

# Educational Employees' Supplementary Retirement System of Fairfax County (ERFC)

Annual Actuarial Valuation

December 31, 2016



# Report of the December 31, 2016 Actuarial Valuation

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September 25, 2017

Board of Trustees  
Educational Employees' Supplementary  
Retirement System of Fairfax County  
Fairfax, Virginia

Dear Board Members:

Submitted in this report are the results of the annual actuarial valuation of the Educational Employees' Supplementary Retirement System of Fairfax County (ERFC), based on data as of December 31, 2016. The valuation was based upon information furnished by your Executive Director and staff, concerning Retirement System benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. Their efforts in furnishing this material are acknowledged with our appreciation. We checked for internal and year-to-year consistency, but did not audit the information supplied. We are not responsible for the accuracy or completeness of the information supplied by others.

This report was prepared at the request of the Executive Director and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with permission of the Board. GRS is not responsible for unauthorized use of this report. GRS specifically disclaims any duty to parties other than the Retirement Board.

The purpose of this valuation was to measure the System's funding progress. This report should not be relied on for any purpose other than the purpose described herein. Information related to the Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68 will be provided in a separate report.

Valuation results and comments are presented in Section B and on pages 3-4. The computed contributions shown on page B-2 may be considered a minimum contribution rate. Users of this report should be aware that contributions made at that rate do not guarantee benefit security. Given the importance of benefit security to any retirement system, we suggest that contributions to the System in excess of those presented in this report be considered.

The computed contributions shown in this report are determined using the actuarial assumptions and methods disclosed in Section G of this report. The assumptions were adopted by the Board of Trustees following a study of experience covering the five-year period ending December 31, 2014, with further adjustments to the mortality and salary assumptions adopted by the Board for the December 31, 2016 valuation. This report includes risk metrics on page F-1 but does not include a more robust assessment of risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment. We encourage a review and assessment of investment and other significant risks that may have a material effect on the Plan's financial condition.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as: plan experience differing from that anticipated by the economic and demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of the actuary's assignment, the actuary did not perform an analysis of the potential range of such future measurements.

To the best of our knowledge, the information contained in this report is accurate and fairly represents the actuarial position of ERFC as of the valuation date. All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

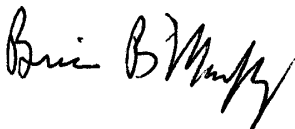
The signing actuaries are independent of the plan sponsor.

Brian B. Murphy and Judith A. Kermans are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

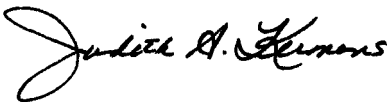
Your attention is directed particularly to:

Comments on page 3;  
Computed Employer Contribution Rates on page B-2;  
Comparative Statement on page B-5; and  
Short Condition Test on page B-7.

Respectfully submitted,



Brian B. Murphy, FSA, EA, FCA, MAAA, PhD



Judith A. Kermans, EA, FCA, MAAA

BBM/JAK:clh:sac/mrb



## Comments

**Funding Policy:** The ERFC Funding Policy, as stated in the ERFC Plan Document is “to establish and receive contributions which will remain approximately level from generation to generation of citizens and which, when combined with other assets and investment return thereon, will be sufficient to pay benefits when due, while providing a reasonable margin for adverse experience.”

**Contribution Rate Policy:** Actuarial valuations as of odd-numbered years (2013, 2015, etc.) are used to set the employer contribution rate for the two-year period beginning 18 months after the valuation date. For example, the December 31, 2015 valuation would typically be used to determine the contribution rate for the period July 1, 2017 to June 30, 2019. Actuarial valuations as of even numbered years, such as this valuation, would typically only provide an interim measure of the financial condition of ERFC and are also used for financial reporting in connection with the Governmental Accounting Standards Board (GASB) Statements, in accordance with parameters specified by the GASB. For funding purposes, unfunded accrued liabilities are currently being amortized over a closed 30-year period ending on June 30, 2040. The remaining amortization period in the December 31, 2016 valuation is 22 years. Effective with valuations on/after December 31, 2019, unfunded accrued liabilities resulting from benefit and/or assumption changes will be amortized over 10 years (or less).

**Contribution Rate:** The contribution rate for the two-year period beginning July 1, 2017, which incorporates assumptions changes adopted by the Board pursuant to the recent experience study, was calculated in the December 31, 2015 valuation to be 6.34% of payroll. The Board approved a **funding policy contribution of 6.40% of payroll**, which includes the calculated rate of 6.34% of pay plus a contingency contribution of 0.06% of pay. However, benefit changes were adopted after December 31, 2016; while most of the changes affect only new hires on/after July 1, 2017, interest crediting for all non-retired members was reduced from 5% to 4%. The School Board reduced the Fiscal Year 2018 contribution by \$2.3 million to reflect the first-year effect of the changes; this resulted in a Fiscal Year 2018 contribution rate of 6.24% of payroll. As of December 31, 2016, assumptions were updated for mortality (MP-2016 projection scale, and incorporating ERFC experience) and salary (adjusted to reflect the effect of the new salary scale adopted by the School Board). Since the Fiscal Year 2019 workforce is expected to include two years’ worth of people affected by the new provisions, approximate techniques were used to reflect the effect of people having the new provisions between now and the next experience study. The effect is a **calculated net employer contribution of 6.26% of payroll for Fiscal Year 2019**.

**Plan Experience:** ERFC’s market value rate of return as measured by the actuary was 6.6%; although it is slightly less than assumed, it represents a very large improvement over the prior year. The funded percent is now 75.2%, which is slightly lower than last year’s funded percent of 76.0%. If the market value of assets were the basis for the measurement (as opposed to the funding value with five-year smoothing of gains and losses and a 25% corridor), the funded percent would be 70.8% (slightly lower than last year’s funded percent on a market value basis of 71.6%) and the calculated rate would be 6.91% of payroll.

**Financial Status:** Based upon the December 31, 2016 valuation, the Fairfax County ERFC is operating in accordance with its Funding Policy and with actuarial principles of level percent-of-payroll financing. ERFC is fortunate that its long standing commitment to excellence in funding has resulted in financial strength that provides a solid basis for the future.

## Other Observations

**General Implications of Funding Policy on Future Expected Plan Contributions and Funded Status:** Given the plan's Funding Policy, if all actuarial assumptions are met (including the assumption of the plan earning 7.25% on the actuarial value of assets), it is expected that:

- 1) The employer normal cost as a percentage of pay will decrease to the level of the ERFC 2001 Post-6/30/2017 hires (ERFC 2001 Tier 2) normal cost as time passes and the majority of the active population is comprised of ERFC 2001 Tier 2 members;
- 2) The unfunded actuarial accrued liabilities will be fully amortized after 22 years; and
- 3) The funded status of the plan will increase gradually towards a 100% funded ratio.

**Limitations of Funded Status Measurements:** Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the actuarial value of assets. Unless otherwise indicated, with regard to any funded status measurements presented in this report:

- 1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations; in other words, of transferring the obligation to an unrelated third party in an arm's length market value type transaction.
- 2) The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. The amounts of future contributions will most certainly differ from those assumed in this report due to future actual experience differing from assumed experience based on actuarial assumptions. A funded status measurement in this report of 100% is not synonymous with no required future contributions. If the funded status were 100%, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit).
- 3) The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets, unless the market value of assets is used in the measurement.

**Limitation of Project Scope:** Actuarial standards do not require the actuary to evaluate the ability of the plan sponsor or other contributing entity to make required contributions to the plan when due. Such an evaluation was not within the scope of this project and is not within the actuary's domain of expertise. Consequently, the actuary performed no such evaluation.

## **SECTION A**

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### **FINANCIAL PRINCIPLES**

## Financial Principles and Operational Techniques

Promises Made, and Eventually Paid. As each year is completed, the plan in effect hands an “IOU” to each member then acquiring a year of service credit --- The “IOU” says: “The Educational Employees’ Supplementary Retirement System of Fairfax County owes you one year’s worth of retirement benefits, payments in cash commencing when you qualify for retirement.”

The related key financial questions are:

Which generation of taxpayers contributes the money to cover the IOU?

The present taxpayers, who receive the benefit of the member’s present year of service?

Or the future taxpayers, who happen to be in Fairfax County at the time the IOU becomes a cash demand?

The financing plan intends that this year’s taxpayers contribute the money to cover the IOUs being handed out this year. By following this principle, the employer contribution rate will remain approximately level from generation to generation --- theoretically, your children and grandchildren will contribute the same percents of active payroll you contribute now.

(There are systems which have a design for deferring contributions to future taxpayers, lured by a lower contribution rate now and putting aside the consequence that the contribution rate must then relentlessly grow much greater over decades of time --- consume now, and let your children face higher contributions after you retire.)

An inevitable by-product of the level-cost design is the accumulation of reserve assets for decades, and the income produced when the assets are invested. Invested assets are a by-product and not the objective. Investment return becomes, in effect, the third contributor for benefits to employees, and is interlocked with the contribution amounts required from employees and employers.

Translated to actuarial terminology, this level-cost objective means that the contribution rates must total at least the following:

Current Cost (the cost of members’ service being rendered this year)

... plus ...

Interest on Unfunded Accrued Liabilities (unfunded accrued liabilities are the difference between: (i) liabilities for service already rendered; and (ii) the accrued assets of the plan).



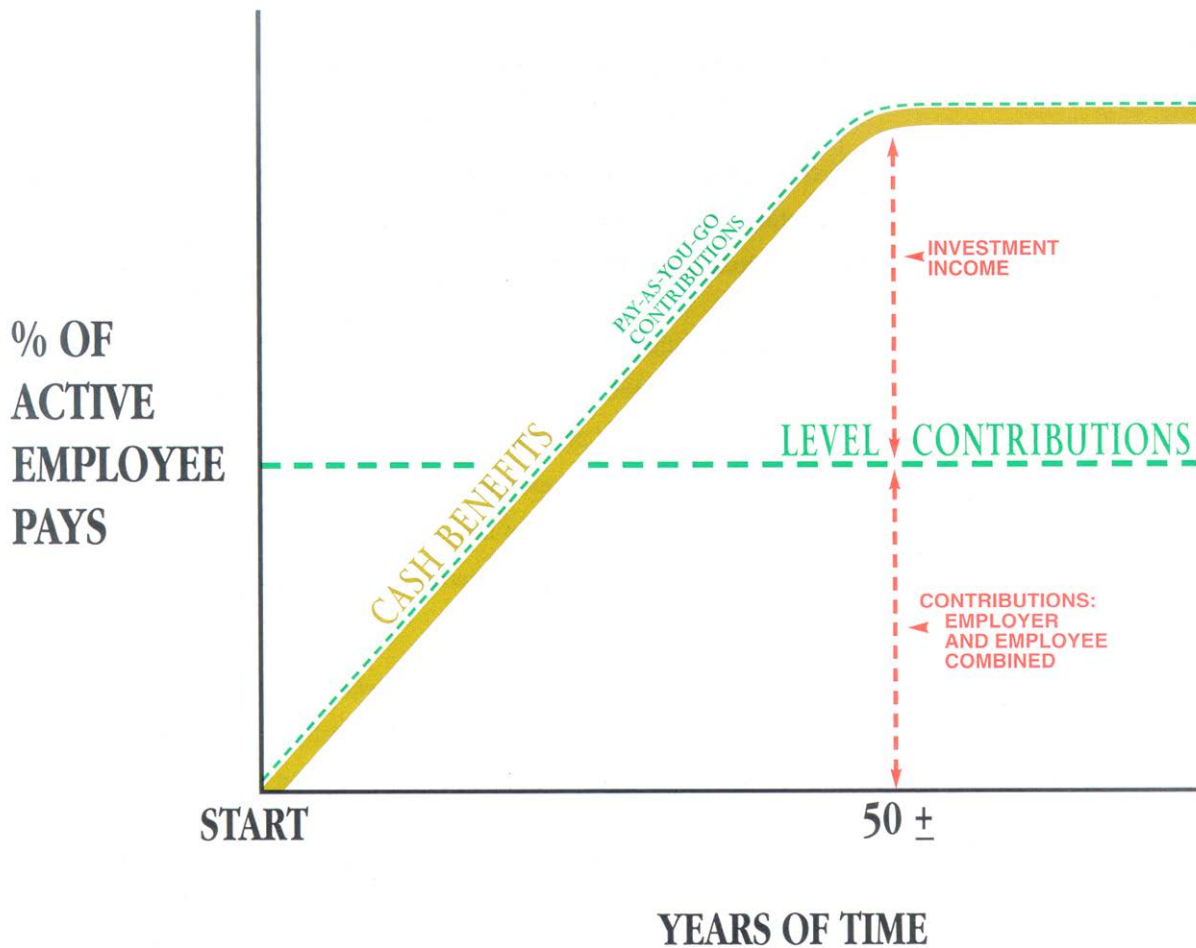
Computing Contributions to Support Plan Benefits. From a given schedule of benefits and from the employee data and asset data furnished, the actuary determines the contribution rates to support the benefits, by means of an actuarial valuation and a funding method.

An actuarial valuation has a number of ingredients such as: the rate of investment return which plan assets are assumed to earn; the rates of withdrawal of active members who leave covered employment before qualifying for any monthly benefit; the rates of mortality; the rates of disability; the rates of pay increases; and the assumed age or ages at actual retirement.

In preparing an actuarial valuation, assumptions must be made as to what the above rates will be for the next year and for decades in the future. Only the subsequent actual experience of the plan can indicate the degree of accuracy of the assumptions.

Reconciling Differences Between Assumed Experience and Actual Experience. Once actual experience has occurred and been observed, it will not coincide exactly with assumed experience, regardless of the wisdom of the assumptions and the skill of the actuary and the millions of calculations made. The demographic future can be predicted with considerable but not 100% precision. However, inflation and investment return rates seem to defy reliable prediction.

The plan copes with these continually changing differences by having periodic actuarial valuations. Each actuarial valuation is a complete recalculation of assumed future experience, taking into account all past differences between assumed and actual experience. The result is continuing adjustments in financial position.



**CASH BENEFITS LINE.** This relentlessly increasing line is the fundamental reality of retirement plan financing. It happens each time a new benefit is added for future retirements (and happens regardless of the design for contributing for benefits).

**LEVEL CONTRIBUTION LINE.** Determining the level contribution line requires detailed assumptions concerning a variety of experiences in future decades, including:

- Economic Risk Areas
  - Rates of investment return
  - Rates of pay increase
  - Changes in active member group size
- Non-Economic Risk Areas
  - Ages at actual retirement
  - Rates of mortality
  - Rates of withdrawal of active members (turnover)
  - Rates of disability

## Actuarial Valuation Process

The financing diagram on the opposite page shows the relationship between the two fundamentally different philosophies of paying for retirement benefits: the method where contributions match cash benefit payments and is thus an increasing contribution method; and the level contribution method which is designed to equalize contributions between the generations.

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The actuarial valuation is the mathematical process by which the level contribution rate is determined, and the flow of activity constituting the valuation may be summarized as follows:

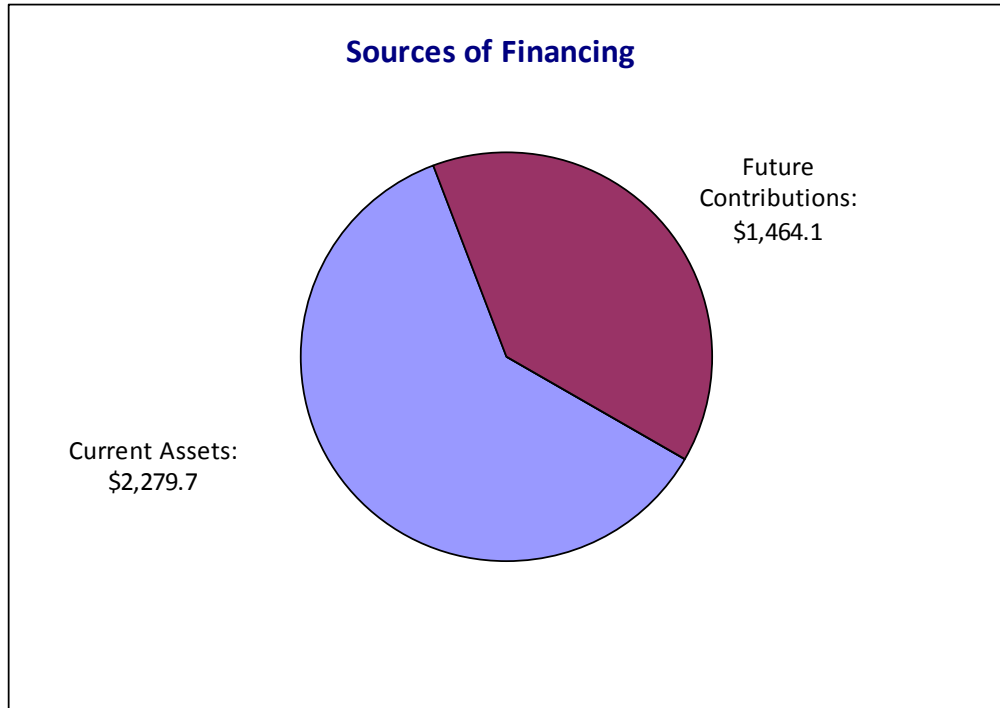
- Covered Person Data, furnished by plan administrator
  - Retired lives now receiving benefits
  - Former employees with vested benefits not yet payable
  - Active employees
- + Asset Data (cash and investments), furnished by plan administrator
- + Assumptions concerning future financial experiences in various risk areas, which assumptions are established by the Board of Trustees after consulting with the actuary
- + The funding method for employer contributions (the long-term, planned pattern for employer contributions)
- + Mathematically combining the assumptions, the funding method, and the data
- = Determination of:
  - Plan Financial Position
  - and/or New Employer Contribution Rate

## **SECTION B**

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### **RESULTS OF THE VALUATION**

## Financing \$3,743.8 Million of Benefit Promises December 31, 2016 (\$ in Millions)



The pie chart above shows that the total amount of benefit promises made to members in *ERFC* and *ERFC 2001* is \$3,743.8 million, based on plan assumptions as of December 31, 2016. In actuarial terms, this is called the present value of future benefit payments. It represents the amount of money, shown in today's dollars, needed to pay benefits to current and future retirees based on plan assumptions. These assumptions are outlined in Section G of this report. The \$3,743.8 million would be sufficient to pay promised benefits if plan members leave active employment as expected (retire, quit, etc.), live exactly according to plan mortality assumptions, and if all other assumptions are exactly realized, in particular the 7.25% investment return assumption. Investment return during 2016, as measured by the actuary, was 6.6% on a market value basis.

## Computed Employer Contribution Rates (as Percents of Active Member Payroll)

| Valuation Date   | December 31, 2016 |
|--|-------------------|
| Contributions for Period Ending June 30                    | 2019              |
| Normal Cost (current cost):                                |                   |
| Service Retirement   | 4.14%             |
| Reduced Service Retirement                                 | 0.32%             |
| Casualty Benefits  | 0.08%             |
| Separation Benefits  | 1.27%             |
| Administrative Expenses                                    | 0.27%             |
| Totals   | 6.08%             |
| Member Contributions                                       | 3.00%             |
| Employer Normal Cost                                       | 3.08%             |
| Unfunded Actuarial Accrued Liability                       | 3.44%             |
| <b>Net Employer Contribution</b>                           | <b>6.52%</b>      |
| <b>Adjustment for Post-6/30/2017 Hires</b>                 | <b>(0.26)%</b>    |
| <b>Actuarially Determined Employer Contribution (ADEC)</b> | <b>6.26%</b>      |

Unfunded liability was amortized as a level percent-of-payroll over 22 years in the December 31, 2016 valuation and 23 years in the December 31, 2015 valuation. If this schedule is continued, unfunded liabilities will be fully amortized on June 30, 2040. Effective with valuations on/after December 31, 2019, unfunded accrued liabilities resulting from benefit and/or assumption changes will be amortized over 10 years (or less).

The contribution rate for the two-year period beginning July 1, 2017, which incorporates assumption changes adopted by the Board pursuant to the recent experience study, was calculated in the December 31, 2015 valuation to be 6.34% of payroll. The Board approved a funding policy contribution of 6.40% of payroll, which includes the calculated rate of 6.34% of pay plus a contingency contribution of 0.06% of pay. However, benefit changes were adopted after December 31, 2016; while most of the changes affect only new hires on/after July 1, 2017, interest crediting for all non-retired members was reduced from 5% to 4%. The School Board reduced the Fiscal Year 2018 contribution by \$2.3 million to reflect the first-year effect of the changes; this resulted in a Fiscal Year 2018 contribution rate of 6.24% of payroll. As of December 31, 2016, assumptions were updated for mortality (MP 2016 projection scale, and incorporating ERFC experience) and salary (adjusted to reflect the effect of the new salary scale adopted by the School Board). Since the Fiscal Year 2019 workforce is expected to include two years' worth of people affected by the new provisions, approximate techniques were used to reflect the effect of people having the new provisions between now and the next experience study. The effect is a reduction in the calculated net employer contribution of 0.26% of payroll for Fiscal Year 2019.

