

**REPORT ON THE RESULTS OF AN  
EXPERIENCE STUDY OF THE  
TOWN OF SMITHFIELD FIRE DEPARTMENT PENSION PLAN  
COVERING THE PERIOD JULY 1, 2006 THROUGH JUNE 30, 2011**

March 22, 2012

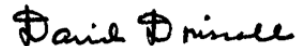
Mr. Randy R. Rossi  
Finance Director  
Town of Smithfield  
64 Farnum Pike  
Smithfield, RI 02917

Dear Randy:

The results of our experience study of the Town of Smithfield Fire Department Pension Plan covering the five-year period ending June 30, 2011, are described in this report, along with our recommendations for changes in the present assumptions.

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

Respectfully submitted,



David L. Driscoll, FSA, EA  
Principal, Consulting Actuary

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## **I. INTRODUCTION**

In order to accumulate funds to pay retirement benefits on a reasonable and relatively stable basis, the actuary prepares annual valuations of the Plan'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 Plan's obligations.

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

While the ultimate cost of the Plan 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, and
- (d) Interest rate.

Before presenting our analysis of the Plan'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 State and the Plan.

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) the recent past experience,
- (b) the 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 the Plan.

The basis for analysis of the Plan's experience is a comparison of the actual number of separations from service under each category 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 age 40 with 10 years of credited

service would be exposed to the probabilities of withdrawal, death and disability. A member age 50 with 20 years of service would be exposed to death, disability and retirement.

Numerical summaries of the Plan's experience from July 1, 2006, through June 30, 2011, are presented in Appendix I. The tables show the ratios of the actual experience of the Plan as compared to that anticipated by the present actuarial assumptions. The results are shown separately by assumption and, where appropriate, by sex.

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

As an aid to those analyzing these results, we have also prepared a series of graphs, which 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 of the Plan.

Reviewing the withdrawal and vesting experience, it can be seen that there are more members than expected leaving before service retirement. Four individuals terminated prior to retirement eligibility whereas the expected number under the valuation assumption was approximately two. However, in light of the size of the exposure, this experience is not sufficient to warrant a recommendation to change the assumption currently in use.

The graph presented on page 6 show the current rates and the actual rates of termination.

*Disability and Death*

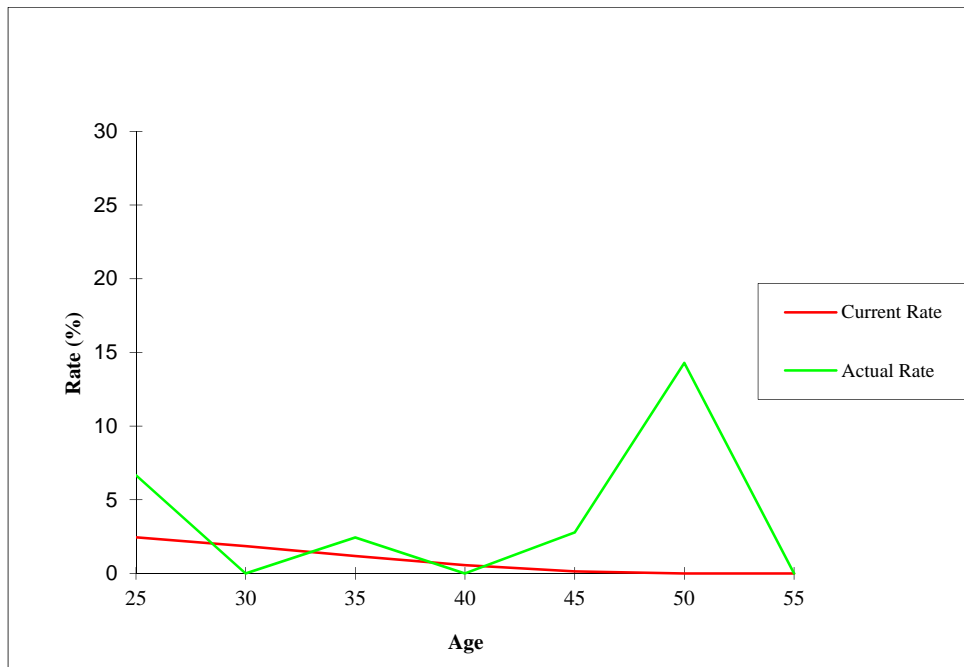
The graphs that follow show the incidence of disability and active service mortality. The financial impact on the funding of the Plan of this experience is relatively minor. It should be noted that the low incidence of actual deaths and disabilities makes this experience susceptible to rather large fluctuations from year to year.

