REPORT ON THE RESULTS OF AN
EXPERIENCE STUDY OF THE
VERMONT MUNICIPAL EMPLOYEES'
RETIREMENT SYSTEM

Covering the period July 1, 2010 – June 30, 2014

July 27, 2015

Board of Trustees
Vermont Municipal Employees' Retirement System
Montpelier, Vermont 05609

Dear Board Members:

Section 5062, subsection (k), of Title 24, Chapter 125, Vermont Statutes Annotated, provides that at least once in each five-year period the actuary is to make a study of the System's recent experience to assist in setting assumptions. In accordance with this provision, the results of our experience study covering the four-year period ending June 30, 2014, are described in this report, along with our recommendations of certain modifications in the present assumptions. We have also included a brief section discussing the financial impact of the recommended changes.

The Table of Contents, which immediately follows, outlines the information contained in this report.

This study was prepared under the supervision of David L. Driscoll, with analysis of the rate-of-return and inflation assumptions performed under the supervision of Kai Petersen. We are Fellows of the Society of Actuaries and Members of the American Academy of Actuaries. We meet the Qualification Standards of the Academy to render the actuarial opinions contained herein, and we are available to answer questions concerning them. Additionally, Mr. Petersen is a Chartered Financial Analyst (CFA) Charter holder and has performed the analyses in accordance with the professional standards of the CFA Institute.

Respectfully submitted,

David L. Driscoll, F.S.A., E.A.   Kai Petersen, F.S.A., C.F.A.
Principal and Consulting Actuary   Principal, National Asset Liability Management Group Leader

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THE VERMONT MUNICIPAL EMPLOYEES' RETIREMENT SYSTEM

REPORT ON THE RESULTS OF AN INVESTIGATION
OF THE ACTUARIAL EXPERIENCE OF THE SYSTEM, 2010 - 2014.

I.   <u>INTRODUCTION</u>

In order to accumulate funds to pay retirement benefits on a reasonable and relatively stable basis, the actuary prepares annual valuations of the System's assets and liabilities to measure the funded status and to ensure that funding is progressing at a rate that is adequate to meet the System's obligations.

The primary purpose of funding is to equitably allocate costs between generations of taxpayers and provide security to members, who view the funds set aside as assurance that their benefits will be paid.

While the ultimate cost of the System is not determinable until all benefits are paid and expenses provided for, each actuarial valuation attempts to estimate costs based on assumptions selected to predict, as accurately as possible, future experience in order to produce stable contribution rates.

Overly conservative or aggressive assumptions will result in actuarial gains or losses each year. When translated into contributions, this will result in decreasing or increasing contribution rates and an inequitable allocation of costs.

The major actuarial assumptions are:

          (a)   Active service demographic assumptions,

          (b)   Compensation increase assumptions,

          (c)   Post-retirement mortality rates,

          (d)   Interest rate, and

          (e)   Cost-of-living adjustment rates.

Before presenting our analysis of the System's experience and discussion of the proposed assumptions, it is important to outline considerations that should govern the selection of actuarial assumptions. The recommendations of the American Academy of Actuaries are as follows:

(i)   The actuarial assumptions selected should reflect the actuary's best judgement of future events. They should take into account actual experience to the extent possible, but they should also reflect long-term future trends rather than give undue weight to recent past experience.

(ii)   The actuary should consider the impact of inflation in selecting the actuarial assumptions to be used.

(iii)   The actuary should give consideration to the reasonableness of each actuarial assumption independently as well as the combined impact of all the assumptions.

(iv)   The actuary should give careful attention to changes in plan design that may significantly alter expected future experience. For example, a liberalization of early retirement benefits may make advisable a revision in the retirement assumption.

(v)   The actuary, in choosing assumptions, should take into account general or specific information available from other sources, including the plan sponsor, plan administrator, investment managers, accountants, economists, etc.

The purpose of this report is to provide the information necessary to decide on the appropriate assumptions to be used in future valuations. It should be noted that these decisions cannot be made "in a vacuum" but must reflect the present and expected situation within the participating municipalities and the System.

The balance of this report deals in detail with the various assumptions. In each area, we have made recommendations as to what we believe are appropriate assumptions. These recommendations reflect our "best estimate" of the likely future experience based on:

(a)   recent past experience,

(b)   general economic views prevailing at this time, and

(c)   anticipated trends.

II.   ACTIVE SERVICE DEMOGRAPHIC ASSUMPTIONS

The active service demographic assumptions include rates of:

(a)   Termination,

(b)   Disability,

(c)   Death before retirement, and

(d)   Retirement.

Our review of active service demographic assumptions is based on the actuarial valuation data for Groups A, B and C members of the System. Retirement rates for Group D were omitted from the study, as the group is relatively new and to date has very few retired members.

The basis for analysis of the System's experience is a comparison of the actual number of separations from service resulting from each of these decrements with those expected based on the assumptions currently in use.

The "expected" values are calculated by applying the various rates or probabilities to the individuals exposed to each respective event. For example, active members not yet eligible for early retirement would be exposed to the probabilities of withdrawal, death and disability. A member eligible for early retirement would be exposed to disability, death and retirement decrements.

Numerical summaries of the System's experience from July 1, 2010, through June 30, 2014, are presented in Appendix I. The tables show the ratios of the actual separations from service resulting from each decrement to those predicted by the present actuarial assumptions. The results are shown separately by assumption and, where appropriate, by gender.

The ratios of actual to expected experience indicate the extent of deviation from the assumptions. A ratio of 1.0 would indicate that experience has been exactly as anticipated.

As an aid to the Trustees in analyzing these results, we have also prepared a series of graphs that present the statistical data summarized in Appendix I in visual form. Our comments will refer to these graphs, which immediately follow each of the following subsections.

Termination

The graphs that follow present the withdrawal and vesting experience separately for male and female municipal employees. It can be seen that the overall experience in the last four years indicates that the actual numbers of female members leaving before service retirement eligibility were close to the expected numbers. The numbers of male members leaving before service retirement eligibility were somewhat below those expected. For both males and females, the numbers leaving at particular ages differed from those expected in ways that suggest probabilities should be adjusted at various ages for both genders. These recommendations are summarized in Appendix II.

Active Service Experience - Terminations
July 1, 2010 through June 30, 2014

Men

Women
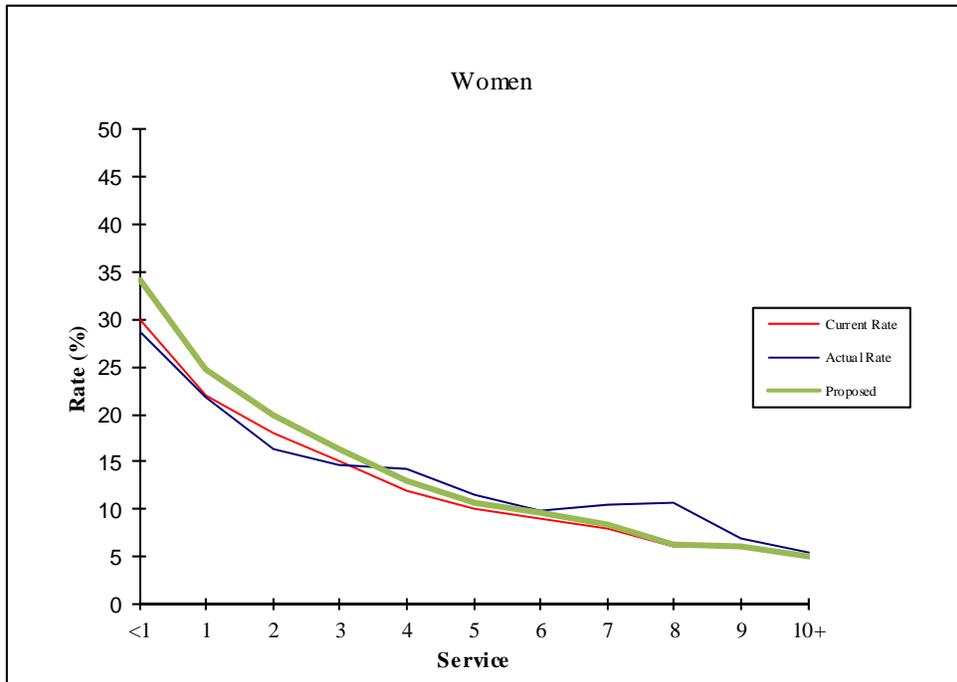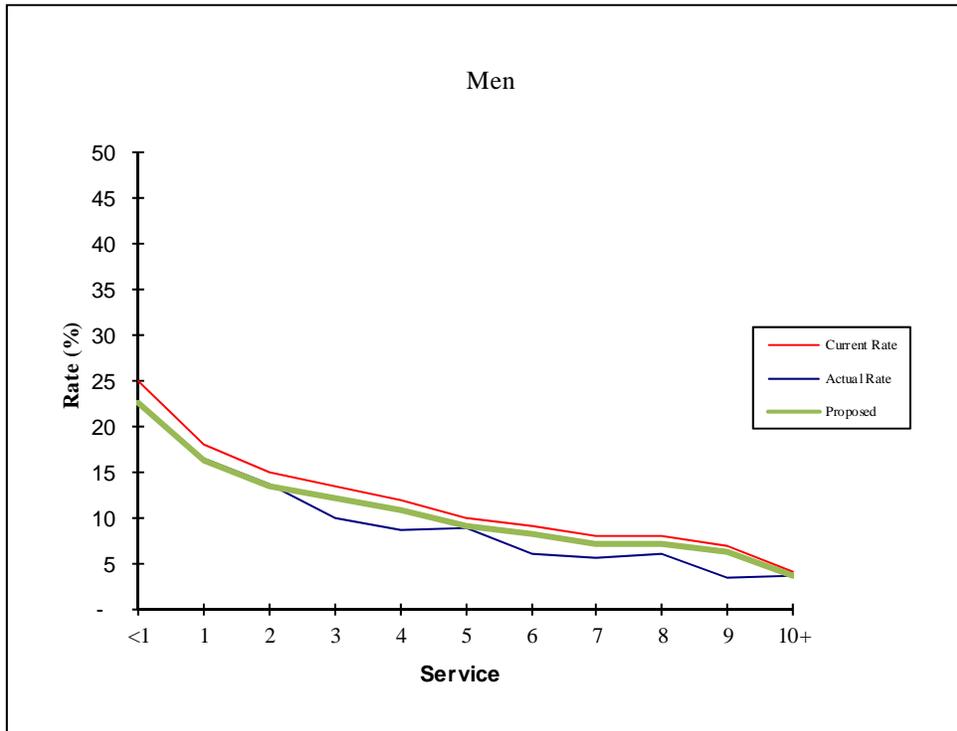
Disability

