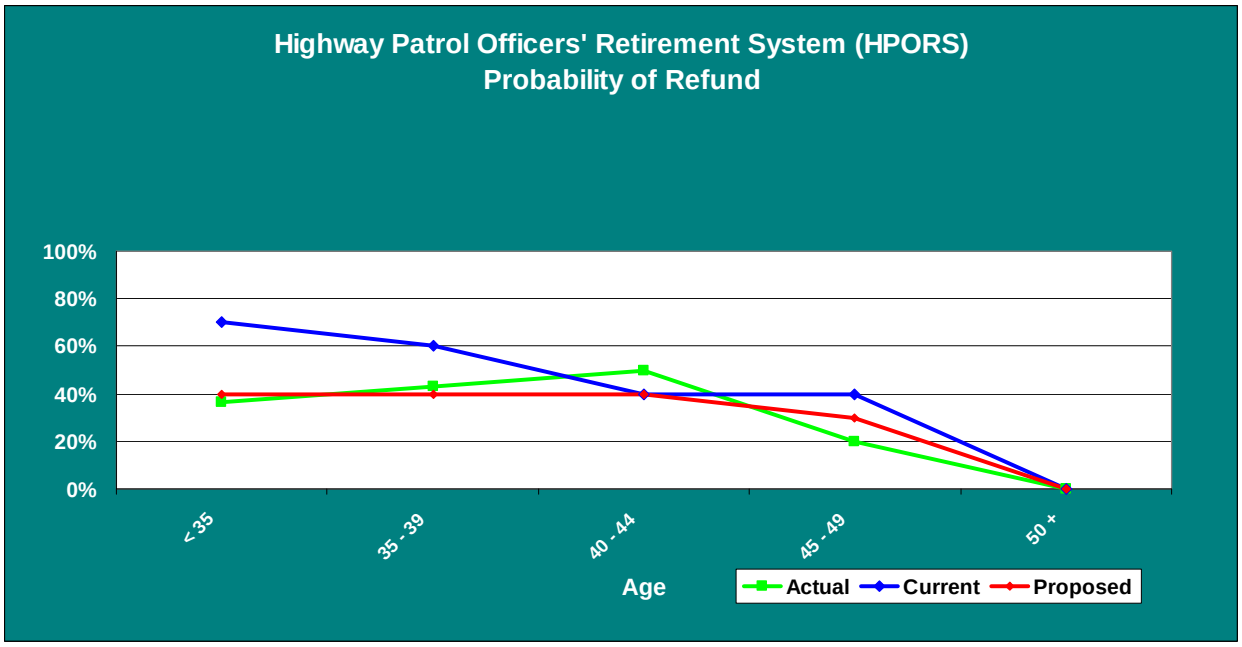




APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

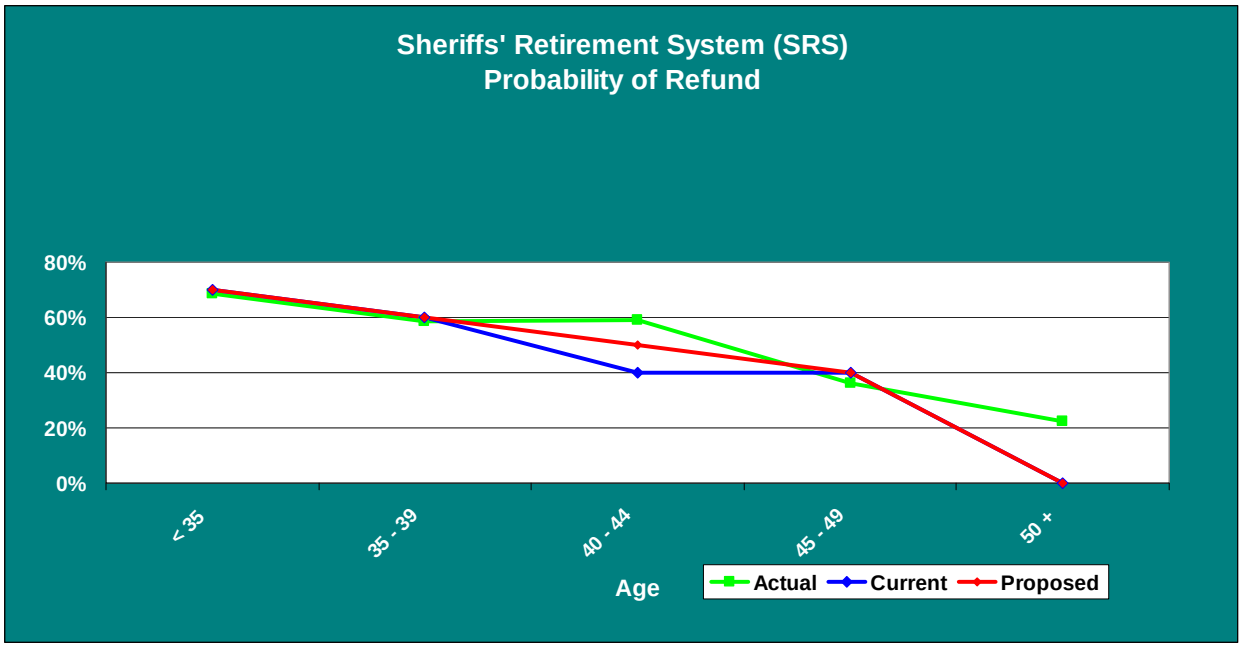
Termination and Refund Experience Graphs (Current/Proposed) ….. continued