In the five-year period covered by this study, there were no actual disabilities. The current assumption predicted fewer than one. We do not recommend any change in the assumed disability rates at this time, as both the expected and actual numbers of participants becoming disabled is small.

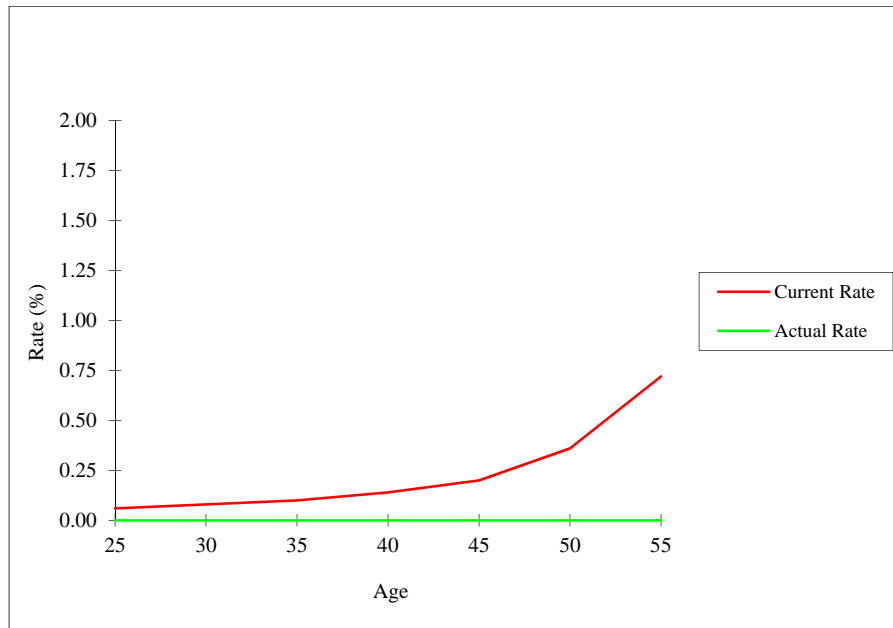
Also, during the five-year period, there were no actual deaths in service. The expectation under the current assumption was fewer than one. We also do not recommend any change in the assumed mortality rates at this time, as the number of both expected and actual deaths is small.



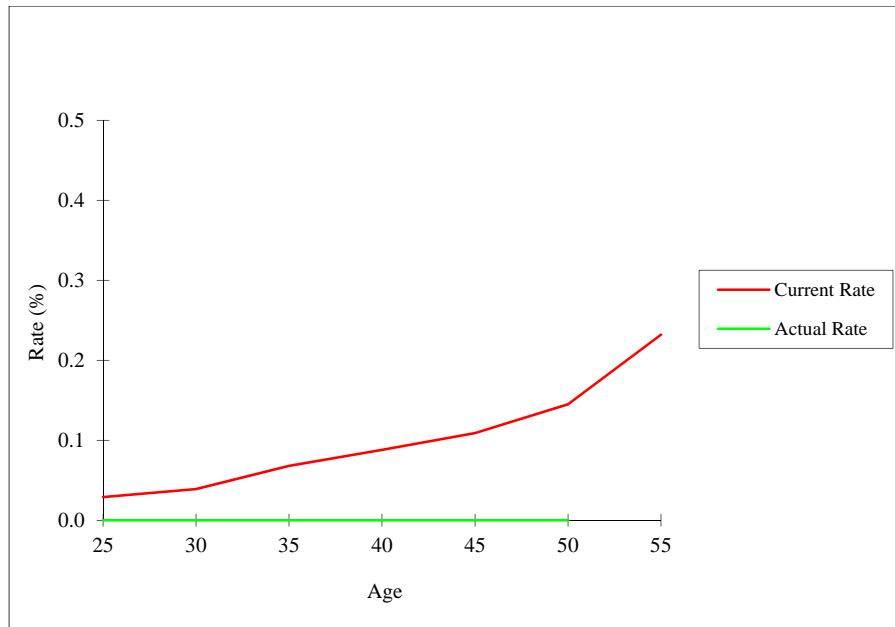
## Active Service Experience - Terminations July 1, 2006 through June 30, 2011