## Contribution Rate History

| Fiscal Year | Valuation Date | Employee Rate | Adopted Employer Rate        |             | ADEC  |
|-------------|----------------|---------------|------------------------------|-------------|-------|
|             |                |               | Support                      | Educational |       |
| 1991        | 1989           | 2.00%         | 5.08%                        | 5.53%       |       |
| 1992        | 1990           | 2.00%         | 5.08%                        | 5.53%       |       |
| 1993        | 1991           | 2.00%         | 5.08%                        | 5.53%       |       |
| 1994        | 1992           | 2.00%         | 5.08%                        | 5.53%       |       |
| 1995        | 1993           | 2.00%         | 5.08%                        | 5.53%       |       |
| 1996        | 1994           | 2.00%         | 5.08%                        | 5.53%       |       |
| 1997        | 1995           | 2.00%         | 5.58%                        | 6.03%       |       |
| 1998        | 1996           | 2.00%         | 5.58%                        | 6.03%       |       |
| 1999        | 1997           | 2.00%         | 5.58%                        | 6.03%       |       |
|             |                |               | <b>Combined July 1, 1999</b> |             |       |
| 2000        | 1998           | 2.00%         | 4.99%                        |             |       |
| 2001        | 1999           | 2.00%         | 3.69%                        |             |       |
| 2002        | 2000           | 2.00%         | 3.69%                        |             |       |
| 2003        | 2001           | 2.00%         | 4.00%                        |             |       |
| 2004        | 2002           | 2.00% / 4.00% | 4.29% / 2.53%                |             |       |
| 2005        | 2003           | 4.00%         | 3.37%                        |             |       |
| 2006        | 2004           | 4.00%         | 3.37%                        |             |       |
| 2007        | 2004           | 4.00%         | 3.37%                        |             |       |
| 2008        | 2005           | 4.00%         | 3.37%                        |             | 3.37% |
| 2009        | 2005           | 4.00%         | 3.37%                        |             | 3.14% |
| 2010        | 2007           | 4.00%         | 3.20%                        |             | 2.97% |
| 2011        | 2007           | 4.00%         | 4.04%                        |             | 4.04% |
| 2012        | 2009           | 4.00%         | 4.34%                        |             | 4.16% |
| 2013        | 2009           | 3.00%         | 5.34%                        |             | 5.38% |
| 2014        | 2011           | 3.00%         | 5.60%                        |             | 5.51% |
| 2015        | 2011           | 3.00%         | 5.60%                        |             | 5.58% |
| 2016        | 2013           | 3.00%         | 5.60%                        |             | 5.54% |
| 2017        | 2013           | 3.00%         | 5.60%                        |             | 5.59% |
| 2018        | 2015           | 3.00%         | 6.24%                        |             | 6.34% |
| 2019        | 2015           | 3.00%         | 6.26%                        |             | 6.26% |

- Notes:
1. In June of 2004, the member rate was increased to 4% and the employer rate was decreased to 2.53%.
  2. The valuation date was June until 2004 when it was changed to December.
  3. Rate for FY 2011 was increased to the ARC. The Funding Policy would have resulted in 3.20%.
  4. On July 1, 2012, the member rate was decreased to 3.0% in conjunction with a restructuring of the VRS employee contribution rate.
  5. ADEC is the Actuarially Determined Employer Contribution.
  6. The School Board adopted an Employer Rate for FY 2018 of 6.24% of payroll, pursuant to benefit changes adopted by the Board.

## Actuarial Accrued Liabilities

| Accrued Liabilities for              | Amounts at December 31 |                 |
|--------------------------------------|------------------------|-----------------|
|                                      | 2016                   | 2015            |
| Present Active Members               | \$1,255,846,936        | \$1,196,690,867 |
| Present Inactive Vested Members      | 108,171,075            | 93,522,474      |
| Present Retirees and Beneficiaries   | 1,668,485,480          | 1,590,489,410   |
| Total Actuarial Accrued Liabilities  | \$3,032,503,491        | \$2,880,702,751 |
| Funding Value of Assets              | 2,279,741,119          | 2,188,037,003   |
| Unfunded Actuarial Accrued Liability | \$ 752,762,372         | \$ 692,665,748  |
| Actuarial Funded Percent             | 75.18%                 | 75.95%          |
| Market Value Funded Percent          | 70.83%                 | 71.64%          |



## Assets and Liabilities Comparative Statement

| Valuation Date    | Active Member Payroll | Computed Liabilities |               |            | Valuation Assets | Unfunded Accrued Liabilities | Funded % |
|-------------------|-----------------------|----------------------|---------------|------------|------------------|------------------------------|----------|
|                   |                       | Retired              | Other Members | Total      |                  |                              |          |
| (\$ in thousands) |                       |                      |               |            |                  |                              |          |
| 6/30/1990         | \$ 411,970            | \$ 240,122           | \$ 404,751    | \$ 644,873 | \$ 461,450       | \$ 183,423                   | 71.6%    |
| 6/30/1991         | 451,873               | 285,618              | 432,109       | 717,727    | 510,825          | 206,902                      | 71.2%    |
| 6/30/1992         | 447,474               | 318,072              | 445,498       | 763,570    | 563,644          | 199,926                      | 73.8%    |
| 6/30/1993#@       | 450,530               | 344,160              | 564,207       | 908,367    | 717,701          | 190,666                      | 79.0%    |
| 6/30/1994         | 480,995               | 374,849              | 597,230       | 972,079    | 766,480          | 205,599                      | 78.8%    |
| 6/30/1995*        | 521,044               | 395,249              | 677,287       | 1,072,536  | 839,930          | 232,606                      | 78.3%    |
| 6/30/1996         | 531,060               | 436,181              | 694,363       | 1,130,544  | 934,571          | 195,973                      | 82.7%    |
| 6/30/1997         | 553,709               | 464,345              | 751,022       | 1,215,367  | 1,045,412        | 169,955                      | 86.0%    |
| 6/30/1998#        | 582,755               | 490,261              | 788,111       | 1,278,372  | 1,194,556        | 83,816                       | 93.4%    |
| 6/30/1999         | 626,015               | 539,917              | 805,742       | 1,345,659  | 1,365,417        | (19,758)                     | 101.5%   |
| 6/30/2000         | 678,937               | 614,739              | 752,632       | 1,367,371  | 1,505,231        | (137,860)                    | 110.1%   |
| 6/30/2001*        | 759,906               | 667,605              | 884,953       | 1,552,558  | 1,599,219        | (46,661)                     | 103.0%   |
| 6/30/2002         | 781,756               | 699,251              | 994,705       | 1,693,956  | 1,619,889        | 74,067                       | 95.6%    |
| 6/30/2003*        | 866,502               | 903,963              | 868,455       | 1,772,418  | 1,597,459        | 174,959                      | 90.1%    |
| 12/31/2004#       | 977,817               | 1,083,988            | 851,594       | 1,935,582  | 1,643,020        | 292,562                      | 84.9%    |
| 12/31/2005        | 1,050,217             | 1,130,378            | 892,584       | 2,022,962  | 1,718,399        | 304,563                      | 84.9%    |
| 12/31/2006        | 1,111,828             | 1,176,979            | 928,573       | 2,105,552  | 1,818,930        | 286,622                      | 86.4%    |
| 12/31/2007        | 1,161,432             | 1,221,969            | 964,832       | 2,186,801  | 1,924,886        | 261,915                      | 88.0%    |
| 12/31/2008@       | 1,211,140             | 1,237,613            | 1,017,685     | 2,255,298  | 1,733,946        | 521,352                      | 76.9%    |
| 12/31/2009#       | 1,208,093             | 1,314,885            | 1,024,984     | 2,339,869  | 1,769,540        | 570,329                      | 75.6%    |
| 12/31/2010@       | 1,191,290             | 1,355,093            | 1,028,968     | 2,384,061  | 1,822,603        | 561,458                      | 76.5%    |
| 12/31/2011*       | 1,246,973             | 1,401,877            | 1,069,087     | 2,470,964  | 1,866,952        | 604,012                      | 75.6%    |
| 12/31/2012        | 1,297,537             | 1,448,291            | 1,117,837     | 2,566,128  | 1,935,292        | 630,836                      | 75.4%    |
| 12/31/2013        | 1,320,309             | 1,482,770            | 1,162,730     | 2,645,500  | 2,029,005        | 616,495                      | 76.7%    |
| 12/31/2014        | 1,340,344             | 1,510,717            | 1,223,128     | 2,733,845  | 2,123,910        | 609,935                      | 77.7%    |
| 12/31/2015#       | 1,373,096             | 1,590,489            | 1,290,214     | 2,880,703  | 2,188,037        | 692,666                      | 76.0%    |
| 12/31/2016        | 1,436,588             | 1,635,185            | 1,375,468     | 3,010,653  | 2,279,741        | 730,912                      | 75.7%    |
| 12/31/2016*       | 1,436,588             | 1,635,185            | 1,374,450     | 3,009,635  | 2,279,741        | 729,894                      | 75.7%    |
| 12/31/2016*^      | 1,436,588             | 1,668,485            | 1,387,851     | 3,056,336  | 2,279,741        | 776,595                      | 74.6%    |
| 12/31/2016*#      | 1,436,588             | 1,668,485            | 1,364,018     | 3,032,503  | 2,279,741        | 752,762                      | 75.2%    |

@ After change in asset valuation method.

\* After change in benefits or contribution rates (interest credits on member accounts only in 2016).

^ After change in (only) mortality assumption.

# After changes in actuarial assumptions or methods.

# Assets and Liabilities Expressed as Percents of Active Member Payroll Comparative Statement

| Valuation Date | Active Member Payroll (\$ thousands) | As Percents of Active Member Payroll |                  |                      |
|----------------|--------------------------------------|--------------------------------------|------------------|----------------------|
|                |                                      | Computed Liabilities                 | Valuation Assets | Unfunded Liabilities |
| 6/30/1990      | \$ 411,970                           | 157%                                 | 112%             | 45%                  |
| 6/30/1991      | 451,873                              | 159%                                 | 113%             | 46%                  |
| 6/30/1992      | 447,474                              | 171%                                 | 126%             | 45%                  |
| 6/30/1993#@    | 450,530                              | 202%                                 | 159%             | 42%                  |
| 6/30/1994      | 480,995                              | 202%                                 | 159%             | 42%                  |
| 6/30/1995*     | 521,044                              | 206%                                 | 161%             | 45%                  |
| 6/30/1996      | 531,060                              | 213%                                 | 176%             | 37%                  |
| 6/30/1997      | 553,709                              | 219%                                 | 189%             | 30%                  |
| 6/30/1998#     | 582,755                              | 219%                                 | 205%             | 14%                  |
| 6/30/1999      | 626,015                              | 215%                                 | 218%             | (3)%                 |
| 6/30/2000      | 678,937                              | 201%                                 | 222%             | (21)%                |
| 6/30/2001*     | 759,906                              | 204%                                 | 210%             | (6)%                 |
| 6/30/2002      | 781,756                              | 217%                                 | 207%             | 10%                  |
| 6/30/2003*     | 866,502                              | 205%                                 | 184%             | 21%                  |
| 12/31/2004#    | 977,817                              | 198%                                 | 168%             | 30%                  |
| 12/31/2005     | 1,050,217                            | 193%                                 | 164%             | 29%                  |
| 12/31/2006     | 1,111,828                            | 189%                                 | 164%             | 25%                  |
| 12/31/2007     | 1,161,432                            | 188%                                 | 166%             | 22%                  |
| 12/31/2008@    | 1,211,140                            | 186%                                 | 143%             | 43%                  |
| 12/31/2009#    | 1,208,093                            | 194%                                 | 146%             | 48%                  |
| 12/31/2010@    | 1,191,290                            | 200%                                 | 153%             | 47%                  |
| 12/31/2011*    | 1,246,973                            | 198%                                 | 150%             | 48%                  |
| 12/31/2012     | 1,297,537                            | 198%                                 | 149%             | 49%                  |
| 12/31/2013     | 1,320,309                            | 200%                                 | 154%             | 46%                  |
| 12/31/2014     | 1,340,344                            | 204%                                 | 158%             | 46%                  |
| 12/31/2015#    | 1,373,096                            | 210%                                 | 159%             | 51%                  |
| 12/31/2016     | 1,436,588                            | 210%                                 | 159%             | 51%                  |
| 12/31/2016*    | 1,436,588                            | 210%                                 | 159%             | 51%                  |
| 12/31/2016*^   | 1,436,588                            | 213%                                 | 159%             | 54%                  |
| 12/31/2016*#   | 1,436,588                            | 211%                                 | 159%             | 52%                  |

@ After change in asset valuation method.

\* After changes in benefits or contribution rates (interest credits on member accounts only in 2016).

^ After change in (only) mortality assumption.

# After changes in actuarial assumptions or methods.

In an inflationary economy the value of dollars is decreasing. Since observation of only the dollar amounts of key facts can be misleading, observation of relationships among key facts tells a more relevant story of the changes in financial strength. The smaller the ratio of unfunded liabilities to active member payroll, the stronger the system. Observation of this relative index over a period of years indicates changes in strength. The larger the ratio of liability and assets to payroll, the greater the inherent contribution rate volatility.

## Short Condition Test

If the contributions to ERFC are level in concept and soundly executed, the System will be able to pay all promised benefits when due -- the ultimate test of financial soundness. Testing for level contribution rates is the long-term test. A short condition test is one means of checking a system's progress under its funding program. In a short condition test, the plan's present assets (cash and investments) are compared with:

- 1) Active member contributions on deposit;
- 2) The liabilities for future benefits to present retired lives; and
- 3) The liabilities for service already rendered by active members.

In a system that has been following the discipline of level percent of payroll financing, the liabilities for active member contributions on deposit (Liability 1) and the liabilities for future benefits to present retired lives (Liability 2) will be fully covered by present assets (except in rare circumstances). In addition, the liabilities for service already rendered by active members (Liability 3) will be partially covered by the remainder of present assets. The larger the funded portion of Liability 3, the stronger the condition of the system.

| Valuation Date           | Aggregate Actuarial Accrued Liabilities For |                            |                                     | Valuation Assets | Portion of Accrued Liabilities Covered by Assets |      |      |
|--------------------------|---|----------------------------|-------------------------------------|------------------|--|------|------|
|                          | (1)   | (2)                        | (3)                                 |                  | (1)  | (2)  | (3)  |
|                          | Member Contributions                        | Retirees and Beneficiaries | Members (Employer Financed Portion) |                  |  |      |      |
| ( . . . \$1,000s . . . ) |   |                            |                                     |                  |  |      |      |
| 6/30/1997                | \$ 144,063                                  | \$ 464,345                 | \$606,959                           | \$1,045,412      | 100%   | 100% | 72%  |
| 6/30/1998#               | 149,220                                     | 490,261                    | 638,891                             | 1,194,556        | 100%   | 100% | 87%  |
| 6/30/1999                | 154,582                                     | 539,917                    | 651,160                             | 1,365,417        | 100%   | 100% | 103% |
| 6/30/2000                | 157,148                                     | 614,739                    | 595,484                             | 1,505,231        | 100%   | 100% | 123% |
| 6/30/2001*               | 178,564                                     | 667,605                    | 706,389                             | 1,599,219        | 100%   | 100% | 107% |
| 6/30/2002                | 170,849                                     | 699,251                    | 823,856                             | 1,619,889        | 100%   | 100% | 91%  |
| 6/30/2003*               | 176,648                                     | 903,963                    | 691,807                             | 1,597,459        | 100%   | 100% | 75%  |
| 12/31/2004#              | 227,725                                     | 1,083,988                  | 623,869                             | 1,643,020        | 100%   | 100% | 53%  |
| 12/31/2005               | 257,142                                     | 1,130,378                  | 635,442                             | 1,718,399        | 100%   | 100% | 52%  |
| 12/31/2006               | 239,780                                     | 1,176,979                  | 688,793                             | 1,818,930        | 100%   | 100% | 58%  |
| 12/31/2007               | 269,404                                     | 1,221,969                  | 695,428                             | 1,924,886        | 100%   | 100% | 62%  |
| 12/31/2008@              | 302,910                                     | 1,237,613                  | 714,775                             | 1,733,946        | 100%   | 100% | 27%  |
| 12/31/2009#              | 342,663                                     | 1,314,885                  | 682,321                             | 1,769,540        | 100%   | 100% | 16%  |
| 12/31/2010@              | 374,086                                     | 1,355,093                  | 654,882                             | 1,822,603        | 100%   | 100% | 14%  |
| 12/31/2011*              | 402,847                                     | 1,401,877                  | 666,240                             | 1,866,952        | 100%   | 100% | 9%   |
| 12/31/2012               | 426,609                                     | 1,448,291                  | 691,228                             | 1,935,292        | 100%   | 100% | 9%   |
| 12/31/2013               | 439,310                                     | 1,482,770                  | 723,420                             | 2,029,005        | 100%   | 100% | 15%  |
| 12/31/2014               | 457,591                                     | 1,510,717                  | 765,537                             | 2,123,910        | 100%   | 100% | 20%  |
| 12/31/2015#              | 472,933                                     | 1,590,489                  | 817,281                             | 2,188,037        | 100%   | 100% | 15%  |
| 12/31/2016               | 491,333                                     | 1,635,185                  | 884,135                             | 2,279,741        | 100%   | 100% | 17%  |
| 12/31/2016*              | 491,333                                     | 1,635,185                  | 883,117                             | 2,279,741        | 100%   | 100% | 17%  |
| 12/31/2016*^             | 491,333                                     | 1,668,485                  | 896,518                             | 2,279,741        | 100%   | 100% | 13%  |
| 12/31/2016*#             | 491,333                                     | 1,668,485                  | 872,685                             | 2,279,741        | 100%   | 100% | 14%  |

@ After change in asset valuation method.

\* After change in benefits or contribution rates (interest credits on member accounts only in 2016).

^ After change in (only) mortality assumption.

# After changes in actuarial assumptions or methods.

## Change in Unfunded Accrued Liabilities During the Year Ending December 31, 2016 (\$ in Millions)

|  | As of December 31 |                  |
|--|-------------------|------------------|
|  | 2016              | 2015             |
| 1. UAAL* at start of year  | \$ 692.7          | \$ 609.9         |
| 2. Normal Cost (6.08% of 2016 payroll)                                       | 87.3              | 80.3             |
| 3. Member and employer contributions   | 120.0             | 116.1            |
| 4. Interest accrual  | 49.1              | 44.4             |
| 5. Expected UAAL before changes: (1. + 2. - 3. + 4.)                         | 709.1             | 618.5            |
| 6. Change from non-recurring activities, assumption and/or benefit changes   | 21.9              | 45.8             |
| 7. Expected UAAL after changes: (5. + 6.)                                    | 731.0             | 664.3            |
| 8. Actual UAAL at end of year  | 752.8             | 692.7            |
| <b>9. Gain (loss): (7. - 8.)</b>   | <b>\$ (21.8)</b>  | <b>\$ (28.4)</b> |
| Gain (loss) as percent of actuarial accrued liabilities<br>at start of year. | (0.8)%            | (1.0)%           |

\* *Unfunded Actuarial Accrued Liability.*

The above schedule estimates the total gain or loss on the Retirement System activities for the year. The next page shows the breakdown of the total gain or loss by Source. Risk areas related to assumptions include Economic Risks and Demographic Risks. Economic Risks relate to Pay Increases and Investment Return. Demographic Risks relate to rates of retirement, death, disability, and other terminations. Risks not directly related to assumptions include granted additional service credit, data adjustments, timing of financial transactions, etc.

## Change in Unfunded Accrued Liabilities Gains and Losses by Risk Area During the Year Ending December 31, 2016

| Type of Risk Area                            | Gain (Loss) in Period |           |                   | Percent of Liabilities |
|--|-----------------------|-----------|-------------------|------------------------|
|  | \$ in millions        |           |                   |                        |
|  | ERFC                  | ERFC 2001 | Totals            |                        |
| <b>Risks Related to Assumptions</b>          |                       |           |                   |                        |
| <b>Economic Risk Areas:</b>                  |                       |           |                   |                        |
| Pay Increases*                               | \$(3.0)               | \$(11.2)  | \$ (14.2)         | (0.5)%                 |
| Investment Return                            |                       |           | (13.9)            | (0.5)%                 |
| <b>Demographic Risk Areas:</b>               |                       |           |                   |                        |
| Full and Reduced Service Retirements         | 5.3                   | (0.2)     | 5.1               | 0.2%                   |
| Vested Deferred Retirements                  | 0.6                   | 5.0       | 5.6               | 0.2%                   |
| Ordinary Death Benefits                      | 0.4                   | 0.0       | 0.4               | 0.0%                   |
| Service-Connected Death Benefits             | 0.0                   | 0.0       | 0.0               | 0.0%                   |
| Ordinary Disability Benefits                 | (0.1)                 | (0.1)     | (0.2)             | 0.0%                   |
| Service-Connected Disability Benefits        | 0.0                   | 0.0       | 0.0               | 0.0%                   |
| Terminated with Refund                       | 0.0                   | 1.0       | 1.0               | 0.0%                   |
| Post-Retirement Mortality*                   | (4.1)                 | (0.3)     | (4.4)             | (0.2)%                 |
| <b>Data Adjustments and Miscellaneous</b>    |                       |           | (1.2)             | 0.0%                   |
| <b>Total Gain (or Loss) During Period</b>    |                       |           | <b>(21.8)</b>     | <b>(0.8)%</b>          |
| <b>Beginning of Year Accrued Liabilities</b> |                       |           | <b>\$ 2,880.7</b> |                        |

\* Based on assumptions in effect during 2016, not prospective assumptions that were changed effective December 31, 2016.

