

December 4, 2017

Board of Trustees  
Kentucky Retirement Systems  
Perimeter Park West  
1260 Louisville Road  
Frankfort, KY 40601

**Subject: Certification of the June 30, 2017 Actuarial Valuation Results**

Dear Trustees of the Board:

Enclosed are the June 30, 2017 actuarial valuation reports for the Kentucky Employees Retirement System (KERS), the County Employees Retirement System (CERS), and the State Police Retirement System (SPRS). These reports provide the current actuarial and financial condition of the Kentucky Retirement Systems (KRS), as well as communicate the actuarially determined employer contribution rates.

Under Kentucky Statute, the Board of Trustees must approve the employer contribution rates. For KERS and CERS, these certified contribution rates will be effective for the two-year period beginning July 1, 2018 and ending June 30, 2020. The certified contribution rates for CERS will be effective for the fiscal year beginning July 1, 2018 and ending June 30, 2019.

These contribution rates are calculated based on the membership data and plan assets as of June 30, 2017. These calculations are also based on the benefit provisions in effect as of June 30, 2017. If new legislation is enacted between the valuation date and the date the contribution rates become effective, the Board may adjust the calculated rates to reflect this new legislation. Such adjustments are based on information supplied by the actuary.

**FINANCING OBJECTIVES AND FUNDING POLICY**

KRS administers a pension and health insurance fund to provide for monthly retirement income and retiree health insurance benefits. The total employer contribution rate is comprised of a contribution to each respective fund.

The contribution rate for each fund consists of a normal cost that is net of employee contributions and an amortization payment on the unfunded actuarial accrued liability (UAAL). In accordance with Section 61.565 of Kentucky Statute, the amortization payment is based on a closed thirty-year amortization period beginning July 1, 2013. As a result, the amortization period used in the 2017 actuarial valuation is 26 years. The amortization period used in subsequent actuarial valuations will decrease by one each future year.

Due to changes in certain economic assumptions adopted by the Board for use in the June 30, 2017 actuarial valuation, the contribution rates for the retirement and health insurance funds have sustainably increased from those in currently in effect. However, the contribution rates determined under these new assumptions are more likely to remain stable, as a percentage of payroll in future years (absent benefit improvements and experience losses).

**PROGRESS TOWARDS REALIZATION OF FUNDING OBJECTIVES**

One way to measure the progress towards achieving the intended funding objective is to measure the relationship between the actuarial value of assets and the actuarial accrued liabilities for each fund. This relationship is referred to as the funded ratio and should increase over time (absence of benefit improvements) with the goal of attaining 100%.

The funded ratio as June 30, 2016 for the retirement and health insurance funds of each System are as follows:

| System             | Funded Ratio (AVA / AAL) |                       |
|--------------------|--------------------------|-----------------------|
|                    | Retirement Fund          | Health Insurance Fund |
| KERS Non-Hazardous | 13.6%                    | 30.7%                 |
| KERS Hazardous     | 54.1%                    | 117.6%                |
| CERS Non-Hazardous | 52.8%                    | 66.4%                 |
| CERS Hazardous     | 48.1%                    | 66.9%                 |
| SPRS               | 27.0%                    | 65.2%                 |

The funding levels for the retirement funds have decreased since the prior year primarily due to the decrease in the assumed rate of return assumption (discussed in more detail later) for use in the June 30, 2017 actuarial valuation. The future improvement of the financial health of these systems will be very dependent on the employers paying the actuarially determined contribution rates in all future years.

In particular, during the last fiscal year KERS non-hazardous pension fund distributed \$960 million in benefit payments and received \$858 million in employer and employee contributions (excluding contributions to the 401(h)). As of June 30, 2017, the market value of assets for this system was \$2,057 million (excluding assets in the 401(h)). To stabilize the financial condition of this system and reduce the likelihood that plan assets will become exhausted, it is imperative that contributions to the system exceed the benefit payments. The employer contribution rate to the retirement fund that is documented in the KERS is projected increase the total employer and member contributions to \$1,164 million for each of the next two fiscal years (i.e. FY 2018-19 and FY 2019-20). If these employer contributions are not made to this system, then the financial condition of this retirement system is expected to continue to deteriorate and there will be a significant risk of plan assets being exhausted.

#### **ASSUMPTIONS AND METHODS**

Kentucky Statutes requires that an actuarial investigation be performed at least every five years to review the economic and demographic assumptions. An experience study was conducted as of June 30, 2013 and the next experience study will be conducted as of June 30, 2018. However, the Board has the authority to review the assumptions on a more frequent basis and adopt new assumptions prior to the next scheduled experience study.

Since the last actuarial valuation the Board adopted changes to certain economic assumptions for KERS, CERS and SPRS. Specifically, the Board decreased the price inflation assumption to 2.30% for all funds. The assumed rate of return was decreased to 5.25% for the KERS non-hazardous retirement fund and the SPRS retirement fund. The assumed rate of return was decreased to 6.25% for the KERS hazardous retirement fund, CERS (non-hazardous and hazardous) retirement funds, and all the insurance funds for KERS, CERS, and SPRS. Furthermore, the Board decreased the payroll growth assumption to 2.00% for all the CERS funds (retirement and health insurance) and adopted a 0.00% payroll growth assumption for calculating the amortization payment for all the KERS and SPRS funds (retirement and health insurance).

It is our opinion that the current assumptions are internally consistent and reasonably reflect the anticipated future experience of the System.

The results of the actuarial valuation are dependent on the actuarial assumptions used. Actual results can, and almost certainly will, differ as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rate, and funding periods. The actuarial calculations are intended to provide information for rational decision making.

#### **BENEFIT PROVISIONS**

The benefit provisions reflected in this valuation are those which were in effect on June 30, 2017. There were no legislative changes enacted since the previous valuation that had a measurable effect on the current valuation.

#### **DATA**

Member data for retired, active and inactive members was supplied as of June 30, 2017, by the KRS staff. The staff also supplied asset information as of June 30, 2017. We did not audit this data, but we did apply a number of tests to the data, and we concluded that it was reasonable and consistent with the prior year's data. GRS is not responsible for the accuracy or completeness of the information provided to us by KRS.

**CERTIFICATION**

We certify that the information presented herein is accurate and fairly portrays the actuarial position of KERS as of June 30, 2017. All of our work conforms with generally accepted actuarial principles and practices, and is in conformity with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of Kentucky Code of Laws and, where applicable, the Internal Revenue Code, ERISA, and the Statements of the Governmental Accounting Standards Board.

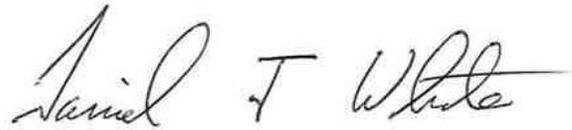
The undersigned are independent actuaries and consultants. Mr. Newton and Mr. White are Enrolled Actuaries. All three of the undersigned are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries. All of the undersigned are experienced in performing valuations for large public retirement systems.

Sincerely,

**Gabriel, Roeder, Smith & Co.**



Joseph P. Newton, FSA, MAAA, EA  
Senior Consultant



Daniel J. White, FSA, MAAA, EA  
Senior Consultant



Jamie Shaw, ASA, MAAA  
Consultant

**Summary of June 30, 2017 Actuarial Valuation Results**

|  | KERS<br>Non-Hazardous | KERS<br>Hazardous | CERS<br>Non-Hazardous | CERS<br>Hazardous | SPRS          |
|--|-----------------------|-------------------|-----------------------|-------------------|---------------|
| <b>Contributions for next fiscal year:</b>     |                       |                   |                       |                   |               |
| Pension Fund Contribution                      | 71.03%                | 34.39%            | 21.84%                | 35.69%            | 119.05%       |
| Insurance Fund Contribution                    | <u>12.40%</u>         | <u>2.46%</u>      | <u>6.21%</u>          | <u>12.17%</u>     | <u>27.23%</u> |
| Total Recommended Employer Contribution        | 83.43%                | 36.85%            | 28.05%                | 47.86%            | 146.28%       |
| <b>Assets:</b>                                 |                       |                   |                       |                   |               |
| Retirement                                     |                       |                   |                       |                   |               |
| • Actuarial value (AVAR)                       | \$2,123,623,157       | \$607,158,871     | \$6,764,873,113       | \$2,238,320,330   | \$261,320,225 |
| • Market value (MVAR)                          | \$2,056,869,899       | \$601,528,922     | \$6,687,237,095       | \$2,217,996,136   | \$255,736,583 |
| • Ratio of actuarial to market value of assets | 103.2%                | 100.9%            | 101.2%                | 100.9%            | 102.2%        |
| Insurance                                      |                       |                   |                       |                   |               |
| • Actuarial value (AVAI)                       | \$823,917,560         | \$493,458,367     | \$2,227,401,268       | \$1,196,779,877   | \$180,463,820 |
| • Market value (MVAI)                          | \$817,369,841         | \$488,838,463     | \$2,212,535,662       | \$1,189,001,387   | \$178,838,260 |
| • Ratio of actuarial to market value of assets | 100.8%                | 100.9%            | 100.7%                | 100.7%            | 100.9%        |
| <b>Funded Status:</b>                          |                       |                   |                       |                   |               |
| Retirement                                     |                       |                   |                       |                   |               |
| • Actuarial accrued liability                  | \$15,591,641,083      | \$1,121,419,836   | \$12,803,509,449      | \$4,649,046,764   | \$967,144,667 |
| • Unfunded accrued liability on AVAR           | \$13,468,017,926      | \$514,260,965     | \$6,038,636,336       | \$2,410,726,434   | \$705,824,442 |
| • Funded ratio on AVAR                         | 13.6%                 | 54.1%             | 52.8%                 | 48.1%             | 27.0%         |
| • Unfunded accrued liability on MVAR           | \$13,534,771,184      | \$519,890,914     | \$6,116,272,354       | \$2,431,050,628   | \$711,408,084 |
| • Funded ratio on MVAR                         | 13.2%                 | 53.6%             | 52.2%                 | 47.7%             | 26.4%         |
| Insurance                                      |                       |                   |                       |                   |               |
| • Actuarial accrued liability                  | \$2,683,496,055       | \$419,439,652     | \$3,355,151,286       | \$1,788,432,768   | \$276,641,361 |
| • Unfunded accrued liability on AVAI           | \$1,859,578,495       | (\$74,018,715)    | \$1,127,750,018       | \$591,652,891     | \$96,177,541  |
| • Funded ratio on AVAI                         | 30.7%                 | 117.6%            | 66.4%                 | 66.9%             | 65.2%         |
| • Unfunded accrued liability on MVAI           | \$1,866,126,214       | (\$69,398,811)    | \$1,142,615,624       | \$599,431,381     | \$97,803,101  |
| • Funded ratio on MVAI                         | 30.5%                 | 116.5%            | 65.9%                 | 66.5%             | 64.6%         |
| <b>Membership:</b>                             |                       |                   |                       |                   |               |
| • Number of                                    |                       |                   |                       |                   |               |
| - Active Members                               | 37,234                | 4,047             | 82,198                | 9,495             | 903           |
| - Retirees and Beneficiaries                   | 44,916                | 4,093             | 59,013                | 8,998             | 1,536         |
| - Inactive Members                             | <u>49,658</u>         | <u>5,298</u>      | <u>85,031</u>         | <u>3,198</u>      | <u>480</u>    |
| - Total  | 131,808               | 13,438            | 226,242               | 21,691            | 2,919         |
| • Projected payroll of active members          | \$1,531,534,820       | \$162,418,070     | \$2,452,407,113       | \$541,632,946     | \$48,598,296  |
| • Average salary of active members             | \$41,133              | \$40,133          | \$29,835              | \$57,044          | \$53,819      |

# Kentucky Employees Retirement System (KERS)

Actuarial Valuation Report  
as of June 30, 2017



December 4, 2017

Board of Trustees  
Kentucky Retirement Systems  
Perimeter Park West  
1260 Louisville Road  
Frankfort, KY 40601

**Subject: Actuarial Valuation as of June 30, 2017**

Dear Trustees of the Board:

This report describes the current actuarial condition of the Kentucky Employees Retirement System (KERS), determines the required employer contribution rates, and analyzes changes in the System's financial condition. In addition, the report provides various summaries of the data. Separate reports are issued with regard to valuation results determined in accordance with Governmental Accounting Standards Board (GASB) Statements 67, 68, 74 and 75. Results of this report should not be used for any other purpose without consultation with the undersigned. Valuations are prepared annually as of June 30, the first day of the plan year for KRS. This report was prepared at the request of the Board of Trustees of the Kentucky Retirement System (Board) and is intended for use by the KRS staff and those designated or approved by the Board.

#### **FINANCING OBJECTIVES AND FUNDING POLICY**

The employer contribution rate is determined in accordance with Section 61.565 of Kentucky Statute. As specified by the Statute, the employer contribution rate is determined based on a closed thirty-year amortization period beginning July 1, 2013. As a result, the amortization period used in the 2017 actuarial valuation is 26 years. The contribution rate determined by this actuarial valuation becomes effective twelve months after the valuation date and is effective for two fiscal years. In other words, the contribution rate determined by this June 30, 2017 actuarial valuation will be used by the Board to certify the Commonwealth's contribution rates for the biennium period beginning July 1, 2018 and ending June 30, 2020.

If new legislation is enacted between the valuation date and the date the contribution rate becomes effective, the Board may adjust the calculated rate before certifying them, in order to reflect this new legislation. Such adjustments are based on information supplied by the actuary.

#### **ASSUMPTIONS AND METHODS**

Kentucky Statutes also requires that an actuarial investigation be performed at least every five years to review the economic and demographic assumptions. An experience study was conducted

as of June 30, 2013 and the next experience study will be conducted as of June 30, 2018. However, the Board has the authority to review the assumptions on a more frequent basis and adopt new assumptions prior to the next scheduled experience study. Subsequent to the last actuarial valuation the Board decreased the price inflation assumption to 2.30% and changed the amortization of the unfunded actuarial accrued liability for the KERS Non-Hazardous and Hazardous Systems (Retirement and Health Insurance) to be based on a 0.00% payroll growth assumption (i.e. on a level dollar basis), but employers will continue to contribute to the System as a percentage of covered payroll. Additionally, the assumed rate of return was decreased to 6.25% for the KERS Hazardous Retirement and both KERS Health Insurance Funds, and the assumed rate of return was decreased to 5.25% for the KERS Non-Hazardous Retirement Fund. It is our opinion that the current assumptions are internally consistent and reasonably reflect the anticipated future experience of the System.

The results of the actuarial valuation are dependent on the actuarial assumptions used. Actual results can, and almost certainly will, differ as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rate, and funding periods. The actuarial calculations are intended to provide information for rational decision making.

#### **BENEFIT PROVISIONS**

The benefit provisions reflected in this valuation are those which were in effect on June 30, 2017. There were no legislative changes enacted since the previous valuation that had a measurable effect on the current valuation.

#### **DATA**

Member data for retired, active and inactive members was supplied as of June 30, 2017, by the KRS staff. The staff also supplied asset information as of June 30, 2017. We did not audit this data, but we did apply a number of tests to the data, and we concluded that it was reasonable and consistent with the prior year's data. GRS is not responsible for the accuracy or completeness of the information provided to us by KRS.

#### **CERTIFICATION**

We certify that the information presented herein is accurate and fairly portrays the actuarial position of KERS as of June 30, 2017.

All of our work conforms with generally accepted actuarial principles and practices, and is in conformity with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of Kentucky Code of Laws and, where applicable, the Internal Revenue Code, ERISA, and the Statements of the Governmental Accounting Standards Board.

The undersigned are independent actuaries and consultants. Mr. Newton and Mr. White are Enrolled Actuaries. All three of the undersigned are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries. All of the undersigned are experienced in performing valuations for large public retirement systems.

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# SECTION 1

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## EXECUTIVE SUMMARY

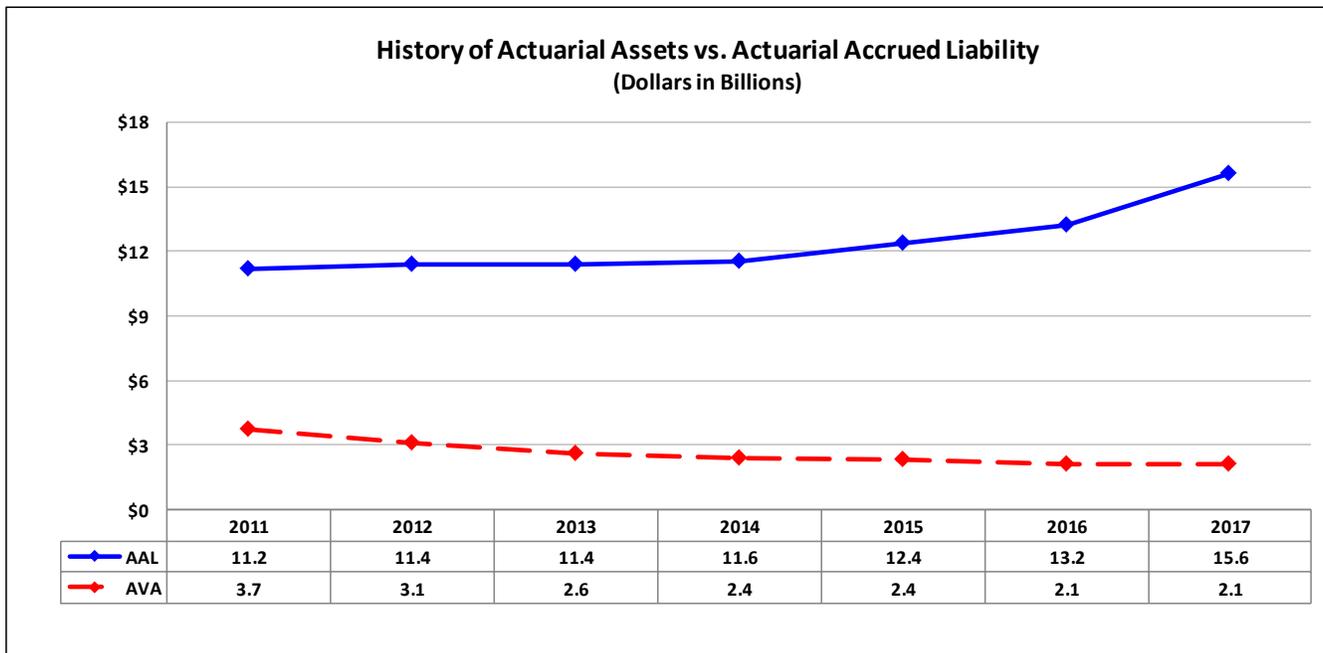
**Summary of Principal Results**  
(Dollar amounts expressed in thousands)

|  | Non-Hazardous |               | Hazardous     |               | Total         |               |
|--|---------------|---------------|---------------|---------------|---------------|---------------|
|  | June 30, 2017 | June 30, 2016 | June 30, 2017 | June 30, 2016 | June 30, 2017 | June 30, 2016 |
| <b>Contributions for next fiscal year:</b>     |               |               |               |               |               |               |
| Retirement                                     | 71.03%        | 41.98%        | 34.39%        | 20.48%        |               |               |
| Insurance                                      | <u>12.40%</u> | <u>8.41%</u>  | <u>2.46%</u>  | <u>1.34%</u>  |               |               |
| Total  | 83.43%        | 50.39%        | 36.85%        | 21.82%        | N/A           | N/A           |
| <b>Assets:</b>                                 |               |               |               |               |               |               |
| Retirement                                     |               |               |               |               |               |               |
| • Actuarial value (AVAR)                       | \$2,123,623   | \$2,112,286   | \$607,159     | \$559,487     | \$2,730,782   | \$2,671,774   |
| • Market value (MVAR)                          | \$2,056,870   | \$1,953,422   | \$601,529     | \$524,679     | \$2,658,399   | \$2,478,101   |
| • Ratio of actuarial to market value of assets | 103.2%        | 108.1%        | 100.9%        | 106.6%        | 102.7%        | 107.8%        |
| Insurance                                      |               |               |               |               |               |               |
| • Actuarial value (AVAI)                       | \$823,918     | \$743,270     | \$493,458     | \$473,160     | \$1,317,376   | \$1,216,430   |
| • Market value (MVAI)                          | \$817,370     | \$695,189     | \$488,838     | \$440,596     | \$1,306,208   | \$1,135,785   |
| • Ratio of actuarial to market value of assets | 100.8%        | 106.9%        | 100.9%        | 107.4%        | 100.9%        | 107.1%        |
| <b>Funded Status:</b>                          |               |               |               |               |               |               |
| Retirement                                     |               |               |               |               |               |               |
| • Actuarial accrued liability                  | \$15,591,641  | \$13,224,698  | \$1,121,420   | \$936,706     | \$16,713,061  | \$14,161,405  |
| • Unfunded accrued liability on AVAR           | \$13,468,018  | \$11,112,412  | \$514,261     | \$377,219     | \$13,982,279  | \$11,489,631  |
| • Funded ratio on AVAR                         | 13.6%         | 16.0%         | 54.1%         | 59.7%         | 16.3%         | 18.9%         |
| • Unfunded accrued liability on MVAR           | \$13,534,771  | \$11,271,276  | \$519,891     | \$412,027     | \$14,054,662  | \$11,683,304  |
| • Funded ratio on MVAR                         | 13.2%         | 14.8%         | 53.6%         | 56.0%         | 15.9%         | 17.5%         |
| Insurance                                      |               |               |               |               |               |               |
| • Actuarial accrued liability                  | \$2,683,496   | \$2,456,678   | \$419,439     | \$377,745     | \$3,102,935   | \$2,834,423   |
| • Unfunded accrued liability on AVAI           | \$1,859,578   | \$1,713,408   | (\$74,019)    | (\$95,415)    | \$1,785,559   | \$1,617,993   |
| • Funded ratio on AVAI                         | 30.7%         | 30.3%         | 117.6%        | 125.3%        | 42.5%         | 42.9%         |
| • Unfunded accrued liability on MVAI           | \$1,866,126   | \$1,761,489   | (\$69,399)    | (\$62,851)    | \$1,796,727   | \$1,698,638   |
| • Funded ratio on MVAI                         | 30.5%         | 28.3%         | 116.5%        | 116.6%        | 42.1%         | 40.1%         |
| <b>Membership:</b>                             |               |               |               |               |               |               |
| • Number of                                    |               |               |               |               |               |               |
| - Active Members                               | 37,234        | 37,779        | 4,047         | 3,959         | 41,281        | 41,738        |
| - Retirees and Beneficiaries                   | 44,916        | 44,004        | 4,093         | 3,966         | 49,009        | 47,970        |
| - Inactive Members                             | <u>49,658</u> | <u>49,040</u> | <u>5,298</u>  | <u>4,925</u>  | <u>54,956</u> | <u>53,965</u> |
| - Total  | 131,808       | 130,823       | 13,438        | 12,850        | 145,246       | 143,673       |
| • Projected payroll of active members          | \$1,531,535   | \$1,529,249   | \$162,418     | \$147,563     | \$1,693,953   | \$1,676,812   |
| • Average salary of active members             | \$41,133      | \$40,479      | \$40,133      | \$37,273      | \$41,035      | \$40,175      |

## Executive Summary (Continued)

### Non-Hazardous Retirement Fund

The unfunded actuarial accrued liability for the non-hazardous retirement fund increased by \$2.356 billion since the prior year’s valuation to \$13.468 billion. The largest source of this increase is the \$2.158 billion due to a decrease in the assumed rate of investment return. Below is a chart with the historical actuarial value of assets and actuarial accrued liability for the non-hazardous fund. The divergence in the assets and liability over the last seven years has generally been due to a combination of: (i) actual contribution rates being insufficient to completely finance the interest on the unfunded actuarial accrued liability, (ii) the actual investment experience being less than the return assumption, and (iii) a decrease in the assumed rate of return in 2015, 2016 and again in 2017.