## Active Service Experience - Disability Retirements July 1, 2006 through June 30, 2011



## Active Service Experience - Deaths July 1, 2006 through June 30, 2011



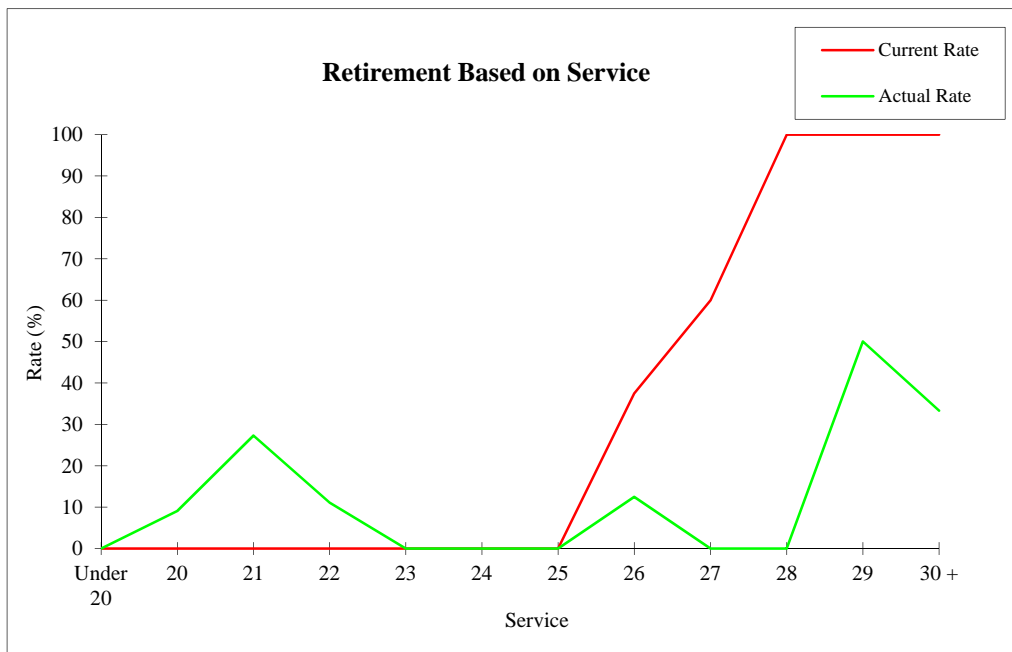
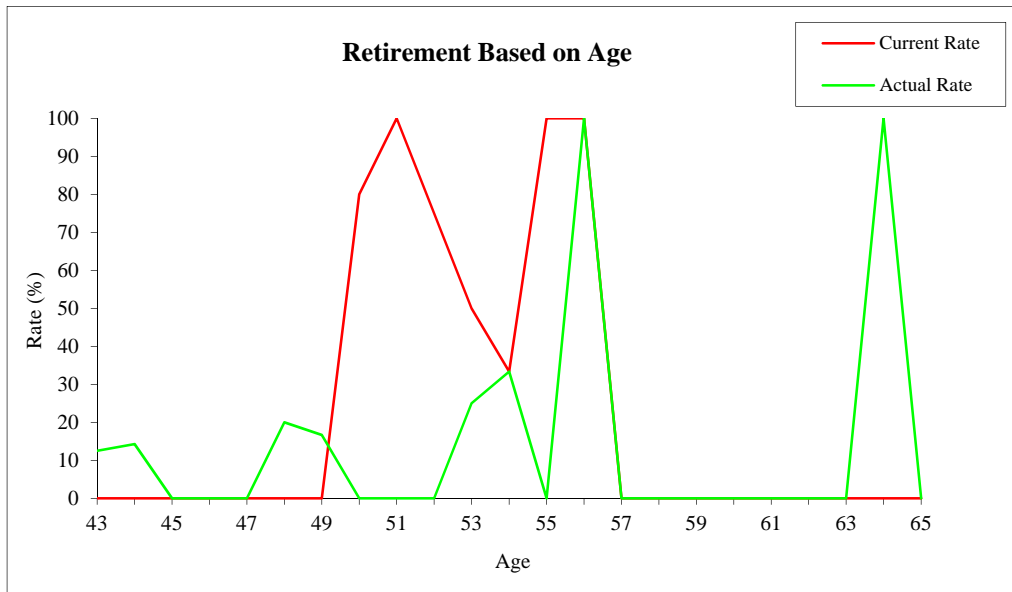
*Service Retirement*