The graphs that follow show the incidence of disability among employees. The financial impact on the funding of the System as the result of this experience is relatively minor. It should be noted that the low incidence of actual in-service deaths and disabilities makes this experience susceptible to rather large fluctuations from year to year. Upon close examination, the present assumed rates of disability produce expected numbers of disabilities that are not substantially different from the actual numbers for male members. However, actual numbers of disabilities among female members were notably lower than expected. We therefore recommend a decrease of 50% in the disability rates applied to female participants. The proposed rates are set forth in detail in Appendix II.

Death

Like disabilities, deaths among active members are a relatively small proportion of the overall incidence of departure from the active population. The financial impact on the funding of the System of this experience is relatively minor. Upon examination, the overall active service mortality experience indicates that the current assumption is forecasting numbers of deaths among male active participants that are very close to those actually observed, while those among female active participants are somewhat lower than those expected.

We recommend the application of assumed mortality among active lives based on the RP-2000 Tables with projection by ten years from the valuation date using Scale BB, with blending of the base table to reflect the blue-collar proportions of the membership of each group, as reported to us by the State Treasurer's office. This is consistent with the recommendation we are making for assumed mortality

among retired lives. This assumption reflects both current and expected future improvements in in-service longevity, as required under applicable Actuarial Standards of Practice.

Active Service Experience - Disability Retirement
July 1, 2010 through June 30, 2014
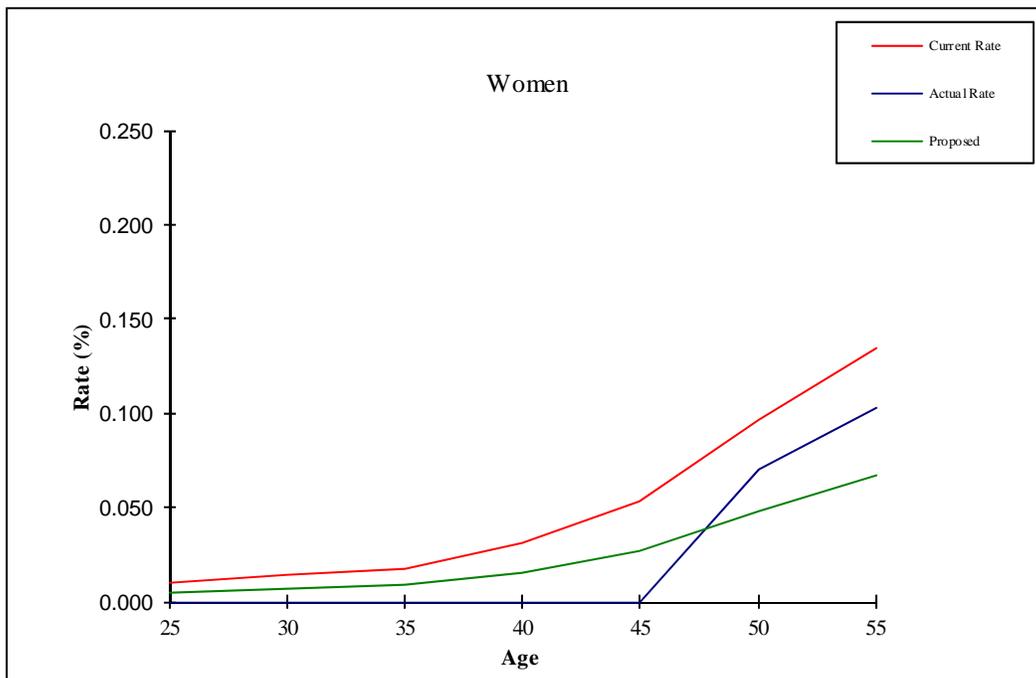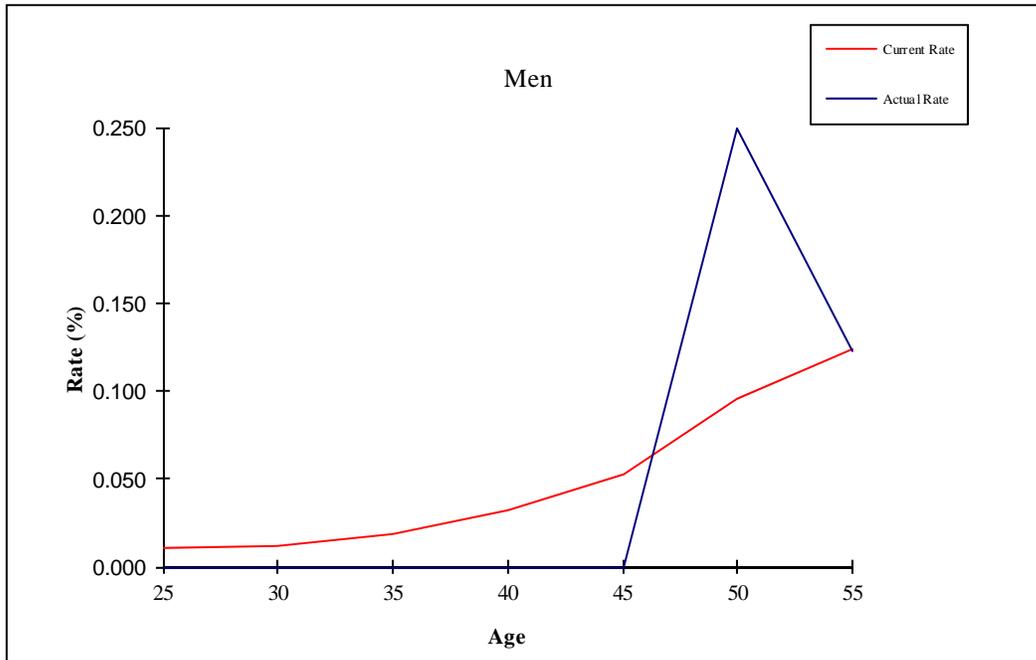
Active Service Experience - Deaths