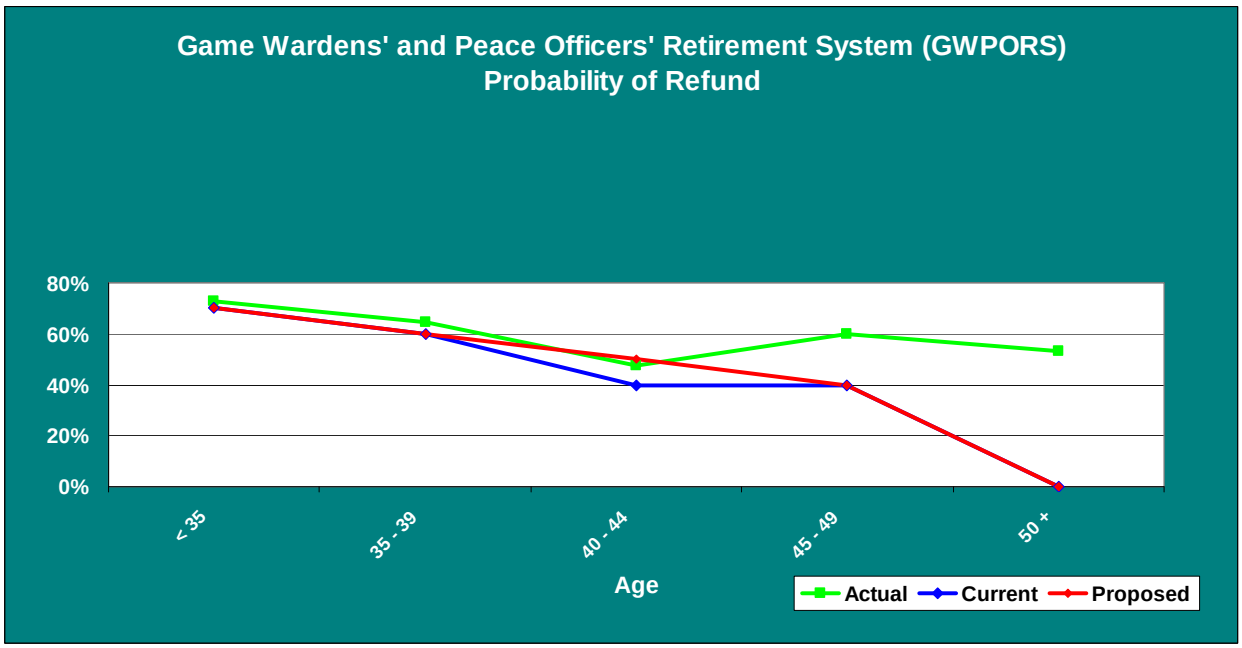




APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

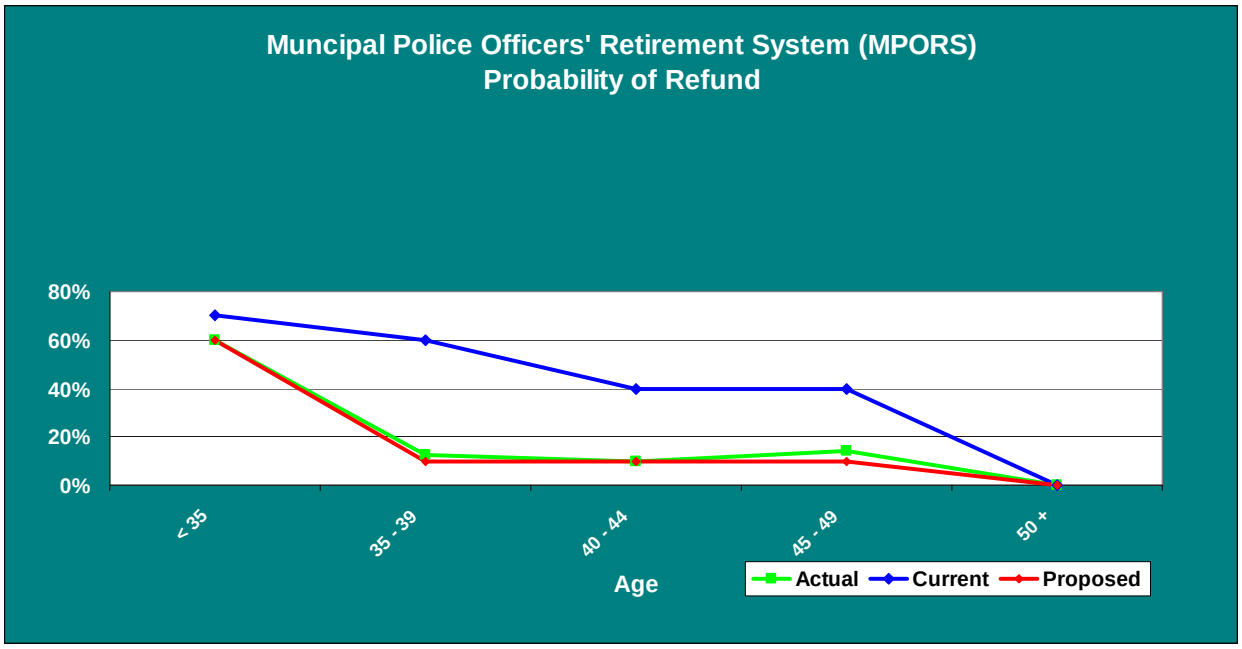
Termination and Refund Experience Graphs (Current/Proposed) ….. continued