## Experience Gains and Losses by Risk Area Comparative Statement (\$ in Millions)

| Experience Period | Pay Increases | Investment Return | Retirement | Disability & Death-in-Service | Other Separations | Other <sup>&amp;</sup> | Total Gain (Loss) |                        |
|-------------------|---------------|-------------------|------------|-------------------------------|-------------------|------------------------|-------------------|------------------------|
|                   |               |                   |            |                               |                   |                        | \$                | Percent of Liabilities |
| 1996-1997         | \$ 9.9        | \$ 53.5           | \$ 2.9     | \$ (1.7)                      | \$ (4.5)          | \$ (8.7)               | \$ 51.4           | 4.5 %                  |
| 1997-1998#        | (2.6)         | 81.1              | 5.9        | (0.5)                         | 6.4               | (13.9)                 | 76.4              | 6.3 %                  |
| 1998-1999*        | (8.4)         | 95.4              | 0.3        | (1.0)                         | 6.5               | (3.8)                  | 89.0              | 7.0 %                  |
| 1999-2000         | (17.6)        | 62.3              | 3.8        | (1.2)                         | 12.9              | 38.9                   | 99.1              | 7.4 %                  |
| 2000-2001         | (9.1)         | 17.6              | (0.3)      | (1.0)                         | 13.0              | (19.5)                 | 0.7               | 0.0 %                  |
| 2001-2002         | 3.0           | (50.4)            | 3.5        | (1.1)                         | 2.6               | (29.9)                 | (72.3)            | (4.7)%                 |
| 2002-2003         | 18.5          | (92.5)            | 11.0       | (0.3)                         | 4.0               | (23.3)                 | (82.6)            | (4.9)%                 |
| 2003-2004#@       |               |                   |            |                               |                   |                        |                   |                        |
| 2005              | (7.1)         | 1.9               | 1.0        | 0.1                           | 0.0               | (3.2)                  | (7.3)             | (0.4)%                 |
| 2006              | (4.7)         | 23.6              | 2.0        | 0.0                           | (0.8)             | 2.6                    | 22.7              | 1.1 %                  |
| 2007              | 10.0          | 25.1              | 1.9        | (0.2)                         | (2.2)             | (7.2)                  | 27.4              | 1.4 %                  |
| 2008              | 4.1           | (277.5)           | 5.2        | (0.4)                         | (4.0)             | 13.5                   | (259.1)           | (11.8)%                |
| 2009              | 45.0          | (34.6)            | 8.8        | (0.8)                         | (10.0)            | (11.6)                 | (3.2)             | (0.1)%                 |
| 2010#             | 53.1          | (16.9)            | 5.2        | 0.2                           | (5.3)             | (4.2)                  | 32.1              | 1.4 %                  |
| 2011              | 18.8          | (30.6)            | 5.3        | (0.2)                         | (4.2)             | (4.8)                  | (15.7)            | (0.7)%                 |
| 2012              | 12.3          | (10.8)            | 4.6        | (0.3)                         | (3.4)             | (10.2)                 | (7.8)             | (0.3)%                 |
| 2013              | 16.6          | 7.6               | 5.7        | 0.0                           | 2.9               | (5.1)                  | 27.7              | 1.1 %                  |
| 2014              | 8.5           | (2.8)             | 5.8        | (0.1)                         | 0.6               | 2.8                    | 14.8              | 0.6 %                  |
| 2015#             | 17.7          | (40.2)            | 5.9        | (0.4)                         | 1.0               | (12.4)                 | (28.4)            | (1.0)%                 |
| 2016              | (14.2)        | (13.9)            | 5.1        | 0.2                           | 6.6               | (5.6)                  | (21.8)            | (0.8)%                 |

# Experience Study.

\* Updated Gain Formulas.

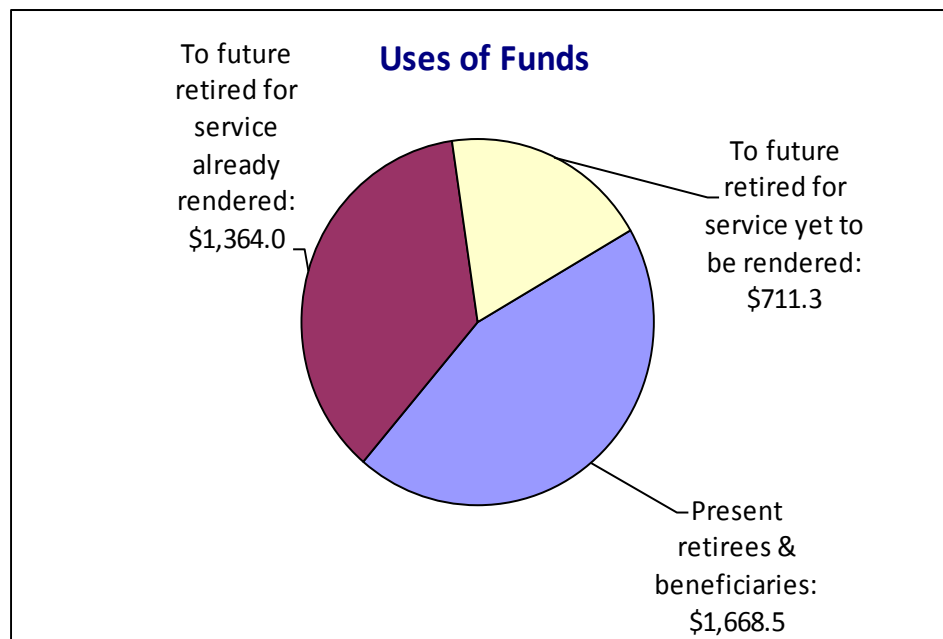
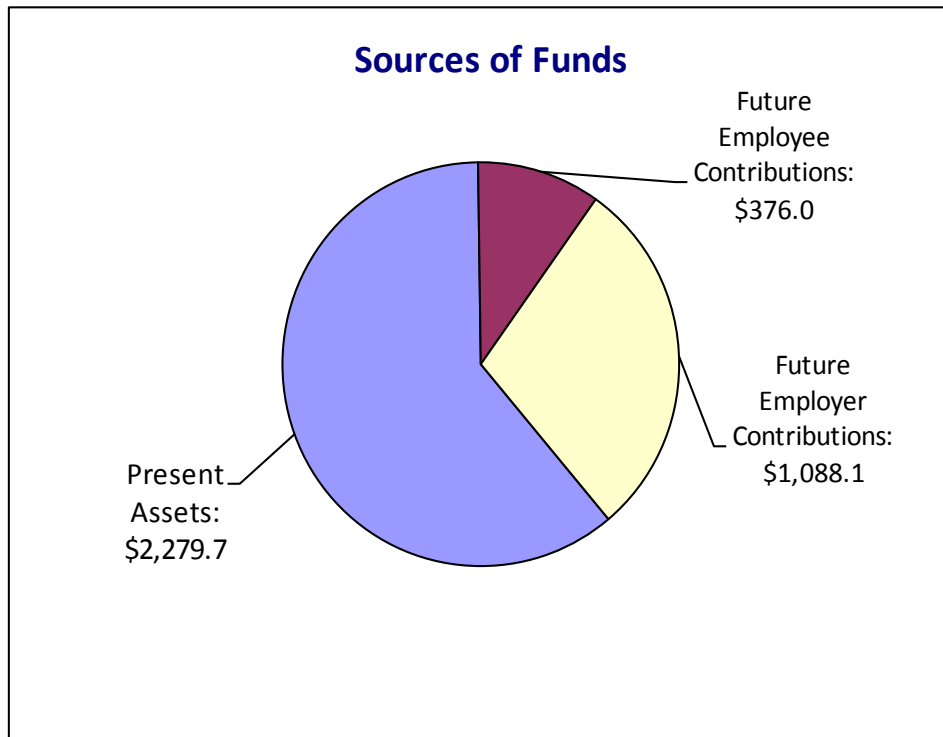
@ Gain (Loss) Analysis not performed.

& Includes post-retirement mortality.

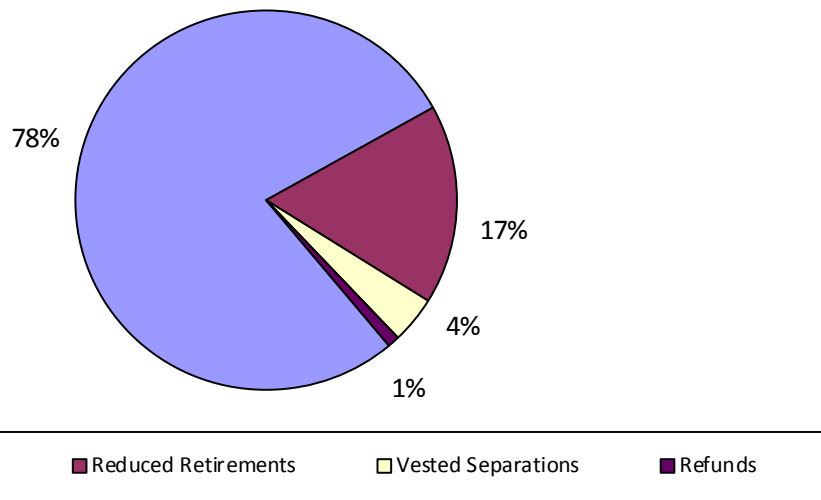
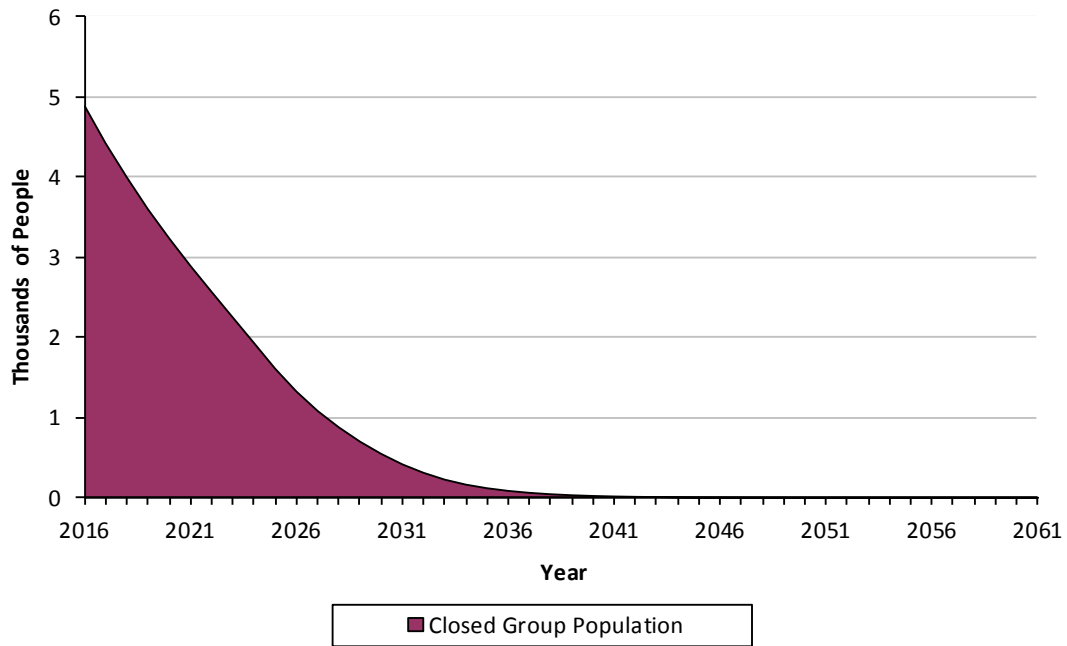
# Financing \$3,743.8 Million of Benefit Promises

## December 31, 2016

### (\$ in Millions)



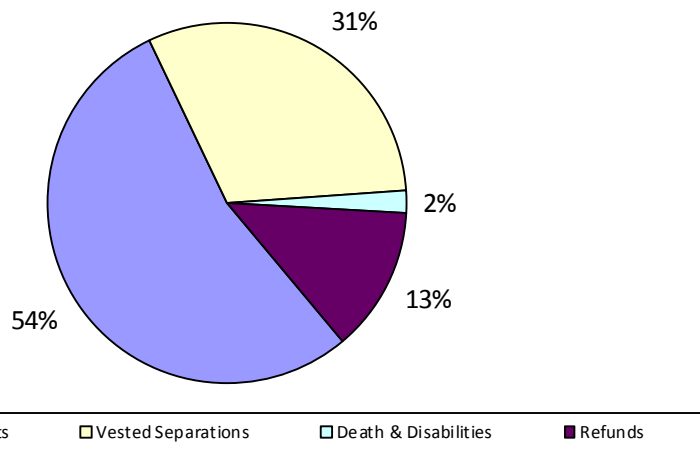
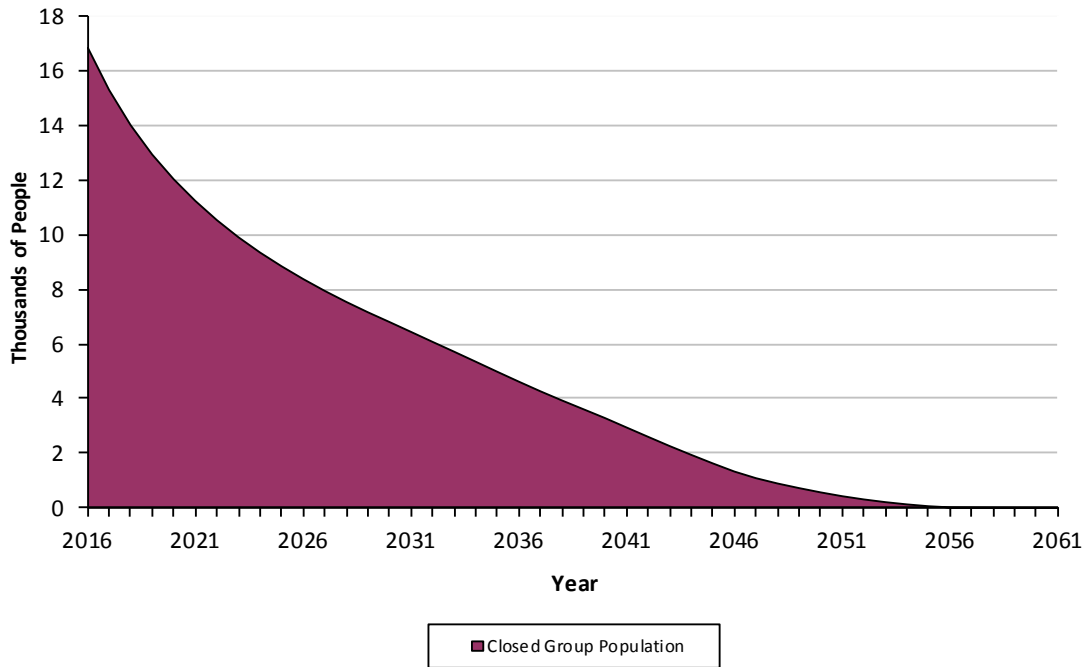
## Expected Development of Present Population – *ERFC* December 31, 2016



The charts show the expected future development of the present population in simplified terms. ERFC Legacy presently covers 4,892 active members. Approximately 99% of the present population is expected to receive monthly retirement benefits either by retiring directly from active service, or by separating from service without withdrawing contributions. Within 7 years, over half of the current membership will have left the group.



# Expected Development of Present Population – ERFC 2001 December 31, 2016



The charts show the expected future development of the present population in simplified terms. ERFC 2001 presently covers 16,856 active members. Eventually, 13% of the population is expected to terminate covered employment prior to retirement and forfeit eligibility for an employer provided benefit. Approximately 85% of the present population is expected to receive monthly retirement benefits either by retiring directly from active service, or by separating from service without withdrawing contributions. 2% of the present population is expected to become eligible for death-in-service or disability benefits. Within 10 years, over half of the current membership will have left the group. The proportion of new hires in this plan will increase more rapidly than normal because the ERFC Legacy plan is closed to new hires.

## SECTION C

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### SUMMARY OF BENEFITS

# Summary of Provisions as of December 31, 2016

## Members Hired After July 1, 1988 but Before July 1, 2001

### *ERFC*

1. **Service Retirement Eligibility.** A member may retire any time after reaching the service retirement date, which is either (i) age 65 with 5 years of service or (ii) age 55 with 25 years of service.
2. **Reduced Service Retirement Eligibility.** A member with 25 years of service but younger than age 55 may retire after age 45. A member with less than 25 years of service and younger than age 65 may retire after age 55.
3. **Deferred Retirement Eligibility.** An inactive member with 5 or more years of service will be entitled to a pension with payments beginning at age 55, provided she/he does not withdraw accumulated member contributions.
4. **Death-in-Service Benefit Eligibility.** An active member with 5 or more years of service who dies will have benefits payable to the surviving spouse or other eligible beneficiary. The 5-year service requirement is waived if the death is service-connected.
5. **Disability Retirement Eligibility.** An active member with 5 or more years of service who becomes totally and permanently disabled may be retired and receive a disability pension. The 5-year service requirement is waived if the disability is service-connected.
6. **Final Average Compensation (FAC).** A member's final average compensation is the average of the 3 highest consecutive years of salary during eligible employment.
7. **Service Retirement Amount.** For payment periods during the retired member's lifetime 103% times (i) minus (ii) where:
  - (i) means 1.85 percent of the FAC multiplied by years of credited service, and
  - (ii) means 1.65 percent of the portion of VRS FAC in excess of \$1,200, multiplied by applicable years of creditable Virginia service; provided if the member is younger than age 65 and if creditable Virginia service is less than 30 years, the result of such multiplication shall be reduced for each month before the earlier of:
    - (1) attainment of age 65; and
    - (2) the date when 30 years of service would have been completed.

The reduction shall be one-half of 1% for each of the first 60 months and four-tenths of one percent for each month beyond 60 months, if any.

For payment periods, if any, before the age the member becomes eligible for full Social Security benefits, an additional temporary benefit equal to 1.00 percent of the FAC multiplied by years of credited service.

# Summary of Provisions as of December 31, 2016

## Members Hired After July 1, 1988 but Before July 1, 2001

### ERFC

8. **Reduced Service Retirement Amount after 25 Years of Service.** Service Retirement amount reduced to reflect retirement age younger than age 55.
9. **Reduced Service Retirement Amount after 5-24 Years of Service.** For payment periods during the retired member's lifetime, the Service Retirement amount payable at age 65 reduced to reflect retirement age younger than age 65. For payment periods before the age the member becomes eligible for full Social Security benefits, an additional temporary benefit equal to the Service Retirement temporary benefit reduced to reflect retirement age younger than age 65.
10. **Deferred Retirement Amount.** Calculated in the same manner as reduced service retirement.
11. **Death-in-Service Benefit Amount.** If the member is eligible for a service or reduced service retirement then an eligible named beneficiary will receive such benefits reduced based upon an Option A (in the case of a spouse or an ex-spouse subject to a DRO) or Option B (in case of another eligible beneficiary) election. If not, the eligible named beneficiary will receive an amount equal to 103% times a lifetime pension equal of 0.25% of the FAC multiplied by years of credited service, and also reduced in connection with an Option A or Option B election. Credited service shall be increased by the time period from the date of death to the date when the member would have reached service retirement with a minimum of 10 years of service used, provided the death was service-connected. If a named beneficiary is not eligible for either of these types of benefits, the named beneficiary will receive a refund of the member's accumulated contributions.
12. **Disability Retirement Amount.** The amount is 103% times a lifetime pension equal to 0.25 percent of the FAC multiplied by years of credited service. Credited service shall be increased by the time period from disability retirement to the date when the member would have reached the service retirement date. The minimum pension payable is 2.5 percent of FAC.
13. **Post-Retirement Increases.** The amount of the monthly benefit is adjusted each March 31, by 3% compounded annually, beginning with the March 31 which is more than three full months after the member's effective retirement date. Pensions of members that retire in the immediately preceding calendar year are increased by 1.489% (one-half a year's increase).
14. **Member Contributions.** Effective July 1, 2012, members contribute 3% of their salaries. Interest credits are 5% annually through June 30, 2017, and 4% annually thereafter. If a member leaves covered employment before becoming eligible to retire, accumulated contributions are returned upon request. Members who receive a refund of contributions and are later rehired become members of ERFC 2001 Tier 2.