July 1, 2010 through June 30, 2014

Men

Women
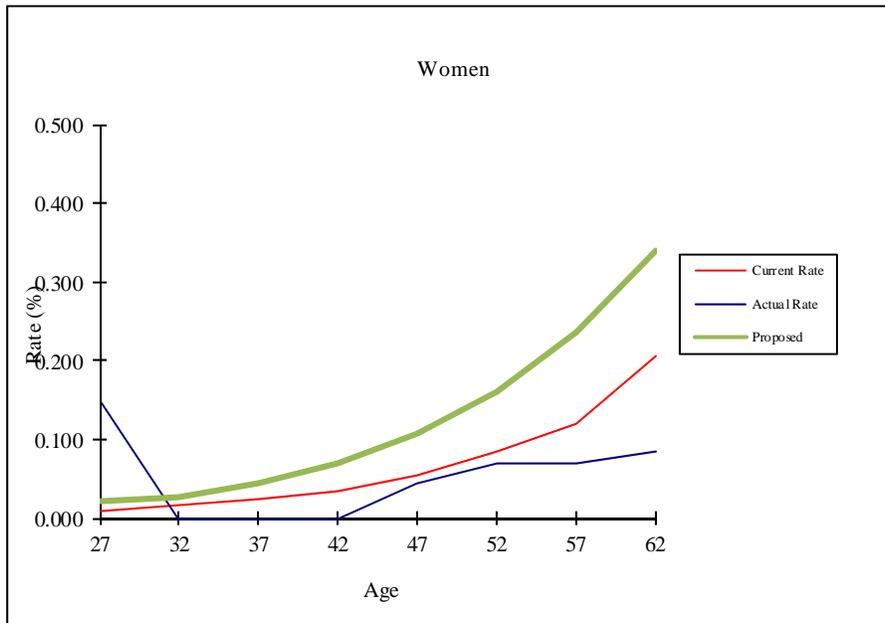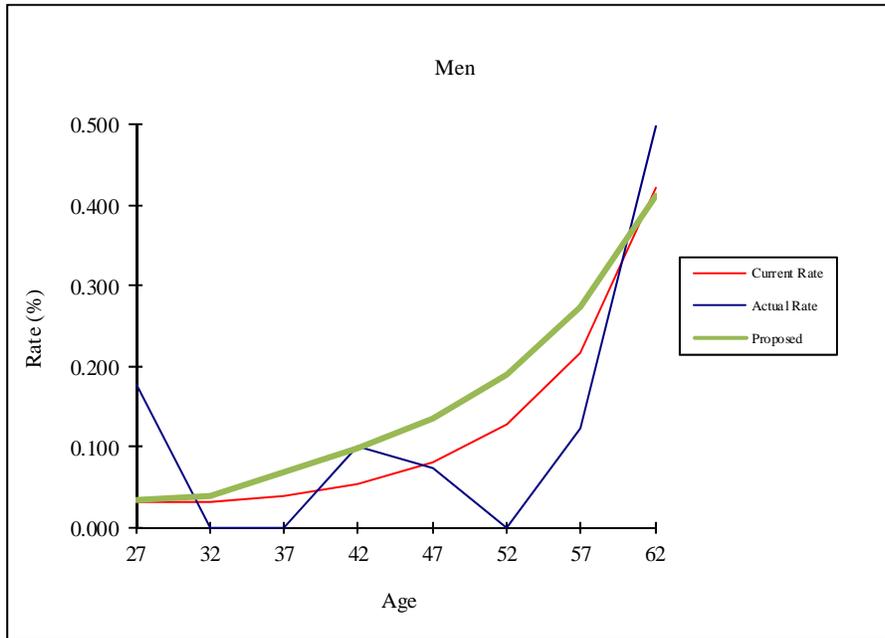
Retirement

The experience with regard to retirement is shown on the following three graphs for Groups A, B and C.

Group A Employees

The graphs that follow indicate that the overall actual numbers of retirements among Group A employees over the past four years have been somewhat lower than the expected numbers of retirements. The differences between actual and expected numbers at most ages are not great, but at certain ages we believe assumed probabilities of retirement should be adjusted to levels that conform more closely to observed behavior. The proposed rates are set forth in detail in Appendix II.

Group B Employees

The graphs that follow indicate that the overall actual numbers of retirements among Group B employees over the past four years have been somewhat lower than the expected numbers of retirements. As in the case of Group A, at certain ages we believe assumed probabilities of retirement should be adjusted to levels that conform more closely to observed behavior. The proposed rates are set forth in detail in Appendix II.

Group C Employees

The graphs that follow indicate that the overall actual numbers of retirements among Group C employees ages 55 through 64 over the past four years have been lower than the expected numbers of retirements. At most ages, there is little exposure, and the numbers of retirements at most are not far off of the numbers expected. We therefore recommend retention of the current assumption.

Active Service Experience - Group A Service Retirements

July 1, 2010 through June 30, 2014
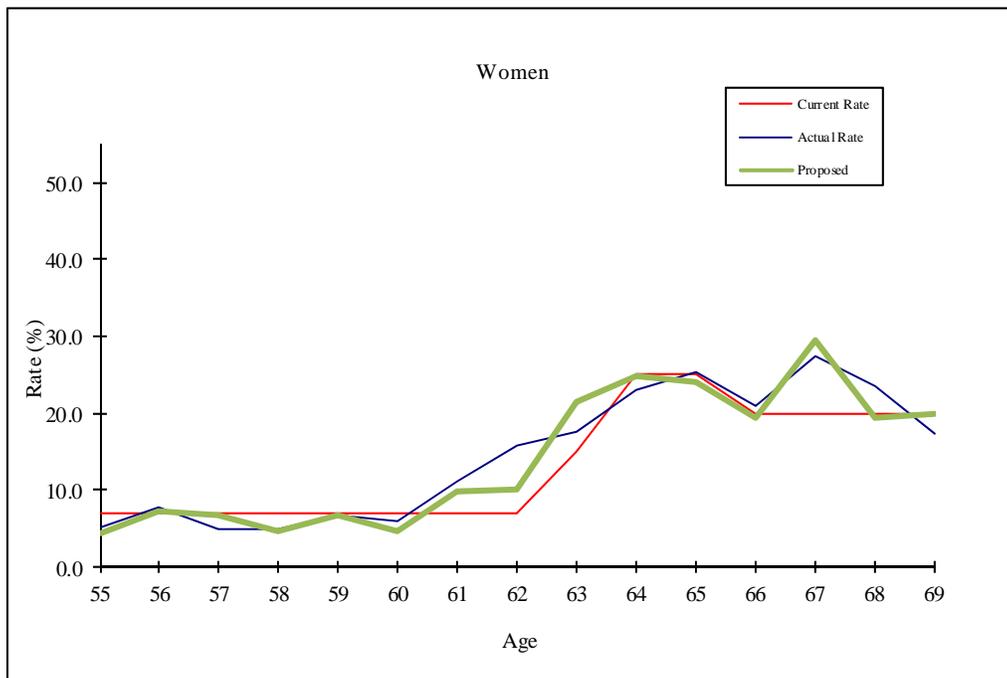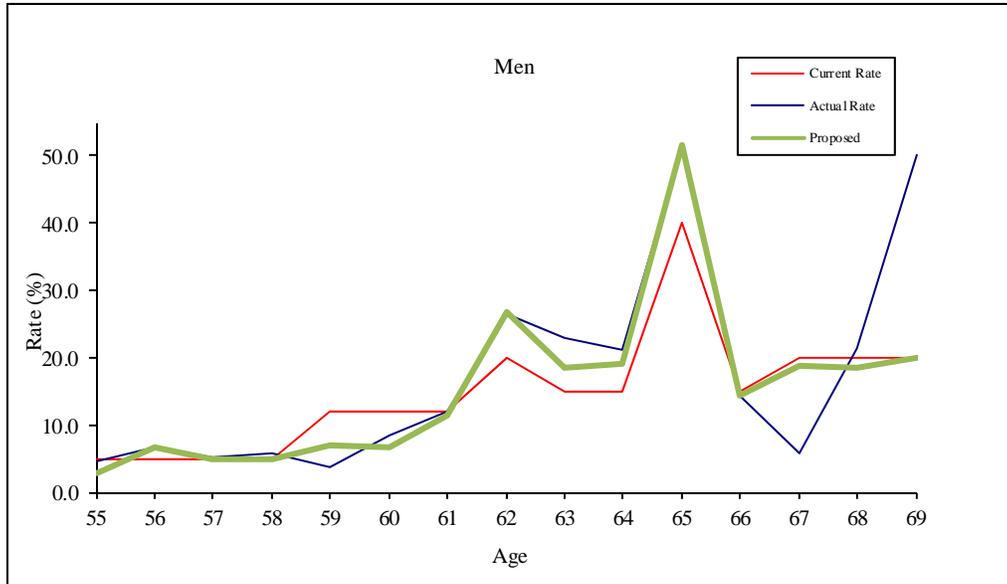
# Active Service Experience - Group B Service Retirements