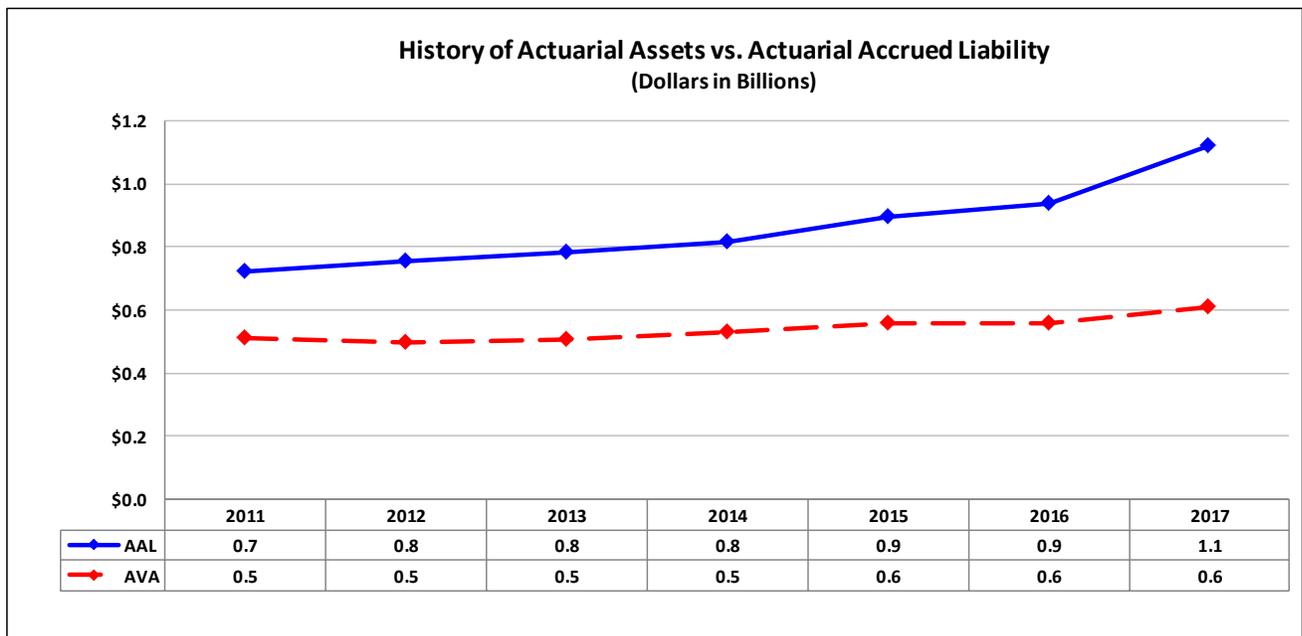


For FY2016-17, the KERS non-hazardous pension system distributed \$960 million in benefit payments and received \$858 million in employer and employee contributions (excluding contributions to the 401(h)). As of June 30, 2017, the market value of assets for this system was \$2,057 million (excluding assets in the 401(h)). To stabilize the financial condition of this system and reduce the likelihood that plan assets will become exhausted, it is imperative that contributions to the system exceed the benefit payments. The 71.03% of pay employer contribution rate to the pension plan that is documented in this report is projected to increase the total employer and member contributions to \$1,164 million for each of the next two fiscal years (i.e. FY 2018-19 and FY 2019-20). If these employer contributions are not made to this system, then the financial condition of this retirement system is expected to continue to deteriorate and there will be a significant risk of plan assets being exhausted.

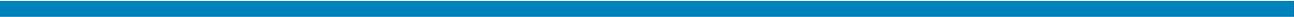
## Executive Summary (Continued)

### Hazardous Retirement Fund

The unfunded actuarial accrued liability for the hazardous retirement fund increased by \$137 million since the prior year's valuation to \$514 million. The largest source of this increase is the \$130 million due to a decrease in the assumed rate of investment return. Below is a chart with the historical actuarial value of assets and actuarial accrued liability for the hazardous retirement fund. The divergence in the assets and liability over the last seven years has generally been due to a combination of: (i) actual contribution rates being insufficient to finance, or pay down the unfunded actuarial accrued liability, (ii) the actual investment experience being less than the fund's expected investment return assumption, and (iii) a decrease in the assumed rate of return in 2015 and again in 2017.



# SECTION 2



## DISCUSSION

## Discussion

The Kentucky Employees Retirement System (KERS) is a defined benefit pension fund that provides pensions and health care coverage for employees of state government, non-teaching staff at regional state supported universities, local health departments, regional mental health/mental retardation agencies, and other quasi-state agencies. KERS includes both non-hazardous and hazardous duty benefits. This report presents the result of the June 30, 2017 actuarial funding valuation for both the Retirement and Insurance Funds.

The primary purposes of the valuation report are to depict the current financial condition of the System, determine the annual required contribution, and analyze changes in the System's financial condition. In addition, the report provides various summaries of the data.

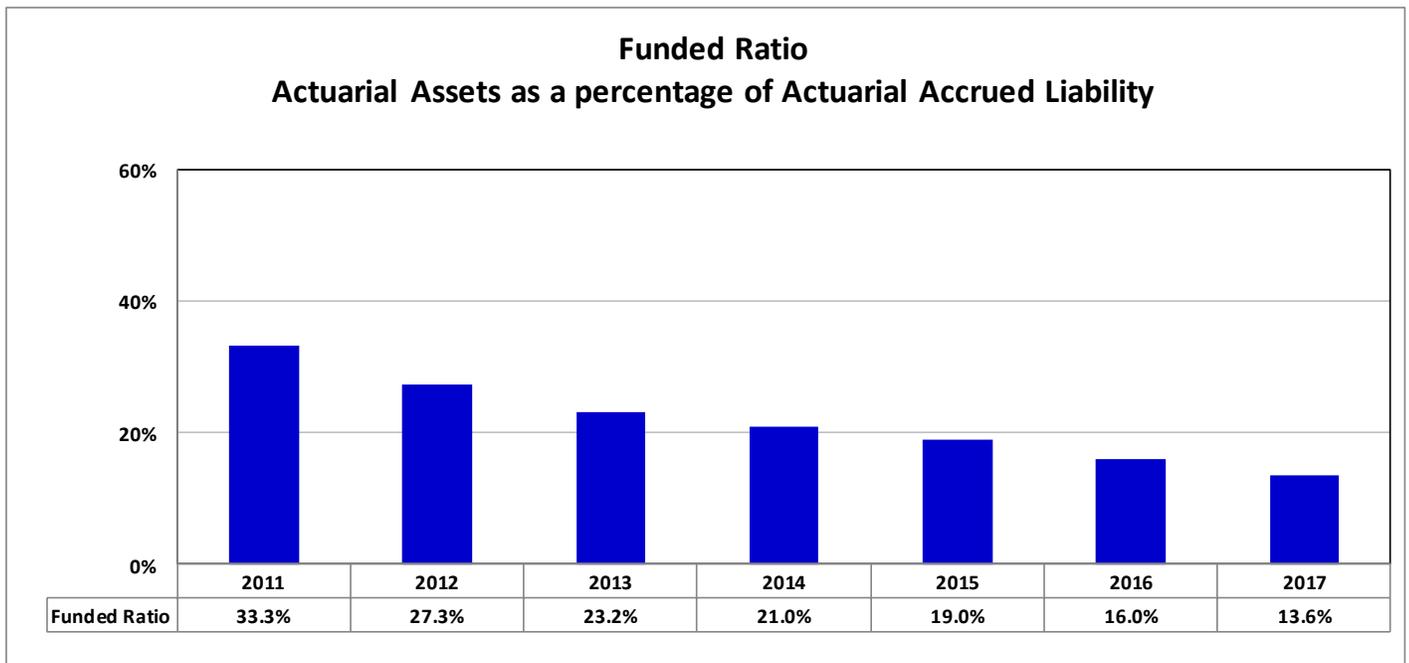
The actuarially determined contribution rates consist of two components: a normal cost rate and an amortization cost to finance the unfunded actuarial accrued liability. The normal cost rate is the theoretical amount which would be required to pay the members' benefits, based on the current plan provisions, if this amount had been contributed from each member's entry date and if the fund's experience exactly followed the actuarial assumptions. This is the amount it should cost to provide the benefits for an average new member. Since members contribute to the fund, only the excess of the normal rate over the member contribution rate is included in the employer contribution rate. The amortization cost is the amount, expressed as a percentage of payroll, necessary to amortize the unfunded actuarial accrued liability. The payroll growth rate and discount rate assumptions are selected by the Board. The funding period is specified in Section 61.565 of Kentucky Statute.

All of the actuarial and financial tables referenced by the other sections of this Report appear in Section 3. Section 4 provides member data and statistical information. Appendices A and B provide summaries of the principle actuarial assumptions and methods and plan provisions. Finally, Appendix C provides a glossary of technical terms that are used throughout this report.

## Funding Progress

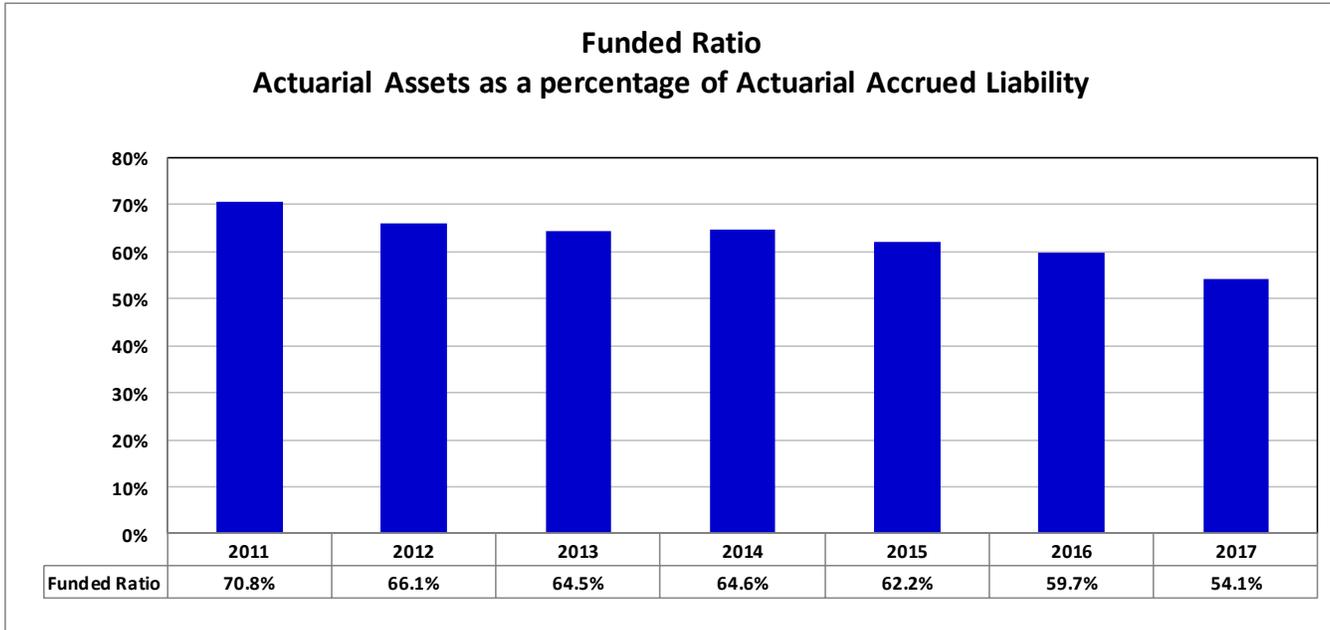
The following charts provide a seven-year history of the funds' funded ratio (i.e. the Actuarial Value of Assets divided by the Actuarial Accrued Liability). The decline in the funded ratio over the last seven years for the retirement funds has generally been due to a combination of: (i) actual contribution rates being insufficient to completely finance, or pay down, the unfunded actuarial accrued liability, (ii) the actual investment experience being less than assumed, and (iii) a decrease in the assumed rate of return in 2015, 2016 and again in 2017.

### Non-Hazardous Retirement Fund



# Funding Progress (Continued)

## Hazardous Retirement Fund



Assuming the actuarial determined contributions are actually paid in future years, then absent future unfavorable investment or demographic experience we expect the funded ratio to begin improving. Also, the dollar amount of the unfunded actuarial accrued liability, or the difference between the actuarial accrued liability and the actuarial value of assets, is expected to decrease after those higher contribution rates become effective. Table 9, Schedule of Funding Progress, in the following section of the report provides additional detail regarding the funding progress of the Retirement System.

## Asset Gains/ (Losses)

The actuarial value of assets (“AVA”) is based on a smoothed market value of assets, using a systematic approach to phase-in the difference between the actual and expected investment return on the market value of assets (adjusted for receipts and disbursements during the year). This is appropriate because it dampens the short-term volatility inherent in investment markets. The returns are computed net of investment expenses. The actuarial value of assets for the non-hazardous retirement fund slightly increased from \$2.112 billion to \$2.124 billion since the prior valuation. Table 7 in the following section of the report provides the development of the actuarial value of assets.

The rate of return on the market value of assets on a dollar-weighted basis for fiscal year 2017 was 11.4% for the non-hazardous retirement fund which is greater than the 6.75% expected annual return during that fiscal year. The return on an actuarial (smoothed) asset value was 6.1%. This difference in the estimated return on market value and actuarial value illustrates the smoothing effect of the asset valuation method.

The market value of assets is \$0.067 billion less than the actuarial value of assets, which signifies that the retirement system is in a position of deferred losses. Therefore, unless the System experiences investment returns in excess of the assumed rate of return in an amount that is at least equal to the outstanding deferred losses, the future recognition of these deferred losses is expected to increase the unfunded actuarial accrued liability.

Table 6 in the following section of this report provides asset information that was included in the annual financial statements of the System. Also, Tables 6 and 7 show the estimated yield on a market value basis and on the actuarial asset valuation method.

## Actuarial Gains/ (Losses)

The annual actuarial valuation is a snapshot analysis of the benefit liabilities, assets and funded position of the System as of the first day of the plan year. In any one fiscal year, the experience can be better or worse from that which is assumed or expected. The actuarial assumptions do not necessarily attempt to model what the experience will be for any one given fiscal year, but instead try to model the overall experience over many years. Therefore, as long as the actual experience of the retirement system is reasonably close to the current assumptions, the long-term funding requirements of the System will remain relatively consistent.

Below are tables that separately show a reconciliation of the actuarial gains / (loss) since the prior actuarial valuation for the retirement and health insurance funds, which include the effect of asset and liability gains and losses, changes in assumptions, changes in plan provisions, etc.

### Retirement Experience Gain or (Loss) (Dollar amounts expressed in thousands)

|   | Non-Hazardous  | Hazardous    |
|---|----------------|--------------|
| A. Calculation of total actuarial gain or loss                |                |              |
| 1. Unfunded actuarial accrued liability (UAAL), previous year | \$ 11,112,412  | \$ 377,219   |
| 2. Normal cost and administrative expenses                    | 157,499        | 22,423       |
| 3. Less: contributions for the year                           | (857,664)      | (70,498)     |
| 4. Interest accrual   | 726,457        | 26,489       |
| 5. Expected UAAL (Sum of Items 1 - 4)                         | \$ 11,138,704  | \$ 355,633   |
| 6. Actual UAAL as of June 30, 2017                            | \$ 13,468,018  | \$ 514,261   |
| 7. Total gain (loss) for the year (Item 5 - Item 6)           | \$ (2,329,314) | \$ (158,628) |
| B. Source of gains and losses                                 |                |              |
| 8. Asset gain (loss) for the year                             | \$ (13,806)    | \$ (765)     |
| 9. Liability experience gain (loss) for the year              | (157,852)      | (27,643)     |
| 10. Assumption change   | (2,157,656)    | (130,220)    |
| 11. Total   | \$ (2,329,314) | \$ (158,628) |

The accrued liability for the non-hazardous retirement fund was about 1% higher than expected, resulting in a \$158 million liability loss. The accrued liability for the hazardous retirement fund was about 3% higher than expected, resulting in a \$28 million liability loss, primarily due to higher than expected salary increases during the past year.

## Actuarial Gains/ (Losses) (Continued)

### Insurance Experience Gain or (Loss) (Dollar amounts expressed in thousands)

|   | Non-Hazardous | Hazardous    |
|---|---------------|--------------|
| A. Calculation of total actuarial gain or loss                |               |              |
| 1. Unfunded actuarial accrued liability (UAAL), previous year | \$ 1,713,408  | \$ (95,415)  |
| 2. Normal cost and administrative expenses                    | 39,632        | 8,539        |
| 3. Less: contributions for the year                           | (157,511)     | (6,431)      |
| 4. Interest accrual   | 124,085       | (7,077)      |
| 5. Expected UAAL (Sum of Items 1 - 4)                         | \$ 1,719,614  | \$ (100,384) |
| 6. Actual UAAL as of June 30, 2017                            | \$ 1,859,578  | \$ (74,019)  |
| 7. Total gain (loss) for the year (Item 5 - Item 6)           | \$ (139,964)  | \$ (26,365)  |
| B. Source of gains and losses                                 |               |              |
| 8. Asset gain (loss) for the year                             | \$ (3,451)    | \$ (3,431)   |
| 9. Liability experience gain (loss) for the year              | 139,085       | 26,833       |
| 10. Assumption change   | (275,598)     | (49,767)     |
| 11. Total   | \$ (139,964)  | \$ (26,365)  |

The 2018 premiums were known at the time of the valuation and were incorporated into the liability measurement. Premiums were lower than expected and resulted in a \$132 million liability experience gain for the non-hazardous insurance fund and a \$24 million liability experience gain for the hazardous insurance fund.

## Actuarial Assumptions and Methods

In determining costs and liabilities, actuaries use assumptions about the future, such as rates of salary increase, probabilities of retirement, termination, death and disability, and an annual investment return assumption. An experience study was conducted as of June 30, 2013 and the next experience study will be conducted as of June 30, 2018. However, the Board has the authority to review the assumptions on a more frequent basis and adopt new assumptions prior to the next scheduled experience study. Since the last actuarial valuation, the Board made the following changes in assumptions:

- Decrease the assumed rate of return to 5.25% for the non-hazardous retirement fund.
- Decrease the assumed rate of return to 6.25% for the hazardous retirement fund and both health insurance funds.
- Decrease the price inflation assumption to 2.30% for the retirement and health insurance funds.
- Amortize the unfunded accrued liability for the retirement and health insurance funds based on a 0.00% payroll growth assumption (i.e. on a level dollar basis), but employers will continue contributing the contribution rate determined as a percentage of the expected covered payroll.
- Decrease in the individual salary increase assumption and health care trend assumption that corresponds with the 0.95% decrease in the price inflation assumption.

Appendix A includes a summary of the actuarial assumptions and methods used in this valuation. It is our opinion that the assumptions are internally consistent, reasonable, and reflect anticipated future experience of the System. The next experience study will be conducted no later than as of June 30, 2018.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or 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. This report does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

## Benefit Provisions

Appendix B of this report includes a summary of the benefit provisions for KERS. There were no legislative changes enacted since the previous valuation that had a measurable effect on the current valuation.

This valuation reflects all benefits promised to KERS members, either by the statutes or by the Board. There are no ancillary benefits that might be deemed a KERS liability if continued beyond the availability of funding by the current funding source.