# Summary of Provisions as of December 31, 2016

## Members Hired After July 1, 1988 but Before July 1, 2001

### *ERFC*

15. **Lifetime Level Benefit (for Retirements after July 1, 2004).** Members are eligible for a lifetime level benefit (LLB) that is calculated by determining the annuitized value of the greater of their accumulated contribution balance or the present value of the currently provided benefit.
16. **Optional Forms of Payment.**
- Option A: 100% Joint and Survivor benefit. Benefit is 85% of the straight life amount adjusted for the difference in age between the retiree and beneficiary. The maximum benefit is 94% of the straight life amount.
  - Option B: 50% Joint and Survivor benefit. Benefit is 91% of the straight life amount adjusted for the difference in age between the retiree and beneficiary. The maximum benefit is 97% of the straight life amount.
  - Option C: 10 years Certain and Life. Benefit is 96% of the straight life amount.
  - Option D: Single sum payment not exceeding member's accumulated contribution balance, plus a single life annuity actuarially reduced from the pension amount otherwise payable. Actuarial equivalent factors are described on page G-16.

## Summary of Provisions as of December 31, 2016

### Alternate Benefits Available to Members with Some Service Before July 1, 1988

**Service Retirement: Alternate Amount After Full Social Security Age.** A member with service before 7/1/1988 may elect, at time of retirement, to receive an alternate benefit amount for payment periods after full Social Security age. The Alternative Guarantee amount is the amount that would have been received after the individual reached eligibility for full Social Security benefits under the Old Plan (pre – July 1, 1988) formulas. The amount is 103% of the total of:

- (i) the amount payable under June 30, 1987 benefit provisions,
- (ii) plus, if the retiring member is younger than full Social Security age and if creditable Virginia service is less than 30 years, 1.65 percent of VRS average final compensation in excess of \$1,200, multiplied by years of creditable Virginia service, and further multiplied by a certain percent based upon the number of months that retirement occurs before reaching the earlier of the above two conditions; such percent is one half of one percent for each of the first 60 such months and four-tenths of one percent for each of the next 60 such months, if any.

**Reduced Service Retirement: Alternate Amount with 25 Years or more Years of Service.** By election at time of retirement, such a member may elect to receive 103% of the following combination of benefits:

**To age 55**, 2.85 percent of the 3-year average annual salary multiplied by years of credited service, then actuarially reduced to reflect retirement age younger than age 55;

**From age 55 to 65**, the amount to age 55 reduced by: 1.65 percent of the portion of VRS average final compensation in excess of \$1,200, multiplied by applicable years of creditable Virginia service; provided if creditable Virginia service is less than 30 years, the result of such multiplication shall be actuarially reduced for each month before the earlier of (1) attainment of age 65; and (2) the date when 30 years' service would have been completed; and

**From age 65 for life**, the amount payable at age 65 according to June 30, 1987 provisions or the amount payable at age 65 according to July 1, 1988 provisions.

# Summary of Provisions as of December 31, 2016

## Members Hired On/After July 1, 2001 but Before July 1, 2017

### *ERFC 2001 Tier 1*

1. **Service Retirement Eligibility.** A member may retire at age 60 with 5 or more years of credited service, or after 30 years of credited service regardless of age.
2. **Deferred Retirement Eligibility.** Any member with 5 or more years of credited service who terminates employment prior to the service retirement date, will be eligible to receive a deferred vested pension commencing at age 60, provided accumulated contributions are left on deposit with the Plan.
3. **Death Benefit Eligibility.** Any member with 5 or more years of credited service who dies before beginning to receive a pension will have benefits payable to the named beneficiary.
4. **Final Average Compensation (FAC).** A member's Final Average Compensation is the average of the 3 highest years of salary during eligible employment.
5. **Service Retirement Pension.** The amount is a lifetime pension equal to 0.8% (eight-tenths of one percent) of FAC at retirement multiplied by years of credited service. If necessary, the pension will be increased to make the reserve value of the pension equal to the member's accumulated contributions as of the retirement effective date.
6. **Deferred Retirement Pension.** The amount is a lifetime pension equal to 0.8% (eight-tenths of one percent) of FAC at termination multiplied by years of credited service. If necessary, the pension will be increased to make the reserve value of the pension equal to the member's accumulated contributions as of the effective retirement date.
7. **Survivor Death Benefit.** The amount is a lifetime pension equal to 0.8% (eight-tenths of one percent) of FAC multiplied by years of credited service at the date of death. If necessary, the pension will be increased to make the reserve value of the pension equal to the member's accumulated contributions as of the date of death. The pension will be adjusted in accordance with an Option A (in the case of a spouse or an ex-spouse subject to a DRO) or Option B (in case of another eligible beneficiary) election payable immediately unless the member did not reach the service retirement eligibility prior to death, in which case the pension is reduced for each month that the member was younger than age 60 on the date of death in the following manner:
  - a. One-half of 1% for each of the first 60 months and four-tenths of one percent for each month beyond 60 months (the number of months used for reduction is not to exceed the difference between the member's credited service at death and 30 years).

**Summary of Provisions as of December 31, 2016**  
**Members Hired On/After July 1, 2001 but Before July 1, 2017**  
***ERFC 2001 Tier 1***

8. **Cost-of-Living Adjustments.** The amount of the monthly benefit is adjusted each March 31<sup>st</sup>, by 3% compounded annually, beginning with the March 31<sup>st</sup> which is more than three full months after the member's effective retirement date. Pensions of members that retire in the immediately preceding calendar year are increased by 1.489% (one-half a year's increase).
9. **Members' Contributions.** Effective July 1, 2012, members contribute 3% of their salaries. Interest credits are 5% annually through June 30, 2017, and 4% annually thereafter. If a member leaves covered employment before becoming eligible to retire, accumulated contributions are returned upon request. Members who receive a refund of contributions and are later rehired become members of ERFC 2001 Tier 2.
10. **Optional Methods of Payment.** Before the effective retirement date, a retiring member may elect one of the following options:
- Option A: 100% Joint and Survivor benefit. Benefit is 85% of the straight life amount adjusted for the difference in age between the retiree and beneficiary. The maximum benefit is 94% of the straight life amount.
  - Option B: 50% Joint and Survivor benefit. Benefit is 91% of the straight life amount adjusted for the difference in age between the retiree and beneficiary. The maximum benefit is 97% of the straight life amount.
  - Option C: 10 years Certain and Life. Benefit is 96% of the straight life amount.



# Summary of Provisions as of December 31, 2016

## Members Hired On/After July 1, 2017

### *ERFC 2001 Tier 2*

1. **Service Retirement Eligibility.** A member may retire at Full Social Security Age (FSSA) with 5 or more years of credited service, or when the sum of age plus service is greater than or equal to 90 (i.e., “Rule of 90”).
2. **Deferred Retirement Eligibility.** Any member with 5 or more years of credited service who terminates employment prior to the service retirement date, will be eligible to receive a deferred vested pension commencing at FSSA, provided accumulated contributions are left on deposit with the Plan.
3. **Death Benefit Eligibility.** Any member with 5 or more years of credited service who dies before beginning to receive a pension will have benefits payable to the named beneficiary.
4. **Final Average Compensation (FAC).** A member’s Final Average Compensation is the average of the 5 highest years of salary during eligible employment.
5. **Service Retirement Pension.** The amount is a lifetime pension equal to 0.8% (eight-tenths of one percent) of FAC at retirement multiplied by years of credited service. If necessary, the pension will be increased to make the reserve value of the pension equal to the member’s accumulated contributions as of the retirement effective date.
6. **Deferred Retirement Pension.** The amount is a lifetime pension equal to 0.8% (eight-tenths of one percent) of FAC at termination multiplied by years of credited service. If necessary, the pension will be increased to make the reserve value of the pension equal to the member’s accumulated contributions as of the effective retirement date.
7. **Survivor Death Benefit.** The amount is a lifetime pension equal to 0.8% (eight-tenths of one percent) of FAC multiplied by years of credited service at the date of death. If necessary, the pension will be increased to make the reserve value of the pension equal to the member’s accumulated contributions as of the date of death. The pension will be adjusted in accordance with an Option A (in the case of a spouse or an ex-spouse subject to a DRO) or Option B (in case of another eligible beneficiary) election payable immediately unless the member did not reach the service retirement eligibility prior to death, in which case the pension is reduced for each month that the member was younger than service retirement eligibility on the date of death in the following manner:
  - a. One-half of 1% for each of the first 60 months and four-tenths of one percent for each month beyond 60 months (the number of months used for reduction is based on the lesser of FSSA or the age the member would have attained “Rule of 90”).

## Summary of Provisions as of December 31, 2016

### Members Hired On/After July 1, 2017

#### *ERFC 2001 Tier 2*

8. **Cost-of-Living Adjustments.** The amount of the monthly benefit is adjusted each March 31<sup>st</sup>, by 100% of the Consumer Price Index (CPI-U) (with a cap of 4%) compounded annually, beginning with the March 31<sup>st</sup> which is more than three full months after the member's effective retirement date. Pensions of members that retire in the immediately preceding calendar year are increased by one-half a year's increase.
  
9. **Members' Contributions.** Members contribute 3% of their salaries. Interest credits are 4% annually. If a member leaves covered employment before becoming eligible to retire, accumulated contributions are returned upon request.
  
10. **Optional Methods of Payment.** Before the effective retirement date, a retiring member may elect one of the following options:
  - Option A: 100% Joint and Survivor benefit. Benefit is 85% of the straight life amount adjusted for the difference in age between the retiree and beneficiary. The maximum benefit is 94% of the straight life amount.
  - Option B: 50% Joint and Survivor benefit. Benefit is 91% of the straight life amount adjusted for the difference in age between the retiree and beneficiary. The maximum benefit is 97% of the straight life amount.
  - Option C: 10 years Certain and Life. Benefit is 96% of the straight life amount.

## Sample Benefit Computation for *ERFC* Member Retiring June 30, 2016

**Data:**

|    |                    |                        |
|----|--------------------|------------------------|
| A. | <u>7/1/1961</u>    | Date of Birth          |
| B. | <u>7/1/2016</u>    | Effective Date         |
| C. | <u>7/1/1987</u>    | Membership Date        |
| D. | <u>29.00</u>       | ERFC Credited Service  |
| E. | <u>29.00</u>       | VRS Creditable Service |
| F. | <u>55.00</u>       | Age                    |
| G. | <u>Service</u>     | Retirement Type        |
| H. | <u>\$60,000.00</u> | 3-Year Average Salary  |
| I. | <u>\$60,000.00</u> | 5-Year Average Salary  |

**ERFC Monthly Benefit Calculation**

**Lifetime Portion of Full Service Benefit**

|   |                  |
|---|------------------|
| J. ERFC Formula Benefit: $1.85\% \times 29 \text{ yrs.} \times \$60,000 =$  | \$ 32,190.00     |
| K. minus VRS Adjustment of: $1.65\% \times 29 \text{ yrs.} \times (\$60,000 - \$1,200) \times 94\% =$<br>(94% is the VRS Early Service Retirement Reduction Factor for 4 years prior to the earlier of age 65 or 30 years of service) | <u>26,447.65</u> |
| L. Sub Total  | 5,742.35         |
| M. plus additional 3% benefit adjustment  | <u>172.27</u>    |
| N. Total of Lifetime Portion  | 5,914.62         |

**Additional Temporary Benefit until age FSSA (Full Social Security Age)**

|  |               |
|--|---------------|
| O. Temporary Benefit Formula: $1\% \times 29 \text{ yrs.} \times \$60,000 =$         | 17,400.00     |
| P. plus additional 3% benefit adjustment   | <u>522.00</u> |
| Q. Total of Additional Temporary Benefit   | 17,922.00     |
| R. Monthly benefit effective 07/01/2016 at age 55 payable until FSSA, $(N + Q)/12 =$ | \$ 1,986.39   |
| S. Monthly benefit effective 07/01/2028 at FSSA payable for life, $N/12 =$           | \$ 492.89     |

The above computation does not reflect the alternative "guarantee" benefit which this member might elect. Members are eligible for a Lifetime Level Benefit (LLB) that is calculated by determining the annuitized value of the greater of their accumulated contribution balance or the present value of the currently provided benefit.

# Sample Benefit Computation for *ERFC 2001* Member

**Data:**

|    |                    |                       |
|----|--------------------|-----------------------|
| A. | <u>7/1/1969</u>    | Date of Birth         |
| B. | <u>7/1/2029</u>    | Effective Date        |
| C. | <u>7/1/2001</u>    | Membership Date       |
| D. | <u>28.00</u>       | ERFC Credited Service |
| E. | <u>60.00</u>       | Age                   |
| F. | <u>Service</u>     | Retirement Type       |
| G. | <u>\$60,000.00</u> | 3-Year Average Salary |

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## ***ERFC 2001* Monthly Benefit Calculation**

### **Lifetime Monthly Benefit**

*ERFC 2001* Formula Benefit:  $0.80\% \times 28 \text{ yrs.} \times \$60,000 / 12 =$  \$ 1,120.00

## **SECTION D**

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### **FINANCIAL INFORMATION**

# Summary of Financial Information

## December 31, 2016

### Revenues and Expenditures

|   | December 31   |                 |
|---|---------------|-----------------|
|   | 2016          | 2015            |
| <b>REVENUES:</b>                        |               |                 |
| a. Member Contributions                 | \$ 42,002,983 | \$ 40,671,716   |
| b. Employer Contributions               | 78,010,181    | 75,420,080      |
| c. Investment Return                    |               |                 |
| 1. Interest and Dividends               | 33,620,545    | 31,878,683      |
| 2. Net Appreciation                     | 110,057,240   | (46,980,636)    |
| 3. Investment Expense                   | (12,922,613)  | (13,723,903)    |
| 4. Net Securities Lending               | 806,705       | 547,703         |
| 5. Real Estate                          | 7,636,954     | 2,496,181       |
| 6. Miscellaneous                        | 742           | 1,117           |
| 7. Total Investment Return              | 139,199,573   | (25,780,855)    |
| d. Total Revenues                       | 259,212,737   | 90,310,941      |
| <b>EXPENDITURES:</b>                    |               |                 |
| a. Refunds of Member Contributions      | 4,609,827     | 4,901,051       |
| b. Retirement Benefits Paid             | 166,555,379   | 164,173,212     |
| c. Administrative Expense               | 3,927,571     | 3,904,262       |
| d. Total Expenditures                   | 175,092,777   | 172,978,525     |
| <b>RESERVE INCREASE:</b>                |               |                 |
| Total Revenues Minus Total Expenditures | \$84,119,960  | \$ (82,667,584) |

### Market Value of Assets

|  | December 31     |                 |
|--|-----------------|-----------------|
|  | 2016            | 2015            |
| <b>Invested Assets</b>                 |                 |                 |
| Bonds                                  | \$ 135,454,807  | \$ 129,624,994  |
| Stocks                                 | 616,789,550     | 581,536,914     |
| Real Estate                            | 172,917,699     | 179,662,223     |
| Global Asset Allocation                | 325,419,762     | 301,280,959     |
| Hedge Fund of Funds                    | 173,811,277     | 167,766,015     |
| Private Equity                         | 63,453,615      | 53,908,783      |
| Commingled Funds                       | 642,515,916     | 631,000,941     |
| Total Invested Assets                  | 2,130,362,626   | 2,044,780,829   |
| Short-term Investments and Cash        | 157,973,454     | 177,231,628     |
| Receivables and Pre-Paid Expenses      | 3,842,091       | 3,657,601       |
| Other Assets (furniture and equipment) | 20,893          | 43,068          |
| Total Assets                           | 2,292,199,064   | 2,225,713,126   |
| Liabilities                            | 144,205,399     | 161,839,421     |
| Net Assets                             | \$2,147,993,665 | \$2,063,873,705 |

## Portfolio Composition at Market Value

The Market Value of the Portfolio was reported to the Actuary as follows:

|  | Year Ended December 31 |                |                        |                |
|--|------------------------|----------------|------------------------|----------------|
|  | 2016                   |                | 2015                   |                |
|  | Value                  | % of Total     | Value                  | % of Total     |
| Bonds                                    | \$ 135,454,807         | 6.3 %          | \$ 129,624,994         | 6.3 %          |
| Stocks                                   | 616,789,550            | 28.7 %         | 581,536,914            | 28.2 %         |
| Real Estate                              | 172,917,699            | 8.1 %          | 179,662,223            | 8.7 %          |
| Commingled Funds                         | 642,515,916            | 29.9 %         | 631,000,941            | 30.6 %         |
| Hedge Fund of Funds                      | 173,811,277            | 8.1 %          | 167,766,015            | 8.1 %          |
| Private Equity                           | 63,453,615             | 3.0 %          | 53,908,783             | 2.6 %          |
| Global Asset Allocation / Better Beta    | 325,419,762            | 15.1 %         | 301,280,959            | 14.6 %         |
| Net Short-Term Investments and Cash      | 13,768,055             | 0.6 %          | 15,392,207             | 0.7 %          |
| Receivables, Pre-Paid Expenses and Other | 3,862,984              | 0.2 %          | 3,700,669              | 0.2 %          |
| <b>Total Assets</b>                      | <b>\$2,147,993,665</b> | <b>100.0 %</b> | <b>\$2,063,873,705</b> | <b>100.0 %</b> |

In performing an actuarial valuation, values must be determined for the assets held by the System on the valuation date. This value may be the current market value, or a value produced by a smoothing formula which recognizes the long-term validity of market value without overreacting to the marketplace's short-term moods.

The value used in the actuarial valuation may thus differ from the value used in the System's financial statements. This does not mean that one is "right" and the other is "wrong;" each is appropriate for the purpose for which it is used.

A smoothing formula has been in use for ERFC valuations since 1986, which in its present form is illustrated on page D-3. In the December 31, 2005 valuation, a new requirement was instituted to prevent unreasonably large differences between the market value and the funding value of assets. Currently, the recognized assets must always be between 75% and 125% of the market value.

## Development of Funding Value of Retirement System Assets

| Year Ended December 31:  | 2016                 | 2017            | 2018           | 2019           | 2020          |
|--|----------------------|-----------------|----------------|----------------|---------------|
| A. Funding Value Beginning of Year                                       | \$2,188,037,003      | \$2,279,741,119 |                |                |               |
| B. Market Value End of Year  | 2,147,993,665        |                 |                |                |               |
| C. Market Value Beginning of Year  | 2,063,873,705        |                 |                |                |               |
| D. Non-Investment Net Cash Flow  | (51,152,042)         |                 |                |                |               |
| E. Investment Return Assumed Rate:                                       | 7.25%                |                 |                |                |               |
| 1. Market Total: B-C-D   | 135,272,002          |                 |                |                |               |
| 2. Amount for Immediate Recognition                                      | 156,778,421          |                 |                |                |               |
| 3. Amount for Phased-in Recognition: (E1-E2)                             | (21,506,419)         |                 |                |                |               |
| F. Phased-In Recognition of Investment Return:                           |                      |                 |                |                |               |
| 1. Current year: 0.20 x E3   | (4,301,284)          |                 |                |                |               |
| 2. First Prior Year  | (37,398,310)         | (4,301,284)     |                |                |               |
| 3. Second Prior Year   | (10,380,347)         | (37,398,310)    | \$ (4,301,284) |                |               |
| 4. Third Prior Year  | 18,413,301           | (10,380,347)    | (37,398,310)   | \$ (4,301,284) |               |
| 5. Fourth Prior year   | 19,744,377           | 18,413,301      | (10,380,345)   | (37,398,308)   | \$(4,301,283) |
| 6. Total Phased-In   | (13,922,263)         | (33,666,640)    | (52,079,939)   | (41,699,592)   | (4,301,283)   |
| G. Funding Value End of Year:  |                      |                 |                |                |               |
| G1. Preliminary Funding Value End of Year: A+D+E2+F6                     | 2,279,741,119        |                 |                |                |               |
| G2. Upper Corridor Limit: 125% x B                                       | 2,684,992,081        |                 |                |                |               |
| G3. Lower Corridor Limit: 75% x B  | 1,610,995,249        |                 |                |                |               |
| <b>G4. Funding Value End of Year</b>                                     | <b>2,279,741,119</b> |                 |                |                |               |
| H. Actual/Projected Difference Between<br>Market Value and Funding Value | (131,747,454)        | (98,080,814)    | (46,000,875)   | (4,301,283)    | 0             |
| I. Market Rate of Return   | 6.6%                 |                 |                |                |               |
| J. Ratio of Funding Value to Market Value                                | 106.1%               |                 |                |                |               |

The Funding Value of Assets recognizes assumed investment return (line E2) fully each year. Differences between actual and assumed investment return (line E3) are phased-in over a closed 5-year period. During periods when investment performance exceeds the assumed rate, Funding Value of Assets will tend to be less than Market Value. During periods when investment performance is less than the assumed rate, Funding Value of Assets will tend to be greater than Market Value. The Funding Value of Assets is *unbiased* with respect to Market Value. If assumed rates are exactly realized for 4 consecutive years, Funding Value will become equal to Market Value.