The current assumption is that active members will retire at the earlier of the attainment of age 65 or age 50 with 25 years of service. During the five-year period covered by the study, there were eight retirements, five of which occurred upon the attainment of 20 years of service and three of which occurred after attainment by the retiree of 25 or more years of service. This experience suggests that for many participants service, rather than age, is the principal determinant of the time of retirement. The graph on page 10 shows the distribution of service retirements over the five-year period.

We recommend that that the assumed probabilities of service retirements be changed to a service-related assumption, with 65% assumed to retire upon the attainment of 20 years of service and the remainder at 25 years. Appendix II shows the current and proposed tables of service retirement probabilities.

# Active Service Experience - Service Retirements

July 1, 2006 through June 30, 2011



### **III. POST-RETIREMENT MORTALITY RATES**

During the five-year period of this study, there was one retiree death. The expectation under the current mortality assumption was about one. This is summarized in Table 7 of Appendix I.

Based on this observation and given the small set of experience data, we recommend no changes be made to the post-retirement mortality tables used in the funding of the Plan. The current assumption, which consists of the table prescribed for use by the Internal Revenue Service in the valuation of private-sector plans and is updated annually, matches current experience about as closely as possible in a group of this size. Continued use of this table seems advisable in view of its fit with recent experience and the annual update, which addresses the need under the current version of Actuarial Standard of Practice No. 35 to incorporate a provision for expected future improvement in longevity in the mortality assumption.

#### **IV. ECONOMIC ASSUMPTIONS**

Economic assumptions include:

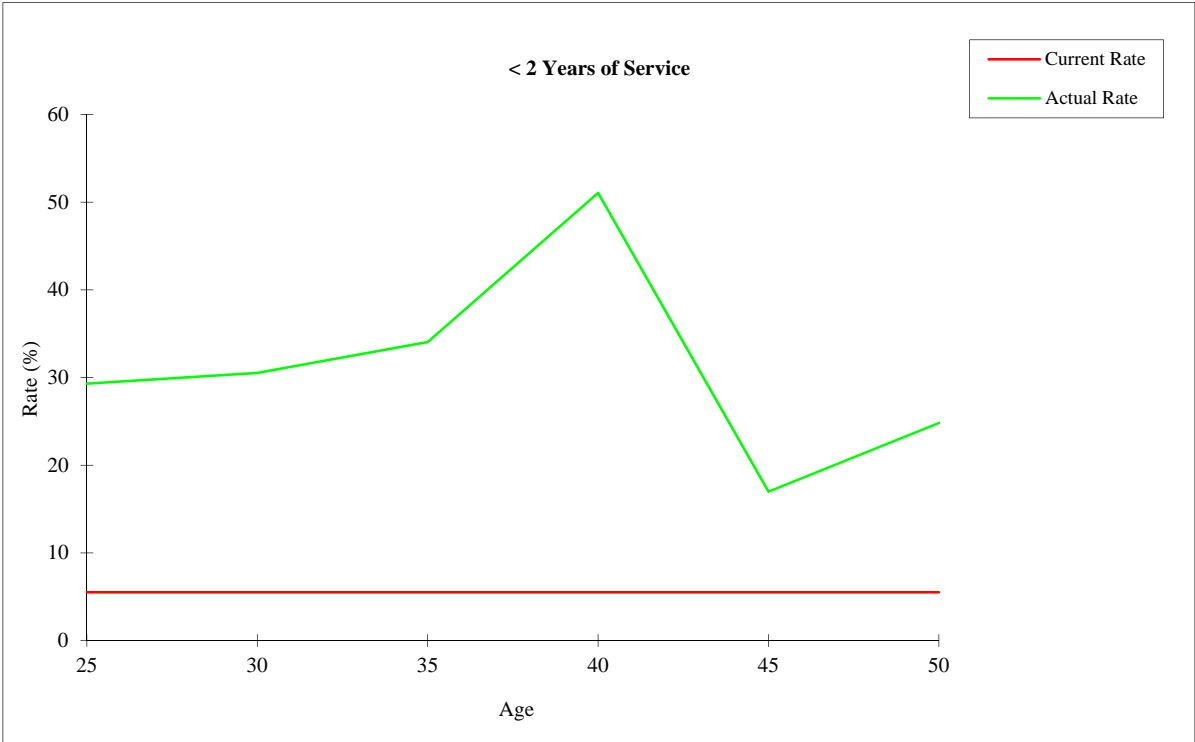
- (a) rates of compensation increase, and
- (b) investment income.