## **SECTION 3**

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### **ACTUARIAL TABLES**

## Actuarial Tables

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# **RETIREMENT BENEFITS**

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## **ACTUARIAL TABLES**

## Development of Unfunded Actuarial Accrued Liability Retirement Benefits

(Dollar amounts expressed in thousands)

|  | June 30, 2017        |                  |
|--|----------------------|------------------|
|  | Non-Hazardous<br>(1) | Hazardous<br>(2) |
| 1. Projected payroll of active members                               | \$ 1,531,535         | \$ 162,418       |
| 2. Present value of future pay                                       | \$ 12,869,356        | \$ 1,364,081     |
| 3. Normal cost rate  |                      |                  |
| a. Total normal cost rate  | 12.45%               | 17.10%           |
| b. Less: member contribution rate                                    | -5.00%               | -8.00%           |
| c. Employer normal cost rate   | 7.45%                | 9.10%            |
| 4. Actuarial accrued liability for active members                    |                      |                  |
| a. Present value of future benefits                                  | \$ 5,514,500         | \$ 592,881       |
| b. Less: present value of future normal costs                        | (1,531,205)          | (217,811)        |
| c. Actuarial accrued liability                                       | \$ 3,983,295         | \$ 375,070       |
| 5. Total actuarial accrued liability                                 |                      |                  |
| a. Retirees and beneficiaries  | \$ 11,120,669        | \$ 712,284       |
| b. Inactive members  | 487,677              | 34,066           |
| c. Active members (Item 4c)  | 3,983,295            | 375,070          |
| d. Total   | \$ 15,591,641        | \$ 1,121,420     |
| 6. Actuarial value of assets   | \$ 2,123,623         | \$ 607,159       |
| 7. Unfunded actuarial accrued liability (UAAL)<br>(Item 5d - Item 6) | \$ 13,468,018        | \$ 514,261       |
| 8. Funded Ratio  | 13.6%                | 54.1%            |

**Actuarial Present Value of Future Benefits**  
**Retirement Benefits**  
(Dollar amounts expressed in thousands)

|   | June 30, 2017        |                  |
|---|----------------------|------------------|
|   | Non-Hazardous<br>(1) | Hazardous<br>(2) |
| 1. Active members                                   |                      |                  |
| a. Service retirement                               | \$ 5,027,645         | \$ 538,918       |
| b. Deferred termination benefits and refunds        | 355,339              | 41,227           |
| c. Survivor benefits                                | 28,322               | 3,260            |
| d. Disability benefits                              | 103,194              | 9,476            |
| e. Total  | \$ 5,514,500         | \$ 592,881       |
| 2. Retired members                                  |                      |                  |
| a. Service retirement                               | \$ 10,203,322        | \$ 656,827       |
| b. Disability retirement                            | 292,992              | 16,391           |
| c. Beneficiaries                                    | 624,355              | 39,066           |
| d. Total  | \$ 11,120,669        | \$ 712,284       |
| 3. Inactive members                                 |                      |                  |
| a. Vested terminations                              | \$ 422,927           | \$ 26,360        |
| b. Nonvested terminations                           | 64,750               | 7,706            |
| c. Total  | \$ 487,677           | \$ 34,066        |
| 4. Total actuarial present value of future benefits | \$ 17,122,846        | \$ 1,339,231     |

## Development of Required Contribution Rate Retirement Benefits

|  | June 30, 2017        |                  |
|--|----------------------|------------------|
|  | Non-Hazardous<br>(1) | Hazardous<br>(2) |
| 1. Total normal cost rate                    |                      |                  |
| a. Service retirement                        | 9.82%                | 13.98%           |
| b. Deferred termination benefits and refunds | 2.18%                | 2.57%            |
| c. Survivor benefits                         | 0.07%                | 0.15%            |
| d. Disability benefits                       | <u>0.38%</u>         | <u>0.40%</u>     |
| e. Total                                     | 12.45%               | 17.10%           |
| 2. Less: member contribution rate            | <u>-5.00%</u>        | <u>-8.00%</u>    |
| 3. Total employer normal cost rate           | 7.45%                | 9.10%            |
| 4. Administrative expenses                   | <u>0.72%</u>         | <u>0.57%</u>     |
| 5. Net employer normal cost rate             | 8.17%                | 9.67%            |
| 6. UAAL amortization contribution            | 62.86%               | 24.72%           |
| 7. Total recommended employer contribution   | 71.03%               | 34.39%           |

**Actuarial Balance Sheet**  
**Non-Hazardous Members Retirement**  
(Dollar amounts expressed in thousands)

|  | June 30, 2017 | June 30, 2016 |
|--|---------------|---------------|
|  | (1)           | (2)           |
| 1. Assets - Present and Expected Future Resources  |               |               |
| a. Current assets (actuarial value)  | \$ 2,123,623  | \$ 2,112,286  |
| b. Present value of future member contributions  | \$ 643,468    | \$ 695,862    |
| c. Present value of future employer contributions  |               |               |
| i. Normal cost contributions   | \$ 887,737    | \$ 556,170    |
| ii. Unfunded accrued liability contributions   | 13,468,018    | 11,112,412    |
| iii. Total future employer contributions   | \$ 14,355,755 | \$ 11,668,582 |
| d. Total assets  | \$ 17,122,846 | \$ 14,476,730 |
| 2. Liabilities - Present Value of Expected Future Benefit Payments                           |               |               |
| a. Active members  |               |               |
| i. Present value of future normal costs  | \$ 1,531,205  | \$ 1,252,032  |
| ii. Accrued liability  | 3,983,295     | 3,214,530     |
| iii. Total present value of future benefits  | \$ 5,514,500  | \$ 4,466,562  |
| b. Present value of benefits payable on account of current retired members and beneficiaries | \$ 11,120,669 | \$ 9,600,528  |
| c. Present value of benefits payable on account of current inactive members                  | \$ 487,677    | \$ 409,640    |
| d. Total liabilities   | \$ 17,122,846 | \$ 14,476,730 |

**Actuarial Balance Sheet**  
**Hazardous Members Retirement**  
(Dollar amounts expressed in thousands)

|  | June 30, 2017 | June 30, 2016 |
|--|---------------|---------------|
|  | (1)           | (2)           |
| 1. Assets - Present and Expected Future Resources  |               |               |
| a. Current assets (actuarial value)  | \$ 607,159    | \$ 559,487    |
| b. Present value of future member contributions  | \$ 109,126    | \$ 107,587    |
| c. Present value of future employer contributions  |               |               |
| i. Normal cost contributions   | \$ 108,685    | \$ 71,148     |
| ii. Unfunded accrued liability contributions   | 514,261       | 377,219       |
| iii. Total future employer contributions   | \$ 622,946    | \$ 448,367    |
| d. Total assets  | \$ 1,339,231  | \$ 1,115,441  |
| 2. Liabilities - Present Value of Expected Future Benefit Payments                           |               |               |
| a. Active members  |               |               |
| i. Present value of future normal costs  | \$ 217,811    | \$ 178,735    |
| ii. Accrued liability  | 375,070       | 288,224       |
| iii. Total present value of future benefits  | \$ 592,881    | \$ 466,959    |
| b. Present value of benefits payable on account of current retired members and beneficiaries | \$ 712,284    | \$ 618,592    |
| c. Present value of benefits payable on account of current inactive members                  | \$ 34,066     | \$ 29,890     |
| d. Total liabilities   | \$ 1,339,231  | \$ 1,115,441  |

**Reconciliation of Retirement Net Assets**  
(Dollar amounts expressed in thousands)

|  | Year Ending          |                  |
|--|----------------------|------------------|
|  | June 30, 2017        | June 30, 2017    |
|  | (1)                  | (2)              |
|  | <b>Non-Hazardous</b> | <b>Hazardous</b> |
| 1. Value of assets at beginning of year                  | \$ 1,953,422         | \$ 524,679       |
| 2. Revenue for the year                                  |                      |                  |
| a. Contributions   |                      |                  |
| i. Member contributions                                  | \$ 100,543           | \$ 17,524        |
| ii. Employer contributions                               | 644,804              | 37,630           |
| iii. Other contributions (less 401h)                     | 112,317              | 15,344           |
| iii. Total   | \$ 857,664           | \$ 70,498        |
| b. Income  |                      |                  |
| i. Interest, dividends, and other income                 | \$ 66,528            | \$ 16,321        |
| ii. Investment expenses                                  | (15,600)             | (4,267)          |
| iii. Net   | \$ 50,928            | \$ 12,054        |
| c. Net realized and unrealized gains (losses)            | 166,122              | 58,554           |
| d. Total revenue   | \$ 1,074,714         | \$ 141,106       |
| 3. Expenditures for the year                             |                      |                  |
| a. Disbursements   |                      |                  |
| i. Refunds   | \$ 11,819            | \$ 2,106         |
| ii. Regular annuity benefits                             | 948,490              | 61,231           |
| iii. Other benefit payments                              | 0                    | 0                |
| iv. Transfers to other systems                           | 0                    | 0                |
| v. Total   | \$ 960,309           | \$ 63,338        |
| b. Administrative expenses and depreciation              | 10,957               | 919              |
| c. Total expenditures                                    | \$ 971,266           | \$ 64,257        |
| 4. Increase in net assets<br>(Item 2. - Item 3.)         | \$ 103,447           | \$ 76,850        |
| 5. Value of assets at end of year<br>(Item 1. + Item 4.) | \$ 2,056,870         | \$ 601,529       |
| 6. Net external cash flow                                |                      |                  |
| a. Dollar amount   | \$ (113,602)         | \$ 6,242         |
| b. Percentage of market value                            | -5.7%                | 1.1%             |
| 7. Estimated annual return on net assets                 | 11.4%                | 13.4%            |

**Development of Actuarial Value of Assets**  
**Non-Hazardous Members Retirement**  
(Dollar amounts expressed in thousands)\*

| Year Ending   | June 30, 2017   |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
|---|---|--------------------------------|--|--------------------------------|------------------------------------|----|------|-----------|-----------|----|------|-----------|----------|----|------|-----------|----------|----|------|---------|--------|----|------|--------|--------|----|-------|--|------------|
| 1. Actuarial value of assets at beginning of year   | \$ 2,112,286  |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| 2. Market value of assets at beginning of year  | \$ 1,953,422  |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| 3. Net new investments  |   |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| a. Contributions  | \$ 857,664  |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| b. Benefit payments   | (960,309)   |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| c. Administrative expenses  | (10,957)  |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| d. Subtotal   | \$ (113,602)  |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| 4. Market value of assets at end of year  | \$ 2,056,870  |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| 5. Net earnings (Item 4. - Item 2. - Item 3.d.)   | \$ 217,050  |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| 6. Assumed investment return rate for fiscal year   | 6.75%   |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| 7. Expected return for immediate recognition  | \$ 128,022  |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| 8. Excess return for phased recognition   | \$ 89,028   |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| 9. Phased-in recognition, 20% of excess return on assets for prior years:                       |   |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
|   | <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;"></th> <th style="text-align: center;"><u>Fiscal Year</u><br/><u>Ending June 30,</u></th> <th style="text-align: center;"><u>Excess</u><br/><u>Return</u></th> <th style="text-align: center;"><u>Recognized</u><br/><u>Amount</u></th> </tr> </thead> <tbody> <tr> <td style="padding-left: 20px;">a.</td> <td style="text-align: center;">2017</td> <td style="text-align: right;">\$ 89,028</td> <td style="text-align: right;">\$ 17,806</td> </tr> <tr> <td style="padding-left: 20px;">b.</td> <td style="text-align: center;">2016</td> <td style="text-align: right;">(183,443)</td> <td style="text-align: right;">(36,689)</td> </tr> <tr> <td style="padding-left: 20px;">c.</td> <td style="text-align: center;">2015</td> <td style="text-align: right;">(142,444)</td> <td style="text-align: right;">(28,489)</td> </tr> <tr> <td style="padding-left: 20px;">d.</td> <td style="text-align: center;">2014</td> <td style="text-align: right;">145,338</td> <td style="text-align: right;">29,068</td> </tr> <tr> <td style="padding-left: 20px;">e.</td> <td style="text-align: center;">2013</td> <td style="text-align: right;">76,106</td> <td style="text-align: right;">15,221</td> </tr> <tr> <td style="padding-left: 20px;">f.</td> <td style="text-align: center;">Total</td> <td></td> <td style="text-align: right; border-top: 1px solid black;">\$ (3,083)</td> </tr> </tbody> </table> |                                | <u>Fiscal Year</u><br><u>Ending June 30,</u> | <u>Excess</u><br><u>Return</u> | <u>Recognized</u><br><u>Amount</u> | a. | 2017 | \$ 89,028 | \$ 17,806 | b. | 2016 | (183,443) | (36,689) | c. | 2015 | (142,444) | (28,489) | d. | 2014 | 145,338 | 29,068 | e. | 2013 | 76,106 | 15,221 | f. | Total |  | \$ (3,083) |
|   | <u>Fiscal Year</u><br><u>Ending June 30,</u>  | <u>Excess</u><br><u>Return</u> | <u>Recognized</u><br><u>Amount</u>           |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| a.  | 2017  | \$ 89,028                      | \$ 17,806                                    |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| b.  | 2016  | (183,443)                      | (36,689)                                     |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| c.  | 2015  | (142,444)                      | (28,489)                                     |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| d.  | 2014  | 145,338                        | 29,068                                       |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| e.  | 2013  | 76,106                         | 15,221                                       |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| f.  | Total   |                                | \$ (3,083)                                   |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| 10. Actuarial value of assets as of June 30, 2017<br>(Item 1. + Item 3.d. + Item 7.+ Item 9.f.) | \$ 2,123,623  |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| 11. Ratio of actuarial value to market value  | 103.2%  |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |
| 12. Estimated annual return on actuarial value of assets  | 6.1%  |                                |  |                                |                                    |    |      |           |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |        |    |       |  |            |

\* Amounts may not add due to rounding

**Development of Actuarial Value of Assets**  
**Hazardous Members Retirement**  
(Dollar amounts expressed in thousands)\*

| Year Ending   | June 30, 2017   |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
|---|---|------------------|--------------------------------|------------------|----------------------|----|------|-----------|----------|----|------|----------|---------|----|------|----------|---------|----|------|--------|-------|----|------|--------|-------|----|-------|--|----------|
| 1. Actuarial value of assets at beginning of year   | \$ 559,487  |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| 2. Market value of assets at beginning of year  | \$ 524,679  |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| 3. Net new investments  |   |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| a. Contributions  | \$ 70,498   |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| b. Benefit payments   | (63,338)  |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| c. Administrative expenses  | (919)   |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| d. Subtotal   | \$ 6,242  |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| 4. Market value of assets at end of year  | \$ 601,529  |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| 5. Net earnings (Item 4. - Item 2. - Item 3.d.)   | \$ 70,608   |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| 6. Assumed investment return rate for fiscal year   | 7.50%   |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| 7. Expected return for immediate recognition  | \$ 39,585   |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| 8. Excess return for phased recognition   | \$ 31,023   |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| 9. Phased-in recognition, 20% of excess return on assets for prior years:                       |   |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
|   | <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;"></th> <th style="text-align: center; border-bottom: 1px solid black;">Fiscal Year<br/>Ending June 30,</th> <th style="text-align: center; border-bottom: 1px solid black;">Excess<br/>Return</th> <th style="text-align: center; border-bottom: 1px solid black;">Recognized<br/>Amount</th> </tr> </thead> <tbody> <tr> <td style="padding-left: 20px;">a.</td> <td style="text-align: center;">2017</td> <td style="text-align: right;">\$ 31,023</td> <td style="text-align: right;">\$ 6,205</td> </tr> <tr> <td style="padding-left: 20px;">b.</td> <td style="text-align: center;">2016</td> <td style="text-align: right;">(42,195)</td> <td style="text-align: right;">(8,439)</td> </tr> <tr> <td style="padding-left: 20px;">c.</td> <td style="text-align: center;">2015</td> <td style="text-align: right;">(33,972)</td> <td style="text-align: right;">(6,794)</td> </tr> <tr> <td style="padding-left: 20px;">d.</td> <td style="text-align: center;">2014</td> <td style="text-align: right;">42,286</td> <td style="text-align: right;">8,457</td> </tr> <tr> <td style="padding-left: 20px;">e.</td> <td style="text-align: center;">2013</td> <td style="text-align: right;">12,081</td> <td style="text-align: right;">2,416</td> </tr> <tr> <td style="padding-left: 20px;">f.</td> <td style="text-align: center;">Total</td> <td></td> <td style="text-align: right; border-top: 1px solid black;">\$ 1,845</td> </tr> </tbody> </table> |                  | Fiscal Year<br>Ending June 30, | Excess<br>Return | Recognized<br>Amount | a. | 2017 | \$ 31,023 | \$ 6,205 | b. | 2016 | (42,195) | (8,439) | c. | 2015 | (33,972) | (6,794) | d. | 2014 | 42,286 | 8,457 | e. | 2013 | 12,081 | 2,416 | f. | Total |  | \$ 1,845 |
|   | Fiscal Year<br>Ending June 30,  | Excess<br>Return | Recognized<br>Amount           |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| a.  | 2017  | \$ 31,023        | \$ 6,205                       |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| b.  | 2016  | (42,195)         | (8,439)                        |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| c.  | 2015  | (33,972)         | (6,794)                        |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| d.  | 2014  | 42,286           | 8,457                          |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| e.  | 2013  | 12,081           | 2,416                          |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| f.  | Total   |                  | \$ 1,845                       |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| 10. Actuarial value of assets as of June 30, 2017<br>(Item 1. + Item 3.d. + Item 7.+ Item 9.f.) | \$ 607,159  |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| 11. Ratio of actuarial value to market value  | 100.9%  |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |
| 12. Estimated annual return on actuarial value of assets  | 7.4%  |                  |                                |                  |                      |    |      |           |          |    |      |          |         |    |      |          |         |    |      |        |       |    |      |        |       |    |       |  |          |

\* Amounts may not add due to rounding

**Schedule of Funding Progress**  
**Retirement Benefits**  
(Dollar amounts expressed in thousands)

| June 30,<br>(1)              | Actuarial Value of<br>Assets (AVA)<br>(2) | Actuarial Accrued<br>Liability (AAL)<br>(3) | Unfunded Actuarial<br>Accrued Liability<br>(UAAL) (3) - (2)<br>(4) | Funded Ratio<br>(2)/(3)<br>(5) | Annual Covered<br>Payroll<br>(6) | UAAL as % of<br>Payroll (4)/(6)<br>(7) |
|------------------------------|---|---|--|--------------------------------|----------------------------------|--|
| <b>Non-Hazardous Members</b> |   |   |  |                                |                                  |  |
| 2011                         | \$ 3,726,986                              | \$ 11,182,142                               | \$ 7,455,156   | 33.3%                          | \$ 1,731,633                     | 430.5%                                 |
| 2012                         | 3,101,317                                 | 11,361,048                                  | 8,259,731  | 27.3%                          | 1,644,897                        | 502.1%                                 |
| 2013                         | 2,636,123                                 | 11,386,602                                  | 8,750,479  | 23.2%                          | 1,644,409                        | 532.1%                                 |
| 2014                         | 2,423,957                                 | 11,550,110                                  | 9,126,154  | 21.0%                          | 1,577,496                        | 578.5%                                 |
| 2015                         | 2,350,990                                 | 12,359,673                                  | 10,008,683   | 19.0%                          | 1,544,234                        | 648.1%                                 |
| 2016                         | 2,112,286                                 | 13,224,698                                  | 11,112,412   | 16.0%                          | 1,529,249                        | 726.7%                                 |
| 2017                         | 2,123,623                                 | 15,591,641                                  | 13,468,018   | 13.6%                          | 1,531,535                        | 879.4%                                 |
| <b>Hazardous Members</b>     |   |   |  |                                |                                  |  |
| 2011                         | \$ 510,749                                | \$ 721,293                                  | \$ 210,545   | 70.8%                          | \$ 133,054                       | 158.2%                                 |
| 2012                         | 497,226                                   | 752,699                                     | 255,473  | 66.1%                          | 131,977                          | 193.6%                                 |
| 2013                         | 505,657                                   | 783,981                                     | 278,324  | 64.5%                          | 132,015                          | 210.8%                                 |
| 2014                         | 527,897                                   | 816,850                                     | 288,953  | 64.6%                          | 129,076                          | 223.9%                                 |
| 2015                         | 556,688                                   | 895,433                                     | 338,746  | 62.2%                          | 128,680                          | 263.2%                                 |
| 2016                         | 559,487                                   | 936,706                                     | 377,219  | 59.7%                          | 147,563                          | 255.6%                                 |
| 2017                         | 607,159                                   | 1,121,420                                   | 514,261  | 54.1%                          | 162,418                          | 316.6%                                 |
| <b>Total KERS Members</b>    |   |   |  |                                |                                  |  |
| 2011                         | \$ 4,237,735                              | \$ 11,903,435                               | \$ 7,665,700   | 35.6%                          | \$ 1,864,687                     | 411.1%                                 |
| 2012                         | 3,598,543                                 | 12,113,747                                  | 8,515,204  | 29.7%                          | 1,776,874                        | 479.2%                                 |
| 2013                         | 3,141,780                                 | 12,170,583                                  | 9,028,803  | 25.8%                          | 1,776,424                        | 508.3%                                 |
| 2014                         | 2,951,854                                 | 12,366,960                                  | 9,415,106  | 23.9%                          | 1,706,572                        | 551.7%                                 |
| 2015                         | 2,907,678                                 | 13,255,106                                  | 10,347,428   | 21.9%                          | 1,672,914                        | 618.5%                                 |
| 2016                         | 2,671,773                                 | 14,161,404                                  | 11,489,631   | 18.9%                          | 1,676,812                        | 685.2%                                 |
| 2017                         | 2,730,782                                 | 16,713,061                                  | 13,982,279   | 16.3%                          | 1,693,953                        | 825.4%                                 |

## Summary of Principal Assumptions and Methods

Below is a summary of the principal economic assumptions, cost method, and the method for financing the unfunded actuarial accrued liability:

|  |  |  |
|--|--|--|
| Valuation date:                            | Non-Hazardous<br>June 30, 2017   | Hazardous<br>June 30, 2017   |
| Actuarial cost method:                     | Entry Age Normal   | Entry Age Normal   |
| Amortization method:                       | Level percentage of payroll<br>(0% payroll growth assumed)   | Level percentage of payroll<br>(0% payroll growth assumed)   |
| Amortization period for contribution rate: | 26-year closed period  | 26-year closed period  |
| Asset valuation method:                    | 5-Year Smoothed Market   | 5-Year Smoothed Market   |
| Actuarial assumptions:                     |  |  |
| Investment rate of return                  | 5.25%  | 6.25%  |
| Projected salary increases                 | 3.55% to 15.55%<br>(varies by service)   | 3.55% to 19.55%<br>(varies by service)   |
| Inflation                                  | 2.30%  | 2.30%  |
| Post-retirement benefit adjustments        | 0.00%  | 0.00%  |
| Retiree Mortality                          | RP-2000 Combined Mortality Table<br>for Males and Females, projected<br>using scale BB to 2013<br>(set back one year for females). | RP-2000 Combined Mortality Table<br>for Males and Females, projected<br>using scale BB to 2013<br>(set back one year for females). |