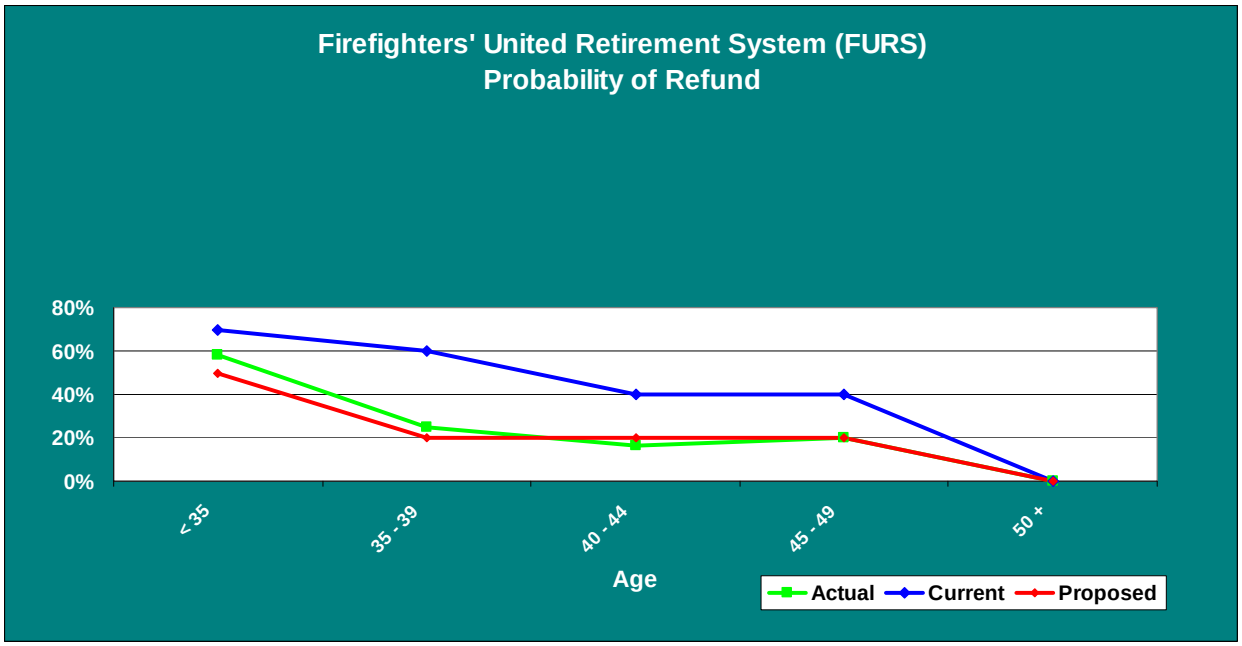




APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

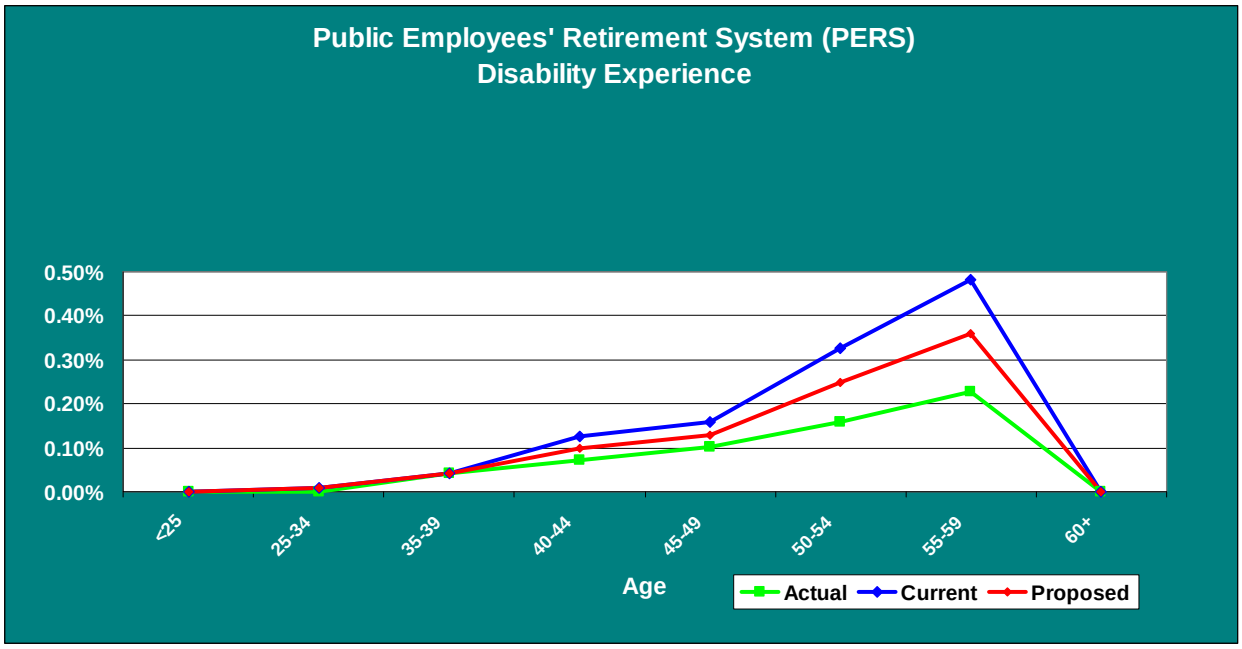
Termination and Refund Experience Graphs (Current/Proposed) ….. continued