##### *Merit-Promotion Salary Increases*

Currently a single compensation scale of 5.50% is used. The graphs on pages 13, 14 and 15 set forth the levels of total compensation increase during the five-year period. While the graph shows that pay increases have exceeded those expected at most ages, this appears to be primarily a result of experience in the first two years of service, as can be seen in the graph on page 13. The summary of actual and expected salaries shown in Table 7 indicates that in the aggregate, after the first two years of service, the current salary scale performs fairly well in predicting salaries of active members. We recommend that no changes be made to the salary increase assumptions at this time.

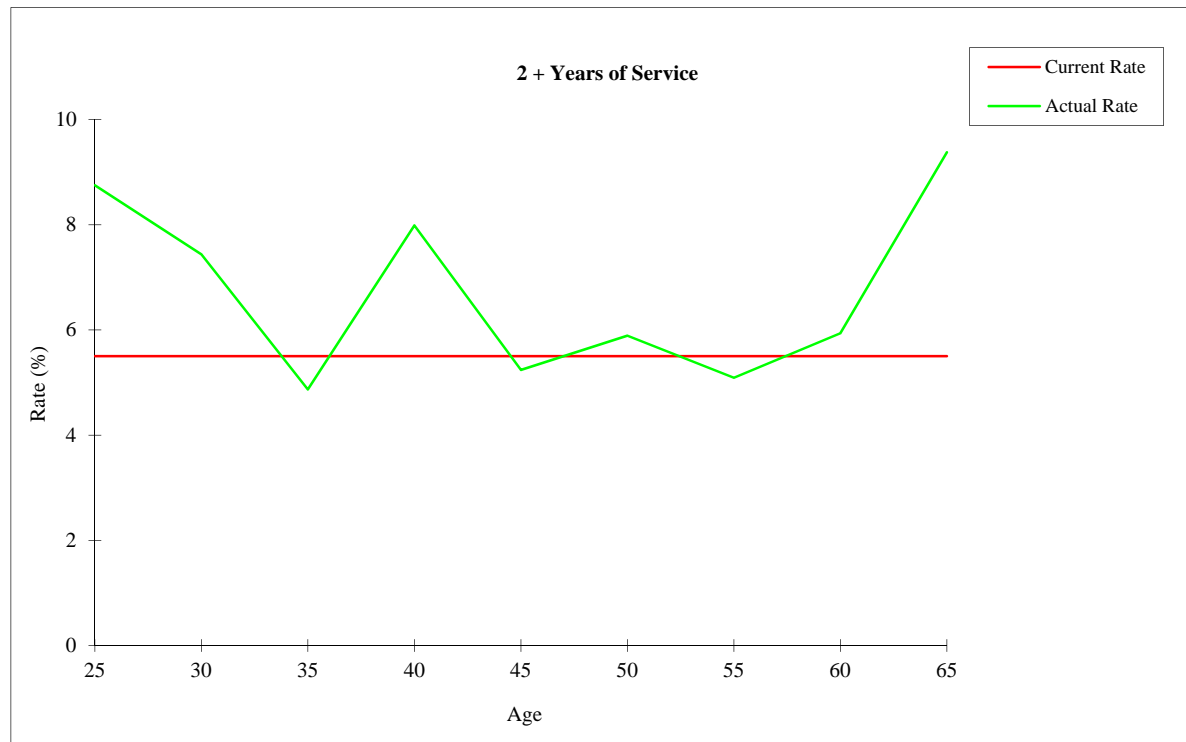
# Active Service Experience - Salary Experience