**Solvency Test**  
**Retirement Benefits**  
(Dollar amounts expressed in thousands)

| June 30,                     | Actuarial Accrued Liability |                                 |                                    |                  | Portion of Aggregate Accrued Liabilities Covered by Assets |         |             |
|------------------------------|-----------------------------|---------------------------------|------------------------------------|------------------|--|---------|-------------|
|                              | Active Member Contributions | Retired Members & Beneficiaries | Active Members (Employer Financed) | Valuation Assets | Active   | Retired | ER Financed |
| (1)                          | (2)                         | (3)                             | (4)                                | (5)              | (6)  | (7)     | (8)         |
| <b>Non-Hazardous Members</b> |                             |                                 |                                    |                  |  |         |             |
| 2008                         | \$ 875,178                  | \$ 7,162,497                    | \$ 2,092,015                       | \$ 5,318,793     | 100.0%   | 62.0%   | 0.0%        |
| 2009                         | 793,575                     | 8,205,156                       | 1,659,819                          | 4,794,611        | 100.0%   | 48.8%   | 0.0%        |
| 2010                         | 869,484                     | 8,329,758                       | 1,805,553                          | 4,210,216        | 100.0%   | 40.1%   | 0.0%        |
| 2011                         | 916,569                     | 8,482,714                       | 1,782,859                          | 3,726,986        | 100.0%   | 33.1%   | 0.0%        |
| 2012                         | 885,137                     | 8,708,536                       | 1,767,375                          | 3,101,317        | 100.0%   | 25.4%   | 0.0%        |
| 2013                         | 922,928                     | 8,709,324                       | 1,754,351                          | 2,636,123        | 100.0%   | 19.7%   | 0.0%        |
| 2014                         | 928,558                     | 8,870,693                       | 1,750,860                          | 2,423,957        | 100.0%   | 16.9%   | 0.0%        |
| 2015                         | 925,934                     | 9,437,468                       | 1,996,271                          | 2,350,990        | 100.0%   | 15.1%   | 0.0%        |
| 2016                         | 920,120                     | 10,010,168                      | 2,294,410                          | 2,112,286        | 100.0%   | 11.9%   | 0.0%        |
| 2017                         | 934,559                     | 11,608,346                      | 3,048,736                          | 2,123,623        | 100.0%   | 10.2%   | 0.0%        |
| <b>Hazardous Members</b>     |                             |                                 |                                    |                  |  |         |             |
| 2008                         | \$ 89,591                   | \$ 355,772                      | \$ 172,648                         | \$ 502,132       | 100.0%   | 100.0%  | 32.9%       |
| 2009                         | 87,780                      | 413,972                         | 172,659                            | 502,503          | 100.0%   | 100.0%  | 0.4%        |
| 2010                         | 88,511                      | 441,657                         | 157,981                            | 502,729          | 100.0%   | 93.8%   | 0.0%        |
| 2011                         | 86,614                      | 490,395                         | 144,284                            | 510,749          | 100.0%   | 86.5%   | 0.0%        |
| 2012                         | 82,101                      | 521,689                         | 148,910                            | 497,226          | 100.0%   | 79.6%   | 0.0%        |
| 2013                         | 82,146                      | 545,597                         | 156,238                            | 505,657          | 100.0%   | 77.6%   | 0.0%        |
| 2014                         | 83,664                      | 581,231                         | 151,955                            | 527,897          | 100.0%   | 76.4%   | 0.0%        |
| 2015                         | 83,606                      | 633,189                         | 178,638                            | 556,688          | 100.0%   | 74.7%   | 0.0%        |
| 2016                         | 86,705                      | 648,482                         | 201,519                            | 559,487          | 100.0%   | 72.9%   | 0.0%        |
| 2017                         | 93,350                      | 746,350                         | 281,720                            | 607,159          | 100.0%   | 68.8%   | 0.0%        |

# **INSURANCE BENEFITS**

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## **ACTUARIAL TABLES**

## Development of Unfunded Actuarial Accrued Liability Insurance Benefits

(Dollar amounts expressed in thousands)

|  | June 30, 2017        |                   |
|--|----------------------|-------------------|
|  | Non-Hazardous<br>(1) | Hazardous<br>(2)  |
| 1. Projected payroll of active members                               | \$ 1,531,535         | \$ 162,418        |
| 2. Present value of future pay                                       | \$ 11,971,740        | \$ 1,360,355      |
| 3. Normal cost rate  |                      |                   |
| a. Total normal cost rate  | 3.06%                | 6.40%             |
| b. Less: member contribution rate                                    | -0.35%               | -0.52%            |
| c. Employer normal cost rate   | <u>2.71%</u>         | <u>5.88%</u>      |
| 4. Actuarial accrued liability for active members                    |                      |                   |
| a. Present value of future benefits                                  | \$ 1,444,863         | \$ 246,482        |
| b. Less: present value of future normal costs                        | (336,661)            | (70,859)          |
| c. Actuarial accrued liability                                       | <u>\$ 1,108,202</u>  | <u>\$ 175,623</u> |
| 5. Total actuarial accrued liability                                 |                      |                   |
| a. Retirees and beneficiaries  | \$ 1,452,876         | \$ 233,808        |
| b. Inactive members  | 122,418              | 10,008            |
| c. Active members (Item 4c)  | <u>1,108,202</u>     | <u>175,623</u>    |
| d. Total   | \$ 2,683,496         | \$ 419,439        |
| 6. Actuarial value of assets   | \$ 823,918           | \$ 493,458        |
| 7. Unfunded actuarial accrued liability (UAAL)<br>(Item 5d - Item 6) | \$ 1,859,578         | \$ (74,019)       |
| 8. Funded Ratio  | 30.7%                | 117.6%            |

## Development of Required Contribution Rate Insurance Benefits

|  | June 30, 2017        |                  |
|--|----------------------|------------------|
|  | Non-Hazardous<br>(1) | Hazardous<br>(2) |
| 1. Total normal cost rate                  | 3.06%                | 6.40%            |
| 2. Less: member contribution rate          | <u>-0.35%</u>        | <u>-0.52%</u>    |
| 3. Total employer normal cost rate         | 2.71%                | 5.88%            |
| 4. Administrative expenses                 | <u>0.06%</u>         | <u>0.06%</u>     |
| 5. Net employer normal cost rate           | 2.77%                | 5.94%            |
| 6. UAAL amortization contribution          | 9.63%                | -3.48%           |
| 7. Total recommended employer contribution | 12.40%               | 2.46%            |

**Actuarial Balance Sheet**  
**Non-Hazardous Members Insurance**  
(Dollar amounts expressed in thousands)

|  | June 30, 2017 | June 30, 2016 |
|--|---------------|---------------|
|  | (1)           | (2)           |
| 1. Assets - Present and Expected Future Resources  |               |               |
| a. Current assets (actuarial value)  | \$ 823,918    | \$ 743,270    |
| b. Present value of future member contributions  | \$ 53,847     | \$ 48,293     |
| c. Present value of future employer contributions  |               |               |
| i. Normal cost contributions   | \$ 282,814    | \$ 243,915    |
| ii. Unfunded accrued liability contributions   | 1,859,578     | 1,713,408     |
| iii. Total future employer contributions   | \$ 2,142,392  | \$ 1,957,323  |
| d. Total assets  | \$ 3,020,157  | \$ 2,748,886  |
| 2. Liabilities - Present Value of Expected Future Benefit Payments                           |               |               |
| a. Active members  |               |               |
| i. Present value of future normal costs  | \$ 336,661    | \$ 292,208    |
| ii. Accrued liability  | 1,108,202     | 973,042       |
| iii. Total present value of future benefits  | \$ 1,444,863  | \$ 1,265,250  |
| b. Present value of benefits payable on account of current retired members and beneficiaries | \$ 1,452,876  | \$ 1,352,227  |
| c. Present value of benefits payable on account of current inactive members                  | \$ 122,418    | \$ 131,409    |
| d. Total liabilities   | \$ 3,020,157  | \$ 2,748,886  |

**Actuarial Balance Sheet**  
**Hazardous Members Insurance**  
(Dollar amounts expressed in thousands)

|  | June 30, 2017 | June 30, 2016 |
|--|---------------|---------------|
|  | (1)           | (2)           |
| 1. Assets - Present and Expected Future Resources  |               |               |
| a. Current assets (actuarial value)  | \$ 493,458    | \$ 473,160    |
| b. Present value of future member contributions  | \$ 9,088      | \$ 7,276      |
| c. Present value of future employer contributions  |               |               |
| i. Normal cost contributions   | \$ 61,771     | \$ 47,365     |
| ii. Unfunded accrued liability contributions   | (74,019)      | (95,415)      |
| iii. Total future employer contributions   | \$ (12,248)   | \$ (48,050)   |
| d. Total assets  | \$ 490,298    | \$ 432,386    |
| 2. Liabilities - Present Value of Expected Future Benefit Payments                           |               |               |
| a. Active members  |               |               |
| i. Present value of future normal costs  | \$ 70,859     | \$ 54,641     |
| ii. Accrued liability  | 175,623       | 149,384       |
| iii. Total present value of future benefits  | \$ 246,482    | \$ 204,025    |
| b. Present value of benefits payable on account of current retired members and beneficiaries | \$ 233,808    | \$ 217,753    |
| c. Present value of benefits payable on account of current inactive members                  | \$ 10,008     | \$ 10,608     |
| d. Total liabilities   | \$ 490,298    | \$ 432,386    |

**Reconciliation of Insurance Net Assets**  
(Dollar amounts expressed in thousands)

|  | Year Ending          |                  |
|--|----------------------|------------------|
|  | June 30, 2017        | June 30, 2017    |
|  | (1)                  | (2)              |
|  | <b>Non-Hazardous</b> | <b>Hazardous</b> |
| 1. Value of assets at beginning of year                  | \$ 695,189           | \$ 440,596       |
| 2. Revenue for the year                                  |                      |                  |
| a. Contributions   |                      |                  |
| i. Member contributions                                  | \$ 5,156             | \$ 811           |
| ii. Employer contributions                               | 133,024              | 4,688            |
| iii. Other contributions                                 | 19,332               | 932              |
| iii. Total   | \$ 157,511           | \$ 6,431         |
| b. Income  |                      |                  |
| i. Interest, dividends, and other income                 | \$ 19,834            | \$ 13,191        |
| ii. Investment expenses                                  | (4,227)              | (3,402)          |
| iii. Net   | \$ 15,608            | \$ 9,789         |
| c. Net realized and unrealized gains (losses)            | 79,244               | 49,786           |
| d. Total revenue   | \$ 252,363           | \$ 66,006        |
| 3. Expenditures for the year                             |                      |                  |
| a. Disbursements   |                      |                  |
| i. Refunds   | \$ 0                 | \$ 0             |
| ii. Healthcare premium subsidies                         | 127,648              | 17,562           |
| iii. Other benefit payments                              | 1,673                | 97               |
| iv. Transfers to other systems                           | 0                    | 0                |
| v. Total   | \$ 129,321           | \$ 17,659        |
| b. Administrative expenses and depreciation              | 861                  | 105              |
| c. Total expenditures                                    | \$ 130,182           | \$ 17,764        |
| 4. Increase in net assets<br>(Item 2. - Item 3.)         | \$ 122,181           | \$ 48,242        |
| 5. Value of assets at end of year<br>(Item 1. + Item 4.) | \$ 817,370           | \$ 488,838       |
| 6. Net external cash flow                                |                      |                  |
| a. Dollar amount   | \$ 27,330            | \$ (11,333)      |
| b. Percentage of market value                            | 3.6%                 | -2.4%            |
| 7. Estimated annual return on net assets                 | 13.4%                | 13.7%            |



**Development of Actuarial Value of Assets**  
**Hazardous Members Insurance**  
(Dollar amounts expressed in thousands)\*

| Year Ending   | June 30, 2017   |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
|---|---|---------------------------------------|--------------------------|------------------------------|---------|-----------|----------|---------|----------|---------|---------|----------|---------|---------|--------|-------|---------|-------|-------|----------|--|----------|
| 1. Actuarial value of assets at beginning of year   | \$ 473,160  |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| 2. Market value of assets at beginning of year  | \$ 440,596  |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| 3. Net new investments  |   |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| a. Contributions  | \$ 6,431  |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| b. Benefit payments   | (17,659)  |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| c. Administrative expenses  | (105)   |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| d. Subtotal   | \$ (11,333)   |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| 4. Market value of assets at end of year  | \$ 488,838  |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| 5. Net earnings (Item 4. - Item 2. - Item 3.d.)   | \$ 59,575   |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| 6. Assumed investment return rate for fiscal year   | 7.50%   |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| 7. Expected return for immediate recognition  | \$ 32,619   |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| 8. Excess return for phased recognition   | \$ 26,956   |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| 9. Phased-in recognition, 20% of excess return on assets for prior years:                       |   |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
|   | <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; vertical-align: bottom;">Fiscal Year<br/><u>Ending June 30,</u></th> <th style="text-align: right; vertical-align: bottom;"><u>Excess<br/>Return</u></th> <th style="text-align: right; vertical-align: bottom;"><u>Recognized<br/>Amount</u></th> </tr> </thead> <tbody> <tr> <td style="padding-left: 20px;">a. 2017</td> <td style="text-align: right;">\$ 26,956</td> <td style="text-align: right;">\$ 5,391</td> </tr> <tr> <td style="padding-left: 20px;">b. 2016</td> <td style="text-align: right;">(33,995)</td> <td style="text-align: right;">(6,799)</td> </tr> <tr> <td style="padding-left: 20px;">c. 2015</td> <td style="text-align: right;">(25,896)</td> <td style="text-align: right;">(5,179)</td> </tr> <tr> <td style="padding-left: 20px;">d. 2014</td> <td style="text-align: right;">22,857</td> <td style="text-align: right;">4,571</td> </tr> <tr> <td style="padding-left: 20px;">e. 2013</td> <td style="text-align: right;">5,137</td> <td style="text-align: right;">1,027</td> </tr> <tr> <td style="padding-left: 20px;">f. Total</td> <td></td> <td style="text-align: right; border-top: 1px solid black;">\$ (988)</td> </tr> </tbody> </table> | Fiscal Year<br><u>Ending June 30,</u> | <u>Excess<br/>Return</u> | <u>Recognized<br/>Amount</u> | a. 2017 | \$ 26,956 | \$ 5,391 | b. 2016 | (33,995) | (6,799) | c. 2015 | (25,896) | (5,179) | d. 2014 | 22,857 | 4,571 | e. 2013 | 5,137 | 1,027 | f. Total |  | \$ (988) |
| Fiscal Year<br><u>Ending June 30,</u>   | <u>Excess<br/>Return</u>  | <u>Recognized<br/>Amount</u>          |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| a. 2017   | \$ 26,956   | \$ 5,391                              |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| b. 2016   | (33,995)  | (6,799)                               |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| c. 2015   | (25,896)  | (5,179)                               |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| d. 2014   | 22,857  | 4,571                                 |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| e. 2013   | 5,137   | 1,027                                 |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| f. Total  |   | \$ (988)                              |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| 10. Actuarial value of assets as of June 30, 2017<br>(Item 1. + Item 3.d. + Item 7.+ Item 9.f.) | \$ 493,458  |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| 11. Ratio of actuarial value to market value  | 100.9%  |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |
| 12. Estimated annual return on actuarial value of assets  | 6.8%  |                                       |                          |                              |         |           |          |         |          |         |         |          |         |         |        |       |         |       |       |          |  |          |

\* Amounts may not add due to rounding

**Schedule of Funding Progress**  
**Insurance Benefits**  
(Dollar amounts expressed in thousands)

| June 30,<br>(1)              | Actuarial Value of<br>Assets (AVA)<br>(2) | Actuarial Accrued<br>Liability (AAL)<br>(3) | Unfunded Actuarial<br>Accrued Liability<br>(UAAL) (3) - (2)<br>(4) | Funded Ratio<br>(2)/(3)<br>(5) | Annual Covered<br>Payroll<br>(6) | UAAL as % of<br>Payroll (4)/(6)<br>(7) |
|------------------------------|---|---|--|--------------------------------|----------------------------------|--|
| <b>Non-Hazardous Members</b> |   |   |  |                                |                                  |  |
| 2011                         | \$ 451,620                                | \$ 4,280,090                                | \$ 3,828,469   | 10.6%                          | \$ 1,731,633                     | 221.1%                                 |
| 2012                         | 446,081                                   | 3,125,330                                   | 2,679,250  | 14.3%                          | 1,644,897                        | 162.9%                                 |
| 2013                         | 497,584                                   | 2,128,754                                   | 1,631,170  | 23.4%                          | 1,644,409                        | 99.2%                                  |
| 2014                         | 621,237                                   | 2,226,760                                   | 1,605,523  | 27.9%                          | 1,577,496                        | 101.8%                                 |
| 2015                         | 695,018                                   | 2,413,705                                   | 1,718,687  | 28.8%                          | 1,544,234                        | 111.3%                                 |
| 2016                         | 743,270                                   | 2,456,678                                   | 1,713,408  | 30.3%                          | 1,529,249                        | 112.0%                                 |
| 2017                         | 823,918                                   | 2,683,496                                   | 1,859,578  | 30.7%                          | 1,531,535                        | 121.4%                                 |
| <b>Hazardous Members</b>     |   |   |  |                                |                                  |  |
| 2011                         | \$ 329,962                                | \$ 507,059                                  | \$ 177,097   | 65.1%                          | \$ 133,054                       | 133.1%                                 |
| 2012                         | 345,574                                   | 384,592                                     | 39,018   | 89.9%                          | 131,977                          | 29.6%                                  |
| 2013                         | 370,774                                   | 385,518                                     | 14,743   | 96.2%                          | 132,015                          | 11.2%                                  |
| 2014                         | 419,396                                   | 396,987                                     | (22,409)   | 105.6%                         | 129,076                          | -17.4%                                 |
| 2015                         | 451,514                                   | 374,904                                     | (76,610)   | 120.4%                         | 128,680                          | -59.5%                                 |
| 2016                         | 473,160                                   | 377,745                                     | (95,415)   | 125.3%                         | 147,563                          | -64.7%                                 |
| 2017                         | 493,458                                   | 419,439                                     | (74,019)   | 117.6%                         | 162,418                          | -45.6%                                 |
| <b>Total KERS Members</b>    |   |   |  |                                |                                  |  |
| 2011                         | \$ 781,582                                | \$ 4,787,149                                | \$ 4,005,567   | 16.3%                          | \$ 1,864,687                     | 214.8%                                 |
| 2012                         | 791,655                                   | 3,509,922                                   | 2,718,267  | 22.6%                          | 1,776,874                        | 153.0%                                 |
| 2013                         | 868,358                                   | 2,514,272                                   | 1,645,914  | 34.5%                          | 1,776,424                        | 92.7%                                  |
| 2014                         | 1,040,633                                 | 2,623,747                                   | 1,583,114  | 39.7%                          | 1,706,572                        | 92.8%                                  |
| 2015                         | 1,146,532                                 | 2,788,609                                   | 1,642,077  | 41.1%                          | 1,672,914                        | 98.2%                                  |
| 2016                         | 1,216,430                                 | 2,834,423                                   | 1,617,993  | 42.9%                          | 1,676,812                        | 96.5%                                  |
| 2017                         | 1,317,376                                 | 3,102,935                                   | 1,785,559  | 42.5%                          | 1,693,953                        | 105.4%                                 |

**Solvency Test**  
**Insurance Benefits**  
(Dollar amounts expressed in thousands)

| June 30,                     | Actuarial Accrued Liability |                                 |                                    |                  | Portion of Aggregate Accrued Liabilities Covered by Assets |         |             |
|------------------------------|-----------------------------|---------------------------------|------------------------------------|------------------|--|---------|-------------|
|                              | Active Member Contributions | Retired Members & Beneficiaries | Active Members (Employer Financed) | Valuation Assets | Active   | Retired | ER Financed |
|                              | (1)                         | (2)                             | (3)                                | (4)              | (5)  | (6)     | (7)         |
| <b>Non-Hazardous Members</b> |                             |                                 |                                    |                  |  |         |             |
| 2008                         | \$ -                        | \$ 2,788,190                    | \$ 2,643,310                       | \$ 603,198       | 100.0%   | 21.6%   | 0.0%        |
| 2009                         | -                           | 2,861,867                       | 1,645,458                          | 534,173          | 100.0%   | 18.7%   | 0.0%        |
| 2010                         | -                           | 2,744,534                       | 1,721,602                          | 471,342          | 100.0%   | 17.2%   | 0.0%        |
| 2011                         | -                           | 2,568,003                       | 1,712,087                          | 451,620          | 100.0%   | 17.6%   | 0.0%        |
| 2012                         | -                           | 1,924,069                       | 1,201,262                          | 446,081          | 100.0%   | 23.2%   | 0.0%        |
| 2013                         | -                           | 1,338,773                       | 789,981                            | 497,584          | 100.0%   | 37.2%   | 0.0%        |
| 2014                         | -                           | 1,425,605                       | 801,155                            | 621,237          | 100.0%   | 43.6%   | 0.0%        |
| 2015                         | -                           | 1,428,350                       | 985,355                            | 695,018          | 100.0%   | 48.7%   | 0.0%        |
| 2016                         | -                           | 1,483,636                       | 973,042                            | 743,270          | 100.0%   | 50.1%   | 0.0%        |
| 2017                         | -                           | 1,575,294                       | 1,108,202                          | 823,918          | 100.0%   | 52.3%   | 0.0%        |
| <b>Hazardous Members</b>     |                             |                                 |                                    |                  |  |         |             |
| 2008                         | \$ -                        | \$ 228,835                      | \$ 312,822                         | \$ 288,162       | 100.0%   | 100.0%  | 19.0%       |
| 2009                         | -                           | 242,123                         | 249,009                            | 301,635          | 100.0%   | 100.0%  | 23.9%       |
| 2010                         | -                           | 268,511                         | 224,787                            | 314,427          | 100.0%   | 100.0%  | 20.4%       |
| 2011                         | -                           | 285,540                         | 221,519                            | 329,962          | 100.0%   | 100.0%  | 20.1%       |
| 2012                         | -                           | 196,579                         | 188,013                            | 345,574          | 100.0%   | 100.0%  | 79.2%       |
| 2013                         | -                           | 202,032                         | 183,486                            | 370,774          | 100.0%   | 100.0%  | 92.0%       |
| 2014                         | -                           | 206,477                         | 190,509                            | 419,396          | 100.0%   | 100.0%  | 100.0%      |
| 2015                         | -                           | 221,115                         | 153,789                            | 451,514          | 100.0%   | 100.0%  | 100.0%      |
| 2016                         | -                           | 228,361                         | 149,384                            | 473,160          | 100.0%   | 100.0%  | 100.0%      |
| 2017                         | -                           | 243,816                         | 175,623                            | 493,458          | 100.0%   | 100.0%  | 100.0%      |