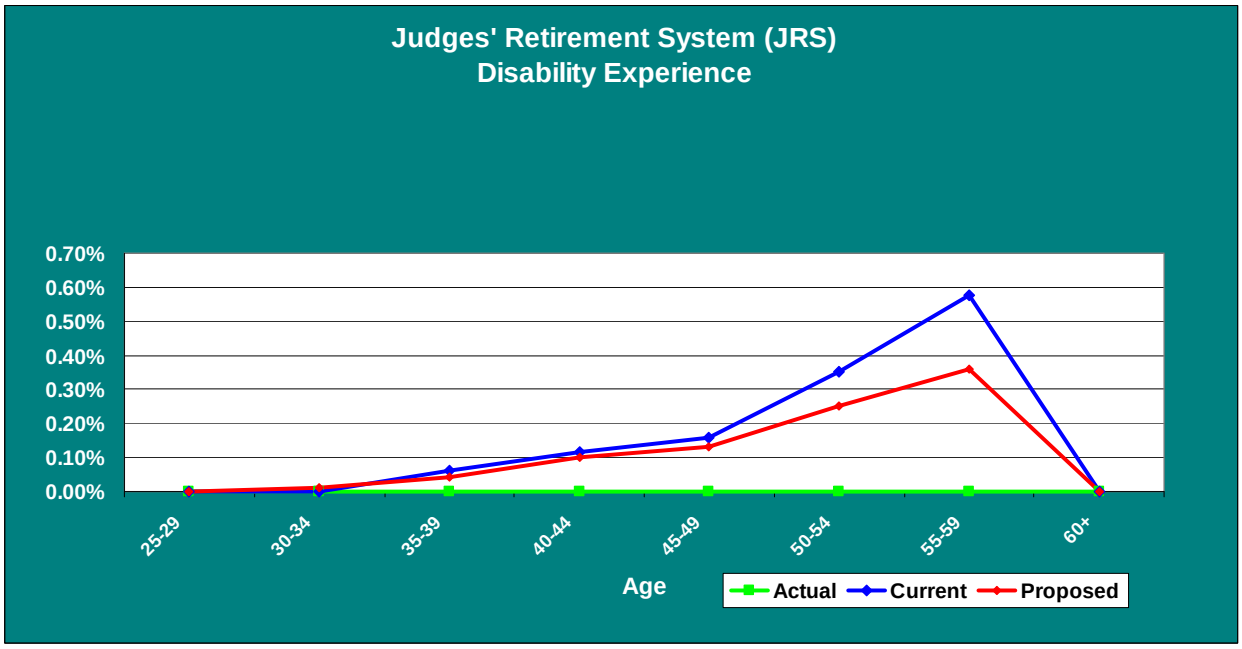




APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

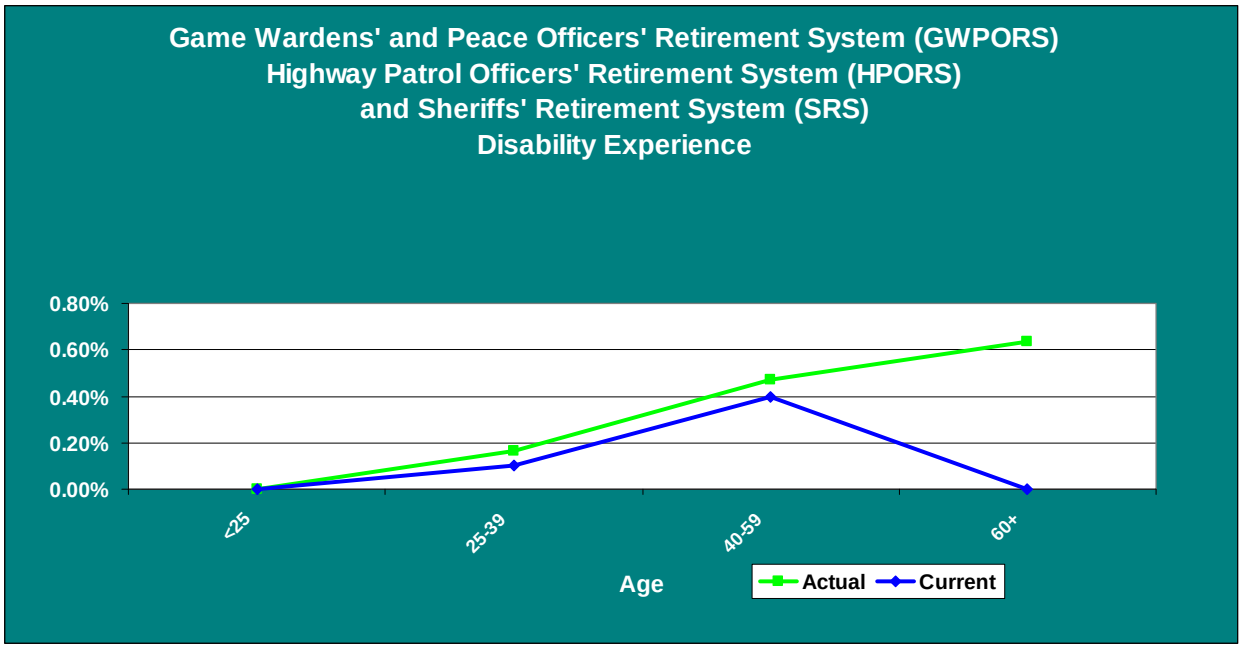
4. Disability Experience Graphs (Current/Proposed)

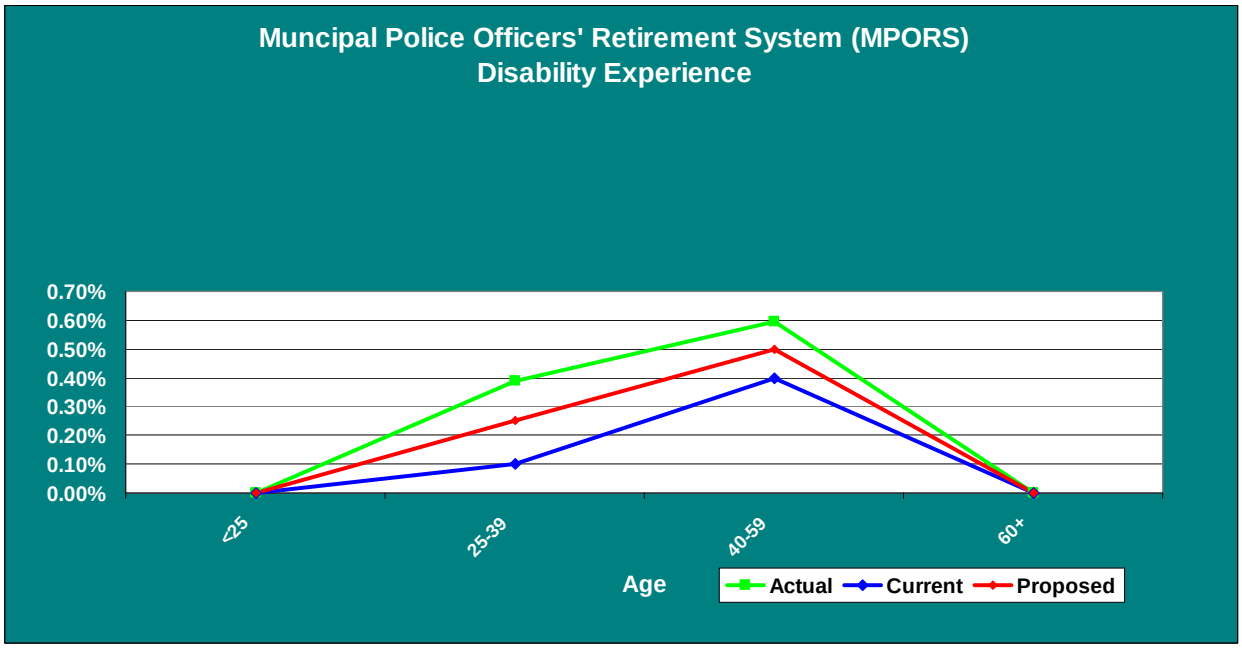




APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

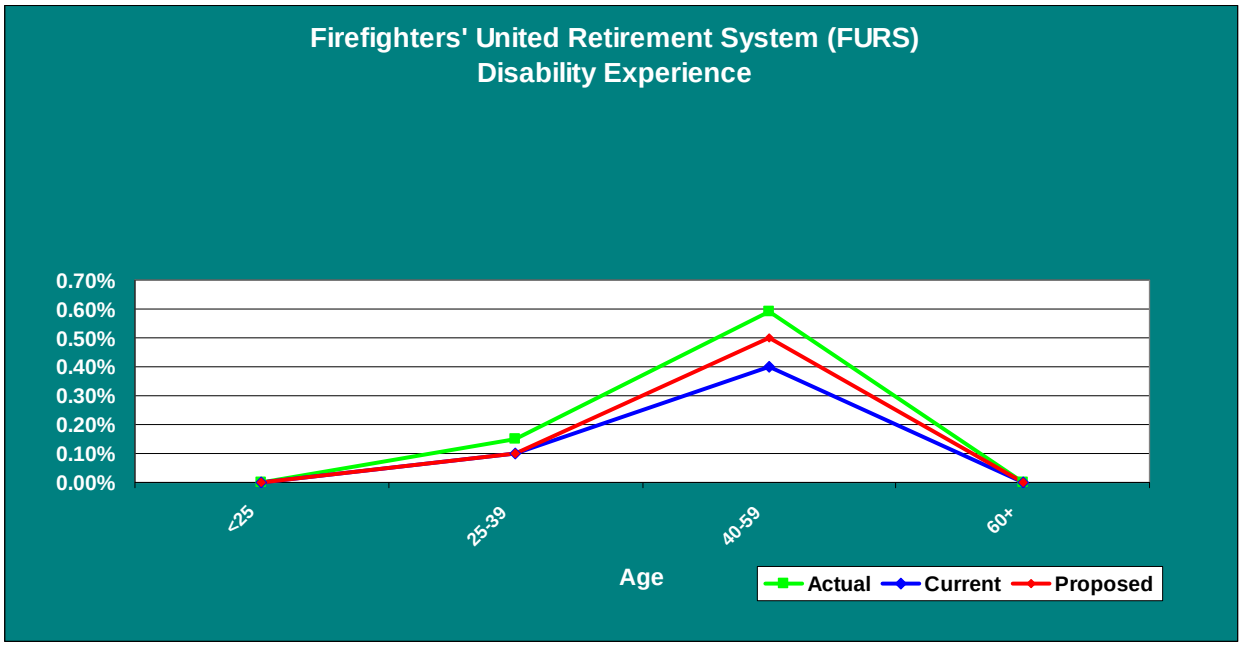
Disability Experience Graphs (Current/Proposed) ….. continued





APPENDIX A
GRAPHS OF SALARY AND DEMOGRAPHIC ASSUMPTIONS

Disability Experience Graphs (Current/Proposed) ….. continued



APPENDIX B
CURRENT ACTUARIAL ASSUMPTIONS

1. Universal Assumptions for Actuarial Valuations

A. Net investment earnings assumption – 8.00%;

B. General wage increase assumption – 4.25%;

C. Actuarial cost method – entry age cost;

D. Asset valuation method – 4-year smoothed market;

E. Probability of marriage assumption – 100% of all non-retired members are assumed to be married. Male spouses are assumed to be four years older than female spouses for all systems except PERS. Male spouses are assumed to be three years older than female spouses in the PERS.