July 1, 2010 through June 30, 2014
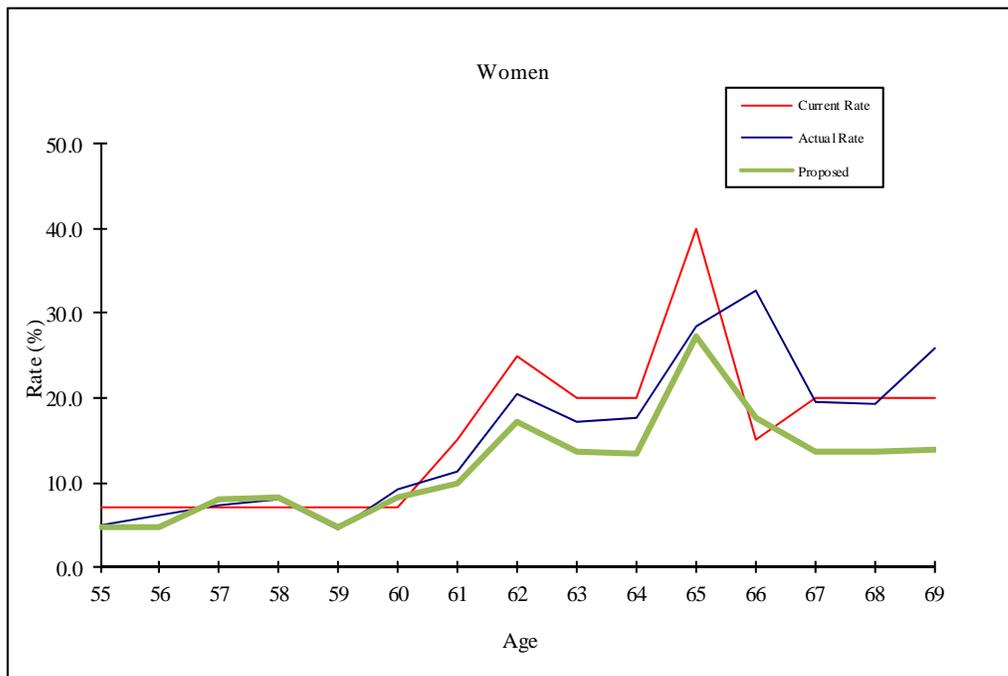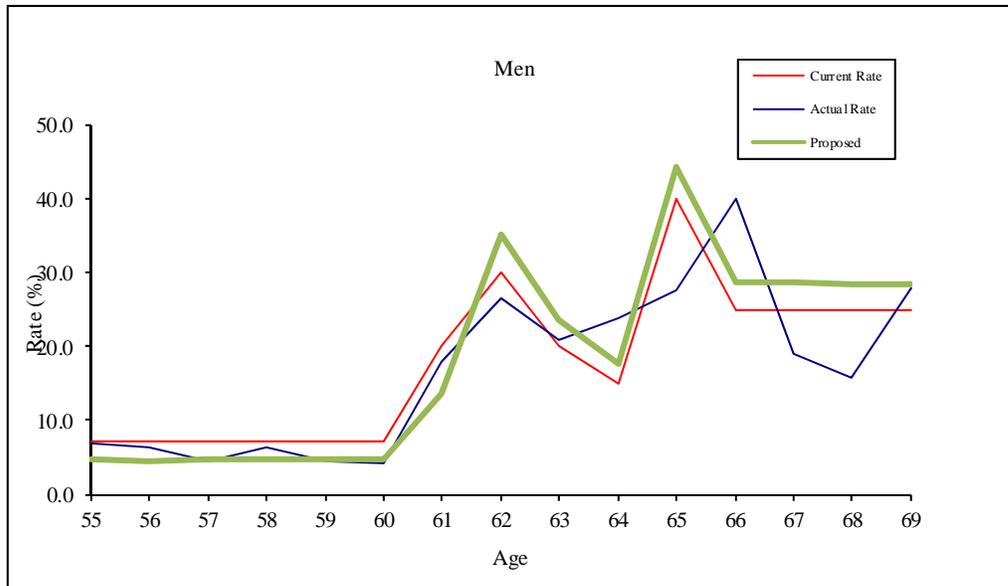
Active Service Experience - Group C Service Retirements

July 1, 2010 through June 30, 2014

Men

Women
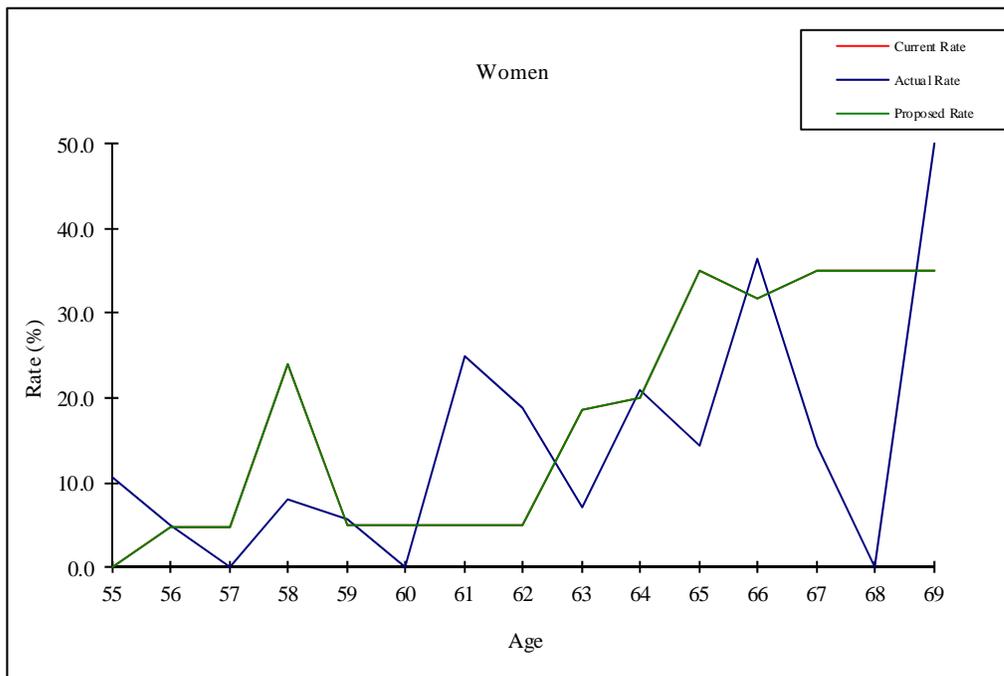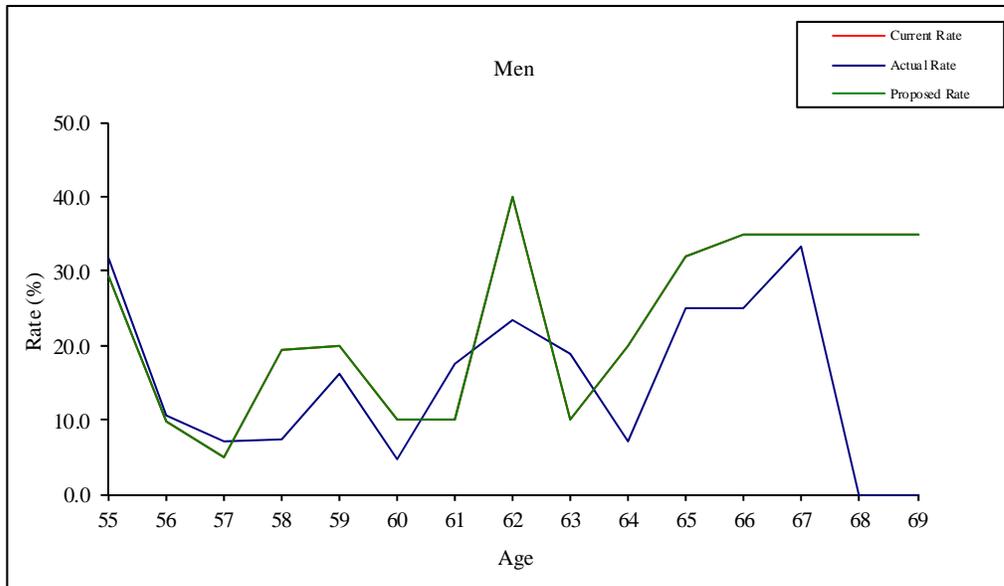
III.   POST-RETIREMENT MORTALITY RATES

To review the statistics with regard to post-retirement mortality for retired members, we examined mortality experience by age and also on a liability-weighted basis.

Examining mortality experience on the basis of liabilities released by deaths as well as on the basis of the numbers of decedents is a recommended approach for measuring mortality experience and is consistent with published studies that show that higher economic class (i.e., higher income level) tends to correlate with longer life expectancy. Mortality measured on the basis of deaths alone is useful for establishing the degree of statistical credibility of a pension plan's own experience in establishing mortality assumptions.

Results summarized in Tables 8 of Appendix I show that mortality among non-disabled male retirees over the past four years has fallen short of predictions based on existing assumptions, while observed morality among male disabled retirees has somewhat outpaced predictions based on the current assumption. For female annuitants of all types, the numbers of deaths have exceeded the numbers predicted by our current assumptions. However, for annuitants of all genders, the current assumption has performed less well in terms of projecting liabilities released by deaths. Recent evidence published by the Society of Actuaries and other sources indicates that the provisions for future improvements in longevity that are incorporated in assumed mortality should be strengthened. Pending the development by the Society of special tables for public retirement systems, we recommend that assumed mortality be set at probabilities in the RP-2000 Pre/Post-Commencement Mortality Table projected ten years

beyond the valuation date by Scale BB for both male and female members. The State Treasurer's office reports that Groups A, B and C are approximately 60% composed of blue-collar workers and that 100% of Group D members are blue-collar workers (where the categorization of blue-collar workers is the same as that used in the construction of the RP-2000 mortality tables), so we have reflected the blue collar composition of these groups by blending of the tables.