# SECTION 4

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## MEMBERSHIP INFORMATION

## Membership Tables

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**Summary of Membership Data**  
(Total dollar amounts expressed in thousands)

|   | Non-Hazardous<br>June 30, 2017<br>(1) | Hazardous<br>June 30, 2017<br>(2) | Total<br>June 30, 2017<br>(3) |
|---|---------------------------------------|-----------------------------------|-------------------------------|
| 1. Active members                           |                                       |                                   |                               |
| a. Males                                    | 14,183                                | 2,808                             | 16,991                        |
| b. Females                                  | 23,051                                | 1,239                             | 24,290                        |
| c. Total members                            | 37,234                                | 4,047                             | 41,281                        |
| d. Total annualized prior year salaries     | \$ 1,531,535                          | \$ 162,418                        | \$ 1,693,953                  |
| e. Average salary                           | \$ 41,133                             | \$ 40,133                         | \$ 41,035                     |
| f. Average age                              | 45.4                                  | 40.3                              | 44.9                          |
| g. Average service                          | 10.9                                  | 7.6                               | 10.6                          |
| h. Member contributions with interest       | \$ 934,559                            | \$ 93,350                         | \$ 1,027,910                  |
| i. Average contributions with interest      | \$ 25,100                             | \$ 23,066                         | \$ 24,900                     |
| 2. Vested inactive members                  |                                       |                                   |                               |
| a. Number                                   | 10,794                                | 505                               | 11,299                        |
| b. Total annual deferred benefits           | \$ 69,704                             | \$ 3,363                          | \$ 73,067                     |
| c. Average annual deferred benefit          | \$ 6,458                              | \$ 6,659                          | \$ 6,467                      |
| d. Average age at the valuation date        | 48.8                                  | 45.1                              | N/A                           |
| 3. Nonvested inactive members               |                                       |                                   |                               |
| a. Number                                   | 38,864                                | 4,793                             | 43,657                        |
| b. Total member contributions with interest | \$ 64,750                             | \$ 7,706                          | \$ 72,457                     |
| c. Average contributions with interest      | \$ 1,666                              | \$ 1,608                          | \$ 1,660                      |
| 4. Service retirees                         |                                       |                                   |                               |
| a. Number                                   | 38,170                                | 3,505                             | 41,675                        |
| b. Total annual benefits                    | \$ 828,249                            | \$ 53,647                         | \$ 881,896                    |
| c. Average annual benefit                   | \$ 21,699                             | \$ 15,306                         | \$ 21,161                     |
| d. Average age at the valuation date        | 68.8                                  | 64.5                              | 68.5                          |
| 5. Disabled retirees                        |                                       |                                   |                               |
| a. Number                                   | 1,978                                 | 159                               | 2,137                         |
| b. Total annual benefits                    | \$ 25,776                             | \$ 1,407                          | \$ 27,183                     |
| c. Average annual benefit                   | \$ 13,031                             | \$ 8,849                          | \$ 12,720                     |
| d. Average age at the valuation date        | 65.2                                  | 59.5                              | 64.8                          |
| 6. Beneficiaries                            |                                       |                                   |                               |
| a. Number                                   | 4,768                                 | 429                               | 5,197                         |
| b. Total annual benefits                    | \$ 67,277                             | \$ 4,108                          | \$ 71,385                     |
| c. Average annual benefit                   | \$ 14,110                             | \$ 9,576                          | \$ 13,736                     |
| d. Average age at the valuation date        | 71.0                                  | 66.2                              | 70.6                          |

## Summary of Historical Active Membership

| June 30,<br>(1)              | Active Members |   | Covered Payroll <sup>1</sup>  |   | Average Annual Pay |   |
|------------------------------|----------------|---|-------------------------------|---|--------------------|---|
|                              | Number<br>(2)  | Percent<br>Increase<br>/(Decrease)<br>(3) | Amount in<br>Thousands<br>(4) | Percent<br>Increase<br>/(Decrease)<br>(5) | Amount<br>(6)      | Percent<br>Increase<br>/(Decrease)<br>(7) |
| <b>Non-Hazardous Members</b> |                |   |                               |   |                    |   |
| 2011                         | 46,617         |   | \$ 1,731,633                  |   | \$ 37,146          | -3.6%                                     |
| 2012                         | 42,196         | -9.5%                                     | 1,644,897                     | -5.0%                                     | 38,982             | 4.9%                                      |
| 2013                         | 42,226         | 0.1%                                      | 1,644,409                     | 0.0%                                      | 38,943             | -0.1%                                     |
| 2014                         | 40,365         | -4.4%                                     | 1,577,496                     | -4.1%                                     | 39,081             | 0.4%                                      |
| 2015                         | 39,056         | -3.2%                                     | 1,544,234                     | -2.1%                                     | 39,539             | 1.2%                                      |
| 2016                         | 37,779         | -3.3%                                     | 1,529,249                     | -1.0%                                     | 40,479             | 2.4%                                      |
| 2017                         | 37,234         | -1.4%                                     | 1,531,535                     | 0.1%                                      | 41,133             | 1.6%                                      |
| <b>Hazardous Members</b>     |                |   |                               |   |                    |   |
| 2011                         | 4,291          |   | \$ 133,054                    |   | \$ 31,008          | -7.3%                                     |
| 2012                         | 4,086          | -4.8%                                     | 131,977                       | -0.8%                                     | 32,300             | 4.2%                                      |
| 2013                         | 4,127          | 1.0%                                      | 132,015                       | 0.0%                                      | 31,988             | -1.0%                                     |
| 2014                         | 4,024          | -2.5%                                     | 129,076                       | -2.2%                                     | 32,077             | 0.3%                                      |
| 2015                         | 3,886          | -3.4%                                     | 128,680                       | -0.3%                                     | 33,114             | 3.2%                                      |
| 2016                         | 3,959          | 1.9%                                      | 147,563                       | 14.7%                                     | 37,273             | 12.6%                                     |
| 2017                         | 4,047          | 2.2%                                      | 162,418                       | 10.1%                                     | 40,133             | 7.7%                                      |

<sup>1</sup> Covered payroll is the annualized, projected compensation for the following year and does not include payroll attributable to working retirees.

**Distribution of Active Members by Age and by Years of Service**  
**Non-Hazardous Members**

| Attained Age | Years of Credited Service |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    | Total              |                    |
|--------------|---------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|              | 0                         | 1                  | 2                  | 3                  | 4                  | 5-9                | 10-14              | 15-19              | 20-24              | 25-29              | 30-34              | 35 & Over          |                    |                    |
|              | Count & Avg. Comp.        | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. |                    |
| Under 20     | 20<br>\$18,022            | 0<br>\$0           | 1<br>\$34,204      | 0<br>\$0           | 21<br>\$18,793     |
| 20-24        | 426<br>\$22,750           | 224<br>\$30,422    | 124<br>\$30,159    | 57<br>\$29,946     | 7<br>\$28,139      | 3<br>\$31,984      | 0<br>\$0           | 841<br>\$26,452    |
| 25-29        | 623<br>\$25,204           | 657<br>\$31,813    | 545<br>\$32,994    | 387<br>\$32,931    | 283<br>\$34,154    | 367<br>\$34,250    | 8<br>\$30,421      | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 2,870<br>\$31,292  |
| 30-34        | 411<br>\$26,132           | 418<br>\$35,183    | 429<br>\$35,597    | 339<br>\$33,933    | 363<br>\$36,162    | 1,394<br>\$38,767  | 341<br>\$38,951    | 15<br>\$39,395     | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 3,710<br>\$35,920  |
| 35-39        | 356<br>\$27,671           | 336<br>\$38,151    | 326<br>\$34,602    | 266<br>\$35,351    | 267<br>\$37,439    | 1,301<br>\$39,959  | 1,384<br>\$43,413  | 531<br>\$43,161    | 35<br>\$50,506     | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 4,802<br>\$39,589  |
| 40-44        | 305<br>\$28,010           | 304<br>\$36,398    | 242<br>\$34,686    | 225<br>\$34,238    | 192<br>\$39,015    | 946<br>\$39,901    | 1,175<br>\$44,443  | 1,351<br>\$47,258  | 405<br>\$49,502    | 38<br>\$59,097     | 2<br>\$83,546      | 0<br>\$0           | 0<br>\$0           | 5,185<br>\$42,328  |
| 45-49        | 292<br>\$28,223           | 274<br>\$35,464    | 243<br>\$34,656    | 192<br>\$34,085    | 195<br>\$35,782    | 916<br>\$39,998    | 1,019<br>\$44,566  | 1,148<br>\$46,471  | 962<br>\$51,721    | 336<br>\$53,093    | 40<br>\$68,288     | 0<br>\$0           | 0<br>\$0           | 5,617<br>\$43,729  |
| 50-54        | 187<br>\$28,042           | 210<br>\$36,046    | 181<br>\$35,598    | 211<br>\$35,282    | 163<br>\$35,054    | 831<br>\$39,806    | 929<br>\$42,759    | 913<br>\$45,493    | 788<br>\$51,399    | 516<br>\$54,307    | 166<br>\$60,489    | 17<br>\$61,460     | 17<br>\$61,460     | 5,112<br>\$44,281  |
| 55-59        | 178<br>\$27,572           | 142<br>\$37,687    | 118<br>\$35,102    | 128<br>\$34,770    | 122<br>\$36,529    | 728<br>\$38,596    | 905<br>\$42,166    | 899<br>\$44,802    | 619<br>\$47,909    | 375<br>\$52,687    | 155<br>\$60,243    | 31<br>\$65,765     | 31<br>\$65,765     | 4,400<br>\$43,326  |
| 60-64        | 82<br>\$31,260            | 84<br>\$54,536     | 75<br>\$41,599     | 70<br>\$37,602     | 93<br>\$39,283     | 577<br>\$41,087    | 695<br>\$42,090    | 690<br>\$45,725    | 425<br>\$47,363    | 241<br>\$54,107    | 95<br>\$60,828     | 44<br>\$70,778     | 44<br>\$70,778     | 3,171<br>\$45,135  |
| 65 & Over    | 43<br>\$37,827            | 38<br>\$63,557     | 37<br>\$36,987     | 35<br>\$45,942     | 34<br>\$35,558     | 268<br>\$39,158    | 354<br>\$44,452    | 343<br>\$46,968    | 164<br>\$50,997    | 109<br>\$56,433    | 46<br>\$65,165     | 34<br>\$71,243     | 34<br>\$71,243     | 1,505<br>\$46,845  |
| Total        | 2,923<br>\$26,504         | 2,687<br>\$35,705  | 2,321<br>\$34,553  | 1,910<br>\$34,419  | 1,719<br>\$36,350  | 7,331<br>\$39,347  | 6,810<br>\$43,189  | 5,890<br>\$45,870  | 3,398<br>\$50,095  | 1,615<br>\$53,905  | 504<br>\$61,615    | 126<br>\$68,413    | 126<br>\$68,413    | 37,234<br>\$41,133 |

**Distribution of Active Members by Age and by Years of Service**  
**Hazardous Members**

| Attained Age | Years of Credited Service |                        |                        |                        |                        |                        |                        |                        |                        |                       |                      |                    | Total Count & Avg. Comp. |                          |
|--------------|---------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------|----------------------|--------------------|--------------------------|--------------------------|
|              | 0                         | 1                      | 2                      | 3                      | 4                      | 5-9                    | 10-14                  | 15-19                  | 20-24                  | 25-29                 | 30-34                | 35 & Over          |                          |                          |
|              | Count & Avg. Comp.        | Count & Avg. Comp.     | Count & Avg. Comp.     | Count & Avg. Comp.     | Count & Avg. Comp.     | Count & Avg. Comp.     | Count & Avg. Comp.     | Count & Avg. Comp.     | Count & Avg. Comp.     | Count & Avg. Comp.    | Count & Avg. Comp.   | Count & Avg. Comp. | Count & Avg. Comp.       |                          |
| Under 20     | 0<br>\$0                  | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 0<br>\$0              | 0<br>\$0             | 0<br>\$0           | 0<br>\$0                 | 0<br>\$0                 |
| 20-24        | 148<br>\$25,971           | 78<br>\$38,449         | 45<br>\$37,348         | 2<br>\$31,005          | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 0<br>\$0              | 0<br>\$0             | 0<br>\$0           | 0<br>\$0                 | 273<br>\$31,448          |
| 25-29        | 158<br>\$27,771           | 137<br>\$35,894        | 109<br>\$38,425        | 100<br>\$38,060        | 75<br>\$39,770         | 52<br>\$40,278         | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 0<br>\$0              | 0<br>\$0             | 0<br>\$0           | 0<br>\$0                 | 631<br>\$35,462          |
| 30-34        | 73<br>\$28,533            | 74<br>\$37,772         | 69<br>\$38,989         | 55<br>\$38,650         | 49<br>\$40,049         | 201<br>\$39,919        | 48<br>\$45,216         | 1<br>\$42,641          | 0<br>\$0               | 0<br>\$0              | 0<br>\$0             | 0<br>\$0           | 0<br>\$0                 | 570<br>\$38,409          |
| 35-39        | 48<br>\$26,832            | 37<br>\$39,720         | 36<br>\$37,001         | 24<br>\$37,922         | 34<br>\$37,059         | 144<br>\$41,392        | 186<br>\$43,673        | 31<br>\$43,649         | 0<br>\$0               | 0<br>\$0              | 0<br>\$0             | 0<br>\$0           | 0<br>\$0                 | 540<br>\$40,179          |
| 40-44        | 35<br>\$25,005            | 40<br>\$34,889         | 32<br>\$38,317         | 24<br>\$40,167         | 29<br>\$36,700         | 98<br>\$43,398         | 137<br>\$44,417        | 140<br>\$48,122        | 18<br>\$55,037         | 1<br>\$79,550         | 0<br>\$0             | 0<br>\$0           | 0<br>\$0                 | 554<br>\$42,727          |
| 45-49        | 36<br>\$29,765            | 39<br>\$36,942         | 22<br>\$39,476         | 19<br>\$37,459         | 25<br>\$38,227         | 92<br>\$40,887         | 127<br>\$47,659        | 117<br>\$48,081        | 54<br>\$53,683         | 12<br>\$56,652        | 0<br>\$0             | 0<br>\$0           | 0<br>\$0                 | 543<br>\$44,322          |
| 50-54        | 25<br>\$25,653            | 30<br>\$35,465         | 31<br>\$38,463         | 22<br>\$36,740         | 14<br>\$41,143         | 84<br>\$40,670         | 87<br>\$43,816         | 79<br>\$46,851         | 29<br>\$51,542         | 16<br>\$64,509        | 3<br>\$60,026        | 0<br>\$0           | 0<br>\$0                 | 420<br>\$42,663          |
| 55-59        | 13<br>\$27,350            | 16<br>\$40,343         | 7<br>\$42,181          | 17<br>\$36,343         | 15<br>\$32,722         | 45<br>\$41,046         | 49<br>\$44,804         | 52<br>\$47,864         | 19<br>\$52,845         | 5<br>\$70,328         | 2<br>\$82,597        | 0<br>\$0           | 0<br>\$0                 | 240<br>\$43,572          |
| 60-64        | 7<br>\$29,352             | 4<br>\$40,919          | 9<br>\$34,410          | 9<br>\$36,271          | 14<br>\$38,805         | 49<br>\$40,090         | 61<br>\$42,050         | 45<br>\$45,678         | 8<br>\$50,553          | 4<br>\$61,256         | 1<br>\$34,006        | 0<br>\$0           | 0<br>\$0                 | 211<br>\$41,787          |
| 65 & Over    | 1<br>\$23,352             | 2<br>\$84,786          | 1<br>\$26,409          | 2<br>\$43,111          | 3<br>\$34,256          | 11<br>\$35,069         | 25<br>\$42,816         | 13<br>\$47,927         | 2<br>\$72,713          | 3<br>\$61,307         | 2<br>\$59,686        | 0<br>\$0           | 0<br>\$0                 | 65<br>\$45,173           |
| <b>Total</b> | <b>544</b><br>\$27,160    | <b>457</b><br>\$37,331 | <b>361</b><br>\$38,254 | <b>274</b><br>\$38,023 | <b>258</b><br>\$38,519 | <b>776</b><br>\$40,859 | <b>720</b><br>\$44,548 | <b>478</b><br>\$47,337 | <b>130</b><br>\$53,371 | <b>41</b><br>\$62,734 | <b>8</b><br>\$62,331 | <b>0</b><br>\$0    | <b>0</b><br>\$0          | <b>4,047</b><br>\$40,133 |

**Distribution of Annuitant Monthly Benefit by Status and Age**  
**Non-Hazardous Retirees and Beneficiaries**  
(Dollar amounts expressed in thousands)

| Current Age<br>(1) | Retirement                  |                                    | Disability                  |                                    | Survivors & Beneficiaries   |                                    | Total                       |                                    |
|--------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|
|                    | Number of Annuitants<br>(2) | Total Annual Benefit Amount<br>(3) | Number of Annuitants<br>(4) | Total Annual Benefit Amount<br>(5) | Number of Annuitants<br>(6) | Total Annual Benefit Amount<br>(7) | Number of Annuitants<br>(8) | Total Annual Benefit Amount<br>(9) |
| Under 50           | 481                         | \$ 11,751                          | 128                         | \$ 1,753                           | 454                         | \$ 5,167                           | 1,063                       | \$ 18,671                          |
| 50 - 54            | 1,644                       | 44,975                             | 171                         | 2,547                              | 183                         | 2,216                              | 1,998                       | 49,738                             |
| 55 - 59            | 4,011                       | 105,459                            | 281                         | 3,804                              | 323                         | 4,412                              | 4,615                       | 113,675                            |
| 60 - 64            | 7,055                       | 172,764                            | 418                         | 5,802                              | 493                         | 7,442                              | 7,966                       | 186,008                            |
| 65 - 69            | 9,426                       | 206,490                            | 388                         | 4,926                              | 592                         | 10,133                             | 10,406                      | 221,549                            |
| 70 - 74            | 6,810                       | 141,009                            | 253                         | 3,043                              | 646                         | 10,347                             | 7,709                       | 154,399                            |
| 75 - 79            | 4,089                       | 75,976                             | 190                         | 2,364                              | 613                         | 9,860                              | 4,892                       | 88,200                             |
| 80 - 84            | 2,455                       | 39,493                             | 100                         | 1,063                              | 569                         | 8,209                              | 3,124                       | 48,765                             |
| 85 - 89            | 1,440                       | 21,180                             | 38                          | 405                                | 489                         | 5,670                              | 1,967                       | 27,255                             |
| 90 And Over        | 759                         | 9,153                              | 11                          | 69                                 | 406                         | 3,821                              | 1,176                       | 13,043                             |
| <b>Total</b>       | <b>38,170</b>               | <b>\$ 828,249</b>                  | <b>1,978</b>                | <b>\$ 25,776</b>                   | <b>4,768</b>                | <b>\$ 67,277</b>                   | <b>44,916</b>               | <b>\$ 921,302</b>                  |

**Distribution of Annuitant Monthly Benefit by Status and Age  
Hazardous Retirees and Beneficiaries  
(Dollar amounts expressed in thousands)**

| Current Age<br>(1) | Retirement                  |                                    | Disability                  |                                    | Survivors & Beneficiaries   |                                    | Total                       |                                    |
|--------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|
|                    | Number of Annuitants<br>(2) | Total Annual Benefit Amount<br>(3) | Number of Annuitants<br>(4) | Total Annual Benefit Amount<br>(5) | Number of Annuitants<br>(6) | Total Annual Benefit Amount<br>(7) | Number of Annuitants<br>(8) | Total Annual Benefit Amount<br>(9) |
| Under 50           | 198                         | \$ 3,741                           | 28                          | \$ 354                             | 47                          | \$ 358                             | 273                         | \$ 4,453                           |
| 50 - 54            | 347                         | 6,752                              | 25                          | 241                                | 19                          | 226                                | 391                         | 7,219                              |
| 55 - 59            | 514                         | 9,387                              | 27                          | 233                                | 44                          | 496                                | 585                         | 10,116                             |
| 60 - 64            | 679                         | 11,151                             | 28                          | 235                                | 63                          | 708                                | 770                         | 12,094                             |
| 65 - 69            | 880                         | 12,460                             | 31                          | 243                                | 64                          | 711                                | 975                         | 13,414                             |
| 70 - 74            | 518                         | 6,864                              | 9                           | 67                                 | 69                          | 590                                | 596                         | 7,521                              |
| 75 - 79            | 228                         | 2,205                              | 6                           | 14                                 | 62                          | 546                                | 296                         | 2,765                              |
| 80 - 84            | 97                          | 696                                | 5                           | 21                                 | 37                          | 308                                | 139                         | 1,025                              |
| 85 - 89            | 36                          | 218                                | 0                           | -                                  | 18                          | 95                                 | 54                          | 313                                |
| 90 And Over        | 8                           | 174                                | 0                           | -                                  | 6                           | 70                                 | 14                          | 244                                |
| <b>Total</b>       | <b>3,505</b>                | <b>\$ 53,647</b>                   | <b>159</b>                  | <b>\$ 1,407</b>                    | <b>429</b>                  | <b>\$ 4,108</b>                    | <b>4,093</b>                | <b>\$ 59,162</b>                   |