2. System Specific Actuarial Valuation Assumptions

A. Public Employees' Retirement System:

1. Assumed interest on member contributions – 5%;

2. Merit salary increase assumptions:

Years of Service	Annual Increase
1	6.00%
2	4.90
3	3.90
4	3.10
5	2.40
6	1.80
7	1.40
8	1.00
9	0.70
10	0.50
11-15	0.30
16-20	0.10
21 and over	0.00

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3. Annual retirement rate assumptions:

Age	<30 years service	30+ years service
<50	0%	10%
50-54	3	10
55	3	15
56	4	15
57	5	15
58	5	15
59	6	15
60	8	15
61	15	15
62	25	25
63	15	15
64	15	15
65	30	30
66	30	30
67	25	25
68	25	25
69	25	25
70+	100	100

4. Annual rate of disablement assumptions:

Age	Male	Female
22	-	-
27	0.01%	0.01%
32	0.01	0.01
37	0.06	0.03
42	0.09	0.15
47	0.17	0.15
52	0.36	0.30
57	0.62	0.36
62	0.00	0.00

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5. Annual rate of other employment terminations assumptions:

   Male members:

Service	Age<30	30-39	40+
0	30%	22%	15%
1	25	15	12
2	16	12	10
3	14	10	8
4	10	8	6
5-9	6	6	5
10-14	3	3	3
15+	-	2	2

   Female members:

Service	Age<30	30-39	40+
0	30%	22%	18%
1	25	16	13
2	16	14	10
3	14	11	9
4	10	8	8
5-9	5	5	5
10-14	4	4	3
15+	-	2	2

   No terminations are assumed after age 55 with 5 years of service for either male or female.

6. Probability of electing a refund of member contributions upon termination assumptions:

Age at Termination	Non-vested	Vested
Under 35	100%	50%
35-39	100	40
40-44	100	40
45-49	100	35
50+	100	30

7. Mortality assumptions among contributing members, service retired members and beneficiaries: males - the 1994 Male Uninsured Pensioner Mortality Table, with ages set back 1 year; females - the 1994 Female Uninsured Pensioner Mortality Table, with ages set back one year. Mortality assumptions among disabled members: males - IRS Social Security Disabled

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Mortality Male Table published in Revenue Ruling 96-7 for pre-1995 disabilities with ages set back 3 years; females - IRS Social Security Disabled Mortality Female Table published in Revenue Ruling 96-7 for pre-1995 disabilities with ages set forward 1 year for females.

B. Judges' Retirement System

1. Assumed interest on member contributions – 5%;

2. Merit salary increase assumptions – 0% for all years of service;

3. Annual retirement rate assumptions:

Age	<15 years service	Year first attaining 15 years of service
60-64	-	50%
65	-	100
66	-	100
67	-	100
68	-	100
69+	-	100
70+	100%	100

All vested terminated members are assumed to retire when first eligible for an unreduced benefit;

4. Annual rate of disablement assumptions:

Age	Male	Female
22	-	-
27	0.01%	0.01%
32	0.01	0.01
37	0.06	0.03
42	0.09	0.15
47	0.17	0.15
52	0.36	0.30
57	0.62	0.36
62	0.00	0.00

5. Annual rate of other employment terminations assumptions for all members – 0% for all years of service;

6. Probability of electing a refund of member contributions upon termination assumptions – 0%;

7. Mortality assumptions among contributing members, service retired members and beneficiaries: males - the 1994 Male Uninsured Pensioner Mortality

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Table, with ages set back 1 year; females - the 1994 Female Uninsured Pensioner Mortality Table, with ages set back one year. Mortality assumptions among disabled members: males - IRS Social Security Disabled Mortality Male Table published in Revenue Ruling 96-7 for pre-1995 disabilities with ages set back 3 years; females - IRS Social Security Disabled Mortality Female Table published in Revenue Ruling 96-7 for pre-1995 disabilities with ages set forward 1 year for females.

C. Highway Patrol Officers' Retirement System

1. Assumed interest on member contributions – 5%;

2. Merit salary increase assumptions:

Years of Service	Annual Increase
1	7.3%
2	5.6
3	4.4
4	3.5
5	2.8
6	2.2
7	1.7
8	1.3
9	1.0
10	0.7
11-15	0.4
16-20	0.2
21 and over	0.0

3. Annual retirement rate assumptions:

Age	With 20 years of service
<50	12%
50-54	16
55	15
56	15
57	15
58	15
59	15
60+	100

All vested terminated members are assumed to retire when first eligible for an unreduced benefit.

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4. Annual rate of disablement assumptions:

Age	Male	Female
22	-	-
27	0.10%	0.10%
32	0.10	0.10
37	0.10	0.10
42	0.40	0.40
47	0.40	0.40
52	0.40	0.40
57	0.40	0.40
62	0.00	0.00

Ten percent of all disabilities are assumed to be duty-related

5. Annual rate of other employment terminations assumptions for all members:

Service	Rate
0	15%
1	10
2	10
3	10
4	5
5-9	5
10-14	3
15+	1

6. Probability of electing a refund of member contributions upon termination assumptions:

Age at Termination	Non-vested	Vested
Under 35	100%	70%
35-39	100	60
40-44	100	40
45-49	100	40
50+	100	-

7. Mortality assumptions: for healthy retirees and non-retired member males, the 1994 Male Uninsured Pensioner Mortality Table with ages set back one year; for healthy retirees and non-retired member females, the 1994 Female Uninsured Pensioner Mortality Table with no change; for disabled male retirees, the 1994 Male Uninsured Pensioner Mortality Table set forward three years; for disabled female retirees, the 1994 Female Uninsured Pensioner Mortality Table set forward two years; for male beneficiaries, the 1994 Male

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Uninsured Pensioner Mortality Table set back one year; for female beneficiaries, the 1994 Female Uninsured Pensioner Mortality Table set back one year. Seventy percent of deaths are assumed to be duty-related.