## Funding Value History

| Year Ended December 31:  | 2012#                | 2013#                | 2014#                | 2015                 |
|--|----------------------|----------------------|----------------------|----------------------|
| A. Funding Value Beginning of Year                                       | \$1,866,952,015      | \$1,935,292,175      | \$2,029,004,521      | \$2,123,910,320      |
| B. Market Value End of Year  | 1,922,507,631        | 2,100,721,679        | 2,146,541,289        | 2,063,873,705        |
| C. Market Value Beginning of Year  | 1,744,597,088        | 1,922,507,631        | 2,100,721,679        | 2,146,541,289        |
| D. Non-Investment Net Cash Flow  | (58,633,969)         | (56,866,863)         | (52,485,779)         | (52,982,467)         |
| E. Investment Return Assumed Rate:                                       | 7.5%                 | 7.5%                 | 7.5%                 | 7.5%                 |
| E1. Market Total: B-C-D  | 236,544,512          | 235,080,911          | 98,305,389           | (29,685,117)         |
| E2. Amount for Immediate Recognition                                     | 137,822,627          | 143,014,406          | 150,207,122          | 157,306,431          |
| E3. Amount for Phased-in Recognition: (E1-E2)                            | 98,721,885           | 92,066,505           | (51,901,733)         | (186,991,548)        |
| F. Phased-in Recognition of Investment Return:                           |                      |                      |                      |                      |
| F1. Current year: 0.20 x E3  | 19,744,377           | 18,413,301           | (10,380,347)         | (37,398,310)         |
| F2. First Prior Year   | (30,576,304)         | 19,744,377           | 18,413,301           | (10,380,347)         |
| F3. Second Prior Year  | (16,571)             | (30,576,304)         | 19,744,377           | 18,413,301           |
| F4. Third Prior Year   | 0                    | (16,571)             | (30,576,304)         | 19,744,377           |
| F5. Fourth Prior year  | 0                    | 0                    | (16,571)             | (30,576,302)         |
| F6. Total Recognized Investment Gain or Loss                             | (10,848,498)         | 7,564,803            | (2,815,544)          | (40,197,281)         |
| G. Funding Value End of Year:  |                      |                      |                      |                      |
| G1. Preliminary Funding Value End of Year: A+D+E2+F6                     | 1,935,292,175        | 2,029,004,521        | 2,123,910,320        | 2,188,037,003        |
| G2. Upper Corridor Limit: 125% x B                                       | 2,403,134,539        | 2,625,902,099        | 2,683,176,611        | 2,579,842,131        |
| G3. Lower Corridor Limit: 75% x B  | 1,441,880,723        | 1,575,541,259        | 1,609,905,967        | 1,547,905,279        |
| <b>G4. Funding Value End of Year</b>                                     | <b>1,935,292,175</b> | <b>2,029,004,521</b> | <b>2,123,910,320</b> | <b>2,188,037,003</b> |
| H. Actual/Projected Difference Between<br>Market Value and Funding Value | (12,784,544)         | 71,717,158           | 22,630,969           | (124,163,298)        |
| I. Market Rate of Return   | 13.8%                | 12.4%                | 4.7%                 | (1.4)%               |
| J. Ratio of Funding Value to Market Value                                | 100.7%               | 96.6%                | 98.9%                | 106.0%               |

# Reflects collapsing of bases for future gains and losses implemented in 2010 actuarial valuation.

**SECTION E**

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**COVERED MEMBER DATA**

**ERFC Members**  
**WOMEN Active Members in Valuation December 31, 2016**  
**by Attained Age and Years of Service**

| Age Group     | Years of Service to Valuation Date |            |            |              |            |            |            | Totals       |                      | Average         |
|---------------|------------------------------------|------------|------------|--------------|------------|------------|------------|--------------|----------------------|-----------------|
|               | 0-4                                | 5-9        | 10-14      | 15-19        | 20-24      | 25-29      | 30 & Up    | No.          | Salary               |                 |
| 35-39         |                                    | 7          | 13         | 75           |            |            |            | 95           | \$ 7,490,473         | \$78,847        |
| 40-44         | 4                                  | 46         | 61         | 308          | 29         |            |            | 448          | 38,029,261           | 84,887          |
| 45-49         | 5                                  | 33         | 79         | 355          | 227        | 42         | 1          | 742          | 65,873,285           | 88,778          |
| 50-54         | 8                                  | 30         | 49         | 266          | 185        | 149        | 28         | 715          | 61,461,982           | 85,961          |
| 55-59         | 2                                  | 8          | 44         | 314          | 194        | 127        | 52         | 741          | 61,301,986           | 82,729          |
| 60            |                                    | 2          | 8          | 54           | 40         | 29         | 4          | 137          | 10,919,186           | 79,702          |
| 61            |                                    |            | 4          | 69           | 46         | 25         | 4          | 148          | 11,507,143           | 77,751          |
| 62            |                                    | 3          | 6          | 77           | 39         | 24         | 9          | 158          | 12,733,971           | 80,595          |
| 63            |                                    |            | 4          | 63           | 40         | 16         | 6          | 129          | 10,402,834           | 80,642          |
| 64            |                                    |            | 2          | 66           | 44         | 21         | 7          | 140          | 10,826,584           | 77,333          |
| 65            |                                    | 1          | 2          | 59           | 28         | 18         | 11         | 119          | 9,511,155            | 79,926          |
| 66            |                                    |            | 1          | 27           | 22         | 10         | 7          | 67           | 5,396,478            | 80,544          |
| 67            |                                    |            | 1          | 24           | 16         | 5          | 5          | 51           | 4,166,141            | 81,689          |
| 68            |                                    |            | 2          | 15           | 11         | 6          | 5          | 39           | 2,922,991            | 74,948          |
| 69            |                                    |            | 1          | 12           | 4          | 2          | 4          | 23           | 1,747,836            | 75,993          |
| 70            |                                    |            | 2          | 8            | 8          | 5          | 1          | 24           | 1,724,285            | 71,845          |
| 71            |                                    |            |            | 1            | 7          | 2          |            | 10           | 917,092              | 91,709          |
| 72            |                                    |            |            | 5            | 3          | 1          |            | 9            | 697,578              | 77,509          |
| 73            |                                    |            |            | 3            |            | 2          | 1          | 6            | 422,569              | 70,428          |
| 74            |                                    |            |            | 2            | 3          | 1          | 1          | 7            | 613,262              | 87,609          |
| 75 & Over     |                                    |            |            | 3            | 3          | 2          | 8          | 16           | 1,116,097            | 69,756          |
| <b>Totals</b> | <b>19</b>                          | <b>130</b> | <b>279</b> | <b>1,806</b> | <b>949</b> | <b>487</b> | <b>154</b> | <b>3,824</b> | <b>\$319,782,189</b> | <b>\$83,625</b> |

While not used in the financial computations the following group averages are computed and shown because of their general interest.

Age: 53.9 years  
Service: 19.7 years  
Annual Pay: \$83,625

## ERFC Members

### MEN Active Members in Valuation December 31, 2016 by Attained Age and Years of Service

| Age Group     | Years of Service to Valuation Date |          |           |            |            |            |           | Totals       |                      | Average         |
|---------------|------------------------------------|----------|-----------|------------|------------|------------|-----------|--------------|----------------------|-----------------|
|               | 0-4                                | 5-9      | 10-14     | 15-19      | 20-24      | 25-29      | 30 & Up   | No.          | Salary               |                 |
| 35-39         |                                    |          | 2         | 10         |            |            |           | 12           | \$ 1,064,403         | \$88,700        |
| 40-44         |                                    |          | 7         | 129        | 17         |            |           | 153          | 14,383,957           | 94,013          |
| 45-49         |                                    | 2        | 4         | 152        | 131        | 12         |           | 301          | 29,359,716           | 97,541          |
| 50-54         |                                    | 1        | 5         | 84         | 97         | 55         | 8         | 250          | 24,104,927           | 96,420          |
| 55-59         |                                    | 2        |           | 81         | 53         | 28         | 19        | 183          | 17,273,818           | 94,392          |
| 60            |                                    |          |           | 14         | 6          | 7          | 5         | 32           | 3,025,198            | 94,537          |
| 61            |                                    |          |           | 10         | 2          | 2          | 3         | 17           | 1,709,373            | 100,551         |
| 62            |                                    |          |           | 10         | 6          | 6          | 3         | 25           | 2,520,704            | 100,828         |
| 63            |                                    |          |           | 7          | 7          | 2          | 1         | 17           | 1,604,380            | 94,375          |
| 64            |                                    |          |           | 10         | 4          | 4          |           | 18           | 1,742,795            | 96,822          |
| 65            |                                    |          |           | 3          | 7          | 3          | 2         | 15           | 1,489,349            | 99,290          |
| 66            |                                    |          |           | 3          | 2          | 1          | 2         | 8            | 742,843              | 92,855          |
| 67            |                                    |          |           | 5          |            | 3          |           | 8            | 748,102              | 93,513          |
| 68            |                                    |          |           | 1          | 2          |            | 2         | 5            | 470,130              | 94,026          |
| 69            |                                    |          | 1         | 3          |            | 1          |           | 5            | 486,984              | 97,397          |
| 70            | 1                                  |          |           | 3          | 1          |            |           | 5            | 446,326              | 89,265          |
| 71            |                                    |          |           | 2          | 1          | 1          |           | 4            | 426,310              | 106,578         |
| 72            |                                    |          |           |            |            | 2          |           | 2            | 210,821              | 105,411         |
| 73            |                                    |          |           |            | 1          |            | 1         | 2            | 207,008              | 103,504         |
| 74            |                                    |          |           | 3          | 1          |            |           | 4            | 331,759              | 82,940          |
| 75 & Over     |                                    |          |           |            | 1          |            | 1         | 2            | 195,715              | 97,858          |
| <b>Totals</b> | <b>1</b>                           | <b>5</b> | <b>19</b> | <b>530</b> | <b>339</b> | <b>127</b> | <b>47</b> | <b>1,068</b> | <b>\$102,544,618</b> | <b>\$96,016</b> |

While not used in the financial computations the following group averages are computed and shown because of their general interest.

Age: 51.9 years  
Service: 20.7 years  
Annual Pay: \$96,016

## ERFC 2001 Members

### WOMEN Active Members in Valuation December 31, 2016 by Attained Age and Years of Service

| Age Group     | Years of Service to Valuation Date |              |              |            |       |       |         | Totals        |                      | Average         |
|---------------|------------------------------------|--------------|--------------|------------|-------|-------|---------|---------------|----------------------|-----------------|
|               | 0-4                                | 5-9          | 10-14        | 15-19      | 20-24 | 25-29 | 30 & Up | No.           | Salary               |                 |
| 20-24         | 462                                | 1            |              |            |       |       |         | 463           | \$ 20,765,528        | \$44,850        |
| 25-29         | 2,080                              | 276          |              |            |       |       |         | 2,356         | 121,903,930          | 51,742          |
| 30-34         | 1,045                              | 1,025        | 161          |            |       |       |         | 2,231         | 129,564,439          | 58,075          |
| 35-39         | 686                                | 543          | 654          | 54         |       |       |         | 1,937         | 126,113,664          | 65,108          |
| 40-44         | 619                                | 329          | 368          | 71         |       |       |         | 1,387         | 89,214,973           | 64,322          |
| 45-49         | 674                                | 430          | 355          | 58         |       |       |         | 1,517         | 92,978,320           | 61,291          |
| 50-54         | 604                                | 467          | 395          | 57         |       |       |         | 1,523         | 87,636,509           | 57,542          |
| 55-59         | 306                                | 399          | 457          | 88         |       |       |         | 1,250         | 74,129,772           | 59,304          |
| 60            | 45                                 | 56           | 67           | 22         |       |       |         | 190           | 12,037,110           | 63,353          |
| 61            | 27                                 | 40           | 81           | 11         |       |       |         | 159           | 9,312,063            | 58,566          |
| 62            | 24                                 | 37           | 65           | 14         |       |       |         | 140           | 8,744,930            | 62,464          |
| 63            | 20                                 | 36           | 64           | 20         |       |       |         | 140           | 9,066,321            | 64,759          |
| 64            | 17                                 | 20           | 45           | 6          |       |       |         | 88            | 5,463,911            | 62,090          |
| 65            | 8                                  | 20           | 39           | 11         |       |       |         | 78            | 5,237,087            | 67,142          |
| 66            | 9                                  | 10           | 29           | 6          |       |       |         | 54            | 3,249,486            | 60,176          |
| 67            | 8                                  | 13           | 17           | 4          |       |       |         | 42            | 2,663,535            | 63,418          |
| 68            | 2                                  | 6            | 19           | 1          |       |       |         | 28            | 1,499,862            | 53,567          |
| 69            | 3                                  | 7            | 7            | 1          |       |       |         | 18            | 1,036,377            | 57,577          |
| 70            | 2                                  |              | 7            | 1          |       |       |         | 10            | 679,244              | 67,924          |
| 71            | 2                                  | 1            | 1            |            |       |       |         | 4             | 208,823              | 52,206          |
| 72            | 1                                  |              | 6            |            |       |       |         | 7             | 325,810              | 46,544          |
| 73            |                                    |              | 2            | 1          |       |       |         | 3             | 259,808              | 86,603          |
| <b>Totals</b> | <b>6,645</b>                       | <b>3,716</b> | <b>2,840</b> | <b>427</b> |       |       |         | <b>13,628</b> | <b>\$802,249,066</b> | <b>\$58,868</b> |

While not used in the financial computations the following group averages are computed and shown because of their general interest.

Age: 41.0 years  
 Service: 6.0 years  
 Annual Pay: \$58,868

## ERFC 2001 Members

### MEN Active Members in Valuation December 31, 2016 by Attained Age and Years of Service

| Age Group     | Years of Service to Valuation Date |            |            |            |       |       |         | Totals       |                      | Average         |
|---------------|------------------------------------|------------|------------|------------|-------|-------|---------|--------------|----------------------|-----------------|
|               | 0-4                                | 5-9        | 10-14      | 15-19      | 20-24 | 25-29 | 30 & Up | No.          | Salary               |                 |
| 20-24         | 57                                 |            |            |            |       |       |         | 57           | \$ 2,266,701         | \$39,767        |
| 25-29         | 409                                | 42         |            |            |       |       |         | 451          | 22,090,842           | 48,982          |
| 30-34         | 297                                | 227        | 43         |            |       |       |         | 567          | 32,484,229           | 57,291          |
| 35-39         | 167                                | 183        | 217        | 20         |       |       |         | 587          | 40,086,709           | 68,291          |
| 40-44         | 130                                | 84         | 162        | 39         |       |       |         | 415          | 30,952,645           | 74,585          |
| 45-49         | 115                                | 82         | 134        | 28         |       |       |         | 359          | 26,891,595           | 74,907          |
| 50-54         | 104                                | 67         | 95         | 16         |       |       |         | 282          | 20,482,940           | 72,635          |
| 55-59         | 77                                 | 55         | 113        | 7          |       |       |         | 252          | 18,984,901           | 75,337          |
| 60            | 8                                  | 14         | 11         | 2          |       |       |         | 35           | 2,643,491            | 75,528          |
| 61            | 9                                  | 7          | 9          | 3          |       |       |         | 28           | 1,831,696            | 65,418          |
| 62            | 13                                 | 5          | 14         | 1          |       |       |         | 33           | 2,348,428            | 71,164          |
| 63            | 8                                  | 6          | 17         | 2          |       |       |         | 33           | 2,401,706            | 72,779          |
| 64            | 9                                  | 6          | 15         |            |       |       |         | 30           | 2,140,771            | 71,359          |
| 65            | 6                                  | 5          | 10         | 1          |       |       |         | 22           | 1,445,281            | 65,695          |
| 66            | 6                                  | 5          | 6          | 2          |       |       |         | 19           | 1,135,285            | 59,752          |
| 67            | 3                                  | 4          | 6          |            |       |       |         | 13           | 755,185              | 58,091          |
| 68            | 1                                  | 5          | 6          | 1          |       |       |         | 13           | 878,778              | 67,598          |
| 69            | 3                                  | 2          | 3          | 2          |       |       |         | 10           | 658,297              | 65,830          |
| 70            | 2                                  | 1          | 4          |            |       |       |         | 7            | 468,371              | 66,910          |
| 71            | 1                                  |            | 1          |            |       |       |         | 2            | 154,635              | 77,318          |
| 72            | 1                                  | 2          | 1          |            |       |       |         | 4            | 270,731              | 67,683          |
| 73            |                                    |            | 1          | 1          |       |       |         | 2            | 151,324              | 75,662          |
| 74            | 1                                  |            | 1          |            |       |       |         | 2            | 100,154              | 50,077          |
| 75 & Over     |                                    | 1          | 4          |            |       |       |         | 5            | 387,426              | 77,485          |
| <b>Totals</b> | <b>1,427</b>                       | <b>803</b> | <b>873</b> | <b>125</b> |       |       |         | <b>3,228</b> | <b>\$212,012,121</b> | <b>\$65,679</b> |

While not used in the financial computations the following group averages are computed and shown because of their general interest.

Age: 41.3 years  
Service: 6.7 years  
Annual Pay: \$65,679

## ALL Active Members in Valuation December 31, 2016 by Attained Age and Years of Service

| Age Group     | Years of Service to Valuation Date |              |              |              |              |            |            | Totals        |                        | Average         |
|---------------|------------------------------------|--------------|--------------|--------------|--------------|------------|------------|---------------|------------------------|-----------------|
|               | 0-4                                | 5-9          | 10-14        | 15-19        | 20-24        | 25-29      | 30 & Up    | No.           | Salary                 |                 |
| 20-24         | 519                                | 1            |              |              |              |            |            | 520           | \$ 23,032,229          | \$44,293        |
| 25-29         | 2,489                              | 318          |              |              |              |            |            | 2,807         | 143,994,772            | 51,298          |
| 30-34         | 1,342                              | 1,252        | 204          |              |              |            |            | 2,798         | 162,048,668            | 57,916          |
| 35-39         | 853                                | 733          | 886          | 159          |              |            |            | 2,631         | 174,755,249            | 66,422          |
| 40-44         | 753                                | 459          | 598          | 547          | 46           |            |            | 2,403         | 172,580,836            | 71,819          |
| 45-49         | 794                                | 547          | 572          | 593          | 358          | 54         | 1          | 2,919         | 215,102,916            | 73,691          |
| 50-54         | 716                                | 565          | 544          | 423          | 282          | 204        | 36         | 2,770         | 193,686,358            | 69,923          |
| 55-59         | 385                                | 464          | 614          | 490          | 247          | 155        | 71         | 2,426         | 171,690,477            | 70,771          |
| 60            | 53                                 | 72           | 86           | 92           | 46           | 36         | 9          | 394           | 28,624,985             | 72,652          |
| 61            | 36                                 | 47           | 94           | 93           | 48           | 27         | 7          | 352           | 24,360,275             | 69,205          |
| 62            | 37                                 | 45           | 85           | 102          | 45           | 30         | 12         | 356           | 26,348,033             | 74,011          |
| 63            | 28                                 | 42           | 85           | 92           | 47           | 18         | 7          | 319           | 23,475,241             | 73,590          |
| 64            | 26                                 | 26           | 62           | 82           | 48           | 25         | 7          | 276           | 20,174,061             | 73,094          |
| 65            | 14                                 | 26           | 51           | 74           | 35           | 21         | 13         | 234           | 17,682,872             | 75,568          |
| 66            | 15                                 | 15           | 36           | 38           | 24           | 11         | 9          | 148           | 10,524,092             | 71,109          |
| 67            | 11                                 | 17           | 24           | 33           | 16           | 8          | 5          | 114           | 8,332,963              | 73,096          |
| 68            | 3                                  | 11           | 27           | 18           | 13           | 6          | 7          | 85            | 5,771,761              | 67,903          |
| 69            | 6                                  | 9            | 12           | 18           | 4            | 3          | 4          | 56            | 3,929,494              | 70,170          |
| 70            | 5                                  | 1            | 13           | 12           | 9            | 5          | 1          | 46            | 3,318,226              | 72,135          |
| 71            | 3                                  | 1            | 2            | 3            | 8            | 3          |            | 20            | 1,706,860              | 85,343          |
| 72            | 2                                  | 2            | 7            | 5            | 3            | 3          |            | 22            | 1,504,940              | 68,406          |
| 73            |                                    |              | 3            | 5            | 1            | 2          | 2          | 13            | 1,040,709              | 80,055          |
| 74            | 1                                  |              | 2            | 6            | 4            | 1          | 1          | 15            | 1,177,849              | 78,523          |
| 75 & Over     | 1                                  | 1            | 4            | 3            | 4            | 2          | 9          | 24            | 1,724,128              | 71,839          |
| <b>Totals</b> | <b>8,092</b>                       | <b>4,654</b> | <b>4,011</b> | <b>2,888</b> | <b>1,288</b> | <b>614</b> | <b>201</b> | <b>21,748</b> | <b>\$1,436,587,994</b> | <b>\$66,056</b> |

While not used in the financial computations the following group averages are computed and shown because of their general interest.

|             | <u>ERFC</u> | <u>ERFC 2001</u> | <u>Total</u> |
|-------------|-------------|------------------|--------------|
| Age:        | 53.5 years  | 41.0 years       | 43.8 years   |
| Service:    | 19.9 years  | 6.1 years        | 9.2 years    |
| Annual Pay: | \$86,330    | \$60,172         | \$66,056     |