### Non-Hazardous Retired Lives Summary

| Form of Payment<br>(1)          | Male Lives    |                                  | Female Lives  |                                  | Total         |                                  |
|---------------------------------|---------------|----------------------------------|---------------|----------------------------------|---------------|----------------------------------|
|                                 | Number<br>(2) | Monthly<br>Benefit Amount<br>(3) | Number<br>(4) | Monthly<br>Benefit Amount<br>(5) | Number<br>(6) | Monthly<br>Benefit Amount<br>(7) |
| Basic                           | 4,000         | \$ 7,199,431                     | 11,597        | \$ 17,003,936                    | 15,597        | \$ 24,203,367                    |
| Joint & Survivor:               |               |                                  |               |                                  |               |                                  |
| 100% to Beneficiary             | 2,249         | 4,141,025                        | 1,028         | 1,293,678                        | 3,277         | 5,434,703                        |
| 66 2/3% to Beneficiary          | 808           | 2,294,297                        | 515           | 1,028,783                        | 1,323         | 3,323,080                        |
| 50% to Beneficiary              | 1,133         | 2,876,489                        | 1,452         | 2,898,594                        | 2,585         | 5,775,084                        |
| Pop-up Option                   | 3,958         | 9,681,044                        | 3,606         | 7,034,454                        | 7,564         | 16,715,498                       |
| Social Security Option:         |               |                                  |               |                                  |               |                                  |
| Age 62 Basic                    | 403           | 860,926                          | 963           | 1,577,120                        | 1,366         | 2,438,046                        |
| Age 62 Survivorship             | 795           | 1,592,322                        | 610           | 979,920                          | 1,405         | 2,572,242                        |
| Partial Deferred (Old Plan)     | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Widows Age 60                   | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 5 Years Certain                 | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 10 Years Certain                | 1             | 6,328                            | 0             | 0                                | 1             | 6,328                            |
| 10 Years Certain & Life         | 962           | 1,690,766                        | 2,183         | 3,285,276                        | 3,145         | 4,976,042                        |
| 15 Years Certain & Life         | 427           | 683,208                          | 594           | 901,118                          | 1,021         | 1,584,326                        |
| 20 Years Certain & Life         | 420           | 921,839                          | 613           | 966,051                          | 1,033         | 1,887,890                        |
| Refund                          | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Partial Lump Sum Option (PLSO): |               |                                  |               |                                  |               |                                  |
| 12 Month Basic                  | 81            | 133,879                          | 289           | 441,461                          | 370           | 575,340                          |
| 24 Month Basic                  | 33            | 40,038                           | 155           | 199,100                          | 188           | 239,138                          |
| 36 Month Basic                  | 141           | 125,618                          | 396           | 301,140                          | 537           | 426,758                          |
| 12 Month Survivor               | 102           | 212,746                          | 102           | 174,084                          | 204           | 386,830                          |
| 24 Month Survivor               | 79            | 126,121                          | 76            | 111,082                          | 155           | 237,203                          |
| 36 Month Survivor               | 222           | 252,145                          | 155           | 134,743                          | 377           | 386,888                          |
| <b>Total:</b>                   | <b>15,814</b> | <b>\$ 32,838,222</b>             | <b>24,334</b> | <b>\$ 38,330,539</b>             | <b>40,148</b> | <b>\$ 71,168,761</b>             |

### Hazardous Retired Lives Summary

| Form of Payment<br>(1)          | Male Lives    |                                  | Female Lives  |                                  | Total         |                                  |
|---------------------------------|---------------|----------------------------------|---------------|----------------------------------|---------------|----------------------------------|
|                                 | Number<br>(2) | Monthly<br>Benefit Amount<br>(3) | Number<br>(4) | Monthly<br>Benefit Amount<br>(5) | Number<br>(6) | Monthly<br>Benefit Amount<br>(7) |
| Basic                           | 604           | \$ 681,533                       | 472           | \$ 504,082                       | 1,076         | \$ 1,185,615                     |
| Joint & Survivor:               |               |                                  |               |                                  |               |                                  |
| 100% to Beneficiary             | 305           | 357,738                          | 36            | 40,460                           | 341           | 398,198                          |
| 66 2/3% to Beneficiary          | 106           | 139,673                          | 28            | 32,358                           | 134           | 172,032                          |
| 50% to Beneficiary              | 159           | 240,641                          | 63            | 96,308                           | 222           | 336,949                          |
| Pop-up Option                   | 846           | 1,267,739                        | 169           | 218,329                          | 1,015         | 1,486,069                        |
| Social Security Option:         |               |                                  |               |                                  |               |                                  |
| Age 62 Basic                    | 58            | 67,088                           | 33            | 29,788                           | 91            | 96,877                           |
| Age 62 Survivorship             | 136           | 179,507                          | 18            | 15,181                           | 154           | 194,688                          |
| Partial Deferred (Old Plan)     | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Widows Age 60                   | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 5 Years Certain                 | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 10 Years Certain                | 47            | 63,141                           | 12            | 15,204                           | 59            | 78,345                           |
| 10 Years Certain & Life         | 111           | 133,256                          | 73            | 64,413                           | 184           | 197,669                          |
| 15 Years Certain & Life         | 46            | 57,774                           | 23            | 23,952                           | 69            | 81,726                           |
| 20 Years Certain & Life         | 58            | 79,865                           | 32            | 41,978                           | 90            | 121,843                          |
| Refund                          | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Partial Lump Sum Option (PLSO): |               |                                  |               |                                  |               |                                  |
| 12 Month Basic                  | 10            | 10,601                           | 13            | 10,878                           | 23            | 21,479                           |
| 24 Month Basic                  | 15            | 15,175                           | 9             | 7,948                            | 24            | 23,123                           |
| 36 Month Basic                  | 44            | 37,923                           | 23            | 20,016                           | 67            | 57,939                           |
| 12 Month Survivor               | 20            | 26,786                           | 6             | 5,151                            | 26            | 31,937                           |
| 24 Month Survivor               | 19            | 27,991                           | 9             | 11,029                           | 28            | 39,020                           |
| 36 Month Survivor               | 46            | 45,660                           | 15            | 18,695                           | 61            | 64,355                           |
| <b>Total:</b>                   | <b>2,630</b>  | <b>\$ 3,432,092</b>              | <b>1,034</b>  | <b>\$ 1,155,770</b>              | <b>3,664</b>  | <b>\$ 4,587,862</b>              |

### Non-Hazardous Beneficiary Lives Summary

| Form of Payment<br>(1)          | Male Lives    |                                  | Female Lives  |                                  | Total         |                                  |
|---------------------------------|---------------|----------------------------------|---------------|----------------------------------|---------------|----------------------------------|
|                                 | Number<br>(2) | Monthly<br>Benefit Amount<br>(3) | Number<br>(4) | Monthly<br>Benefit Amount<br>(5) | Number<br>(6) | Monthly<br>Benefit Amount<br>(7) |
| Basic                           | 15            | \$ 8,685                         | 31            | \$ 33,721                        | 46            | \$ 42,406                        |
| Joint & Survivor:               |               |                                  |               |                                  |               |                                  |
| 100% to Beneficiary             | 411           | 373,818                          | 1,426         | 1,526,485                        | 1,837         | 1,900,303                        |
| 66 2/3% to Beneficiary          | 81            | 101,018                          | 307           | 358,426                          | 388           | 459,444                          |
| 50% to Beneficiary              | 175           | 131,945                          | 425           | 330,193                          | 600           | 462,137                          |
| Pop-up Option                   | 231           | 395,789                          | 647           | 1,049,103                        | 878           | 1,444,892                        |
| Social Security Option:         |               |                                  |               |                                  |               |                                  |
| Age 62 Basic                    | 0             | 0                                | 10            | 9,527                            | 10            | 9,527                            |
| Age 62 Survivorship             | 83            | 119,325                          | 289           | 491,116                          | 372           | 610,441                          |
| Partial Deferred (Old Plan)     | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Widows Age 60                   | 0             | 0                                | 3             | 1,475                            | 3             | 1,475                            |
| 5 Years Certain                 | 43            | 58,509                           | 41            | 34,945                           | 84            | 93,455                           |
| 10 Years Certain                | 96            | 69,175                           | 95            | 73,455                           | 191           | 142,630                          |
| 10 Years Certain & Life         | 28            | 24,922                           | 40            | 37,513                           | 68            | 62,435                           |
| 15 Years Certain & Life         | 12            | 17,463                           | 44            | 46,676                           | 56            | 64,139                           |
| 20 Years Certain & Life         | 21            | 35,928                           | 62            | 112,428                          | 83            | 148,356                          |
| Refund                          | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Partial Lump Sum Option (PLSO): |               |                                  |               |                                  |               |                                  |
| 12 Month Basic                  | 0             | 0                                | 1             | 1,792                            | 1             | 1,792                            |
| 24 Month Basic                  | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 36 Month Basic                  | 0             | 0                                | 2             | 3,357                            | 2             | 3,357                            |
| 12 Month Survivor               | 7             | 14,743                           | 20            | 34,246                           | 27            | 48,990                           |
| 24 Month Survivor               | 12            | 13,730                           | 25            | 23,881                           | 37            | 37,611                           |
| 36 Month Survivor               | 25            | 17,183                           | 60            | 55,825                           | 85            | 73,008                           |
| <b>Total:</b>                   | <b>1,240</b>  | <b>\$ 1,382,234</b>              | <b>3,528</b>  | <b>\$ 4,224,163</b>              | <b>4,768</b>  | <b>\$ 5,606,397</b>              |

### Hazardous Beneficiary Lives Summary

| Form of Payment<br>(1)          | Male Lives    |                                  | Female Lives  |                                  | Total         |                                  |
|---------------------------------|---------------|----------------------------------|---------------|----------------------------------|---------------|----------------------------------|
|                                 | Number<br>(2) | Monthly<br>Benefit Amount<br>(3) | Number<br>(4) | Monthly<br>Benefit Amount<br>(5) | Number<br>(6) | Monthly<br>Benefit Amount<br>(7) |
| Basic                           | 2             | \$ 1,052                         | 6             | \$ 4,264                         | 8             | \$ 5,316                         |
| Joint & Survivor:               |               |                                  |               |                                  |               |                                  |
| 100% to Beneficiary             | 25            | 17,918                           | 129           | 92,927                           | 154           | 110,845                          |
| 66 2/3% to Beneficiary          | 1             | 368                              | 18            | 8,555                            | 19            | 8,922                            |
| 50% to Beneficiary              | 7             | 5,153                            | 28            | 9,884                            | 35            | 15,037                           |
| Pop-up Option                   | 19            | 18,849                           | 87            | 84,606                           | 106           | 103,455                          |
| Social Security Option:         |               |                                  |               |                                  |               |                                  |
| Age 62 Basic                    | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Age 62 Survivorship             | 8             | 9,889                            | 29            | 29,500                           | 37            | 39,389                           |
| Partial Deferred (Old Plan)     | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Widows Age 60                   | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 5 Years Certain                 | 1             | 635                              | 6             | 5,089                            | 7             | 5,723                            |
| 10 Years Certain                | 5             | 5,823                            | 14            | 12,003                           | 19            | 17,826                           |
| 10 Years Certain & Life         | 6             | 3,889                            | 3             | 2,535                            | 9             | 6,425                            |
| 15 Years Certain & Life         | 3             | 2,044                            | 4             | 2,627                            | 7             | 4,670                            |
| 20 Years Certain & Life         | 0             | 0                                | 7             | 5,460                            | 7             | 5,460                            |
| Refund                          | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Partial Lump Sum Option (PLSO): |               |                                  |               |                                  |               |                                  |
| 12 Month Basic                  | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 24 Month Basic                  | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 36 Month Basic                  | 0             | 0                                | 1             | 126                              | 1             | 126                              |
| 12 Month Survivor               | 0             | 0                                | 4             | 4,145                            | 4             | 4,145                            |
| 24 Month Survivor               | 1             | 995                              | 3             | 2,022                            | 4             | 3,017                            |
| 36 Month Survivor               | 3             | 1,640                            | 9             | 10,330                           | 12            | 11,970                           |
| <b>Total:</b>                   | <b>81</b>     | <b>\$ 68,254</b>                 | <b>348</b>    | <b>\$ 274,072</b>                | <b>429</b>    | <b>\$ 342,327</b>                |

**Schedule of Retirants Added to And Removed from Rolls**  
(Dollar amounts except average allowance expressed in thousands)

| Year Ended           | Added to | Removed    | Rolls End of the Year |                 | % Increase in Annual Benefit | Average Annual Benefit |
|----------------------|----------|------------|-----------------------|-----------------|------------------------------|------------------------|
|                      | Rolls    | from Rolls | Number                | Annual Benefits |                              |                        |
| (1)                  | Number   | Number     | (4)                   | (5)             | (6)                          | (7)                    |
| <b>Non-Hazardous</b> |          |            |                       |                 |                              |                        |
| 2011                 | 1,592    | 940        | 38,597                | \$ 821,197      |                              | \$ 21,276              |
| 2012                 | 1,707    | 1,078      | 39,226                | 844,881         | 2.9%                         | 21,539                 |
| 2013                 | 1,982    | 1,014      | 40,194                | 872,140         | 3.2%                         | 21,698                 |
| 2014                 | 2,067    | 1,038      | 41,223                | 866,047         | -0.7%                        | 21,009                 |
| 2015                 | 2,140    | 1,094      | 42,269                | 883,578         | 2.0%                         | 20,904                 |
| 2016                 | 2,441    | 706        | 44,004                | 934,930         | 5.8%                         | 21,246                 |
| 2017                 | 2,181    | 1,269      | 44,916                | 921,302         | -1.5%                        | 20,512                 |
| <b>Hazardous</b>     |          |            |                       |                 |                              |                        |
| 2011                 | 288      | 59         | 3,064                 | \$ 45,609       |                              | \$ 14,885              |
| 2012                 | 243      | 54         | 3,253                 | 49,231          | 7.9%                         | 15,134                 |
| 2013                 | 229      | 52         | 3,430                 | 51,122          | 3.8%                         | 14,904                 |
| 2014                 | 256      | 66         | 3,620                 | 54,272          | 6.2%                         | 14,992                 |
| 2015                 | 203      | 65         | 3,758                 | 56,431          | 4.0%                         | 15,016                 |
| 2016                 | 237      | 29         | 3,966                 | 59,001          | 4.6%                         | 14,877                 |
| 2017                 | 206      | 79         | 4,093                 | 59,162          | 0.3%                         | 14,454                 |

## **APPENDIX A**

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### **ACTUARIAL ASSUMPTIONS AND METHODS**

## Summary of Actuarial Methods and Assumptions

The following presents a summary of the actuarial assumptions and methods used in the valuation of the Kentucky Employees Retirement System.

**In general, the assumptions and methods used in the valuation are based on the actuarial experience study for the five-year period ending June 30, 2013, submitted April 30, 2014, and adopted by the Board on December 4, 2014. The investment return, price inflation, and payroll growth assumption were adopted by the Board in May and July 2017 for use with the June 30, 2017 valuation in order to reflect future economic expectations.**

*Investment return rate:*

Assumed annual rate of 5.25% net of investment expenses for the non-hazardous retirement fund

Assumed annual rate of 6.25% net of investment expenses for the hazardous retirement fund, non-hazardous insurance fund, and hazardous insurance fund

*Price Inflation:*

Assumed annual rate of 2.30%

*Rates of Annual Salary Increase:*

Assumed rates of annual salary increases are shown below.

| Service Years | Annual Rates of Salary Increases |           |                                |                |           |
|---------------|----------------------------------|-----------|--------------------------------|----------------|-----------|
|               | Merit & Seniority                |           | Price Inflation & Productivity | Total Increase |           |
|               | Non-Hazardous                    | Hazardous |                                | Non-Hazardous  | Hazardous |
| 0             | 12.50%                           | 16.50%    | 3.05%                          | 15.55%         | 19.55%    |
| 1             | 4.50%                            | 4.50%     | 3.05%                          | 7.55%          | 7.55%     |
| 2             | 2.00%                            | 2.50%     | 3.05%                          | 5.05%          | 5.55%     |
| 3             | 1.50%                            | 2.00%     | 3.05%                          | 4.55%          | 5.05%     |
| 4             | 1.50%                            | 1.50%     | 3.05%                          | 4.55%          | 4.55%     |
| 5             | 1.50%                            | 1.00%     | 3.05%                          | 4.55%          | 4.05%     |
| 6             | 1.00%                            | 0.50%     | 3.05%                          | 4.05%          | 3.55%     |
| 7             | 1.00%                            | 0.50%     | 3.05%                          | 4.05%          | 3.55%     |
| 8             | 1.00%                            | 0.50%     | 3.05%                          | 4.05%          | 3.55%     |
| 9             | 0.50%                            | 0.50%     | 3.05%                          | 3.55%          | 3.55%     |
| 10 & Over     | 0.50%                            | 0.50%     | 3.05%                          | 3.55%          | 3.55%     |

Retirement rates:

Assumed annual rates of retirement are shown below. Rates are only applicable for members who are eligible for a service retirement.

| Age | Non-Hazardous                                      |   | Service | Hazardous  |   |
|-----|--|---|---------|--|---|
|     | Members participating before 9/1/2008 <sup>1</sup> | Members participating on or after 9/1/2008 <sup>2</sup> |         | Members participating before 9/1/2008 <sup>3</sup> | Members participating on or after 9/1/2008 <sup>4</sup> |
| 55  | 8.0%   |   | 20      | 40.0%  |   |
| 56  | 8.0%   |   | 21      | 40.0%  |   |
| 57  | 8.0%   |   | 22      | 40.0%  |   |
| 58  | 8.0%   |   | 23      | 40.0%  |   |
| 59  | 8.0%   |   | 24      | 40.0%  |   |
| 60  | 10.0%  | 10.0%   | 25      | 47.0%  | 40.0%   |
| 61  | 20.0%  | 20.0%   | 26      | 47.0%  | 40.0%   |
| 62  | 20.0%  | 20.0%   | 27      | 47.0%  | 40.0%   |
| 63  | 20.0%  | 20.0%   | 28      | 47.0%  | 40.0%   |
| 64  | 20.0%  | 20.0%   | 29      | 47.0%  | 40.0%   |
| 65  | 20.0%  | 25.0%   | 30      | 47.0%  | 47.0%   |
| 66  | 20.0%  | 25.0%   | 31      | 47.0%  | 47.0%   |
| 67  | 20.0%  | 25.0%   | 32      | 50.0%  | 47.0%   |
| 68  | 20.0%  | 25.0%   | 33      | 50.0%  | 47.0%   |
| 69  | 20.0%  | 25.0%   | 34      | 50.0%  | 47.0%   |
| 70  | 20.0%  | 25.0%   | 35      | 60.0%  | 47.0%   |
| 71  | 20.0%  | 25.0%   | 36      | 60.0%  | 47.0%   |
| 72  | 20.0%  | 25.0%   | 37      | 60.0%  | 50.0%   |
| 73  | 20.0%  | 25.0%   | 38      | 60.0%  | 50.0%   |
| 74  | 20.0%  | 25.0%   | 39      | 60.0%  | 50.0%   |
| 75  | 100.0%   | 100.0%  | 40      | 60.0%  | 60.0%   |

<sup>1</sup> If service is at least 27 years, the rate is 35%.

<sup>2</sup> If age plus service is at least 87, the rate is 35%.

<sup>3</sup> The annual rate of service retirement is 100% at age 65.

<sup>4</sup> The annual rate of service retirement is 100% at age 60.

*Disability rates:*

An abbreviated table with assumed rates of disability is show below.

| Age | Non-Hazardous |        | Hazardous |        |
|-----|---------------|--------|-----------|--------|
|     | Male          | Female | Male      | Female |
| 20  | 0.02%         | 0.02%  | 0.03%     | 0.03%  |
| 30  | 0.03%         | 0.03%  | 0.05%     | 0.05%  |
| 40  | 0.07%         | 0.07%  | 0.10%     | 0.10%  |
| 50  | 0.19%         | 0.19%  | 0.28%     | 0.28%  |
| 60  | 0.49%         | 0.49%  | 0.73%     | 0.73%  |

*Withdrawal rates (for causes other than death, disability or retirement):*

Assumed annual rates of withdrawal are shown below.

| Service Years | Annual Rates of Withdrawal |           |
|---------------|----------------------------|-----------|
|               | Non-Hazardous              | Hazardous |
| 0             | 22.50%                     | 25.00%    |
| 1             | 15.50%                     | 10.50%    |
| 2             | 12.50%                     | 7.50%     |
| 3             | 10.50%                     | 6.50%     |
| 4             | 9.00%                      | 5.50%     |
| 5             | 6.50%                      | 4.50%     |
| 6             | 5.50%                      | 3.00%     |
| 7             | 5.00%                      | 3.00%     |
| 8             | 4.50%                      | 3.00%     |
| 9             | 4.50%                      | 2.50%     |
| 10            | 4.00%                      | 2.50%     |
| 11-12         | 4.00%                      | 2.00%     |
| 13-14         | 3.50%                      | 2.00%     |
| 15 & Over     | 3.00%                      | 2.00%     |

*Mortality Assumption:*

Pre-retirement mortality: RP-2000 Combined Mortality Table projected with Scale BB to 2013. Male mortality rates are multiplied by 50% and female mortality rates are multiplied by 30%.