D. Sheriffs' Retirement System:

1. Assumed interest on member contributions – 5%;

2. Merit salary increase assumptions:

Years of Service	Annual Increase
1	7.3%
2	5.6
3	4.4
4	3.5
5	2.8
6	2.2
7	1.7
8	1.3
9	1.0
10	0.7
11-15	0.4
16-20	0.2
21 and over	0.0

3. Annual retirement rate assumptions:

Age	With 20 years of service
<50	10%
50-54	20
55	35
56	15
57	15
58	20
59	40
60	40
61	40
62	40
63	40
64	40
65+	100

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All vested terminated members are assumed to retire when first eligible for an unreduced benefit

4. Annual rate of disablement assumptions:

Age	Male	Female
22	-	-
27	0.10%	0.10%
32	0.10	0.10
37	0.10	0.10
42	0.40	0.40
47	0.40	0.40
52	0.40	0.40
57	0.40	0.40
62	0.00	0.00

Ten percent of all disabilities are assumed to be duty related

5. Annual rate of other employment terminations assumptions for all members:

Service	Rate
0	15%
1	13
2	9
3	6
4	6
5-9	5
10-14	3
15+	1

6. Probability of electing a refund of member contributions upon termination assumptions:

Age at Termination	Non-vested	Vested
Under 35	100%	70%
35-39	100	60
40-44	100	40
45-49	100	40
50+	100	-

7. Mortality assumptions: for healthy retirees and non-retired member males, the 1994 Male Uninsured Pensioner Mortality Table with ages set back one year; for healthy retirees and non-retired member females, the 1994 Female Uninsured Pensioner Mortality Table with no change; for disabled male

retirees, the 1994 Male Uninsured Pensioner Mortality Table set forward three years; for disabled female retirees, the 1994 Female Uninsured Pensioner Mortality Table set forward two years; for male beneficiaries, the 1994 Male Uninsured Pensioner Mortality Table set back one year; for female beneficiaries, the 1994 Female Uninsured Pensioner Mortality Table set back one year. Seventy percent of all member deaths are assumed to be duty-related

E. Game Wardens' and Peace Officers' Retirement System:

1. Assumed interest on member contributions – 5%;

2. Merit salary increase assumptions:

Years of Service	Annual Increase
1	7.3%
2	5.6
3	4.4
4	3.5
5	2.8
6	2.2
7	1.7
8	1.3
9	1.0
10	0.7
11-15	0.4
16-20	0.2
21 and over	0.0

3. Annual retirement rate assumptions:

Age	With 20 years of service
<50	0%
50-54	5
55	10
56	10
57	10
58	10
59	10
60+	100

All vested terminated members are assumed to retire when first eligible for an unreduced benefit

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4. Annual rate of disablement assumptions:

Age	Male	Female
22	-	-
27	0.10%	0.10%
32	0.10	0.10
37	0.10	0.10
42	0.40	0.40
47	0.40	0.40
52	0.40	0.40
57	0.40	0.40
62	0.00	0.00

Ten percent of all disabilities are assumed to be duty-related.

5. Annual rate of other employment terminations assumptions for all members:

Service	Rate
0	20%
1	15
2	10
3	6
4	6
5-9	5
10-14	5
15+	5

6. Probability of electing a refund of member contributions upon termination assumptions:

Age at Termination	Non-vested	Vested
Under 35	100%	70%
35-39	100	60
40-44	100	40
45-49	100	40
50+	100	-

7. Mortality assumptions: for healthy retirees and non-retired member males, the 1994 Male Uninsured Pensioner Mortality Table with ages set back one year; for healthy retirees and non-retired member females, the 1994 Female Uninsured Pensioner Mortality Table with no change; for disabled male retirees, the 1994 Male Uninsured Pensioner Mortality Table set forward three years; for disabled female retirees, the 1994 Female Uninsured Pensioner Mortality Table set forward two years; for male beneficiaries, the 1994 Male Uninsured Pensioner Mortality Table set back one year; for female

beneficiaries, the 1994 Female Uninsured Pensioner Mortality Table set back one year. Seventy Percent of all member deaths are assumed to be duty-related.

F. Municipal Police Officers' Retirement System:

1. Assumed interest on member contributions – 5%;

2. Merit salary increase assumptions:

Years of Service	Annual Increase
1	7.3%
2	5.6
3	4.4
4	3.5
5	2.8
6	2.2
7	1.7
8	1.3
9	1.0
10	0.7
11-15	0.4
16-20	0.2
21 and over	0.0

3. Annual retirement rate assumptions:

Age	With 20 years of service
<50	20%
50-54	25
55	20
56	20
57	20
58	20
59	20
60	20
61	20
62	20
63	20
64	20
65+	100

All vested terminated members are assumed to retire when first eligible for an unreduced benefit

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4. Annual rate of disablement assumptions:

Age	Male	Female
22	-	-
27	0.10%	0.10%
32	0.10	0.10
37	0.10	0.10
42	0.40	0.40
47	0.40	0.40
52	0.40	0.40
57	0.40	0.40
62	0.00	0.00

Ten percent of all disabilities are assumed to be duty-related.

5. Annual rate of other employment terminations assumptions for all members:

Service	Rate
0	10%
1	7
2	7
3	6
4	5
5-9	3
10-14	1
15+	1

6. Probability of electing a refund of member contributions upon termination assumptions:

Age at Termination	Non-vested	Vested
Under 35	100%	70%
35-39	100	60
40-44	100	40
45-49	100	40
50+	100	-

7. Mortality assumptions: for healthy retirees and non-retired member males, the 1994 Male Uninsured Pensioner Table with ages set back one year; for healthy retirees and non-retired member females, the 1994 Female Uninsured Pensioner Mortality Table with no change; for disabled male retirees, the 1994 Male Uninsured Pensioner Mortality Table set forward three years; for disabled female retirees, the 1994 Female Uninsured Pensioner Mortality Table set forward two years; for male beneficiaries, the 1994 Male Uninsured

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Pensioner Table set back one year; for female beneficiaries, the 1994 Female Uninsured Pensioner Mortality Table set back one year.

8. DROP account assumptions: DROP accounts are assumed to earn the actuarial rate of return on the trust fund net of expenses plus 1.5% to cover the minimum 0% earnings guarantee on DROP accounts. 33% of all active members are assumed to elect to enter the DROP upon first attainment of 20 years of service. These members are assumed to elect to participate in the DROP plan for five years. Members who have elected to participate in the DROP are assumed to remain in the DROP until the end of the DROP period elected, unless they die or become disabled while in the DROP.