## Active Members by Years of Service December 31, 2016

| Service<br>Years | Number of Members |               |               | Annual Pays            |                 |
|------------------|-------------------|---------------|---------------|------------------------|-----------------|
|                  | Males             | Females       | Total         | Total                  | Average         |
| 0                | 390               | 1,715         | 2,105         | \$ 102,170,513         | \$48,537        |
| 1                | 326               | 1,603         | 1,929         | 98,068,913             | 50,839          |
| 2                | 246               | 1,032         | 1,278         | 67,997,838             | 53,206          |
| 3                | 230               | 1,194         | 1,424         | 78,946,627             | 55,440          |
| 4                | 236               | 1,120         | 1,356         | 77,657,174             | 57,269          |
| 5                | 220               | 1,052         | 1,272         | 74,576,360             | 58,629          |
| 6                | 172               | 799           | 971           | 58,890,815             | 60,650          |
| 7                | 105               | 570           | 675           | 41,131,412             | 60,935          |
| 8                | 147               | 687           | 834           | 54,372,498             | 65,195          |
| 9                | 164               | 738           | 902           | 57,855,409             | 64,141          |
| 10               | 177               | 688           | 865           | 58,984,800             | 68,191          |
| 11               | 199               | 743           | 942           | 65,939,650             | 70,000          |
| 12               | 206               | 664           | 870           | 63,765,649             | 73,294          |
| 13               | 161               | 552           | 713           | 55,388,358             | 77,684          |
| 14               | 149               | 472           | 621           | 47,487,446             | 76,469          |
| 15               | 151               | 596           | 747           | 59,882,171             | 80,164          |
| 16               | 150               | 526           | 676           | 53,999,202             | 79,880          |
| 17               | 157               | 454           | 611           | 50,434,282             | 82,544          |
| 18               | 110               | 388           | 498           | 41,572,909             | 83,480          |
| 19               | 87                | 269           | 356           | 30,348,516             | 85,249          |
| 20               | 71                | 244           | 315           | 28,091,411             | 89,179          |
| 21               | 67                | 156           | 223           | 20,965,118             | 94,014          |
| 22               | 82                | 213           | 295           | 27,270,234             | 92,441          |
| 23               | 80                | 201           | 281           | 26,321,768             | 93,672          |
| 24               | 39                | 135           | 174           | 16,502,892             | 94,844          |
| 25               | 23                | 114           | 137           | 12,857,421             | 93,850          |
| 26               | 39                | 124           | 163           | 15,631,662             | 95,900          |
| 27               | 27                | 80            | 107           | 10,445,690             | 97,623          |
| 28               | 26                | 105           | 131           | 12,148,521             | 92,737          |
| 29               | 12                | 64            | 76            | 7,300,412              | 96,058          |
| 30 & Up          | 47                | 154           | 201           | 19,582,323             | 97,424          |
| <b>Totals</b>    | <b>4,296</b>      | <b>17,452</b> | <b>21,748</b> | <b>\$1,436,587,994</b> | <b>\$66,056</b> |



# Persons in Valuations - Comparative Statement

## Active Members

| Valuation Date | Number    |           |        | Average Pay | Annual Increase In Average Pay |              | Price Inflation (CPI-U) Last Year |
|----------------|-----------|-----------|--------|-------------|--------------------------------|--------------|-----------------------------------|
|                | ERFC      | ERFC 2001 | Total  |             | Last Year                      | Last 5 Years |                                   |
|                | 2/28/1974 | 7,429     |        |             | 7,429                          | \$13,087     |                                   |
| 2/28/1975      | 8,075     |           | 8,075  | 13,693      |                                |              |                                   |
| 2/28/1976      | 8,609     |           | 8,609  | 15,929      |                                |              |                                   |
| 2/29/1980      | 8,990     |           | 8,990  | 18,901      |                                |              |                                   |
| 6/30/1983      | 9,359     |           | 9,359  | 24,104      |                                |              |                                   |
| 6/30/1985      | 9,596     |           | 9,596  | 26,229      |                                |              |                                   |
| 6/30/1986      | 10,084    |           | 10,084 | 27,523      | 4.9 %                          |              | 1.8 %                             |
| 6/30/1987      | 10,560    |           | 10,560 | 28,887      | 5.0 %                          |              | 3.7 %                             |
| 6/30/1988      | 10,727    |           | 10,727 | 31,784      | 10.0 %                         |              | 4.0 %                             |
| 6/30/1989      | 11,019    |           | 11,019 | 33,540      | 5.5 %                          |              | 5.2 %                             |
| 6/30/1990      | 11,539    |           | 11,539 | 35,702      | 6.4 %                          | 6.4 %        | 4.7 %                             |
| 6/30/1991      | 12,313    |           | 12,313 | 36,699      | 2.8 %                          | 5.9 %        | 4.7 %                             |
| 6/30/1992      | 12,308    |           | 12,308 | 36,356      | (0.9)%                         | 4.7 %        | 3.1 %                             |
| 6/30/1993      | 12,330    |           | 12,330 | 36,539      | 0.5 %                          | 2.8 %        | 3.0 %                             |
| 6/30/1994      | 12,873    |           | 12,873 | 37,365      | 2.3 %                          | 2.2 %        | 2.5 %                             |
| 6/30/1995      | 13,287    |           | 13,287 | 39,215      | 5.0 %                          | 1.9 %        | 3.0 %                             |
| 6/30/1996      | 13,110    |           | 13,110 | 40,508      | 3.3 %                          | 2.0 %        | 2.8 %                             |
| 6/30/1997      | 13,473    |           | 13,473 | 41,098      | 1.5 %                          | 2.5 %        | 2.3 %                             |
| 6/30/1998      | 13,806    |           | 13,806 | 42,210      | 2.7 %                          | 2.9 %        | 1.7 %                             |
| 6/30/1999      | 14,449    |           | 14,449 | 43,326      | 2.6 %                          | 3.0 %        | 2.0 %                             |
| 6/30/2000      | 15,050    |           | 15,050 | 45,112      | 4.1 %                          | 2.8 %        | 3.7 %                             |
| 6/30/2001      | 15,955    |           | 15,955 | 47,628      | 5.6 %                          | 3.3 %        | 3.2 %                             |
| 6/30/2002      | 15,363    | 711       | 16,074 | 48,635      | 2.1 %                          | 3.4 %        | 1.1 %                             |
| 6/30/2003      | 13,934    | 3,804     | 17,738 | 48,850      | 0.4 %                          | 3.0 %        | 2.1 %                             |
| 12/31/2004     | 11,856    | 6,864     | 18,720 | 52,234      | 6.9 %                          | 3.8 %        | 3.3 %                             |
| 12/31/2005     | 10,895    | 8,186     | 19,081 | 55,040      | 5.4 %                          | 4.1 %        | 3.4 %                             |
| 12/31/2006     | 10,065    | 9,306     | 19,371 | 57,396      | 4.3 %                          | 3.8 %        | 2.5 %                             |
| 12/31/2007     | 9,350     | 10,249    | 19,599 | 59,260      | 3.2 %                          | 4.0 %        | 4.1 %                             |
| 12/31/2008     | 8,791     | 10,940    | 19,731 | 61,383      | 3.6 %                          | 4.7 %        | 0.1 %                             |
| 12/31/2009     | 8,417     | 11,474    | 19,891 | 60,736      | (1.1)%                         | 3.1 %        | 2.7 %                             |
| 12/31/2010     | 7,900     | 12,241    | 20,141 | 59,148      | (2.6)%                         | 1.4 %        | 1.5 %                             |
| 12/31/2011     | 7,353     | 13,623    | 20,976 | 59,448      | 0.5 %                          | 0.7 %        | 3.0 %                             |
| 12/31/2012     | 6,801     | 14,718    | 21,519 | 60,297      | 1.4 %                          | 0.3 %        | 1.7 %                             |
| 12/31/2013     | 6,221     | 15,422    | 21,643 | 61,004      | 1.2 %                          | (0.1)%       | 1.5 %                             |
| 12/31/2014     | 5,754     | 15,598    | 21,352 | 62,774      | 2.9 %                          | 0.7 %        | 0.8 %                             |
| 12/31/2015     | 5,292     | 16,293    | 21,585 | 63,613      | 1.3 %                          | 1.5 %        | 0.7 %                             |
| 12/31/2016     | 4,892     | 16,856    | 21,748 | 66,056      | 3.8 %                          | 2.1 %        | 2.1 %                             |

# Persons in Valuations - Comparative Statement

## Retired Lives

| Valuation Date | Number | Average Annual Benefit | Total Benefits | Active Member Payroll | Total Benefits as % of Payroll |
|----------------|--------|------------------------|----------------|-----------------------|--------------------------------|
| 2/28/1974      | -      | -                      | -              | \$ 97,221,025         |                                |
| 2/28/1975      | 195    | \$ 3,463               | \$ 675,344     | 110,571,258           | 0.61%                          |
| 2/28/1976      | 456    | 3,270                  | 1,491,310      | 137,131,905           | 1.09%                          |
| 2/29/1980      | 1,012  | 4,238                  | 4,288,395      | 169,924,320           | 2.52%                          |
| 6/30/1983      | 1,448  | 5,136                  | 7,437,571      | 225,592,433           | 3.30%                          |
| 6/30/1985      | 1,823  | 6,220                  | 11,339,462     | 251,691,261           | 4.51%                          |
| 6/30/1986      | 2,047  | 6,614                  | 13,539,032     | 277,545,288           | 4.88%                          |
| 6/30/1987      | 2,232  | 7,007                  | 15,639,820     | 305,050,734           | 5.13%                          |
| 6/30/1988      | 2,425  | 7,629                  | 18,502,289     | 340,945,603           | 5.43%                          |
| 6/30/1989      | 2,679  | 8,671                  | 23,230,719     | 369,574,756           | 6.29%                          |
| 6/30/1990      | 2,932  | 9,354                  | 27,428,027     | 411,970,032           | 6.66%                          |
| 6/30/1991      | 3,209  | 10,146                 | 32,559,349     | 451,872,668           | 7.21%                          |
| 6/30/1992      | 3,311  | 10,960                 | 36,289,308     | 447,473,936           | 8.11%                          |
| 6/30/1993      | 3,486  | 11,307                 | 39,417,339     | 450,530,273           | 8.75%                          |
| 6/30/1994      | 3,775  | 11,285                 | 42,600,996     | 480,995,439           | 8.86%                          |
| 6/30/1995      | 3,927  | 11,529                 | 45,274,131     | 521,044,021           | 8.69%                          |
| 6/30/1996      | 4,225  | 11,843                 | 50,036,473     | 531,060,397           | 9.42%                          |
| 6/30/1997      | 4,478  | 11,908                 | 53,322,514     | 553,709,472           | 9.63%                          |
| 6/30/1998      | 4,773  | 12,156                 | 58,018,744     | 582,754,912           | 9.96%                          |
| 6/30/1999      | 5,113  | 12,383                 | 63,312,850     | 626,015,364           | 10.11%                         |
| 6/30/2000      | 5,344  | 13,201                 | 70,548,074     | 678,937,233           | 10.39%                         |
| 6/30/2001      | 5,766  | 13,167                 | 75,922,636     | 759,905,510           | 9.99%                          |
| 6/30/2002      | 6,375  | 13,645                 | 86,985,606     | 781,756,005           | 11.13%                         |
| 6/30/2003      | 6,729  | 14,493                 | 97,522,562     | 866,501,799           | 11.25%                         |
| 12/31/2004     | 7,430  | 14,767                 | 110,029,000    | 977,817,281           | 11.25%                         |
| 12/31/2005     | 7,710  | 15,077                 | 116,242,812    | 1,050,216,544         | 11.07%                         |
| 12/31/2006     | 8,029  | 15,370                 | 123,402,840    | 1,111,827,576         | 11.10%                         |
| 12/31/2007     | 8,354  | 15,598                 | 130,307,079    | 1,161,431,668         | 11.22%                         |
| 12/31/2008     | 8,595  | 15,631                 | 134,346,260    | 1,211,140,009         | 11.09%                         |
| 12/31/2009     | 8,772  | 15,697                 | 137,692,304    | 1,208,092,606         | 11.40%                         |
| 12/31/2010     | 9,081  | 15,677                 | 142,366,660    | 1,191,290,190         | 11.95%                         |
| 12/31/2011     | 9,467  | 15,707                 | 148,697,364    | 1,246,973,240         | 11.92%                         |
| 12/31/2012     | 9,788  | 15,594                 | 152,634,070    | 1,297,536,507         | 11.76%                         |
| 12/31/2013     | 10,156 | 15,193                 | 154,304,935    | 1,320,308,508         | 11.69%                         |
| 12/31/2014     | 10,524 | 14,893                 | 156,735,926    | 1,340,343,666         | 11.69%                         |
| 12/31/2015     | 10,937 | 14,649                 | 160,215,262    | 1,373,095,719         | 11.67%                         |
| 12/31/2016     | 11,367 | 14,356                 | 163,189,230    | 1,436,587,994         | 11.36%                         |

Total benefits as a % of payroll are much higher than total contributions as a % of payroll. This is an expected condition in a mature plan such as ERFC.

|                    | Average           |                 |               |                              |                   |
|--------------------|-------------------|-----------------|---------------|------------------------------|-------------------|
|                    | Age at Retirement | Monthly Benefit |               | Service Credit 2016 Retirees | Age 2016 Retirees |
|                    |                   | All Retirees    | 2016 Retirees |                              |                   |
| <i>ERFC Legacy</i> | 59.0              | \$1,264.24      | \$1,369.46    | 22.6                         | 62.5              |
| <i>ERFC 2001</i>   | 63.6              | 398.37          | 459.44        | 10.7                         | 64.5              |

**Original Benefit Formulas (Before July 1, 1988)  
Retirees and Beneficiaries December 31, 2016  
by Type of Benefit Being Paid**

| Type of Pension Being Paid   | No.        | Annual Amounts      |                      |                     |
|--|------------|---------------------|----------------------|---------------------|
|  |            | Payable for Life    | Temporary Supplement | Current Benefits    |
| Age and Service - Normal:  |            |                     |                      |                     |
| Straight Life  | 354        | \$ 6,654,185        |                      | \$ 6,654,185        |
| Optional Forms   | 15         | 318,885             |                      | 318,885             |
| Age and Service - Early:   |            |                     |                      |                     |
| Straight Life  | 272        | 3,472,783           | \$14,030             | 3,486,813           |
| Optional Forms   | 16         | 273,696             |                      | 273,696             |
| Age and Service Totals   | 657        | 10,719,549          | 14,030               | 10,733,579          |
| Duty Disability:   |            |                     |                      |                     |
| Straight Life  | 3          | 104,740             |                      | 104,740             |
| Non-Duty Disability  |            |                     |                      |                     |
| Straight Life  | 29         | 320,235             |                      | 320,235             |
| Age and Service Survivor<br>Beneficiary, Duty Death, and<br>Non-Duty Death | 42         | 452,364             |                      | 452,364             |
| Other Totals   | 74         | 877,339             |                      | 877,339             |
| <b>Total Benefits</b>  | <b>731</b> | <b>\$11,596,888</b> | <b>\$14,030</b>      | <b>\$11,610,918</b> |

**BENEFIT FORMULAS (EFFECTIVE JULY 1, 1988)**  
**Retirees and Beneficiaries December 31, 2016**  
**by Type of Benefit Being Paid**

| Type of Pension Being Paid   | No.           | Annual Amounts        |                      |                      |
|--|---------------|-----------------------|----------------------|----------------------|
|  |               | Payable for Life      | Temporary Supplement | Current Benefits     |
| Age and Service - Normal:  |               |                       |                      |                      |
| Straight Life  | 4,783         | \$ 71,943,828         | \$22,551,175         | \$ 94,495,003        |
| Optional Forms   | 770           | 10,826,271            | 4,086,196            | 14,912,467           |
| Age and Service - Early:   |               |                       |                      |                      |
| Straight Life  | 3,568         | 20,232,794            | 12,532,134           | 32,764,928           |
| Optional Forms   | 329           | 1,915,079             | 1,435,813            | 3,350,892            |
| Age and Service Totals   | 9,450         | 104,917,972           | 40,605,318           | 145,523,290          |
| Duty Disability:   |               |                       |                      |                      |
| Straight Life  | 13            | 52,001                |                      | 52,001               |
| Optional Forms   | 1             | 2,049                 |                      | 2,049                |
| Non-Duty Disability:   |               |                       |                      |                      |
| Straight Life  | 134           | 585,948               | 12,530               | 598,478              |
| Optional Forms   | 14            | 55,611                |                      | 55,611               |
| Age and Service Survivor<br>Beneficiary, Duty Death, and<br>Non-Duty Death | 133           | 876,709               | 210,804              | 1,087,513            |
| Other Totals   | 295           | 1,572,318             | 223,334              | 1,795,652            |
| <b>Total Benefits</b>  | <b>9,745*</b> | <b>\$106,490,290*</b> | <b>\$40,828,652</b>  | <b>\$147,318,942</b> |

\* Includes benefits split in DROs.

**Benefit Formulas (Effective July 1, 2001)  
 Retirees and Beneficiaries December 31, 2016  
 by Type of Benefit Being Paid**

| Type of Pension Being Paid   | No.        | Annual Amounts     |
|--|------------|--------------------|
| Age and Service - Normal:  |            |                    |
| Straight Life  | 734        | \$3,534,129        |
| Optional Forms   | 146        | 687,224            |
| Age and Service - Early:   |            |                    |
| Straight Life  |            |                    |
| Optional Forms   |            |                    |
| Age and Service Totals   | 880        | 4,221,353          |
| Duty Disability:   |            |                    |
| Straight Life  |            |                    |
| Optional Forms   |            |                    |
| Non-Duty Disability:   |            |                    |
| Straight Life  |            |                    |
| Optional Forms   |            |                    |
| Age and Service Survivor<br>Beneficiary, Duty Death, and<br>Non-Duty Death | 11         | 38,017             |
| Other Totals   | 11         | 38,017             |
| <b>Total Benefits</b>  | <b>891</b> | <b>\$4,259,370</b> |

**Original Benefit Formulas (Before July 1, 1988)  
 Retirees and Beneficiaries December 31, 2016  
 Current Annual Benefits - Tabulated by Attained Ages**

| <b>Attained<br/>Ages</b> | <b>No.</b> | <b>Annual<br/>Amount</b> |
|--------------------------|------------|--------------------------|
| 61                       | 1          | \$ 2,106                 |
| 62                       |            |                          |
| 63                       | 4          | 21,715                   |
| 64                       | 2          | 6,071                    |
| 65                       | 1          | 10,399                   |
| 66                       | 1          | 17,421                   |
| 67                       |            |                          |
| 68                       | 2          | 23,227                   |
| 69                       |            |                          |
| 70                       | 1          | 33,647                   |
| 71                       | 3          | 52,090                   |
| 72                       | 2          | 22,843                   |
| 73                       | 2          | 17,167                   |
| 74                       | 2          | 22,642                   |
| 75                       | 5          | 63,208                   |
| 76                       | 3          | 39,850                   |
| 77                       | 13         | 160,471                  |
| 78                       | 20         | 308,921                  |
| 79                       | 35         | 629,587                  |
| 80-84                    | 228        | 4,910,072                |
| 85-89                    | 209        | 3,511,133                |
| 90 & Up                  | 197        | 1,758,348                |
| <b>Total</b>             | <b>731</b> | <b>\$11,610,918</b>      |

**Benefit Formulas (Effective July 1, 1988)**  
**Retirees and Beneficiaries December 31, 2016**  
**Current Annual Benefits - Tabulated by Attained Ages**

| <b>Attained Ages</b> | <b>No.</b>   | <b>Annual Amount</b> |
|----------------------|--------------|----------------------|
| Under 40             | 2            | \$ 6,897             |
| 40-44                | 2            | 6,174                |
| 45                   | 3            | 22,896               |
| 46                   | 2            | 42,973               |
| 47                   | 3            | 15,141               |
| 48                   | 3            | 30,411               |
| 49                   | 3            | 23,672               |
| 50                   | 3            | 63,225               |
| 51                   | 8            | 193,030              |
| 52                   | 8            | 221,491              |
| 53                   | 20           | 441,920              |
| 54                   | 23           | 583,752              |
| 55                   | 63           | 1,253,095            |
| 56                   | 76           | 1,668,070            |
| 57                   | 104          | 2,592,906            |
| 58                   | 146          | 3,664,034            |
| 59                   | 185          | 4,717,998            |
| 60                   | 212          | 5,300,563            |
| 61                   | 273          | 6,539,786            |
| 62                   | 325          | 7,845,782            |
| 63                   | 337          | 8,321,809            |
| 64                   | 417          | 10,065,459           |
| 65                   | 490          | 11,209,856           |
| 66                   | 505          | 5,741,949            |
| 67                   | 549          | 5,966,482            |
| 68                   | 586          | 6,552,486            |
| 69                   | 663          | 7,537,496            |
| 70-74                | 2,363        | 27,691,328           |
| 75-79                | 1,400        | 17,532,917           |
| 80 & Up              | 971          | 11,465,344           |
| <b>Totals*</b>       | <b>9,745</b> | <b>\$147,318,942</b> |

\* Includes benefits split in DROs.