## July 1, 2006 through June 30, 2011

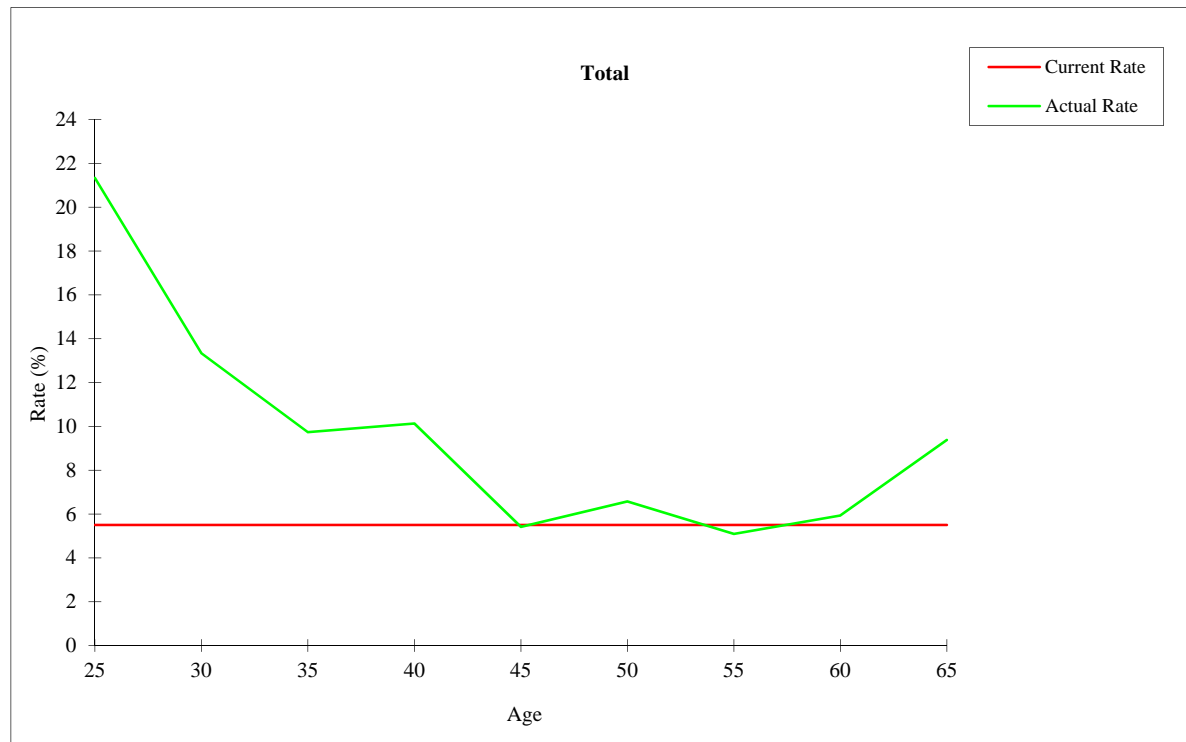




## Active Service Experience - Salary Experience July 1, 2006 through June 30, 2011 (continued)



## Active Service Experience - Salary Experience July 1, 2006 through June 30, 2011 (continued)



Interest Rate

The present interest assumption used in the funding of the Plan is 8.50% per year. Over the five years covered by the study, the annual rates of return earned on the assets of the Plan have fluctuated widely, as shown below:

Fiscal year ending in	Approximate rate of return
2007	16.5%
2008	-12.3%
2009	-24.3%
2010	10.9%
2011	23.1%

However, the focus of the analysis here is most appropriately directed to the expected future return on the assets held by the Plan. In an effort to forecast the expected long-term rate of return on Plan assets, we use a capital market model known as GEMS (General Economy and Market Simulator, described in more detail in Appendix III), 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 incorporated into a forecast of the performance of a portfolio invested in accordance with the Plan's present asset allocation. 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 annual rate of return forecast for such a portfolio is approximately 9.48%. The 75<sup>th</sup> and 25<sup>th</sup> percentiles of the distributions of annual rate of return forecasts over 30 years are 11.44% and 7.38%, respectively.