Deaths among disabled lives have greatly exceeded the numbers projected by the current assumption. We recommend that the mortality assumption applied to disabled retirees be changed to the RP-2000 Disabled life tables for Males and Females projected to 2019 by Scale AA with a five-year age set-forward.

IV. MEMBERS IN INACTIVE STATUS

Since 2008, liabilities for members in inactive status have been maintained at 200% of their accumulated contributions with interest. An examination of the liability ultimately created by participants who ultimately move from inactive status to some other status leads us to recommend that the percentage of contributions with interest used to estimate the liability for these participants remain at 200%.

Post Retirement Experience - Deaths
July 1, 2010 through June 30, 2014

Men

Women
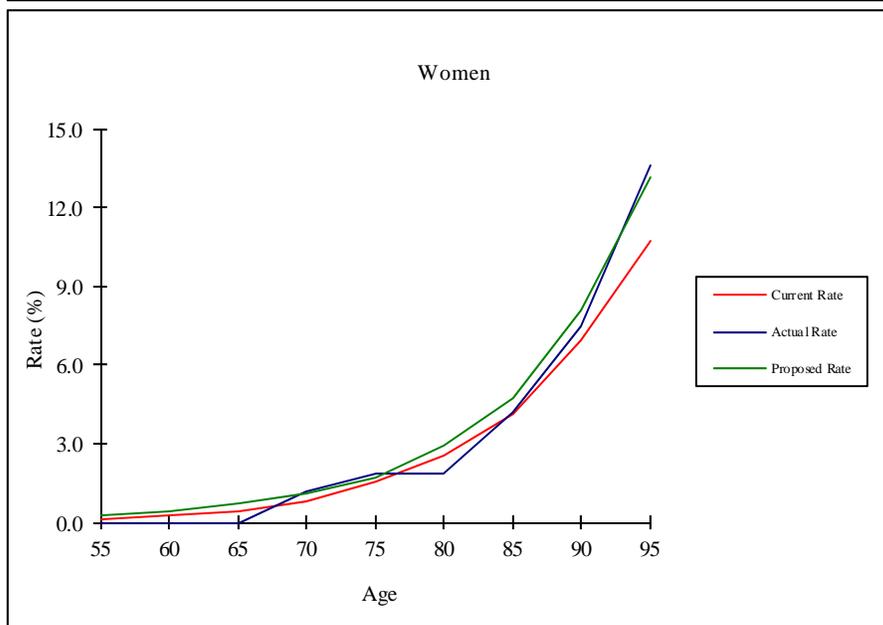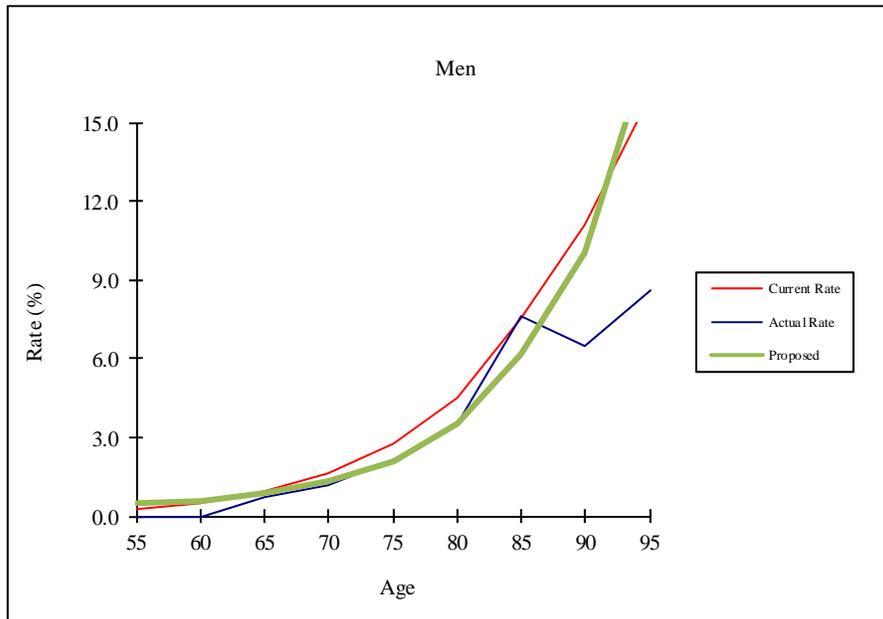
V.   <u>ECONOMIC ASSUMPTIONS</u>

Economic assumptions include:

    (a)   rates of compensation increase,

    (b)   investment income, and

    (c)   post-retirement adjustment in benefits on account of inflation.

Inflation / Cost-of-Living

The System provides annual cost-of-living adjustments (COLAs). For the Group A, the annual adjustment is equal to one-half of the percentage increase in the CPI-U, but not more than 2%. For Groups B, C and D, the adjustment equals one-half of the percentage increase in the CPI-U, limited to 3%.

With regard to the inflation assumption, the U.S. Consumer Price Index indicates that annual rates of inflation have been as follows since 2010:

Fiscal Year End	Increase*
2010	1.1%
2011	3.6%
2012	1.7%
2013	1.8%
2014	2.1%

*Based on CPI-U unadjusted 12 month ended June 30 for All items

Over the four-year period covered by this study, the U.S. Consumer Price Index (CPI-U) thus indicates that the inflation rate has averaged slightly above 2.0% annually.

The long-term expected level of inflation forecast by GEMS, the economic scenario generator used by Buck (which is described in greater detail subsequently) is approximately 3% per year. We therefore recommend that assumed inflation be maintained at an annual rate of 3%, and that assumed future COLAs be maintained at existing levels for all groups.

Merit-Promotion Salary Increases

Currently, salaries are assumed to increase at 5.0% annually. As shown in Table 7 of Appendix I, overall active service salary increase experience over the past four years conformed closely to this assumption. We recommend no changes to the current assumption.

Interest Rate

The estimated total rates of return earned by the VMERS' assets are shown below.

Year Ending June 30	Rate of Return Based on Actuarial Asset Value	Rate of Return Based on Market Asset Value
2010	10.92%	18.4%
2011	4.82%	21.0%
2012	2.20%	2.4%
2013	4.98%	8.8%
2014	10.87%	14.6%
2010-2014	6.70%	12.8%

The rate of return on the market value of assets has averaged approximately 12.8% annually during the past five years.

In an effort to forecast the expected long-term rate of return on System assets, we use a capital market model (described in more detail in Appendix IV) in which individual asset class returns are estimated under a wide variety of simulated economic environments based on their underlying relationships to key economic variables, and then rolled up into a forecast of the performance of a portfolio invested in accordance with the most recent target allocation established by the Vermont Pension Investment Committee (VPIC). The model is calibrated to current economic and market conditions, and trends to a state of equilibrium. Over a 30- year period, the 50th percentile rate of return forecast by our model for such a portfolio is approximately 7.97%. In keeping with the rounding practices used in the past, we recommend the System adopt an assumed rate of return on assets of 7.95%.

APPENDIX I

ACTUAL AND EXPECTED EXPERIENCE

TABLE 1

**COMPARISON OF ACTUAL AND EXPECTED SEPARATIONS
FROM ACTIVE SERVICE**

TERMINATIONS

Central Age of Group	Men			Women		
	Actual	Expected	Ratio of Actual To Expected	Actual	Expected	Ratio of Actual To Expected
Under 23	17	18.4	0.926	12	17.4	0.688
25	125	109.7	1.030	271	162.3	1.670
30	113	108.7	0.847	234	161.0	1.454
35	92	102.9	0.894	173	155.8	1.110
40	96	125.2	0.767	187	216.7	0.863
45	91	143.2	0.635	255	267.0	0.955
50	114	164.5	0.693	275	302.5	0.909
53 and over	162	185.4	0.874	226	305.2	0.740
Total	810	958	0.846	1,633	1,588	1.028

TABLE 2

**COMPARISON OF ACTUAL AND EXPECTED SEPARATIONS
FROM ACTIVE SERVICE**

DISABILITY RETIREMENTS

Central Age of Group	Men			Women		
	Actual	**Expected**	**Ratio of Actual To Expected**	**Actual**	**Expected**	**Ratio of Actual To Expected**
Under 23	0	0.01	0.000	0	0.00	0.000
25	0	0.06	0.000	0	0.07	0.000
30	0	0.08	0.000	0	0.12	0.000
35	0	0.14	0.000	0	0.17	0.000
40	0	0.32	0.000	0	0.47	0.000
45	0	0.71	0.000	0	1.17	0.000
50	4	1.54	2.597	2	2.74	0.730
53 and over	4	4.74	0.844	3	9.57	0.313
Total	8	7.60	1.053	5	14.31	0.349