## ERFC 2001

### Retirees and Beneficiaries December 31, 2016 Current Annual Benefits - Tabulated by Attained Ages

| Attained Ages | No.        | Annual Amount      |
|---------------|------------|--------------------|
| 40-44         | 1          | \$ 2,799           |
| 46            | 1          | 3,552              |
| 49            | 1          | 3,258              |
| 59            | 1          | 1,927              |
| 60            | 50         | 242,160            |
| 61            | 48         | 221,638            |
| 62            | 73         | 404,411            |
| 63            | 69         | 326,896            |
| 64            | 63         | 288,101            |
| 65            | 75         | 356,370            |
| 66            | 93         | 480,077            |
| 67            | 85         | 441,575            |
| 68            | 81         | 374,093            |
| 69            | 73         | 339,472            |
| 70-74         | 150        | 673,802            |
| 75-79         | 19         | 73,266             |
| 80 & Up       | 8          | 25,973             |
| <b>Totals</b> | <b>891</b> | <b>\$4,259,370</b> |



**Original Benefit Formulas (Before July 1, 1988)  
Inactive Vested Members December 31, 2016  
Annual Deferred Benefits – Tabulated by Attained Ages**

| <b>Attained<br/>Ages</b> | <b>Number</b> | <b>Annual<br/>Amount</b> |
|--------------------------|---------------|--------------------------|
| 63                       | 2             | \$ 5,043                 |
| 64                       | 5             | 11,422                   |
| 65                       | 3             | 1,411                    |
| <b>Totals*</b>           | <b>10</b>     | <b>\$17,876</b>          |

\* In addition, there are 13 members whose accumulated contributions exceed the present value of their estimated future benefits. Liabilities for these members were set equal to their accumulated contributions.

**Benefit Formulas (Effective July 1, 1988)**  
**Inactive Vested Members December 31, 2016**  
**Annual Deferred Benefits – Tabulated by Attained Ages**

| <b>Attained Ages</b> | <b>Number</b> | <b>Annual Amount</b> |
|----------------------|---------------|----------------------|
| 37                   | 1             | \$ 1,884             |
| 38                   | 33            | 86,345               |
| 39                   | 53            | 129,632              |
| 40                   | 72            | 191,334              |
| 41                   | 71            | 180,263              |
| 42                   | 94            | 186,398              |
| 43                   | 98            | 241,463              |
| 44                   | 102           | 236,613              |
| 45                   | 114           | 318,556              |
| 46                   | 118           | 304,367              |
| 47                   | 105           | 290,810              |
| 48                   | 97            | 298,249              |
| 49                   | 91            | 253,096              |
| 50                   | 85            | 245,789              |
| 51                   | 80            | 227,973              |
| 52                   | 75            | 230,190              |
| 53                   | 78            | 299,868              |
| 54                   | 74            | 251,522              |
| 55                   | 40            | 149,619              |
| 56                   | 34            | 116,614              |
| 57                   | 32            | 110,994              |
| 58                   | 23            | 116,577              |
| 59                   | 32            | 138,378              |
| 60                   | 22            | 104,072              |
| 61                   | 24            | 114,300              |
| 62                   | 22            | 168,803              |
| 63                   | 25            | 189,233              |
| 64                   | 22            | 94,696               |
| 65 & Up              | 38            | 99,615               |
| <b>Totals</b>        | <b>1,755</b>  | <b>\$ 5,377,253</b>  |

## ERFC 2001

### Inactive Vested Members December 31, 2016 Annual Deferred Benefits – Tabulated by Attained Ages

| Attained Ages | Number       | Annual Amount       |
|---------------|--------------|---------------------|
| 26            | 1            | \$ 1,896            |
| 27            | 10           | 26,612              |
| 28            | 42           | 119,400             |
| 29            | 55           | 167,254             |
| 30            | 80           | 266,830             |
| 31            | 89           | 305,852             |
| 32            | 126          | 475,861             |
| 33            | 164          | 671,611             |
| 34            | 167          | 699,360             |
| 35            | 198          | 844,172             |
| 36            | 196          | 841,993             |
| 37            | 201          | 858,342             |
| 38            | 172          | 724,632             |
| 39            | 128          | 517,960             |
| 40            | 105          | 419,802             |
| 41            | 81           | 317,518             |
| 42            | 63           | 228,289             |
| 43            | 60           | 243,964             |
| 44            | 44           | 177,349             |
| 45            | 62           | 213,910             |
| 46            | 41           | 149,802             |
| 47            | 43           | 168,134             |
| 48            | 33           | 123,700             |
| 49            | 38           | 157,940             |
| 50            | 29           | 113,424             |
| 51            | 30           | 102,528             |
| 52            | 37           | 127,768             |
| 53            | 32           | 116,268             |
| 54            | 37           | 136,409             |
| 55            | 49           | 166,369             |
| 56            | 54           | 200,867             |
| 57            | 46           | 173,505             |
| 58            | 50           | 188,541             |
| 59            | 52           | 204,316             |
| 60            | 18           | 76,152              |
| 61            | 8            | 31,298              |
| 62            | 6            | 21,257              |
| 63            | 7            | 27,479              |
| 64            | 2            | 12,168              |
| 65 & Over     | 12           | 28,730              |
| <b>Totals</b> | <b>2,668</b> | <b>\$10,449,262</b> |

## **SECTION F**

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### **SUMMARY OF RISK MEASURES BASED ON MARKET VALUE OF ASSETS**

## Summary of Risk Measures Based on Market Value of Assets

| Actuarial Valuation Date | Funded Ratio | Annuitant Liabilities / AAL | AAL / Payroll | UAAL / Payroll | Market Value of Assets / Payroll | Portfolio Std Dev % of Payroll |
|--------------------------|--------------|-----------------------------|---------------|----------------|----------------------------------|--------------------------------|
| 12/31/14                 | 78.52 %      | 0.55                        | 2.04          | 0.44           | 1.60                             | 17 %                           |
| 12/31/15                 | 71.64 %      | 0.55                        | 2.10          | 0.59           | 1.50                             | 16 %                           |
| 12/31/16                 | 70.83 %      | 0.55                        | 2.11          | 0.62           | 1.50                             | 17 %                           |

Short-term fluctuations in the Risk Measures will occur due to experience, plan changes, and assumption and method changes. Long-term expectations are described below:

**Funded Ratio:** The funded ratio is expected to trend toward 100% by June 30, 2040 under the current 30-year amortization period.

**Annuitant Liabilities / AAL:** The ratio of annuitant (retiree) liabilities to total accrued liabilities gives an indication of the maturity of the system. As the ratio increases, cash flow needs increase, and liquidity needs of the portfolio change. A ratio on the order of 0.50 indicates a maturing system; a ratio approaching 1.00 indicates a closed system or another special situation.

**AAL / Payroll:** This ratio is expected to grow as the System matures.

**UAAL / Payroll:** The ratio of the unfunded actuarial accrued liability to payroll is expected to trend toward 0% by June 30, 2040.

**Market Value of Assets / Payroll:** As the funded ratio increases, this ratio is expected to converge to the ratio of AAL / Payroll.

**Portfolio Standard Deviation % of Payroll:** This measure illustrates the impact of a one standard deviation change in the investment return as a percent of payroll. Investment return experience other than expected ultimately affects the employer contribution rates. The higher the ratio of this risk metric, the greater the expected volatility in employer contribution rates. Absent changes in the investment policy, this metric is expected to increase as the assets grow to 100% of the AAL. As of December 31, 2016, this risk measure is calculated to be 17% (based on the ten-year annualized standard deviation times the Market Value of Assets divided by the active member payroll).

## **SECTION G**

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### **ACTUARIAL ASSUMPTIONS AND MISCELLANEOUS**

# Summary of Assumptions Used for ERFC Actuarial Valuation Assumptions Adopted by the Board of Trustees after Consulting with Actuary

**The actuarial assumptions used in making the valuation** are shown in this section of the report. Except as otherwise noted, the rationale for the assumptions for the December 31, 2016 actuarial valuation is based upon a study of experience during the period January 1, 2010 to December 31, 2014.

## Economic Assumptions

**The investment return rate** used in making the valuation was 7.25% per year, compounded annually (net of investment expenses). The real rate of return over wages or the “spread” is defined to be the portion of total investment return which is more than the wage inflation rate. Based upon an assumed wage inflation rate of 3.25%, the 7.25% investment return rate translates to an assumed real rate of return over wages of 4.00%. The assumed real return over prices would be higher.

**Pay increase assumptions** for individual active members are shown by years of service on page G-10. Part of the pay increase assumption is for merit and/or seniority increase, and the other 3.25% recognizes price inflation and real wage growth.

**Price Inflation:** No explicit price inflation assumption is needed for this valuation. However, the above assumptions would be consistent with a price inflation assumption around 2.75%.

**The number of active members** is assumed to continue at the present number.

**Total active member payroll** is assumed to increase 3.25% annually in the long term, which is the portion of the individual pay increase assumptions attributable to wage inflation. This assumed increase is recognized in the funding of unfunded actuarial accrued liabilities.

## Non-Economic Assumptions

**The mortality table** used to measure retired life mortality was 90% of the male rates and 79% of the female rates of the RP-2014 mortality Total Data Set Healthy Annuitant Mortality tables, adjusted for mortality improvement back to the base year of 2006. Mortality rates for a particular calendar year are determined by applying the fully generational MP-2016 Mortality Improvement scale to the above-described tables. Tables were extended below age 50 with a cubic spline to published Juvenile rates. Related values are shown on page G-6. The corresponding Disabled and Employee tables were used for disability and pre-retirement mortality, respectively; related values are shown on page G-8. These tables were first used in the December 31, 2016 valuation. The rationale for the mortality assumption is based on the 2010-2014 Experience Study issued November 10, 2015 and further analysis done in July 2017.

**The probabilities of retirement** for members eligible to retire are shown on page G-7.

**The probabilities of withdrawal** from service, **death-in-service** and **disability** are shown for sample ages on pages G-8 and G-9.

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**The individual entry age actuarial cost method of valuation** was used for determining actuarial accrued liabilities and normal cost. The method determines separate normal costs for *ERFC* and for *ERFC 2001* and blends the results together to produce the normal costs shown on page B-2. This means that in the long run, the normal cost will become the normal cost of ERFC 2001 Tier 2.

Unfunded actuarial accrued liabilities are amortized to produce contribution amounts (principal and interest) which are level percent-of-payroll contributions, assuming payroll grows at the rate indicated elsewhere in the report.

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**Present assets (cash and investments) are valued on a market-related basis effective June 30, 1986.**

Page D-3 provides specifics. A one-time adjustment toward market was made in connection with the 1990-93 experience study and an additional one-time adjustment set the funding value equal to the market value as of December 31, 2004. An 85% - 115% market value corridor was added in the December 31, 2005 valuation. This was adjusted to 75% - 125% in the December 31, 2008 valuation, as requested by the Board, and remains at that level.

**The data about persons now covered and about present assets** was furnished by the System's administrative staff. Although examined for general reasonableness, the data was not audited by the Actuary.

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The actuarial valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (MAAA).



Adopted: March 21, 2006  
Amended: May 28, 2009  
Amended: May 17, 2012  
Amended: June 27, 2013  
Amended: May 29, 2014

## **ERFC Regulations – Funding Policy and Employer Contribution Rate**

**(Applicable to ERFC and ERFC 2001)**

Pursuant to their authority under §15.03 of the *ERFC* Plan Document and §10.03 of the *ERFC 2001* Plan Document, the Trustees have adopted the following regulations governing determination of the Employer contribution rate and implementation of the funding policy pursuant to §§3.05 and 16.03 of the *ERFC* Plan Document and §§3.05 and 11.03 of the *ERFC 2001* Plan Document.

**16.03A Purpose of Regulations.** The funding policy of the Plan is stated in §16.03 of the *ERFC* Plan Document and §11.03 of the *ERFC 2001* Plan Document. That policy is “to establish and receive contributions which will remain approximately level from generation to generation of citizens and which, when combined with other assets and investment return thereon, will be sufficient to pay benefits when due, while providing a reasonable margin for adverse experience.” Section 3.05 in each Plan Document provides that the employer “shall contribute a percentage of each Member’s Salary, at a rate to be determined by the actuary in accordance with the funding policy set forth in [this Plan Document].” Within the broader context of the stated funding policy, the objectives of the Trustees are:

- (1) To make consistent progress toward 100% funding of the Plan and to maintain 100% funding once it has been attained;
- (2) To stabilize the Employer contribution rate and avoid sharp increases or decreases due to specific events or short-term conditions; and
- (3) To maintain the Plan’s funding in accordance with actuarial standards of practice that apply to public sector plans and with applicable federal, state, and local laws and regulations.

**16.03B Frequency of Actuarial Valuations.** The actuary shall prepare annual actuarial valuations based upon calendar-year data. Whenever possible, the valuation for a particular year should be presented to the Trustees within the first 120 days of the following calendar year.

**16.03C Schedule for Setting the Employer Contribution Rate.** The Trustees will determine the Employer contribution rate biennially, in consultation with the actuary, based upon the actuarial valuation for the most recently completed calendar year. The rate shall be set and communicated to the Employer at least 9 months in advance of the effective date so that it will be available for use in the Employer’s budgetary process. Each rate shall remain in effect for two consecutive fiscal years. For example, a rate will be set in accordance with this schedule based on the actuarial valuation as of December 31, 2013. It will become effective July 1, 2015, and will remain in effect through June 30, 2017.

**16.03D The Employer Contribution Rate.** The Employer contribution rate will be set at a level that is expected to:

- (1) pay all normal costs accruing under the Plan during the Fiscal Years for which the rate is effective; and
- (2) amortize any unfunded liabilities over a reasonable period.

**16.03E The Amortization Period for Unfunded Liabilities.** In the biennial determination of the Employer contribution rate, the amortization period for unfunded liabilities will be set within the parameters permitted by actuarial standards of practice that apply to public sector plans and by applicable federal, state, or local laws and regulations, and shall, if permitted, be based upon level percent of pay. If those standards, laws, and regulations and the other principles stated in Paragraphs 16.03A and 16.03D permit, the amortization period for unfunded liabilities shall be set with the objective that the Plan will be 100% funded by June 30, 2040. In conjunction with actuarial valuations dated December 31, 2019 and later, the Trustees may elect to create a new 20-year amortization schedule for unfunded liabilities arising during that valuation and subsequent valuations, and to continue the amortization of preexisting unfunded liabilities to their scheduled end date. In order to stabilize contributions, the Trustees may from time to time elect to combine separate amortization schedules into a single schedule over the average remaining amortization period being used. Unfunded liabilities associated with benefit changes or assumption changes shall be funded over a period not exceeding 10 years. However, unfunded liabilities arising in conjunction with early retirement incentive programs offered by the Employer after 2013 shall be separately funded over a period not exceeding five future years and shall not be subject to the combining of amortization schedules mentioned elsewhere in this Paragraph 16.03E.

**16.03F The Valuation of Plan Assets.** The actuarial value of Plan assets shall be determined as a 5-year smoothed market value of assets. The smoothing technique shall fully recognize the assumed return each year. It shall further spread the difference between the actual return and the assumed return in equal installments over the current year and four future years. In the event that the method would result in an actuarial value of assets that is less than 75% of market value or more than 125% of market value, the actuarial value of assets shall be reset to 75% of market value or 125% of market value, as the case may be, and the total difference between market and actuarial value shall be spread over four future years. Based upon consultation with the actuary, the Trustees may combine bases in order to reset the actuarial value to be equal to the market value when the difference between market value and actuarial value is 5% or less of market value.

**16.03G The Valuation of Plan Liabilities.** The actuarial liabilities of the Plan shall be determined using the entry age actuarial cost method, and an investment return assumption chosen by the Trustees in conjunction with the Plan actuary and investment consultant. The investment return assumptions shall be based upon the long term expected return on assets, although the Trustees may take other factors into account when determining this assumption. The Trustees shall also adopt other assumptions necessary for the valuation based upon the advice of the actuary and the judgment of the Trustees. The Trustees shall cause a study of actuarial experience under the Plan to be performed at least once in each five-year period and shall adjust all assumptions accordingly as deemed necessary for prudent operation of the Plan.

**16.03H Overfunding.** In the event that the Plan's assets exceed the Plan's liabilities, all amortization schedules other than those related to any post-2013 early retirement incentive programs offered by the Employer shall be considered completed, and the Employer contribution rate will be set based upon the normal cost and the completion of any remaining amortizations due to post-2013 early retirement incentive programs offered by the Employer, without regard to such overfunding. In such event, the Trustees shall review the Plan's asset allocation with a view toward de-risking the portfolio and potentially lowering the investment return assumption. Should such de-risking of the portfolio or future unfavorable experiences cause the unfunded liabilities to arise again, such liabilities shall be funded over a closed period of 20 future years, and shall otherwise be subject to the regulations set forth in Paragraph 16.03E.

# Single Life Retirement Values

## Mortality

| Future Life Expectancy (Years) |       |         |
|--------------------------------|-------|---------|
| Sample Ages<br>in 2016         | Males | Females |
| 55                             | 30.67 | 34.35   |
| 60                             | 26.07 | 29.50   |
| 65                             | 21.69 | 24.82   |
| 70                             | 17.54 | 20.34   |
| 75                             | 13.67 | 16.13   |
| 80                             | 10.21 | 12.32   |
| Ref:                           | 2135  | 2136    |

The corresponding Disabled and Employee tables were used for disability and pre-retirement mortality, respectively; related values are shown on page G-8.

## Probabilities of Retirement for Members Eligible to Retire

| Ages      | ERFC<br>(Hired Before 7/1/2001) |                 | ERFC 2001 Tier 1<br>(Hired 7/1/2001-6/30/2017) |         |               | ERFC 2001 Tier 2<br>(Hired On/After 7/1/2017) |        |
|-----------|---------------------------------|-----------------|--|---------|---------------|---|--------|
|           | Type of Retirement              |                 | Age Based                                      | Service | Service Based | Age Based                                     |        |
|           | Service                         | Reduced Service |  |         |               | Rule of 90 Met?                               |        |
|           |                                 |                 | Yes  | No      |               |   |        |
| 45        |                                 | 2.0%            |  |         |               |   |        |
| 46        |                                 | 2.0%            |  |         |               |   |        |
| 47        |                                 | 2.0%            |  |         |               |   |        |
| 48        |                                 | 2.0%            |  |         |               |   |        |
| 49        |                                 | 2.0%            |  |         |               |   |        |
| 50        |                                 | 2.0%            |  |         |               |   |        |
| 51        |                                 | 3.0%            |  |         |               |   |        |
| 52        |                                 | 6.0%            |  |         |               |   |        |
| 53        |                                 | 7.0%            |  |         |               |   |        |
| 54        |                                 | 8.0%            |  |         |               |   |        |
| 55        | 35.0%                           | 6.0%            | 17.5%  | 30      | 17.5%         |   |        |
| 56        | 35.0%                           | 4.0%            | 17.5%  | 31      | 17.5%         | 35.0%   | 0.0%   |
| 57        | 25.0%                           | 4.0%            | 12.5%  | 32      | 12.5%         | 35.0%   | 0.0%   |
| 58        | 25.0%                           | 4.0%            | 12.5%  | 33      | 12.5%         | 35.0%   | 0.0%   |
| 59        | 25.0%                           | 4.0%            | 12.5%  | 34      | 12.5%         | 35.0%   | 0.0%   |
| 60        | 25.0%                           | 7.0%            | 10.0%  | 35      | 10.0%         | 35.0% *                                       | 0.0%   |
| 61        | 30.0%                           | 8.0%            | 10.0%  | 36      | 10.0%         | 35.0%   | 0.0%   |
| 62        | 30.0%                           | 13.0%           | 10.0%  | 37      | 10.0%         | 35.0%   | 0.0%   |
| 63        | 30.0%                           | 13.0%           | 10.0%  | 38      | 25.0%         | 35.0%   | 0.0%   |
| 64        | 30.0%                           | 13.0%           | 20.0%  | 39      | 40.0%         | 35.0%   | 0.0%   |
| 65        | 30.0%                           |                 | 25.0%  | 40 & Up | 100.0%        | 35.0%   | 0.0%   |
| 66        | 30.0%                           |                 | 30.0%  |         |               | 35.0%   | 0.0%   |
| 67        | 25.0%                           |                 | 25.0%  |         |               | 35.0%   | 30.0%  |
| 68        | 25.0%                           |                 | 15.0%  |         |               | 35.0%   | 15.0%  |
| 69        | 20.0%                           |                 | 15.0%  |         |               | 35.0%   | 15.0%  |
| 70        | 20.0%                           |                 | 15.0%  |         |               | 35.0%   | 15.0%  |
| 71        | 20.0%                           |                 | 15.0%  |         |               | 35.0%   | 15.0%  |
| 72        | 20.0%                           |                 | 15.0%  |         |               | 35.0%   | 15.0%  |
| 73        | 30.0%                           |                 | 15.0%  |         |               | 35.0%   | 15.0%  |
| 74        | 30.0%                           |                 | 15.0%  |         |               | 35.0%   | 15.0%  |
| 75 & Over | 100.0%                          |                 | 100.0%   |         |               | 100.0%  | 100.0% |
| Ref:      | 2891                            | 2893            | 2892   |         | 2894          | 999   | 999    |

\* The probability is 60% at age 60 for people who first meet the Rule of 90 at age 60.

The age column index does not apply to the service based retirements. In ERFC 2001 Tier 1 an individual can retire at 30 years of service regardless of age. In ERFC 2001 Tier 2, an individual would be able to retire at FSSA with 5 years of service or when the sum of age and service is greater than or equal to 90. FSSA is assumed to be age 67 for members hired on/after July 1, 2017.