On the basis of these results, we recommend that the rate of return assumption used in the valuation be maintained at 8.50% per year.

*Inflation Rate*

Although not a separately set actuarial assumption, it is customary to examine assumptions about the underlying rate of inflation implicit in the salary increase and investment return assumptions for internal consistency. The 50<sup>th</sup> percentile 30-year projection of inflation from GEMS is 3.10%. This is consistent with both the salary-increase and rate of return assumptions developed here.

**V. COST ANALYSIS AND CONCLUSIONS**

To assist in the selection and approval of the final package of valuation assumptions to be used prospectively from July 1, 2011, we have recalculated the results of the valuation of the Plan as of July 1, 2011, to reflect the potential impact of the recommended assumptions.

Based on the revised valuation the recommended Town contribution for the year beginning July 1, 2011, would have increased from \$1,477,037 to \$1,628,395. These results are summarized in Appendix II.

We would be pleased to discuss the results of this experience investigation with the Board prior to the preparation of the July 1, 2012, valuation of the Plan.

**APPENDIX I**

**ACTUAL AND EXPECTED EXPERIENCE**

**TABLE 1**  
**COMPARISON OF ACTUAL AND EXPECTED SEPARATIONS**  
**FROM ACTIVE SERVICE**

**TERMINATIONS**

<b>Central Age of Group</b>	<b>Actual</b>	<b>Expected</b>	<b>Ratio of Actual To Expected</b>
Under 25	1	0.39	2.564
25-29	0	0.70	0.000
30-34	1	0.66	1.515
35-39	0	0.42	0.000
40-44	1	0.16	6.250
45-49	1	0.01	100.000
50-54	0	0.00	0.000
55 and over	0	0.00	0.000
Total	4	2.34	1.709

**TABLE 2**  
**COMPARISON OF ACTUAL AND EXPECTED SEPARATIONS**  
**FROM ACTIVE SERVICE**

**DISABILITY RETIREMENTS**

<b>Central Age of Group</b>	<b>Actual</b>	<b>Expected</b>	<b>Ratio of Actual To Expected</b>
Under 25	0	0.01	0.000
25-29	0	0.02	0.000
30-34	0	0.04	0.000
35-39	0	0.06	0.000
40-44	0	0.09	0.000
45-49	0	0.09	0.000
50-54	0	0.05	0.000
55 and over	0	0.16	0.000
Total	0	0.52	0.000



**TABLE 3**  
**COMPARISON OF ACTUAL AND EXPECTED SEPARATIONS**  
**FROM ACTIVE SERVICE**

**DEATHS**

<b>Central Age of Group</b>	<b>Actual</b>	<b>Expected</b>	<b>Ratio of Actual To Expected</b>
Under 25	0	0.00	0.000
25-29	0	0.01	0.000
30-34	0	0.02	0.000
35-39	0	0.04	0.000
40-44	0	0.06	0.000
45-49	0	0.04	0.000
50-54	0	0.02	0.000
55-59	0	0.01	0.000
60-64	0	0.03	0.000
65 and over	0	0.00	0.000
Total	0	0.23	0.000

**TABLE 4**  
**COMPARISON OF ACTUAL AND EXPECTED SEPARATIONS**  
**FROM ACTIVE SERVICE**

**SERVICE RETIREMENTS – AGE BASED**

Central Age of Group	Age Based		
	Actual	Expected	Ratio of Actual To Expected
Under 45	2	0	0.000
45	0	0	0.000
46	0	0	0.000
47	0	0	0.000
48	1	0	0.000
49	1	0	0.000
50	0	4	0.000
51	0	4	0.000
52	0	3	0.000
53	1	2	0.500
54	1	1	1.000
55	0	1	0.000
56	1	1	1.000
57	0	0	0.000
58	0	0	0.000
59	0	0	0.000
60	0	0	0.000
61	0	0	0.000
62	0	0	0.000
63	0	0	0.000
64	1	0	0.000
65 and over	0	0	0.000
Total	8	16.00	0.500