Post-retirement mortality (non-disabled): RP-2000 Combined Mortality Table projected with Scale BB to 2013. Female mortality rates are set back one year.

Post-retirement mortality (disabled): RP-2000 Combined Disabled Mortality Table projected with Scale BB to 2013. Male mortality rates are set back four years.

At the time of the last experience study, performed as of June 30, 2013, this mortality assumption provided 37% and 19% margin for future improvement for males and females, respectively.

*Marital status:*

100% of employees are assumed to be married, with the female spouse 3 years younger than the male spouse.

*Line of Duty Disability*

0% of disabilities are assumed to occur in the line of duty

*Line of Duty Death*

25% of deaths are assumed to occur in the line of duty

*Dependent Children:*

For members in the Hazardous Plan who receive a duty-related death benefit, the member is assumed to be survived by two dependent children, each age 6 with payments for 15 years.

*Form of Payment:*

Members are assumed to elect a life-only annuity at retirement.

*Actuarial Cost Method:*

Entry Age Normal, Level Percentage of Pay. The Entry Age Normal actuarial cost method allocates the System's actuarial present value of future benefits to various periods based upon service. The portion of the present value of future benefits allocated to years of service prior to the valuation date is the actuarial accrued liability, and the portion allocated to years following the valuation date is the present value of future normal costs. The normal cost is determined for each active member as the level percent of pay necessary to fully fund the expected benefits to be earned over the career of each individual active member. The normal cost is partially funded with active member contributions with the remainder funded by employer contributions.

*Health Care Age Related Morbidity/Claims Utilization:*

To model the impact of aging on the underlying health care costs for Medicare retirees, the valuation relied on the Society of Actuaries' 2013 Study "Health Care Costs – From Birth to Death". Table 4 (Development of Plan Specific Medicare Age Curve) was used to model the impact of aging for ages 65 and over.

Health Care Cost Trend Rates<sup>1</sup>:

| January 1     | Non-Medicare Plans | Medicare Plans | Dollar Contribution <sup>2</sup> |
|---------------|--------------------|----------------|----------------------------------|
| 2019          | 7.25%              | 5.10%          | 1.50%                            |
| 2020          | 7.00%              | 5.00%          | 1.50%                            |
| 2021          | 6.75%              | 4.90%          | 1.50%                            |
| 2022          | 6.50%              | 4.80%          | 1.50%                            |
| 2023          | 6.25%              | 4.70%          | 1.50%                            |
| 2024          | 6.00%              | 4.60%          | 1.50%                            |
| 2025          | 5.75%              | 4.50%          | 1.50%                            |
| 2026          | 5.50%              | 4.40%          | 1.50%                            |
| 2027          | 5.25%              | 4.30%          | 1.50%                            |
| 2028          | 5.00%              | 4.20%          | 1.50%                            |
| 2029          | 4.75%              | 4.10%          | 1.50%                            |
| 2030          | 4.50%              | 4.05%          | 1.50%                            |
| 2031          | 4.25%              | 4.05%          | 1.50%                            |
| 2032 & Beyond | 4.05%              | 4.05%          | 1.50%                            |

<sup>1</sup>All increases are assumed to occur on January 1. The 2018 premiums were known at the time of the valuation and were incorporated into the liability measurement using a trend of 1.232% for Non-Medicare plans and a trend of 0.00% for Medicare plans at January 1, 2018.

<sup>2</sup>Applies to members participating on or after July 1, 2003

Health care trend assumptions are based on the model issued by the Society of Actuaries "Getzen model of Long-Run Medical Cost Trends for the SOA; Thomas E. Getzen, iHEA and Temple University 2014 © Society of Actuaries.

The underlying assumptions used to develop the health care trend rates include:

- A short run period-this is a period for which anticipated health care trend rates are manually set based on local information as well as plan-specific and carrier information.
- Long term real GDP growth- 1.75%
- Long term rate of inflation- 2.30%
- Long term nominal GDP growth – 4.05%
- Year that excess rate converges to 0- 15 years from the valuation

Health care trend rates are thus the manually set rates for the short run period and rates which decline to an ultimate trend rate which equals the assumed nominal long term GDP growth rate.

*Health Care Participation Assumptions:*

- Members are assumed to elect health coverage at retirement at the following participation rates.

| Service at Retirement | Members participating before 7/1/2003* | Members participating between 7/1/2003 and 9/1/2008 | Members participating after 9/1/2008 |
|-----------------------|--|---|--------------------------------------|
| Under 10              | 50%                                    | 100%  | 100%                                 |
| 10-14                 | 75%                                    | 100%  | 100%                                 |
| 15-19                 | 90%                                    | 100%  | 100%                                 |
| Over 20               | 100%                                   | 100%  | 100%                                 |

\* 100% of members with a duty disability or a duty death (in service) benefit are assumed to elect coverage at retirement.

- Future retirees are assumed to have a similar distribution by plan type as the current retirees.

| Medicare Plan | June 30, 2017 Participation* |
|---------------|------------------------------|
| Medical Only  | 7%                           |
| Essential     | 8%                           |
| Premium       | 84%                          |

\* May not add due to rounding

| Non-Medicare Plan | June 30, 2017 Participation |
|-------------------|-----------------------------|
| Standard PPO      | 14%                         |
| Standard CDHP     | 2%                          |
| LivingWell CDHP   | 22%                         |
| LivingWell PPO    | 62%                         |

- 50% of deferred vested members participating before July 1, 2003 are assumed to elect health coverage at retirement. 100% of deferred vested members participating after July 1, 2003 are assumed to elect health coverage at retirement. Deferred vested members with non-hazardous service are assumed to begin health coverage at age 55 for members participating before September 1, 2008, and at age 60 for members participating on or after September 1, 2008. Deferred vested members with hazardous service are assumed to begin health coverage at age 50.
- 50% of future retirees, with hazardous service, are assumed to elect spouse health care coverage. No dependent coverage is assumed for members who only have non-hazardous service. 100% of spouses with health care coverage are assumed to continue coverage after the member's death.

### *Excise (“Cadillac”) Tax:*

For taxable years beginning after December 31, 2019, a 40% excise tax will be required to be paid (by the employer and/or insurer) on the aggregate cost of the health plan in excess of certain legislated thresholds. For 2018, the thresholds are \$850 per month for individual coverage and \$2,292 per month for family coverage.

Both Actuarial Standard of Practice No. 6 and GASB Statement Nos. 74 and 75 reference this tax, and, in accordance with these standards an estimate of the impact of the Cadillac tax has been included in this valuation.

Assumptions and methods used to determine the impact of the Cadillac Tax include:

- 2018 thresholds of \$850/\$2,292 were indexed annually by 2.30%.
- Premium data submitted was not adjusted for permissible exclusions to the Cadillac Tax.
- There were no special adjustments to the dollar limit other than those permissible for non-Medicare retirees over 55.

In this valuation, the impact of the Cadillac Tax has been calculated by increasing the employer paid premiums for Non-Medicare retirees, who became participants before July 1, 2003, by 3.6%. Non-Medicare retirees who became participants after July 1, 2003 receive dollar subsidies per year of service, which are not expected to exceed the overall Non-Medicare premiums. As a result, the costs attributable to the Cadillac Tax for members who became participants after July 1, 2003 will be paid by the retirees.

### *Changes in Assumptions since the prior valuation:*

1. The assumed investment return was changed from 6.75% to 5.25% for the non-hazardous retirement fund and from 7.50% to 6.25% for the hazardous retirement fund and both insurance funds.
2. The price inflation assumption was changed from 3.25% to 2.30%, which also resulted in a 0.95% decrease in the salary increase assumption at all years of service and a 0.95% decrease in the health care cost trend rates.
3. The amortization method for unfunded accrued liabilities was changed to a level dollar basis (which is then converted to a percentage of expected covered payroll) from a level percentage of pay basis.

## Development of Baseline Claims Cost

For non-Medicare retirees, the initial per capita costs were based on the plan premiums effective January 1, 2017, and are used for both current and future retirees. An inherent assumption in this methodology is that the projected future retirees will have a similar distribution by plan type as the current retirees. The spouse/dependent premium of \$862.64 for non-Medicare retirees is based on a blending of Family and Couple premiums for the current retirees that have over 4 years of hazardous service. The fully-insured premiums KRS pays the Kentucky Employees' Health Plan (KEHP) are blended rates based on the combined experience of active and retired members. Because the average cost of providing health care benefits to retirees under age 65 is higher than the average cost of providing health care benefits to active employees, there is an implicit rate subsidy for the non-Medicare eligible retirees. Actuarial Standard of Practice No. 6 (ASOP No. 6) requires aging subsidies (or implicit rate subsidies) to be recognized. However, the KRS health insurance trusts are only used to reimburse KEHP for the employer's portion of the blended premiums. Said another way, the trusts are not used to fund the difference between the underlying retiree claims and the blended KEHP premiums. As a result, the retiree health care liabilities developed in this report for the non-Medicare retirees are based solely on the premiums charged by KEHP, without any age-adjustment. GASB Statements No. 74 and No. 75 prohibit such a deviation from ASOP No. 6. The liabilities developed in this report are solely for the purpose of funding the benefits paid by the health insurance funds and are not appropriate for financial statement disclosures required by GASB. GRS provides separate GASB reports to KRS which include the liabilities associated with the implicit rate subsidy.

| <b>FOR THOSE NOT ELIGIBLE FOR MEDICARE</b> |               |                          |
|--|---------------|--------------------------|
| <b>AGE</b>                                 | <b>MEMBER</b> | <b>SPOUSE/DEPENDENTS</b> |
| <65  | \$711.22      | \$862.64                 |

For Medicare retirees, the initial per capita costs were estimated based on the plan premiums effective January 1, 2017, and are used for both current and future retirees. An inherent assumption in this methodology is that the projected future retirees will have a similar distribution by plan type as the current retirees. Age graded and sex distinct premiums are utilized for retirees over the age of 65. These costs are appropriate for the unique age and sex distribution currently existing. Over the future years covered by this valuation, the age and sex distribution will most likely change. Therefore, our process "distributes" the average premium over all age/sex combinations and assigns a unique premium for each combination. The age/sex specific costs more accurately reflect the health care utilization and cost at that age.

| <b>FOR THOSE ELIGIBLE FOR MEDICARE</b> |             |               |
|--|-------------|---------------|
| <b>AGE</b>                             | <b>MALE</b> | <b>FEMALE</b> |
| 65                                     | \$208.66    | \$196.81      |
| 75                                     | 244.13      | 238.22        |
| 85                                     | 258.16      | 261.20        |

Appendix B of the report provides a full schedule of premiums.

Mehdi Riazi is a Member of the American Academy of Actuaries (MAAA) and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.



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Mehdi Riazi, FSA, EA, MAAA

## **APPENDIX B**

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### **BENEFIT PROVISIONS**

# Summary of Benefit Provisions for Kentucky Employees Retirement System (KERS)

## KERS Non-Hazardous Employees

*Retirement: Tier 1, Participation before 9/1/2008*

|                               |   |
|-------------------------------|---|
| Normal Retirement Eligibility | Age 65 with at least 1 month of service credit; or<br>Any age with at least 27 years of service   |
| Benefit Amount                | <p>If a member has at least 48 months of service, the monthly benefit is 2.00% times final average compensation times years of service. For members who did not have 13 months of service credit for 1/1/1998-1/1/1999, the monthly benefit is 1.97% times final average compensation times years of service.</p> <p>If a member has less than 48 months of service, the monthly benefit is the actuarial equivalent of two times the member's contributions with interest.</p> <p>Final average compensation is based on the member's highest 5 years of compensation.</p> |
| Early Retirement Eligibility  | Any age (prior to age 65) with at least 25 years of service; or<br>Age 55 with at least 5 years of service  |
| Early Retirement Reduction    | Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement eligibility precedes the member's normal retirement date.  |

## KERS Non-Hazardous Employees (continued)

### *Retirement: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014*

|                               |  |
|-------------------------------|--|
| Normal Retirement Eligibility | Age 65 with at least 5 years of service; or Rule of 87 (Age 57 or older if age plus service equals 87)                     |
| Benefit Amount                | The monthly benefit is equal to the applicable benefit multiplier times final average compensation times years of service. |

| Years of Service | Benefit Multiplier |
|------------------|--------------------|
| 10 or less       | 1.10%              |
| 10-20            | 1.30%              |
| 20-26            | 1.50%              |
| 26-30            | 1.75%              |
| Greater than 30* | 2.00%              |

\* The 2.00% benefit multiplier only applies to service credit in excess of 30 years. If a member has greater than 30 years of service at retirement, service prior to 30 years will be multiplied by the 1.75% benefit multiplier.

Final compensation is based on the member's last 5 years of compensation.

|                              |  |
|------------------------------|--|
| Early Retirement Eligibility | Age 60 with at least 10 years of service |
|------------------------------|--|

|                            |  |
|----------------------------|--|
| Early Retirement Reduction | Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility. |
|----------------------------|--|

### *Retirement: Tier 3, Participation on or after 1/1/2014*

|                               |  |
|-------------------------------|--|
| Normal Retirement Eligibility | Age 65 with at least 5 years of service; or Rule of 87 (Age 57 or older if age plus service equals 87) |
|-------------------------------|--|

|                |  |
|----------------|--|
| Benefit Amount | Each year that the member is active, a 4.00% employer pay credit and the employee's 5.00% contribution will be credited to each member's hypothetical cash balance account. The hypothetical account will earn interest at a minimum rate of 4%, annually. If the System's geometric average net investment return for the previous five years exceeds 4%, then the hypothetical account will be credited with an additional amount of interest in that year equal to 75% of the amount of the return which exceeds 4%. All interest credits will be applied to the hypothetical account balance on June 30 based on the account balance as of June 30 of the previous year. |
|----------------|--|

At retirement, the member's hypothetical account balance may be converted into an annuity based on an actuarial factor.

|                              |     |
|------------------------------|-----|
| Early Retirement Eligibility | N/A |
|------------------------------|-----|

## KERS Non-Hazardous Employees (continued)

### *Deferred Vested Benefit: Tier 1, Participation before 9/1/2008*

|                |   |
|----------------|---|
| Eligibility    | At least 1 month of service credit  |
| Benefit Amount | Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age |

### *Deferred Vested Benefit: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014*

|                |   |
|----------------|---|
| Eligibility    | 5 years of service  |
| Benefit Amount | Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age |

### *Deferred Vested Benefit Tier 3, Participation on or after 1/1/2014*

|                |  |
|----------------|--|
| Eligibility    | 5 years of service   |
| Benefit Amount | At termination of employment, members may choose to leave their account balance with the System and retire once they are eligible. The hypothetical account balance will earn 4% annual interest after termination. Members may also choose to withdrawal their entire accumulated balance. If a member does not have 5 years of service at termination, the member is eligible to receive a partial refund of their account balance. This refund includes the member's contributions with interest. |

### *Disability Retirement: Participation before 8/1/2004*

|                    |  |
|--------------------|--|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)  |
| Disability Benefit | Disability benefits are calculated in the same manner as the normal retirement benefit with years of service and final compensation being determined as of the date of disability, except that service credit shall be added to the person's total service beginning with the last date of paid employment and continuing to the member's 65 <sup>th</sup> birthday, with total service not exceeding 25 years. Total service credit added shall not be greater than the member's actual service at disability. For members with at least 25 years of service on the last day of paid employment but less than 27 years of service, total service shall be 27 years. For members with 27 or more years of service credit, actual service will be used. |

## KERS Non-Hazardous Employees (continued)

### *Disability Retirement: Participation on or after 8/1/2004 but before 1/1/2014*

|                    |   |
|--------------------|---|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)   |
| Disability Benefit | The higher of 20% of the member's final monthly rate of pay or the member's normal retirement benefit (without reduction for early retirement) with years and final compensation being determined as of the date of disability. |

### *Disability Retirement: Participation on or after 1/1/2014*

|                    |   |
|--------------------|---|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)   |
| Disability Benefit | The higher of 20% of the member's final monthly rate of pay or the member's retirement benefit calculated at the member's normal retirement date. |

### *Line of Duty Disability Benefit*

|                    |  |
|--------------------|--|
| Disability Benefit | If the disability is a direct result of an act in the line of duty, the benefit shall not be less than 25% of the member's final monthly rate of pay. Additionally, each eligible dependent child will receive 10% of the member's monthly final rate of pay up to a maximum of 40%. |
|--------------------|--|

### *Pre-Retirement Death Benefit*

|                |  |
|----------------|--|
| Eligibility    | Eligible for early or normal retirement; or<br>Under age 55 with at least 60 months of service and actively working at the time of death; or<br>At least 144 months of service, if no longer actively working  |
| Spouse Benefit | The member's retirement benefit calculated in the same manner as if the member had retired on the day of the member's death and elected a 100% joint and survivor benefit. The benefit is actuarially reduced if the member dies prior to their normal retirement age. |

### *Pre-Retirement Death Benefit (Death in the Line of Duty)*

|                |   |
|----------------|---|
| Eligibility    | One month of service credit   |
| Spouse Benefit | A \$10,000 lump sum payment plus a monthly payment of 25% of the deceased member's final monthly rate of pay. A spouse may also elect the non-line of duty death benefit. |
| Child Benefit  | Each eligible dependent child will receive 10% of the member's final monthly rate of pay up to a maximum of 40%.  |

## KERS Non-Hazardous Employees (continued)

### *Post-Retirement Death Benefit*

|               |   |
|---------------|---|
| Eligibility   | 48 months of service, and in receipt of retirement benefits |
| Death Benefit | A \$5,000 lump sum payment                                  |

### *Member Contributions*

|  |   |
|--|---|
| Tier 1, Participation before 9/1/2008                          | 5% of creditable compensation. Members who do not receive a retirement benefit are entitled to a full refund of contributions with interest. The annual interest rate is set by the KRS board, not less than 2.0%.  |
| Tier 2, Participation on or after 9/1/2008 but before 1/1/2014 | 5% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest. The annual interest rate is 2.5%. |
| Tier 3, Participation after 1/1/2014                           | 5% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest.                                   |

### *Changes since the Prior Valuation*

None.

## KERS Hazardous Employees

### *Retirement: Tier 1, Participation before 9/1/2008*

|                               |  |
|-------------------------------|--|
| Normal Retirement Eligibility | Age 55 with at least 1 month of service credit; or<br>Any age with at least 20 years of service  |
| Benefit Amount                | If a member has at least 60 months of service, the monthly benefit is 2.49% times final average compensation times years of service.<br><br>If a member has less than 60 months of service, the monthly benefit is the actuarial equivalent of two times the member's contributions with interest.<br><br>Final average compensation is based on the member's highest 3 years of compensation. |
| Early Retirement Eligibility  | Age 50 with at least 15 years of service   |
| Early Retirement Reduction    | Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility.   |

## KERS Hazardous Employees (continued)

### *Retirement: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014*

|                               |  |
|-------------------------------|--|
| Normal Retirement Eligibility | Age 60 with at least 5 years of service; or<br>Any age with at least 25 years of service                                   |
| Benefit Amount                | The monthly benefit is equal to the applicable benefit multiplier times final average compensation times years of service. |

| Years of Service | Benefit Multiplier |
|------------------|--------------------|
| 10 or less       | 1.30%              |
| 10-20            | 1.50%              |
| 20-25            | 2.25%              |
| Greater than 25  | 2.50%              |

Final average compensation is based on the member's highest 3 years of compensation.

|                              |  |
|------------------------------|--|
| Early Retirement Eligibility | Age 50 with at least 15 years of service   |
| Early Retirement Reduction   | Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility. |

### *Retirement: Tier 3, Participation on or after 1/1/2014*

|                               |   |
|-------------------------------|---|
| Normal Retirement Eligibility | Age 60 with at least 5 years of service; or<br>Any age with at least 25 years of service  |
| Benefit Amount                | Each year that the member is active, a 7.50% employer pay credit and the employee's 8.00% contribution will be credited to each member's hypothetical cash balance account. The hypothetical account will earn interest at a minimum rate of 4%, annually. If the System's geometric average net investment return for the previous five years exceeds 4%, then the hypothetical account will be credited with an additional amount of interest in that year equal to 75% of the amount of the return which exceeds 4%. All interest credits will be applied to the hypothetical account balance on June 30 based on the account balance as of June 30 of the previous year.<br><br>At retirement, the member's hypothetical account balance may be converted into an annuity based on an actuarial factor. |
| Early Retirement Eligibility  | N/A   |

## KERS Hazardous Employees (continued)

### *Deferred Vested Benefit: Tier 1, Participation before 9/1/2008*

|                |   |
|----------------|---|
| Eligibility    | At least 1 month of service credit  |
| Benefit Amount | Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age |

### *Deferred Vested Benefit: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014*

|                |   |
|----------------|---|
| Eligibility    | 5 years of service  |
| Benefit Amount | Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age |

### *Deferred Vested Benefit Tier 3, Participation on or after 1/1/2014*

|                |  |
|----------------|--|
| Eligibility    | 5 years of service   |
| Benefit Amount | At termination of employment, members may choose to leave their account balance with the System and retire once they are eligible. The hypothetical account balance will earn 4% annual interest after termination. Members may also choose to withdrawal their entire accumulated balance. If a member does not have 5 years of service at termination, the member is eligible to receive a partial refund of their account balance. This refund includes the member's contributions with interest. |

### *Disability Retirement: Participation before 8/1/2004*

|                    |  |
|--------------------|--|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)  |
| Disability Benefit | Disability benefits are calculated in the same manner as the normal retirement benefit with years of service and final compensation being determined as of the date of disability, except that if the member has less than 20 years of service at disability, service credit shall be added to the person's total service beginning with the last date of paid employment and continuing to the member's 55 <sup>th</sup> birthday, with total service not exceeding 20 years. Total service credit added shall not be greater than the member's actual service at disability. |

## KERS Hazardous Employees (continued)

### *Disability Retirement: Participation on or after 8/1/2004 but before 1/1/2014*

|                    |   |
|--------------------|---|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)   |
| Disability Benefit | The higher of 25% of the member's final monthly rate of pay or the member's normal retirement benefit (without reduction for early retirement) with years and final compensation being determined as of the date of disability. |

### *Disability Retirement: Participation on or after 1/1/2014*

|                    |   |
|--------------------|---|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)   |
| Disability Benefit | The higher of 25% of the member's final monthly rate of pay or the member's retirement benefit calculated at the member's normal retirement date. |

### *Line of Duty Disability Benefit*

|                    |  |
|--------------------|--|
| Disability Benefit | If the disability is a direct result of an act in the line of duty, the benefit shall not be less than 25% of the member's final monthly rate of pay. Additionally, each eligible dependent child will receive 10% of the member's monthly final rate of pay up to a maximum of 40%. |
|--------------------|--|

### *Pre-Retirement Death Benefit*

|                |  |
|----------------|--|
| Eligibility    | Eligible for early or normal retirement; or<br>Under age 55 with at least 60 months of service and actively working at the time of death; or<br>At least 144 months of service, if no longer actively working  |
| Spouse Benefit | The member's retirement benefit calculated in the same manner as if the member had retired on the day of the member's death and elected a 100% joint and survivor benefit. The benefit is actuarially reduced if the member dies prior to their normal retirement age. |

### *Pre-Retirement Death Benefit (Death in the Line of Duty)*

|                    |  |
|--------------------|--|
| Eligibility        | One month of service credit  |
| Spouse Benefit     | A \$10,000 lump sum payment plus a monthly payment of 25% of the deceased member's final monthly rate of pay. A spouse may also elect the non-line of duty death benefit.        |
| Non-Spouse Benefit | If the beneficiary is only one person who is a dependent receiving at least 50% of his or her support from the member, the beneficiary may elect a lump sum payment of \$10,000. |
| Child Benefit      | Each eligible dependent child will receive 10% of the member's final monthly rate of pay up to a maximum of 40%.   |

## KERS Hazardous Employees (continued)

### *Post-Retirement Death Benefit*

|               |   |
|---------------|---|
| Eligibility   | 48 months of service, and in receipt of retirement benefits |
| Death Benefit | A \$5,000 lump sum payment                                  |

### *Member Contributions*

|  |   |
|--|---|
| Tier 1, Participation before 9/1/2008                          | 8% of creditable compensation. Members who do not receive a retirement benefit are entitled to a full refund of contributions with interest. The annual interest rate is set by the KRS board, not less than 2.0%.  |
| Tier 2, Participation on or after 9/1/2008 but before 1/1/2014 | 8% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest. The annual interest rate is 2.5%. |
| Tier 3, Participation after 1/1/2014                           | 8% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest.                                   |

### *Changes since the Prior Valuation*

None.