TABLE 3

**COMPARISON OF ACTUAL AND EXPECTED SEPARATIONS
FROM ACTIVE SERVICE**

DEATHS

Central Age of Group	Men			Women		
	Actual	Expected	Ratio of Actual To Expected	Actual	Expected	Ratio of Actual To Expected
Under 23	0	0.03	0.000	0	0.01	0.000
25	1	0.21	4.762	1	0.06	16.667
30	0	0.24	0.000	0	0.11	0.000
35	0	0.30	0.000	0	0.21	0.000
40	1	0.53	1.887	0	0.45	0.000
45	1	0.99	1.010	1	1.02	0.980
50	0	1.83	0.000	2	2.05	0.976
55	2	2.92	0.685	3	3.09	0.971
60	7	4.56	1.535	2	3.75	0.533
63 and over	5	4.60	1.087	3	4.62	0.649
Total	17	16.21	1.049	12	15.37	0.781

TABLE 4

**COMPARISON OF ACTUAL AND EXPECTED SEPARATIONS
FROM ACTIVE SERVICE**

GROUP A SERVICE RETIREMENTS

Age	Men			Women		
	Actual	**Expected**	**Ratio of Actual To Expected**	**Actual**	**Expected**	**Ratio of Actual To Expected**
50	0	0.00	0.000	0	0.00	0.000
51	0	0.00	0.000	0	0.00	0.000
52	0	0.00	0.000	0	0.00	0.000
53	0	0.00	0.000	0	0.00	0.000
54	0	0.00	0.000	0	0.00	0.000
55	3	3.25	0.923	11	13.72	0.802
56	5	3.30	1.515	18	15.12	1.190
57	4	3.75	1.067	11	14.91	0.738
58	5	4.15	1.205	11	14.91	0.738
59	3	9.60	0.313	14	14.00	1.000
60	6	7.80	0.769	11	12.39	0.888
61	8	7.44	1.075	20	11.97	1.671
62	13	9.40	1.383	27	11.55	2.338
63	8	4.65	1.720	26	21.30	1.221
64	7	4.50	1.556	31	33.25	0.932
65	19	13.60	1.397	28	26.50	1.057
66	3	3.00	1.000	16	14.80	1.081
67	1	3.20	0.313	14	10.00	1.400
68	3	2.60	1.154	8	6.60	1.212
69	6	2.40	2.500	4	4.60	0.870
70 and over	13	45.00	0.289	29	105.00	0.276
Total	107	127.64	0.838	279	330.62	0.844

TABLE 5

**COMPARISON OF ACTUAL AND EXPECTED SEPARATIONS
FROM ACTIVE SERVICE**

GROUP B SERVICE RETIREMENTS

Age	Men			Women		
	Actual	**Expected**	**Ratio of Actual To Expected**	**Actual**	**Expected**	**Ratio of Actual To Expected**
50	0	0.00	0.000	0	0.00	0.000
51	0	0.00	0.000	0	0.00	0.000
52	0	0.00	0.000	0	0.00	0.000
53	0	0.00	0.000	0	0.00	0.000
54	0	0.00	0.000	0	0.00	0.000
55	8	7.98	1.003	11	14.49	0.759
56	8	8.12	0.985	13	14.14	0.919
57	5	7.63	0.655	15	14.07	1.066
58	7	7.21	0.971	16	13.86	1.154
59	5	7.77	0.644	8	12.32	0.649
60	5	8.19	0.611	16	11.97	1.337
61	21	23.00	0.913	17	21.45	0.793
62	29	32.10	0.903	29	34.75	0.835
63	17	16.00	1.063	22	25.00	0.880
64	15	9.30	1.613	19	20.60	0.922
65	14	18.80	0.745	23	31.60	0.728
66	16	9.50	1.684	17	7.65	2.222
67	4	5.00	0.800	8	8.00	1.000
68	3	4.50	0.667	6	6.00	1.000
69	5	4.25	1.176	7	5.40	1.296
70 and over	10	66.00	0.152	21	95.00	0.221
Total	172	235.35	0.731	248	336.30	0.737

TABLE 6

**COMPARISON OF ACTUAL AND EXPECTED SEPARATIONS
FROM ACTIVE SERVICE**

GROUP C SERVICE RETIREMENTS

Age	Men			Women		
	Actual	**Expected**	**Ratio of Actual To Expected**	**Actual**	**Expected**	**Ratio of Actual To Expected**
50	0	0.00	0.000	0	0.00	0.000
51	0	0.00	0.000	0	0.00	0.000
52	0	0.00	0.000	0	0.00	0.000
53	0	0.00	0.000	0	0.00	0.000
54	0	0.00	0.000	0	0.00	0.000
55	14	12.90	1.085	2	0.00	0.000
56	5	4.60	1.087	1	0.95	1.053
57	3	2.15	1.395	0	1.45	0.000
58	3	8.00	0.375	2	6.00	0.333
59	6	7.40	0.811	1	0.90	1.111
60	1	2.10	0.476	0	0.60	0.000
61	4	2.30	1.739	3	0.60	5.000
62	4	6.80	0.588	3	0.80	3.750
63	3	1.60	1.875	1	2.60	0.385
64	1	2.80	0.357	4	3.80	1.053
65	3	3.85	0.779	2	4.90	0.408
66	2	2.80	0.714	4	3.50	1.143
67	1	1.05	0.952	1	2.45	0.408
68	0	0.70	0.000	0	1.05	0.000
69	0	0.70	0.000	1	0.70	1.429
70 and over	3	26.00	0.115	1	6.00	0.167
Total	53	85.75	0.618	26	36.30	0.716

TABLE 7

**COMPARISON OF ACTUAL AND EXPECTED
ANNUAL SALARIES OF MEMBERS**

Age	Annual Salaries (Salaries shown in 1,000s)		
	Actual	**Expected**	**Ratio of Actual To Expected**
Under 23	3,382	3,289	1.028
23-27	26,382	26,115	1.010
28-32	40,251	40,186	1.002
33-37	51,835	52,180	0.993
38-42	77,969	78,650	0.991
43-47	113,168	114,458	0.989
48-52	139,553	141,619	0.985
53-57	147,180	149,964	0.981
58-62	115,672	118,047	0.980
63 and over	59,343	60,876	0.975
Total	774,735	785,384	0.986

TABLE 8

**SUMMARY OF MORTALITY EXPERIENCE
OF PENSIONERS**

Group	Men			Women			Total		
	Actual	Expected	Ratio of Actual To Expected	Actual	Expected	Ratio of Actual To Expected	Actual	Expected	Ratio of Actual To Expected
Service Retirees	74	96.74	0.765	85	79.24	1.073	159	175.98	0.904
Disability Retirees	8	6.23	1.284	4	3.24	1.235	12	9.47	1.267
Dependants of Deceased Members	2	4.09	0.489	18	10.45	1.722	20	14.54	1.376
Total	84	107.06	0.785	107	92.93	1.151	191	199.99	0.955

APPENDIX II

RECOMMENDED ACTIVE SERVICE TABLES

TABLE 1

RECOMMENDED SEPARATIONS
FROM ACTIVE SERVICE

TERMINATIONS

Service	Men		Female		
				Ages 25-34	All Other Ages
of Group	Current	Recommended	Current	Recommended	
0	25.0%	22.5%	30.0%	45.0%	30.00%
1	18.0%	16.2%	22.0%	33.0%	22.00%
2	15.0%	13.5%	18.0%	27.0%	18.00%
3	13.5%	12.2%	15.0%	22.5%	15.00%
4	12.0%	10.8%	12.0%	18.0%	12.00%
5	10.0%	9.0%	10.0%	15.0%	10.00%
6	9.0%	8.1%	9.0%	13.5%	9.00%
7	8.0%	7.2%	8.0%	12.0%	8.00%
8	8.0%	7.2%	6.0%	9.0%	6.00%
9	7.0%	6.3%	6.0%	9.0%	6.00%
10	4.0%	3.6%	5.0%	7.5%	5.00%