**TABLE 5**  
**COMPARISON OF ACTUAL AND EXPECTED SEPARATIONS**  
**FROM ACTIVE SERVICE**

**SERVICE RETIREMENTS – SERVICE BASED**

Central Service of Group	Service Based		
	Actual	Expected	Ratio of Actual To Expected
Under 20	0	0	0.000
20	1	0	0.000
21	3	0	0.000
22	1	0	0.000
23	0	0	0.000
24	0	0	0.000
25	0	0	0.000
26	1	3	0.333
27	0	3	0.000
28	0	5	0.000
29	1	2	0.500
30 +	1	3	0.333
Total	8	16.00	0.500

**TABLE 6**  
**COMPARISON OF ACTUAL AND EXPECTED**  
**ANNUAL SALARIES OF MEMBERS**

Central Age of Group	Under 2 Years of Service			2 + Years of Service			Total		
	Annual Salaries			Annual Salaries			Annual Salaries		
	Actual	Expected	Ratio of Actual To Expected	Actual	Expected	Ratio of Actual To Expected	Actual	Expected	Ratio of Actual To Expected
Under 25	552,599	450,856	2.358	294,363	285,568	1.031	846,962	736,424	1.150
25-29	508,261	410,835	1.237	1,219,392	1,197,419	1.018	1,727,653	1,608,255	1.074
30-34	350,523	275,884	1.271	1,370,611	1,378,872	0.994	1,721,134	1,654,756	1.040
35-39	205,167	143,283	1.432	2,798,474	2,734,008	1.024	3,003,641	2,877,291	1.044
40-44	46,617	42,043	1.109	2,712,736	2,719,486	0.998	2,759,353	2,761,530	0.999
45-49	74,874	63,292	1.183	1,700,544	1,694,271	1.004	1,775,417	1,757,563	1.010
50-54	-	-	0.000	1,115,054	1,119,406	0.996	1,115,054	1,119,406	0.996
55-59	-	-	0.000	233,253	232,295	1.004	233,253	232,295	1.004
60-64	-	-	0.000	114,893	110,821	1.037	114,893	110,821	1.037
65 and over	-	-	0.000	-	-	0.000	-	-	0.000
Total	1,738,041	1,169,661	1.486	11,559,320	11,472,146	1.008	13,297,360	12,858,341	1.034

**TABLE 7****SUMMARY OF MORTALITY EXPERIENCE  
OF PENSIONERS**

<b>Group</b>	<b>Actual</b>	<b>Expected</b>	<b>Ratio of Actual To Expected</b>
Service Retirees	1	1.33	0.752
Disability Retirees	0	0.03	0.000
Dependants of Deceased Members	0	0.90	0.000
<b>Total</b>	<b>1</b>	<b>2.26</b>	<b>0.442</b>

**APPENDIX II**

**COMPARATIVE VALUATION RESULTS**

**RESULTS FOR THE ACTUARIAL VALUATION  
PREPARED AS OF JULY 1, 2011, ON  
CURRENT AND RECOMMENDED ASSUMPTIONS**

Item	Current Assumptions	Recommended Assumptions
1. Accrued Liabilities:		
Active and Members	\$ 6,995,542	\$ 7,762,183
Retired Members, Beneficiaries and Members Entitled to Deferred Vested Benefits	<u>11,597,585</u>	<u>11,597,585</u>
Total	\$ 18,593,127	\$ 19,359,768
2. Assets	13,291,142	13,291,142
3. Unfunded Actuarial Accrued Liability	\$ 5,301,985	\$ 6,068,626
4. 20-year Amortization of Unfunded Actuarial Liability	\$ 516,374	\$ 591,039
5. Normal Contribution	\$ 866,627	\$ 937,270
6. Expected Expenses	\$ 35,000	\$ 35,000
7. Adjustment for interest to mid-year	<u>\$ 59,036</u>	<u>\$ 65,086</u>
8. Total Recommended Contribution = (4) + (5) + (6) +(7)	\$ 1,477,037	\$ 1,628,395

**APPENDIX III**

**ABOUT GEMS**



## ABOUT GEMS GENERAL ECONOMY AND MARKET SIMULATOR

GEMS<sup>®</sup> 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.