G. Firefighters' Unified Retirement System:

1. Assumed interest on member contributions – 5%;

2. Merit salary increase assumptions:

Years of Service	Annual Increase
1	7.3%
2	5.6
3	4.4
4	3.5
5	2.8
6	2.2
7	1.7
8	1.3
9	1.0
10	0.7
11-15	0.4
16-20	0.2
21 and over	0.0

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3. Annual retirement rate assumptions:

Age	With 20 years of service
<50	20%
50-54	12
55	15
56	15
57	15
58	15
59	15
60	15
61	15
62	15
63	15
64	15
65+	100

All vested terminated members are assumed to retire when first eligible for an unreduced benefit

4. Annual rate of disablement assumptions:

Age	Male	Female
22	-	-
27	0.10%	0.10%
32	0.10	0.10
37	0.10	0.10
42	0.40	0.40
47	0.40	0.40
52	0.40	0.40
57	0.40	0.40
62	0.00	0.00

Ten percent of disabilities are assumed to be duty-related

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CURRENT ACTUARIAL ASSUMPTIONS

5. Annual rate of other employment terminations assumptions for all members:

Service	Rate
0	4%
1	2
2	2
3	2
4	2
5-9	1
10-14	1
15+	0

6. Probability of electing a refund of member contributions upon termination assumptions:

Age at Termination	Non-vested	Vested
Under 35	100%	70%
35-39	100	60
40-44	100	40
45-49	100	40
50+	100	-

7. Mortality assumptions: for healthy retirees and non-retired member males, the 1994 Male Uninsured Pensioner Mortality Table with ages set back one year; for healthy retirees and non-retired member females, the 1994 Female Uninsured Pensioner Mortality Table with no change; for disabled. Male retirees, the 1994 Male Uninsured Pensioner Mortality Table set forward three years; for disabled female retirees, the 1994 Female Uninsured Pensioner Mortality Table set forward two years; for male beneficiaries, the 1994 Male Uninsured Pensioner Mortality Table set back one year; for female beneficiaries, the 1994 Female Uninsured Pensioner Mortality Table set back one year.

H. Volunteer Firefighters' Compensation Act:

1. Annual retirement rate assumptions:

Age	10 years service	20 years service
<55	0%	0%
55-59	0	100
60+	100	100

All vested terminated members are assumed to retire when first eligible for an unreduced benefit.

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CURRENT ACTUARIAL ASSUMPTIONS

2. Annual rate of other employment terminations assumptions:

Age	Rate
25	12.79%
30	12.33
35	11.61
40	10.34
45	8.30
50	5.32

3. Mortality assumptions: for healthy retirees, beneficiaries and non-retired member males, the 1994 Male Uninsured Pensioner Mortality Table with ages set back one year; for healthy retirees, beneficiaries and non-retired member females, the 1994 Female Uninsured Pensioner Mortality Table set back one year; for disabled. male retirees, the 1994 Male Uninsured Pensioner Mortality Table set back one year; for disabled female retirees, the 1994 Female Uninsured Pensioner Mortality Table set forward three years;

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PROPOSED ACTUARIAL ASSUMPTIONS

All changes from the current assumptions are highlighted below.

1. Universal Assumptions for Actuarial Valuations

A. Net investment earnings assumption – 7.75%;

B. General wage increase assumption – 4.00%;

C. Actuarial cost method – entry age cost;

D. Asset valuation method – 4-year smoothed market;

E. Probability of marriage assumption – 100% of all non-retired members are assumed to be married. Male spouses are assumed to be three years older than female spouses for all systems except JRS where the male spouses are assumed to be four years older than female spouses;

F. Mortality assumption among contributing members, terminated vested members, service retired members and beneficiaries: RP-2000 Combined Healthy Male and Female Mortality Tables projected to 2015 with scale AA. Mortality assumption among disabled members: RP-2000 Combined Healthy Male and Female Mortality tables with no projections.

2. System Specific Actuarial Valuation Assumptions

A. Public Employees' Retirement Administration:

1. Assumed interest on member contributions – 3.5%;

2. Merit salary increase assumptions:

Years of Service	Annual Increase
1	6.00%
2	4.90
3	3.90
4	3.10
5	2.40
6	1.80
7	1.40
8	1.00
9	0.70
10	0.50
11-15	0.30
16-20	0.10
21 and over	0.00

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PROPOSED ACTUARIAL ASSUMPTIONS

3. Annual retirement rate assumptions:

Age	30+ years service and age 60 with 25 years	Other Retirements
<50	10%	0%
50-54	10	3
55	15	3
56	15	4
57	15	5
58	15	5
59	15	6
60	15	8
61	15	15
62	25	25
63	15	15
64	15	15
65	30	30
66	30	30
67	25	25
68	25	25
69	25	25
70+	100	100

4. Annual rate of disablement assumptions:

Age	Rate
22	-
27	0.01%
32	0.01
37	0.04
42	0.10
47	0.13
52	0.25
57	0.36
62	0.00

APPENDIX C
PROPOSED ACTUARIAL ASSUMPTIONS

5. Annual rate of other employment terminations assumptions:

Service	Rate
0	25%
1	20
2	15
3	10
4	10
5-9	5
10-14	5
15+	2

No terminations are assumed after age 50 with 5 years of service for either male or female.

6. Probability of electing a refund of member contributions upon termination assumptions:

Age at Termination	Non-vested	Vested
Under 35	100%	60%
35-39	100	50
40-44	100	45
45-49	100	35
50+	100	30

B. Judges' Retirement Administration

1. Assumed interest on member contributions – 3.5%;

2. Merit salary increase assumptions – 0% for all years of service;

3. Annual retirement rate assumptions:

Age	Rate
60	15%
61-64	5
65	15
66-69	5
70+	100

All vested terminated members are assumed to retire when first eligible for an unreduced benefit;

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PROPOSED ACTUARIAL ASSUMPTIONS

4. Annual rate of disablement assumptions:

Age	Rate
22	-
27	-
32	0.01%
37	0.04
42	0.10
47	0.13
52	0.25
57	0.36
62	0.00

All disabilities are assumed to be non-duty related.

5. Annual rate of other employment terminations assumptions for all members – 0% for all years of service;

6. Probability of electing a refund of member contributions upon termination assumptions – 0%;

C. Highway Patrol Officers' Retirement Administration

1. Assumed interest on member contributions – 3.5%;

2. Merit salary increase assumptions:

Years of Service	Annual Increase
1	7.3%
2	5.6
3	4.4
4	3.5
5	2.8
6	2.2
7	1.7
8	1.3
9	1.0
10	0.7
11-15	0.4
16-20	0.2
21 and over	0.0

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PROPOSED ACTUARIAL ASSUMPTIONS

3. Annual retirement rate assumptions:

Age	With 20 Years of Service
<50	12%
50-54	16
55-59	20
60+	100

All vested terminated members are assumed to retire when first eligible for an unreduced benefit.