## Sample Rates of Separation from Active Employment Before Retirement

| Ages | % of Active Members<br>Dying or Becoming Disabled within Next Year |             |             |             |            |           |           |           |
|------|--|-------------|-------------|-------------|------------|-----------|-----------|-----------|
|      | Death*   |             |             |             | Disability |           |           |           |
|      | Ordinary   |             | Duty        |             | Ordinary   |           | Duty      |           |
|      | Men  | Women       | Men         | Women       | Men        | Women     | Men       | Women     |
| 25   | 0.0232%  | 0.0072%     | 0.0023%     | 0.0007%     | 0.0146%    | 0.0082%   | 0.0036%   | 0.0020%   |
| 30   | 0.0219%  | 0.0093%     | 0.0022%     | 0.0009%     | 0.0158%    | 0.0122%   | 0.0040%   | 0.0031%   |
| 35   | 0.0255%  | 0.0122%     | 0.0026%     | 0.0011%     | 0.0234%    | 0.0214%   | 0.0059%   | 0.0054%   |
| 40   | 0.0303%  | 0.0165%     | 0.0030%     | 0.0015%     | 0.0339%    | 0.0308%   | 0.0085%   | 0.0077%   |
| 45   | 0.0465%  | 0.0272%     | 0.0046%     | 0.0025%     | 0.0520%    | 0.0456%   | 0.0130%   | 0.0114%   |
| 50   | 0.0805%  | 0.0461%     | 0.0081%     | 0.0043%     | 0.0842%    | 0.0726%   | 0.0210%   | 0.0181%   |
| 55   | 0.1353%  | 0.0710%     | 0.0135%     | 0.0066%     | 0.1469%    | 0.1228%   | 0.0367%   | 0.0307%   |
| 60   | 0.2303%  | 0.1027%     | 0.0230%     | 0.0096%     | 0.2447%    | 0.1770%   | 0.0612%   | 0.0443%   |
| Ref: | 0.50 x 2133  | 0.43 x 2134 | 0.05 x 2133 | 0.04 x 2134 |            |           |           |           |
|      | sb 0   | sb 0        | sb 0        | sb 0        | 0.08 x 16  | 0.08 x 17 | 0.02 x 16 | 0.02 x 17 |

\* Applicable to calendar year 2016 . Rates in future years are determined by the MP-2016 projection scale.

## Sample Rates of Separation from Active Employment Before Retirement

| Service | % of Active Participants |         |
|---------|--------------------------|---------|
|         | Withdrawing              |         |
|         | Males                    | Females |
| 0 - 1   | 13%                      | 15%     |
| 1 - 2   | 12%                      | 14%     |
| 2 - 3   | 11%                      | 13%     |
| 3 - 4   | 9%                       | 11%     |
| 4 - 5   | 7%                       | 9%      |
| 5 - 6   | 6%                       | 9%      |
| 6 - 7   | 5%                       | 9%      |
| 7 - 8   | 4%                       | 9%      |
| 8 - 9   | 4%                       | 6%      |
| 9 - 10  | 4%                       | 5%      |
| 10 - 11 | 4%                       | 5%      |
| 11 - 12 | 3%                       | 4%      |
| 12 - 13 | 3%                       | 4%      |
| 13 - 14 | 3%                       | 3%      |
| 14 - 15 | 2%                       | 3%      |
| 15 - 16 | 2%                       | 3%      |
| 16 - 17 | 1%                       | 3%      |
| 17 - 18 | 1%                       | 2%      |
| 18 - 19 | 1%                       | 2%      |
| 19 - 20 | 1%                       | 2%      |
| 20 - 21 | 1%                       | 2%      |
| 21 - 22 | 1%                       | 2%      |
| 22 - 23 | 1%                       | 2%      |
| 23 - 24 | 1%                       | 2%      |
| 24 - 25 | 1%                       | 2%      |
| Ref:    | 1671                     | 1672    |

In addition, forfeiture occurs when a vested person separates from service and withdraws contributions thereby forfeiting future rights to an employer financed benefit. The total probability of forfeiture is obtained by multiplying the probability of withdrawal above by 10%. Forfeiture rates do not apply to individuals who are eligible for retirement at time of termination.

## Sample Pay Increase Assumptions for an Individual Member

| <b>Pay Increase Assumption</b> |                              |                       |                           |
|--------------------------------|------------------------------|-----------------------|---------------------------|
| <b>Service Index</b>           | <b>Merit &amp; Seniority</b> | <b>Base (Economy)</b> | <b>Increase Next Year</b> |
| 1                              | 5.80%                        | 3.25%                 | 9.05%                     |
| 2                              | 4.00%                        | 3.25%                 | 7.25%                     |
| 3                              | 3.30%                        | 3.25%                 | 6.55%                     |
| 4                              | 3.10%                        | 3.25%                 | 6.35%                     |
| 5                              | 2.50%                        | 3.25%                 | 5.75%                     |
| 6                              | 2.40%                        | 3.25%                 | 5.65%                     |
| 7                              | 2.30%                        | 3.25%                 | 5.55%                     |
| 8                              | 1.70%                        | 3.25%                 | 4.95%                     |
| 9                              | 1.60%                        | 3.25%                 | 4.85%                     |
| 10                             | 1.40%                        | 3.25%                 | 4.65%                     |
| 11                             | 1.40%                        | 3.25%                 | 4.65%                     |
| 12                             | 1.40%                        | 3.25%                 | 4.65%                     |
| 13                             | 1.40%                        | 3.25%                 | 4.65%                     |
| 14                             | 1.40%                        | 3.25%                 | 4.65%                     |
| 15                             | 0.90%                        | 3.25%                 | 4.15%                     |
| 16                             | 0.80%                        | 3.25%                 | 4.05%                     |
| 17                             | 0.70%                        | 3.25%                 | 3.95%                     |
| 18                             | 0.50%                        | 3.25%                 | 3.75%                     |
| 19                             | 0.50%                        | 3.25%                 | 3.75%                     |
| 20                             | 0.40%                        | 3.25%                 | 3.65%                     |
| 21                             | 0.30%                        | 3.25%                 | 3.55%                     |
| 22                             | 0.20%                        | 3.25%                 | 3.45%                     |
| 23                             | 0.20%                        | 3.25%                 | 3.45%                     |
| 24                             | 0.20%                        | 3.25%                 | 3.45%                     |
| 25                             | 0.00%                        | 3.25%                 | 3.25%                     |
| Ref:                           | 739                          | 3.25%                 |                           |

These rates were first used in the December 31, 2016 valuation. The rationale for the salary assumption is based on the 2010-2014 Experience Study issued November 10, 2015 and further analysis in July 2017.



# Investment Return and Inflation: Past and Future

## Inflation Distortions

Inflation's impact on investment return is not uniform from year to year. A common expectation for real investment return (which is the portion of total return remaining after price inflation) is in the area of 3% to 5% annually.

## Historical Economic Data

Over the last 30 years, real return on average has exceeded the 3% to 5% range. However, for parts of this period, real return was actually negative. It is difficult to maintain a long-term portfolio allocation during periods of negative real return.

**Annual Investment Return % (including Income) expressed as  
Real Return (Remainder after Price Inflation)**

| No. Years<br>Ended<br>December | Inflation<br>(CPI) | Cash<br>Equiv.<br>(T-Bills) | Bonds (Long Term) |                          | Stocks<br>(S & P 500) | Real Return for Sample Fund |            |            |
|--------------------------------|--------------------|-----------------------------|-------------------|--------------------------|-----------------------|-----------------------------|------------|------------|
|                                |                    |                             | US<br>Treasury    | Corporate<br>(Sol. Bro.) |                       | A                           | B          | C          |
| 1/2012                         | 1.7                | (1.6)                       | 1.6               | 8.8                      | 14.1                  | 7.2                         | 8.9        | 10.4       |
| 1/2013                         | 1.5                | (1.5)                       | (12.7)            | (8.5)                    | 30.4                  | 2.7                         | 10.8       | 17.1       |
| 1/2014                         | 0.8                | (0.8)                       | 22.9              | 16.4                     | 12.8                  | 15.6                        | 14.2       | 13.0       |
| 1/2015                         | 0.7                | (0.2)                       | (2.0)             | (5.5)                    | 0.7                   | (2.0)                       | (1.2)      | (0.6)      |
| 1/2016                         | 2.1                | (1.0)                       | (0.9)             | 8.7                      | 9.9                   | 5.2                         | 6.4        | 7.5        |
| 5/1985                         | 4.8                | 5.2                         | 11.5              | 12.3                     | 9.4                   | 10.7                        | 10.2       | 9.8        |
| 5/1990                         | 4.1                | 2.6                         | 6.4               | 6.1                      | 8.6                   | 6.7                         | 7.2        | 7.6        |
| 5/1995                         | 2.8                | 1.5                         | 10.0              | 9.1                      | 13.4                  | 10.0                        | 10.8       | 11.3       |
| 5/2000                         | 2.5                | 2.6                         | 4.9               | 3.2                      | 15.4                  | 7.7                         | 10.0       | 11.7       |
| 5/2005                         | 2.5                | (0.4)                       | 5.1               | 6.6                      | (2.0)                 | 3.4                         | 2.0        | 0.7        |
| 5/2010                         | 2.2                | 0.0                         | 3.3               | 3.6                      | 0.1                   | 3.1                         | 2.6        | 2.0        |
| 5/2015                         | 1.5                | (1.4)                       | 5.9               | 4.7                      | 10.9                  | 6.8                         | 7.9        | 8.6        |
| 5/2016                         | 1.4                | (0.9)                       | 1.1               | 3.5                      | 13.3                  | 5.6                         | 7.7        | 9.4        |
| <b>30/2016</b>                 | <b>2.6</b>         | <b>0.7</b>                  | <b>5.3</b>        | <b>5.4</b>               | <b>7.6</b>            | <b>6.0</b>                  | <b>6.5</b> | <b>6.8</b> |

**Sample Funds** (only three of many reasonable samples)

|                      | A    | B    | C    |
|----------------------|------|------|------|
| Cash Equiv.: T-Bills | 10 % | 10 % | 10 % |
| Bonds: US Treasury   | 30   | 20   | 10   |
| Bonds: Corporate     | 30   | 20   | 15   |
| Stock                | 30   | 50   | 65   |

For many pension plans, benefit increases after retirement have fallen short of keeping up with inflation. The retired life group has been affected more than the active life group. The investment return that would be necessary for the indexing of benefits with inflation after retirement probably cannot be realized during periods of high inflation.

## Forward-Looking Economic Data

The assumed rate of price inflation should not give undue weight to recent experience. Some historical economic data may not be appropriate for use in developing assumptions for future periods due to changes in the underlying economic environment. Professional forecasters, economists, and investors are reliable sources to guide in the selection and evaluation of expected future price inflation rates.

## Investment Return and Inflation: Past and Future – Concluded

The Survey of Professional Forecasters, maintained by the Federal Reserve Bank of Philadelphia, is the longest running quarterly survey of macroeconomic forecasts in the U.S. Over 50 forecasters from industry, government, banking, and academics are included in this Survey. With respect to price inflation, their median projections are published quarterly for the annual-average Headline CPI over the next 10 years. Headline CPI is the total CPI, as opposed to Core CPI, which excludes food and energy prices. The following table presents the Survey's quarterly projections through the third quarter of 2017.

**Quarterly Median Projections of the 10-Year Annual-Average Headline CPI-U Inflation (Philadelphia Federal Reserve)**

| 2014-4 | 2015-1 | 2015-2 | 2015-3 | 2015-4 | 2016-1 | 2016-2 | 2016-3 | 2016-4 | 2017-1 | 2017-2 | 2017-3 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 2.20%  | 2.10%  | 2.14%  | 2.15%  | 2.15%  | 2.12%  | 2.20%  | 2.15%  | 2.22%  | 2.30%  | 2.30%  | 2.35%  |

Source: Federal Reserve Bank of Philadelphia – Survey of Professional Forecasters Quarterly (Inflation.xlsx)

The Congressional Budget Office (CBO) regularly publishes its Budget and Economic Outlook. This report includes a forecast of annual CPI-U (All Urban Consumers). The following table presents the CBO's forecast for calendar years 2017 – 2027, as published in its report dated January, 2017.

**Consumer Price Index Forecast (CBO)**

| 2017  | 2018  | 2019  | 2020  | 2021  | 2022  | 2023  | 2024  | 2025  | 2026  | 2027  | Compound Average |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------|
| 2.30% | 2.30% | 2.40% | 2.40% | 2.40% | 2.40% | 2.40% | 2.40% | 2.40% | 2.40% | 2.40% | 2.38%            |

Source: Congressional Budget Office – The Budget and Economic Outlook: 2017 – 2027, Table 2-1 (p. 40)

The Trustees of the Social Security system prepare and publish an annual report. Social Security's economists develop a forecast of future CPI-W (for Urban Wage Earners and Clerical Workers). The following table presents their forecasts in the 2016 annual report.

**Social Security Trustees'  
Ultimate CPI-W Assumption for  
2019 and later**

|              |       |
|--------------|-------|
| Low-cost     | 3.20% |
| Intermediate | 2.60% |
| High-cost    | 2.00% |

Source: 2016 Social Security Trustees' Report (p. 9)

Another source of information about future price inflation is the market for U.S. Treasury bonds. Comparing spreads between nominal and inflation-indexed treasury securities (TIPS) provides an estimate of the bond market's expectation of inflation over the next decade or more. However, this analysis ignores the inflation risk premium that buyers of U.S. Treasury bonds often demand, and it ignores the differences in liquidity between U.S. Treasury bonds and TIPS.

**Treasury Constant Maturities (2016 Annual Yields)**

| Term    | Nominal | Inflation-Indexed | Implied Inflation |
|---------|---------|-------------------|-------------------|
| 10-year | 1.84%   | 0.27%             | 1.57%             |
| 20-year | 2.22%   | 0.65%             | 1.57%             |
| 30-year | 2.59%   | 0.86%             | 1.73%             |

Source: Board of Governors of the Federal Reserve System, Selected Interest Rates (Daily) – H.15

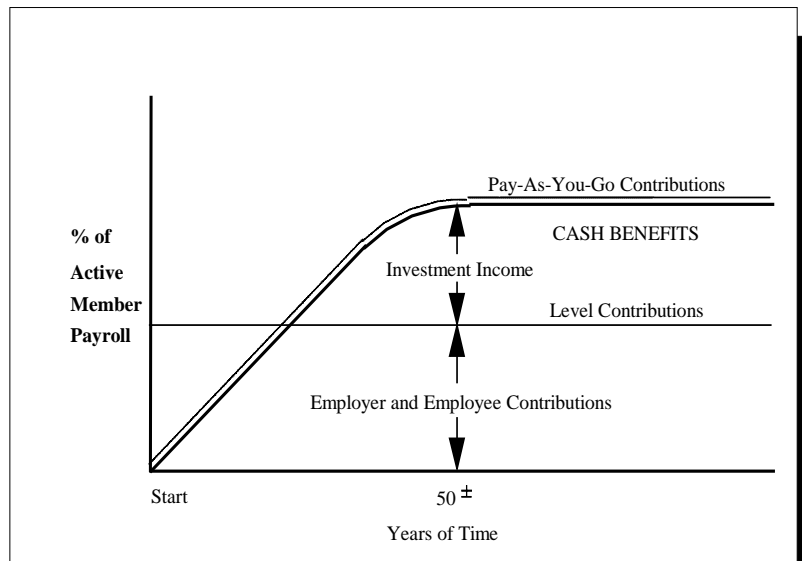
# Selection of Assumptions Used in Actuarial Valuations

## Economic Assumptions

Investment return  
Pay increases to individual employees:  
the portion for economic changes  
Active member group size and  
total payroll growth

## Demographic Assumptions

Actual ages at service retirement  
Pay increases to individual members:  
the portion for merit & seniority  
Disability while actively employed  
Separations before retirement  
Mortality after retirement  
Mortality before retirement



## Relationship Between Plan Governing Body and the Actuary

The actuary should have the primary responsibility for choosing the **demographic** assumptions used in the actuarial valuation, making use of specialized training and experience.

The actuary and other professionals can provide guidance concerning the choice of suitable economic assumptions, but the basis of the economic assumptions is the assumed rate of **inflation**, a quantity which defies accurate prediction. Given an assumed rate of future inflation, it is very important that this rate be applied in a consistent manner in deriving the assumed rate of investment return, the economic portion of the assumption on pay increases to individual employees, and the assumed rate of growth of active member payroll. Consistent application of assumptions is an area in which the actuary has specialized training.

A sound procedure is that the actuary suggests reasonable alternatives for economic assumptions, followed by discussion involving the actuary, the Plan Governing Body, and other professionals, and the Plan Governing Body then makes a final choice from the various alternatives.

## Definitions of Technical Terms

**Accrued Service.** Service credited under the system which was rendered before the date of the actuarial valuation.

**Actuarial Accrued Liability.** The difference between the actuarial present value of system benefits and the actuarial present value of future normal costs. Also referred to as “past service liability.”

**Actuarial Assumptions.** Estimates of future experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment return and pay increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (pay increases and investment return) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

**Actuarial Cost Method.** A mathematical budgeting procedure for allocating the dollar amount of the “actuarial present value of future benefits” between future normal costs and actuarial accrued liability. Sometimes referred to as the “actuarial funding method.”

**Actuarial Equivalent.** One series of payments is said to be actuarially equivalent to another series of payments if the two series have the same actuarial present value.

**Actuarial Gain (Loss).** The difference between actual unfunded actuarial accrued liabilities and anticipated unfunded actuarial accrued liabilities -- during the period between two valuation dates. It is a measurement of the difference between actual and expected experience.

**Actuarial Present Value.** The single sum now which is equal to a payment or series of payments in the future. It is determined by discounting future payments at predetermined rates of interest, and by probabilities of payment.

**Actuary.** A person who is trained in the application of probability and compound interest to problems in business and finance that involve payment of money in the future, contingent upon the occurrence of future events. Most actuaries in the United States are Members of the American Academy of Actuaries. The Society of Actuaries is an international research, education and membership organization for actuaries in the life and health insurance, employee benefits, and pension fields. It administers a series of examinations leading initially to Associateship and the designation ASA. and ultimately to Fellowship with the designation FSA.

**Amortization.** Paying off an interest bearing liability with periodic payments as opposed to paying it off with a single sum payment.

**Normal Cost.** The portion of the actuarial present value of future benefits that is assigned to the current year by the actuarial cost method. Sometimes referred to as “current cost.”

**Unfunded Actuarial Accrued Liabilities.** The difference between actuarial accrued liabilities and valuation assets. Sometimes referred to as “unfunded past service liability” or simply as “unfunded liability.”

**Valuation Assets.** The value of plan assets recognized for valuation purposes. This may not be the same value that is used by the plan for financial reporting.

## Miscellaneous and Technical Assumptions

|  |   |
|--|---|
| <b>Marriage Assumption:</b>  | 100% of males and 100% of females are assumed to be married for purposes of death-in-service benefits. Male spouses are assumed to be three years older than female spouses.  |
| <b>Pay Increase Timing:</b>  | Nine months after the valuation date (October 1 <sup>st</sup> ).  |
| <b>Decrement Timing:</b>   | Decrements of all types are assumed to occur mid-year.  |
| <b>Eligibility Testing:</b>  | Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.  |
| <b>COLA Assumption:</b>  | Members hired prior to July 1, 2017: 3% (actual COLA).<br>Members hired on/after July 1, 2017: 2.59% (long-term estimate of provision of 100% of CPI-U capped at 4%; see GRS letter dated November 22, 2016).   |
| <b>Benefit Commencement for Terminated Vested Members:</b>           | At plan commencement age provided in terminated vested member data.   |
| <b>Adjustments:</b>  | For members hired prior to July 1, 2001 computed liabilities and normal costs are increased by 3.25% to reflect service credit for unused sick leave that may be granted at retirement.<br><br>Computed liabilities and normal costs for Normal and Early retirement are reduced by 1% to reflect a “negative subsidy” in the Plan Document option factors.<br><br>To account for administrative expenses, 0.27% of pay was added to the otherwise computed normal cost. This amount will be adjusted each year based on actual administrative expenses during the year and pay as of the valuation date. |
| <b>Decrement Relativity:</b>   | Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.   |
| <b>Decrement Operation:</b>  | Disability, mortality and turnover do not operate during retirement eligibility.  |
| <b>Incidence of Contributions:</b>                                   | Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.   |
| <b>Normal Form of Benefit:</b>                                       | The assumed normal form of benefit is the straight life form.   |
| <b>Benefit Service:</b>  | Exact Fractional Service is used to determine the amount of benefit payable.  |
| <b>Actuarial Equivalent Factors (as of the date of this report):</b> | The interest rate is 7.25% for the Option D form of payment. For Small Pension payouts the interest rate is the lesser of 7.25% or the rate for 20-year Treasury Notes raised to the next highest integer, as of the December 1 <sup>st</sup> preceding the Calendar year of retirement. Mortality is based upon a 20% unisex blend of the RP-2014 Total Data Set Healthy Annuitant Mortality Table.  |