TABLE 2

**COMPARISON OF CURRENT AND RECOMMENDED SEPARATIONS
FROM ACTIVE SERVICE**

DISABILITY

Central Age of Group	Men		Women	
	Current	Recommended	Current	Recommended
25	0.01%	0.01%	0.01%	0.005%
26	0.01%	0.01%	0.01%	0.005%
27	0.01%	0.01%	0.01%	0.006%
28	0.01%	0.01%	0.01%	0.006%
29	0.01%	0.01%	0.01%	0.006%
30	0.01%	0.01%	0.01%	0.007%
31	0.01%	0.01%	0.01%	0.007%
32	0.02%	0.02%	0.02%	0.008%
33	0.02%	0.02%	0.02%	0.008%
34	0.02%	0.02%	0.02%	0.009%
35	0.02%	0.02%	0.02%	0.009%
36	0.02%	0.02%	0.02%	0.010%
37	0.02%	0.02%	0.02%	0.011%
38	0.03%	0.03%	0.03%	0.013%
39	0.03%	0.03%	0.03%	0.014%
40	0.03%	0.03%	0.03%	0.015%
41	0.03%	0.03%	0.03%	0.017%
42	0.04%	0.04%	0.04%	0.019%
43	0.04%	0.04%	0.04%	0.021%
44	0.05%	0.05%	0.05%	0.023%
45	0.05%	0.05%	0.05%	0.025%
46	0.06%	0.06%	0.06%	0.029%
47	0.07%	0.07%	0.07%	0.033%
48	0.07%	0.07%	0.07%	0.037%
49	0.08%	0.08%	0.08%	0.041%
50	0.09%	0.09%	0.09%	0.045%
51	0.11%	0.11%	0.11%	0.054%
52	0.13%	0.13%	0.13%	0.063%
53	0.14%	0.14%	0.14%	0.072%
54	0.16%	0.16%	0.16%	0.081%

TABLE 3

**COMPARISON OF CURRENT AND RECOMMENDED SEPARATIONS
FROM ACTIVE SERVICE**

GROUP A SERVICE RETIREMENTS

Central Age of Group	Men		Women	
	Current	Recommended	Current	Recommended
55	5.00%	3.00%	7.00%	4.90%
56	5.00%	7.50%	7.00%	7.70%
57	5.00%	5.00%	7.00%	7.00%
58	5.00%	5.00%	7.00%	4.90%
59	12.00%	7.20%	7.00%	7.00%
60	12.00%	7.20%	7.00%	4.90%
61	12.00%	12.00%	7.00%	10.50%
62	20.00%	28.00%	7.00%	10.50%
63	15.00%	21.00%	15.00%	22.50%
64	15.00%	21.00%	25.00%	25.00%
65	40.00%	56.00%	25.00%	25.00%
66	15.00%	15.00%	20.00%	20.00%
67	20.00%	20.00%	20.00%	30.00%
68	20.00%	20.00%	20.00%	20.00%
69	20.00%	20.00%	20.00%	20.00%
70	100.00%	100.00%	100.00%	100.00%

TABLE 5

**COMPARISON OF CURRENT AND RECOMMENDED SEPARATIONS
FROM ACTIVE SERVICE**

GROUP B SERVICE RETIREMENTS

Central Age of Group	Men		Women	
	Current	Recommended	Current	Recommended
55	7.00%	4.90%	7.00%	4.90%
56	7.00%	4.90%	7.00%	4.90%
57	7.00%	4.90%	7.00%	8.40%
58	7.00%	4.90%	7.00%	8.40%
59	7.00%	4.90%	7.00%	4.90%
60	7.00%	4.90%	7.00%	8.40%
61	20.00%	14.00%	15.00%	10.50%
62	30.00%	36.00%	25.00%	17.50%
63	20.00%	24.00%	20.00%	14.00%
64	15.00%	18.00%	20.00%	14.00%
65	40.00%	48.00%	40.00%	28.00%
66	25.00%	30.00%	15.00%	18.00%
67	25.00%	30.00%	20.00%	14.00%
68	25.00%	30.00%	20.00%	14.00%
69	25.00%	30.00%	20.00%	14.00%
70	100.00%	100.00%	100.00%	100.00%

APPENDIX III

RECOMMENDED POST-RETIREMENT MORTALITY

RECOMMENDED POST RETIREMENT MORTALITY TABLES
PENSIONERS AND BENEFICIARIES

Base Table

AGE	MALES	FEMALES	AGE	MALES	FEMALES
50	0.00492	0.00230	86	0.11297	0.08465
51	0.00509	0.00241	87	0.12516	0.09441
52	0.00519	0.00259	88	0.13854	0.10516
53	0.00526	0.00284	89	0.15311	0.11677
54	0.00533	0.00313	90	0.16874	0.12905
55	0.00543	0.00346	91	0.18379	0.14171
56	0.00563	0.00385	92	0.19928	0.15447
57	0.00593	0.00430	93	0.21497	0.16702
58	0.00634	0.00482	94	0.23064	0.17914
59	0.00689	0.00542	95	0.24609	0.19062
60	0.00754	0.00608	96	0.26119	0.20127
61	0.00828	0.00678	97	0.27586	0.21094
62	0.00912	0.00754	98	0.29007	0.21947
63	0.01008	0.00834	99	0.30379	0.22676
64	0.01115	0.00921	100	0.31699	0.23272
65	0.01235	0.01016	101	0.32994	0.23994
66	0.01368	0.01119	102	0.34195	0.24941
67	0.01514	0.01229	103	0.35240	0.26072
68	0.01674	0.01350	104	0.36064	0.27347
69	0.01850	0.01485	105	0.36606	0.28725
70	0.02043	0.01641	106	0.36800	0.30166
71	0.02260	0.01821	107	0.36800	0.31627
72	0.02510	0.02025	108	0.36800	0.33069
73	0.02796	0.02251	109	0.36800	0.34451
74	0.03119	0.02495	110	0.36800	0.35733
75	0.03481	0.02754	111	0.36800	0.36872
76	0.03880	0.03035	112	0.36800	0.37830
77	0.04315	0.03342	113	0.36800	0.38564
78	0.04795	0.03684	114	0.36800	0.39034
79	0.05329	0.04068	115	0.36800	0.39200
80	0.05922	0.04496	116	0.36800	0.39200
81	0.06628	0.04976	117	0.36800	0.39200
82	0.07405	0.05517	118	0.36800	0.39200
83	0.08254	0.06126	119	0.36800	0.39200
84	0.09180	0.06813	120	1.00000	1.00000
85	0.10190	0.07590			

Adjustment Scale BB

AGE	MALES	FEMALES	AGE	MALES	FEMALES
50	0.00300	0.00300	86	0.01500	0.01200
51	0.00300	0.00300	87	0.01400	0.01200
52	0.00300	0.00300	88	0.01300	0.01200
53	0.00300	0.00300	89	0.01200	0.01200
54	0.00300	0.00400	90	0.01100	0.01100
55	0.00300	0.00500	91	0.01000	0.01000
56	0.00300	0.00600	92	0.00900	0.00900
57	0.00400	0.00700	93	0.00800	0.00800
58	0.00500	0.00800	94	0.00700	0.00700
59	0.00600	0.00900	95	0.00600	0.00600
60	0.00700	0.01000	96	0.00500	0.00500
61	0.00800	0.01100	97	0.00400	0.00400
62	0.00900	0.01200	98	0.00400	0.00400
63	0.01000	0.01200	99	0.00300	0.00300
64	0.01100	0.01200	100	0.00300	0.00300
65	0.01200	0.01200	101	0.00200	0.00200
66	0.01300	0.01200	102	0.00200	0.00200
67	0.01400	0.01200	103	0.00100	0.00100
68	0.01500	0.01200	104	0.00100	0.00100
69	0.01500	0.01200	105	0.00000	0.00000
70	0.01500	0.01200	106	0.00000	0.00000
71	0.01500	0.01200	107	0.00000	0.00000
72	0.01500	0.01200	108	0.00000	0.00000
73	0.01500	0.01200	109	0.00000	0.00000
74	0.01500	0.01200	110	0.00000	0.00000
75	0.01500	0.01200	111	0.00000	0.00000
76	0.01500	0.01200	112	0.00000	0.00000
77	0.01500	0.01200	113	0.00000	0.00000
78	0.01500	0.01200	114	0.00000	0.00000
79	0.01500	0.01200	115	0.00000	0.00000
80	0.01500	0.01200	116	0.00000	0.00000
81	0.01500	0.01200	117	0.00000	0.00000
82	0.01500	0.01200	118	0.00000	0.00000
83	0.01500	0.01200	119	0.00000	0.00000
84	0.01500	0.01200	120	0.00000	0.00000
85	0.01500	0.01200			