4. Annual rate of disablement assumptions:

Age	Rate
22	-
27	0.10%
32	0.10
37	0.10
42	0.40
47	0.40
52	0.40
57	0.40
62	0.00

Seventy-five percent of all disabilities are assumed to be duty-related

5. Annual rate of other employment terminations assumptions for all members:

Service	Rate
0	12%
1-5	7.5
5-9	5
10-14	3
15+	1

6. Probability of electing a refund of member contributions upon termination assumptions:

Age at Termination	Non-vested	Vested
Under 35	100%	40%
35-39	100	40
40-44	100	40
45-49	100	30
50+	100	-

APPENDIX C
PROPOSED ACTUARIAL ASSUMPTIONS

7. Seventy percent of deaths are assumed to be duty-related.

D. Sheriffs' Retirement Administration:

1. Assumed interest on member contributions – 3.5%;

2. Merit salary increase assumptions:

Years of Service	Annual Increase
1	7.3%
2	5.6
3	4.4
4	3.5
5	2.8
6	2.2
7	1.7
8	1.3
9	1.0
10	0.7
11-15	0.4
16-20	0.2
21 and over	0.0

3. Annual retirement rate assumptions:

Age	With 20 years of service
<50	10%
50-54	10
55-59	15
60-64	20
65+	100

All vested terminated members are assumed to retire when first eligible for an unreduced benefit

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PROPOSED ACTUARIAL ASSUMPTIONS

4. Annual rate of disablement assumptions:

Age	Rate
22	-
27	0.10%
32	0.10
37	0.10
42	0.40
47	0.40
52	0.40
57	0.40
62	0.00

Seventy-five percent of all disabilities are assumed to be duty related

5. Annual rate of other employment terminations assumptions for all members:

Service	Rate
0	20%
1	15
2	12
3	10
4	10
5-9	5
10-14	3
15+	2

6. Probability of electing a refund of member contributions upon termination assumptions:

Age at Termination	Non-vested	Vested
Under 35	100%	70%
35-39	100	60
40-44	100	50
45-49	100	40
50+	100	-

7. Ten percent of all member deaths are assumed to be duty-related

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PROPOSED ACTUARIAL ASSUMPTIONS

E. Game Wardens' and Peace Officers' Retirement Administration:

1. Assumed interest on member contributions – 3.5%;

2. Merit salary increase assumptions:

Years of Service	Annual Increase
1	7.3%
2	5.6
3	4.4
4	3.5
5	2.8
6	2.2
7	1.7
8	1.3
9	1.0
10	0.7
11-15	0.4
16-20	0.2
21 and over	0.0

3. Annual retirement rate assumptions:

Age	Age 55 with 5 years of service	With 20 years of service and age 60 with 5 years of service
<50		0%
50-54		15
55	15%	25
56-59	5	25
60-61		15
62		40
62-64		15
65+		100

All vested terminated members are assumed to retire when first eligible for an unreduced benefit

APPENDIX C
PROPOSED ACTUARIAL ASSUMPTIONS

4. Annual rate of disablement assumptions:

Age	Rate
22	-
27	0.10%
32	0.10
37	0.10
42	0.40
47	0.40
52	0.40
57	0.40
62	0.00

Seventy-five percent of all disabilities are assumed to be duty-related.

5. Annual rate of other employment terminations assumptions for all members:

Service	Rate
0	25%
1	20
2	15
3	12
4	10
5-9	6
10-14	3
15+	2

6. Probability of electing a refund of member contributions upon termination assumptions:

Age at Termination	Non-vested	Vested
Under 35	100%	70%
35-39	100	60
40-44	100	50
45-49	100	40
50+	100	-

7. Ten percent of all member deaths are assumed to be duty-related.

F. Municipal Police Officers' Retirement Administration:

1. Assumed interest on member contributions – 3.5%;

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PROPOSED ACTUARIAL ASSUMPTIONS

2. Merit salary increase assumptions:

Years of Service	Annual Increase
1	7.3%
2	5.6
3	4.4
4	3.5
5	2.8
6	2.2
7	1.7
8	1.3
9	1.0
10	0.7
11-15	0.4
16-20	0.2
21 and over	0.0

3. Annual retirement rate assumptions:

Age	With 20 years of service
<50	12%
50-54	15
55-61	20
62+	100

All vested terminated members are assumed to retire when first eligible for an unreduced benefit.

4. Annual rate of disablement assumptions:

Age	Rate
22	-
27	0.25%
32	0.25
37	0.25
42	0.50
47	0.50
52	0.50
57	0.50
62	0.00

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PROPOSED ACTUARIAL ASSUMPTIONS

5. Annual rate of other employment terminations assumptions for all members:

Service	Rate
0	15%
1	10
2	10
3	10
4	10
5-9	5
10-14	2
15+	1

6. Probability of electing a refund of member contributions upon termination assumptions:

Age at Termination	Non-vested	Vested
Under 35	100%	60%
35-39	100	10
40-44	100	10
45-49	100	10
50+	100	-

7. DROP account assumptions: DROP accounts are assumed to earn the actuarial rate of return. 15% of all active members are assumed to elect to enter the DROP for each of the first six years following DROP eligibility. These members are assumed to elect to participate in the DROP plan for five years. Members who have elected to participate in the DROP are assumed to remain in the DROP until the end of the DROP period elected, unless they die or become disabled while in the DROP.

G. Firefighters' Unified Retirement Administration:

1. Assumed interest on member contributions – 3.5%;

APPENDIX C
PROPOSED ACTUARIAL ASSUMPTIONS

2. Merit salary increase assumptions:

Years of Service	Annual Increase
1	7.3%
2	5.6
3	4.4
4	3.5
5	2.8
6	2.2
7	1.7
8	1.3
9	1.0
10	0.7
11-15	0.4
16-20	0.2
21 and over	0.0

3. Annual retirement rate assumptions:

Age	With 20 years of service
<50	5%
50-54	10
55-59	25
60-62	50
63+	100

All vested terminated members are assumed to retire when first eligible for an unreduced benefit

4. Annual rate of disablement assumptions:

Age	Rate
22	-
27	0.10%
32	0.10
37	0.10
42	0.50
47	0.50
52	0.50
57	0.50
62	0.00

APPENDIX C
PROPOSED ACTUARIAL ASSUMPTIONS

5. Annual rate of other employment terminations assumptions for all members:

Service	Rate
0	4%
1	4
2	2
3	2
4	2
5-9	2
10-14	2
15+	1

6. Probability of electing a refund of member contributions upon termination assumptions:

Age at Termination	Non-vested	Vested
Under 35	100%	50%
35-39	100	20
40-44	100	20
45-49	100	20
50+	100	-

H. Volunteer Firefighters' Compensation Act:

1. Annual retirement rate assumptions:

Age	10-19 years service	20 years service
<55	0%	0%
55-59	0	40
60-69	20	40
70+	100	100

All vested terminated members are assumed to retire when first eligible for an unreduced benefit.

2. Annual rate of other employment terminations assumptions:

Service	Rate
<4	20%
4-9	15
10+	10