APPENDIX III

RECOMMENDED POST RETIREMENT MORTALITY TABLES
DISABILITY PENSIONERS

Base Table

AGE	MALES	FEMALES	AGE	MALES	FEMALES
19	0.00000	0.00000	70	0.06258	0.03764
20	0.00000	0.00000	71	0.06584	0.04014
21	0.02257	0.00745	72	0.06941	0.04285
22	0.02257	0.00745	73	0.07329	0.04577
23	0.02257	0.00745	74	0.07751	0.04890
24	0.02257	0.00745	75	0.08207	0.05223
25	0.02257	0.00745	76	0.08695	0.05578
26	0.02257	0.00745	77	0.09215	0.05955
27	0.02257	0.00745	78	0.09764	0.06355
28	0.02257	0.00745	79	0.10339	0.06779
29	0.02257	0.00745	80	0.10937	0.07231
30	0.02257	0.00745	81	0.11554	0.07714
31	0.02257	0.00745	82	0.12188	0.08230
32	0.02257	0.00745	83	0.12834	0.08784
33	0.02257	0.00745	84	0.13492	0.09379
34	0.02257	0.00745	85	0.14160	0.10020
35	0.02257	0.00745	86	0.14837	0.10710
36	0.02257	0.00745	87	0.15524	0.11451
37	0.02257	0.00745	88	0.16219	0.12246
38	0.02257	0.00745	89	0.16923	0.13097
39	0.02257	0.00745	90	0.18341	0.14005
40	0.02257	0.00745	91	0.19977	0.14970
41	0.02257	0.00745	92	0.21661	0.15992
42	0.02257	0.00745	93	0.23366	0.17043
43	0.02257	0.00745	94	0.25069	0.18280
44	0.02257	0.00745	95	0.26749	0.19451
45	0.02257	0.00745	96	0.28391	0.20538
46	0.02385	0.00818	97	0.29985	0.21524
47	0.02512	0.00896	98	0.31530	0.22395
48	0.02640	0.00978	99	0.33021	0.23139
49	0.02769	0.01063	100	0.34456	0.23747
50	0.02898	0.01154	101	0.35863	0.24483
51	0.03027	0.01248	102	0.37169	0.25450
52	0.03156	0.01346	103	0.38304	0.26604
53	0.03286	0.01447	104	0.39200	0.27906
54	0.03415	0.01550	105	0.39789	0.29312
55	0.03544	0.01654	106	0.40000	0.30781
56	0.03673	0.01760	107	0.40000	0.32273
57	0.03803	0.01865	108	0.40000	0.33744
58	0.03933	0.01971	109	0.40000	0.35154
59	0.04067	0.02077	110	0.40000	0.36462
60	0.04204	0.02184	111	0.40000	0.37625
61	0.04347	0.02294	112	0.40000	0.38602
62	0.04498	0.02408	113	0.40000	0.39351
63	0.04658	0.02529	114	0.40000	0.39831
64	0.04831	0.02660	115	0.40000	0.40000
65	0.05017	0.02803	116	0.40000	0.40000
66	0.05221	0.02959	117	0.40000	0.40000
67	0.05445	0.03133	118	0.40000	0.40000
68	0.05691	0.03323	119	0.40000	0.40000
69	0.05961	0.03534	120	1.00000	1.00000

Adjustment Scale AA

AGE	MALES	FEMALES	AGE	MALES	FEMALES
19	0.01900	0.01500	70	0.01500	0.00500
20	0.01900	0.01600	71	0.01500	0.00600
21	0.01800	0.01700	72	0.01500	0.00600
22	0.01700	0.01700	73	0.01500	0.00700
23	0.01500	0.01600	74	0.01500	0.00700
24	0.01300	0.01500	75	0.01400	0.00800
25	0.01000	0.01400	76	0.01400	0.00800
26	0.00600	0.01200	77	0.01300	0.00700
27	0.00500	0.01200	78	0.01200	0.00700
28	0.00500	0.01200	79	0.01100	0.00700
29	0.00500	0.01200	80	0.01000	0.00700
30	0.00500	0.01000	81	0.00900	0.00700
31	0.00500	0.00800	82	0.00800	0.00700
32	0.00500	0.00800	83	0.00800	0.00700
33	0.00500	0.00900	84	0.00700	0.00700
34	0.00500	0.01000	85	0.00700	0.00600
35	0.00500	0.01100	86	0.00700	0.00500
36	0.00500	0.01200	87	0.00600	0.00400
37	0.00500	0.01300	88	0.00500	0.00400
38	0.00600	0.01400	89	0.00500	0.00300
39	0.00700	0.01500	90	0.00400	0.00300
40	0.00800	0.01500	91	0.00400	0.00300
41	0.00900	0.01500	92	0.00300	0.00300
42	0.01000	0.01500	93	0.00300	0.00200
43	0.01100	0.01500	94	0.00300	0.00200
44	0.01200	0.01500	95	0.00200	0.00200
45	0.01300	0.01600	96	0.00200	0.00200
46	0.01400	0.01700	97	0.00200	0.00100
47	0.01500	0.01800	98	0.00100	0.00100
48	0.01600	0.01800	99	0.00100	0.00100
49	0.01700	0.01800	100	0.00100	0.00100
50	0.01800	0.01700	101	0.00000	0.00000
51	0.01900	0.01600	102	0.00000	0.00000
52	0.02000	0.01400	103	0.00000	0.00000
53	0.02000	0.01200	104	0.00000	0.00000
54	0.02000	0.01000	105	0.00000	0.00000
55	0.01900	0.00800	106	0.00000	0.00000
56	0.01800	0.00600	107	0.00000	0.00000
57	0.01700	0.00500	108	0.00000	0.00000
58	0.01600	0.00500	109	0.00000	0.00000
59	0.01600	0.00500	110	0.00000	0.00000
60	0.01600	0.00500	111	0.00000	0.00000
61	0.01500	0.00500	112	0.00000	0.00000
62	0.01500	0.00500	113	0.00000	0.00000
63	0.01400	0.00500	114	0.00000	0.00000
64	0.01400	0.00500	115	0.00000	0.00000
65	0.01400	0.00500	116	0.00000	0.00000
66	0.01300	0.00500	117	0.00000	0.00000
67	0.01300	0.00500	118	0.00000	0.00000
68	0.01400	0.00500	119	0.00000	0.00000
69	0.01400	0.00500	120	0.00000	0.00000

APPENDIX IV

DESCRIPTION OF CAPITAL MARKET MODEL USED IN ANALYSIS
OF EXPECTED RATE OF RETURN ON SYSTEM ASSETS

ABOUT GEMS GENERAL ECONOMY AND MARKET SIMULATOR)

GEMS® is a cutting-edge Economic Scenario Generator (ESG) that enables users to simulate future states of the global economy and financial markets, including the pricing of derivatives and alternative assets. It uses financial models that are the most technologically advanced in the industry, ensuring that models perform consistently with history, provide a realistic representation of extreme events and support hedging strategies with market consistent pricing. GEMS includes comprehensive yield curve modeling and a multifactor arbitrage pricing model that develops asset-class return series based on asset-class relationships to underlying economic and capital market variables such as GDP, inflation, interest rates, credit spreads, and unemployment. The model is calibrated to current market conditions and trends the economic variables to longer-term historical norms – simulating a variety of economic environments and concomitant asset-class returns in the process.

Some of the other distinguishing features of GEMS are:

1. Many asset-class return distributions are non-normal even though many models historically have treated them as such. Asset classes exhibit non-normal return distribution characteristics such as skew and kurtosis. GEMS is more effective at capturing these characteristics. In doing so, it more effectively captures outlier fat-tail events (leptokurtosis) and positive or negative skew in a manner that more closely resembles what actually occurs.

2. Asset-class returns are linked to underlying economic conditions in the model so the user can relate a specific asset-class or portfolio return path to conditions that can be described in terms of economic variables.

3. Because GEMS is calibrated to current levels of economic activity and trends to a longer-term state of equilibrium, shorter-term asset returns forecasts in GEMS are more reflective

of recent market activity and short-term characteristics and trends in economic and market variables, and longer-term returns reflect asset performance over complete market cycles.

4. There is empirical evidence that asset correlations are dynamic and move closer to unity when markets are volatile and under stress. GEMS models asset correlations dynamically.

APPENDIX V

COMPARATIVE VALUATION RESULTS

RESULTS FOR THE ACTUARIAL VALUATION
PREPARED AS OF JUNE 30, 2014 ON
CURRENT AND RECOMMENDED ASSUMPTIONS

Item	Current	Recommmended Assumptions
1. Present Value of Future Benefits:		
Active and Inactive Members	$ 487,518,910	$ 528,421,054
Retired Members	$ 227,674,219	$ 227,402,627
Total	$ 715,193,129	$ 755,823,681
2. Assets	$ 500,557,919	$ 500,557,919
3. Present Value of Contributions		
Member	$ 85,113,636	$ 85,384,678
Employer Normal	$ 49,106,514	$ 14,219,474
4. Unfunded Accrued Liability	$ 80,415,060	$ 155,661,610
5. Normal Contribution	2.98%	0.83%
6. Accrued Liability Contribution	1.95%	3.80%
7. Total FYE Contribution (5. + 6.)	4.93%	4.63%