## Summary of Main Retiree Insurance Benefit Provisions

### Insurance Tier 1: Participation began before 7/1/2003

**Benefit Eligibility**                      Recipient of a retirement allowance

**Benefit Amount**

| Non-Hazardous Service | Percentage of Member Premium Paid by Retirement System | Hazardous Service | Percentage of Member & Dependent Premium Paid by Retirement System |
|-----------------------|--|-------------------|--|
| Less than 4 years     | 0%   | Less than 4 years | 0%   |
| 4 – 9 years           | 25%  | 4 – 9 years       | 25%  |
| 10 – 14 years         | 50%  | 10 – 14 years     | 50%  |
| 15 – 19 years         | 75%  | 15 – 19 years     | 75%  |
| 20 or more years      | 100%   | 20 or more years  | 100%   |

The percentage paid by the retirement system is applied to the ‘contribution’ plan selected by the KRS Board.

**Duty Disability Retirement**      If disability was a result of injuries sustained while in the line of duty, the member receives 100% of the maximum contribution for the member and dependents. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.

**Duty Death in Service**            If an active employee’s death was a result of injuries sustained while in the line of duty, the member’s spouse and children receive 100% of the maximum contribution. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.

**Non-Duty Death in Service**      If the surviving spouses is in receipt of a pension allowance, he or she is eligible for continued health coverage. The percentage of the premium paid for by the retirement system is based on the member’s years of hazardous service at the time of death.

**Surviving Spouse of a Retiree**    A surviving spouse of a retiree, who is in receipt of a pension allowance, will receive a premium subsidy based on the member’s years of hazardous service.

**Hazardous employees who retired prior to August 1, 1998**    System’s contribution for spouse and dependents is based on total service.

## Insurance Tier 2: Participation began on or after 7/1/2003, but before 9/1/2008

|                                   |   |
|-----------------------------------|---|
| <b>Benefit Eligibility</b>        | Recipient of a retirement allowance with at least 120 months of service at retirement   |
| <b>Non-Hazardous Subsidy</b>      | Monthly contribution of \$10 for each year of earned service. The monthly contribution is increased by 1.5% each July 1. As of July 1, 2017, the Non-Hazardous monthly contribution was \$13.18/year of service. Upon the retiree's death, the surviving spouse may continue coverage (if in receipt of a retirement allowance) but will be 100% responsible for the premiums.                                    |
| <b>Hazardous Subsidy</b>          | Monthly contribution of \$15 for each year of earned hazardous service. The monthly contribution is increased by 1.5% each July 1. As of July 1, 2017, the Non-Hazardous monthly contribution was \$19.77/year of service. Upon the retiree's death, the surviving spouse of a hazardous duty member will receive a monthly contribution of \$10 (\$13.18 as of July 1, 2017) for each year of hazardous service. |
| <b>Duty Disability Retirement</b> | If disability was a result of injuries sustained while in the line of duty, the member receives a benefit equal to at least 20 times the Non-Hazardous monthly contribution. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.  |
| <b>Duty Death in Service</b>      | If an active employee's death was a result of injuries sustained while in the line of duty, the member's spouse and children receive a benefit equal to at least 20 times the Non-Hazardous monthly contribution. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.   |
| <b>Non-Duty Death in Service</b>  | If the surviving spouse is in receipt of a pension allowance, he or she is eligible for continued health coverage. The percentage of the premium paid for by the retirement system is based on the member's years of hazardous service at the time of death.  |

## Insurance Tier 3: Participation began on or after 9/1/2008

Tier 3 insurance benefits are identical to Tier 2, except Tier 3 members are required to have at least 180 months of service in order to be eligible.

## Monthly Health Plan Premiums – Effective January 1, 2018

| Plan Option     | Non-Medicare Plan Options |             |            |            |              |
|-----------------|---------------------------|-------------|------------|------------|--------------|
|                 | Single                    | Parent Plus | Couple     | Family     | Family X-Ref |
| LivingWell PPO* | \$729.34                  | \$1,037.08  | \$1,589.10 | \$1,767.60 | \$876.68     |
| LivingWell CDHP | 709.46                    | 978.50      | 1,325.64   | 1,479.76   | 818.96       |
| Standard PPO    | 685.38                    | 975.90      | 1,497.18   | 1,666.26   | 824.54       |
| Standard CDHP   | 682.80                    | 940.64      | 1,450.02   | 1,615.30   | 800.94       |

| Medicare Plan Options   |          |
|---|----------|
| Kentucky Retirement Systems - Medical Only Plan                 | \$165.01 |
| Kentucky Retirement Systems – Medicare Advantage/Essential Plan | 75.56    |
| Kentucky Retirement Systems – Medicare Advantage/Premium Plan*  | 252.21   |

\*For 2018, the contribution plans selected by the KRS Board were the LivingWell PPO plan option for non-Medicare retirees and the Medicare Advantage Premium plan option for Medicare retirees.

## Dollar Contribution Amount for Insurance Tier 2 and Tier 3

Monthly contribution amounts per year of service as of July 1, 2017.

| Non-Hazardous Service | Hazardous Service |
|-----------------------|-------------------|
| \$13.18               | \$19.77           |

# APPENDIX C



## GLOSSARY

## Glossary

**Actuarial Accrued Liability (AAL):** That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of Future Plan Benefits which is not provided for by future Normal Costs. It is equal to the Actuarial Present Value of Future Plan Benefits minus the actuarial present value of future Normal Costs.

**Actuarial Assumptions:** Assumptions as to future experience under the Fund. These include assumptions about the occurrence of future events affecting costs or liabilities, such as:

- mortality, withdrawal, disablement, and retirement;
- future increases in salary;
- future rates of investment earnings and future investment and administrative expenses;
- characteristics of members not specified in the data, such as marital status;
- characteristics of future members;
- future elections made by members; and
- other relevant items.

**Actuarial Cost Method or Funding Method:** A procedure for allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability. These items are used to determine the ADC.

**Actuarial Gain or Actuarial Loss:** A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two Actuarial Valuation dates. Through the actuarial assumptions, rates of decrements, rates of salary increases, and rates of fund earnings have been forecasted. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., the fund's assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results that produce actuarial liabilities which are larger than projected. Actuarial gains will shorten the time required for funding of the actuarial balance sheet deficiency while actuarial losses will lengthen the funding period.

**Actuarially Equivalent:** Of equal actuarial present value, determined as of a given date and based on a given set of Actuarial Assumptions.

**Actuarial Present Value (APV):** The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. For purposes of this standard, each such amount or series of amounts is:

- a. adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.)
- b. multiplied by the probability of the occurrence of an event (such as survival, death, disability, termination of employment, etc.) on which the payment is conditioned, and
- c. discounted according to an assumed rate (or rates) of return to reflect the time value of money.

**Actuarial Present Value of Future Plan Benefits:** The Actuarial Present Value of those benefit amounts which are expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future compensation and service credits. The Actuarial Present Value of Future Plan Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive, non-retired members either entitled to a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.

**Actuarial Valuation:** The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial valuation for a governmental retirement system typically also includes calculations that provide the financial information of the plan, such as the funded ratio, unfunded actuarial accrued liability and the ADC.

**Actuarial Value of Assets or Valuation Assets:** The value of the Fund's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly actuaries use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the ADC.

**Actuarially Determined:** Values which have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the law.

**Actuarially Determined Contribution (ADC):** The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation. The ADC consists of the Employer Normal Cost and the Amortization Payment.

**Amortization Method:** A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the stream of payments increases at the assumed rate at which total covered payroll of all active members will increase.

**Amortization Payment:** The portion of the pension plan contribution or ADC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

**Closed Amortization Period:** A specific number of years that is counted down by one each year, and therefore declines to zero with the passage of time. For example if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc. See Funding Period and Open Amortization Period.

**Decrements:** Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or termination.

**Defined Benefit Plan:** A retirement plan that is not a Defined Contribution Plan. Typically a defined benefit plan is one in which benefits are defined by a formula applied to the member's compensation and/or years of service.

**Defined Contribution Plan:** A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, and the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.

**Employer Normal Cost:** The portion of the Normal Cost to be paid by the employers. This is equal to the Normal Cost less expected member contributions.

**Experience Study:** A periodic review and analysis of the actual experience of the Fund which may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified as deemed appropriate by the Actuary.

**Funded Ratio:** The ratio of the actuarial value of assets (AVA) to the actuarial accrued liability (AAL). Plans sometimes calculate a market funded ratio, using the market value of assets (MVA), rather than the AVA.

**Funding Period or Amortization Period:** The term "Funding Period" is used two ways. In the first sense, it is the period used in calculating the Amortization Payment as a component of the ADC. This funding period is specified in State statute. In the second sense, it is a calculated item: the number of years in the future that will theoretically be required to amortize (i.e., pay off or eliminate) the Unfunded Actuarial Accrued Liability, based on a statutory employer contribution rate, and assuming no future actuarial gains or losses.

**GASB:** Governmental Accounting Standards Board.

**GASB 67 and GASB 68:** Governmental Accounting Standards Board Statements No. 67 and No. 68. These are the governmental accounting standards that set the accounting and reporting rules for public retirement systems and the employers that sponsor, participate in, or contribute to them. Statement No. 67 sets the accounting rules for the financial reporting of the retirement systems, while Statement No. 68 sets the rules for the employers that sponsor, participate in, or contribute to public retirement systems.

**Normal Cost:** That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method. Any payment in respect of an Unfunded

Actuarial Accrued Liability is not part of Normal Cost (see Amortization Payment). For pension plan benefits which are provided in part by employee contributions, Normal Cost refers to the total of employee contributions and employer Normal Cost unless otherwise specifically stated. Under the entry age normal cost method, the Normal Cost is intended to be the level cost (when expressed as a percentage of pay) needed to fund the benefits of a member from hire until ultimate termination, death, disability or retirement.

**Open Amortization Period:** An open amortization period is one which is used to determine the Amortization Payment but may not decrease by exactly one year in the subsequent year's actuarial valuation. For instance, if the initial period is set as 30 years, the same 30-year period is used in determining the Amortization Period each year.

**Unfunded Actuarial Accrued Liability:** The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus.

**Valuation Date or Actuarial Valuation Date:** The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Plan Benefits is determined. The expected benefits to be paid in the future are discounted to this date.

# County Employees Retirement System (CERS)

Actuarial Valuation Report  
as of June 30, 2017



December 4, 2017

Board of Trustees  
Kentucky Retirement Systems  
Perimeter Park West  
1260 Louisville Road  
Frankfort, KY 40601

**Subject: Actuarial Valuation as of June 30, 2017**

Dear Trustees of the Board:

This report describes the current actuarial condition of the County Employees Retirement System (CERS), determines the required employer contribution rates, and analyzes changes in the System's financial condition. In addition, the report provides various summaries of the data. Separate reports are issued with regard to valuation results determined in accordance with Governmental Accounting Standards Board (GASB) Statements 67, 68, 74 and 75. Results of this report should not be used for any other purpose without consultation with the undersigned. Valuations are prepared annually as of June 30, the first day of the plan year for KRS. This report was prepared at the request of the Board of Trustees of the Kentucky Retirement System (Board) and is intended for use by the KRS staff and those designated or approved by the Board.

#### **FINANCING OBJECTIVES AND FUNDING POLICY**

The employer contribution rate is determined in accordance with Section 61.565 of Kentucky Statute. As specified by the Statute, the employer contribution rate is determined based on a closed thirty-year amortization period beginning July 1, 2013. As a result, the amortization period used in the 2017 actuarial valuation is 26 years. The contribution rate determined by this actuarial valuation becomes effective twelve months after the valuation date. In other words, the contribution rate determined by this June 30, 2017 actuarial valuation will be used by the Board to certify the participating employer's contribution rates for the fiscal year July 1, 2018 and ending June 30, 2019.

If new legislation is enacted between the valuation date and the date the contribution rate becomes effective, the Board may adjust the calculated rate before certifying them, in order to reflect this new legislation. Such adjustments are based on information supplied by the actuary.

#### **ASSUMPTIONS AND METHODS**

Kentucky Statutes also requires that an actuarial investigation be performed at least every five years to review the economic and demographic assumptions. An experience study was conducted

as of June 30, 2013 and the next experience study will be conducted as of June 30, 2018. However, the Board has the authority to review the assumptions on a more frequent basis and adopt new assumptions prior to the next scheduled experience study. Subsequent to the last actuarial valuation the Board decreased the price inflation assumption to 2.30% and the payroll growth assumption to 2.00% for the CERS Non-Hazardous and Hazardous Systems (Retirement and Health Insurance). Additionally, the assumed rate of return was decreased to 6.25% for the CERS Non-Hazardous and Hazardous Systems (Retirement and Health Insurance). It is our opinion that the current assumptions are internally consistent and reasonably reflect the anticipated future experience of the System.

The results of the actuarial valuation are dependent on the actuarial assumptions used. Actual results can, and almost certainly will, differ as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rate, and funding periods. The actuarial calculations are intended to provide information for rational decision making.

#### **BENEFIT PROVISIONS**

The benefit provisions reflected in this valuation are those which were in effect on June 30, 2017. There were no legislative changes enacted since the previous valuation that had a measurable effect on the current valuation.

#### **DATA**

Member data for retired, active and inactive members was supplied as of June 30, 2017, by the KRS staff. The staff also supplied asset information as of June 30, 2017. We did not audit this data, but we did apply a number of tests to the data, and we concluded that it was reasonable and consistent with the prior year's data. GRS is not responsible for the accuracy or completeness of the information provided to us by KRS.

#### **CERTIFICATION**

We certify that the information presented herein is accurate and fairly portrays the actuarial position of CERS as of June 30, 2017.

All of our work conforms with generally accepted actuarial principles and practices, and is in conformity with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of Kentucky Code of Laws and, where applicable, the Internal Revenue Code, ERISA, and the Statements of the Governmental Accounting Standards Board.

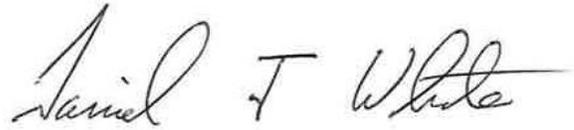
The undersigned are independent actuaries and consultants. Mr. Newton and Mr. White are Enrolled Actuaries. All three of the undersigned are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries. All of the undersigned are experienced in performing valuations for large public retirement systems.

Sincerely,

**Gabriel, Roeder, Smith & Co.**



Joseph P. Newton, FSA, MAAA, EA  
Senior Consultant



Daniel J. White, FSA, MAAA, EA  
Senior Consultant



Jamie Shaw, ASA, MAAA  
Consultant

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# SECTION 1

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## EXECUTIVE SUMMARY

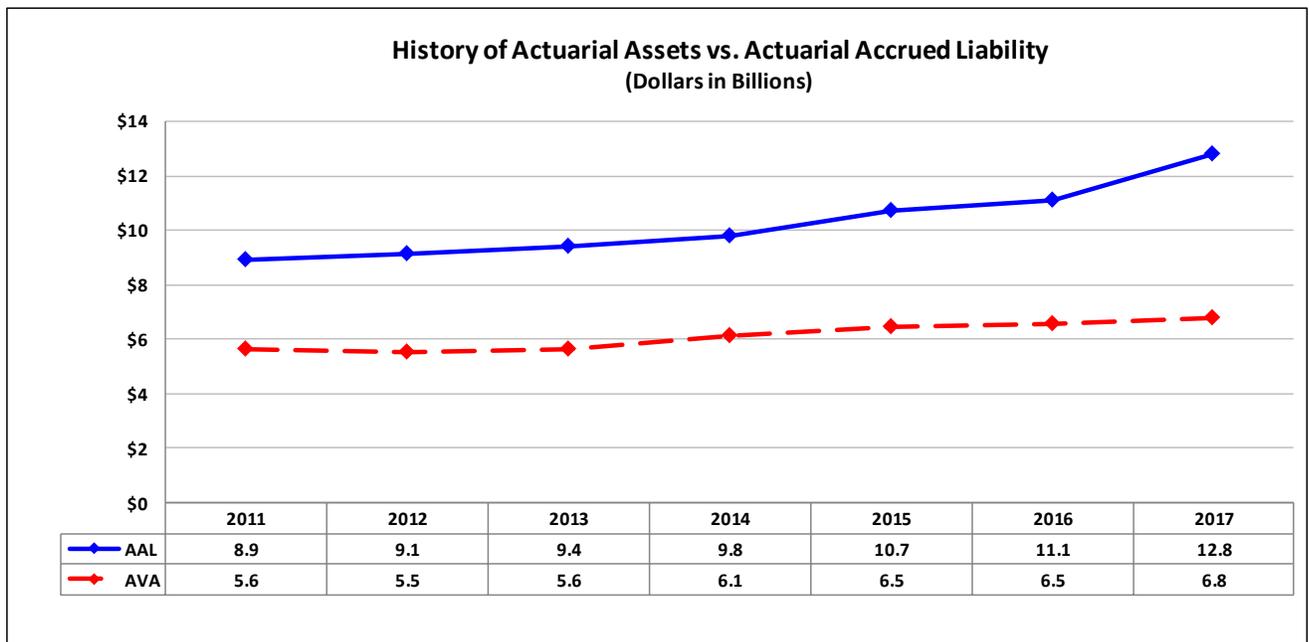
**Summary of Principal Results**  
(Dollar amounts expressed in thousands)

|  | Non-Hazardous |               | Hazardous     |               | Total         |               |
|--|---------------|---------------|---------------|---------------|---------------|---------------|
|  | June 30, 2017 | June 30, 2016 | June 30, 2017 | June 30, 2016 | June 30, 2017 | June 30, 2016 |
| <b>Contributions for next fiscal year:</b>     |               |               |               |               |               |               |
| Retirement                                     | 21.84%        | 14.48%        | 35.69%        | 22.20%        |               |               |
| Insurance                                      | <u>6.21%</u>  | <u>4.70%</u>  | <u>12.17%</u> | <u>9.35%</u>  |               |               |
| Total  | 28.05%        | 19.18%        | 47.86%        | 31.55%        | N/A           | N/A           |
| <b>Assets:</b>                                 |               |               |               |               |               |               |
| Retirement                                     |               |               |               |               |               |               |
| • Actuarial value (AVAR)                       | \$6,764,873   | \$6,535,372   | \$2,238,320   | \$2,139,119   | \$9,003,193   | \$8,674,492   |
| • Market value (MVAR)                          | \$6,687,237   | \$6,106,187   | \$2,217,996   | \$2,003,669   | \$8,905,233   | \$8,109,856   |
| • Ratio of actuarial to market value of assets | 101.2%        | 107.0%        | 100.9%        | 106.8%        | 101.1%        | 107.0%        |
| Insurance                                      |               |               |               |               |               |               |
| • Actuarial value (AVAI)                       | \$2,227,401   | \$2,079,811   | \$1,196,780   | \$1,135,784   | \$3,424,181   | \$3,215,595   |
| • Market value (MVAI)                          | \$2,212,536   | \$1,943,757   | \$1,189,001   | \$1,062,602   | \$3,401,537   | \$3,006,359   |
| • Ratio of actuarial to market value of assets | 100.7%        | 107.0%        | 100.7%        | 106.9%        | 100.7%        | 107.0%        |
| <b>Funded Status:</b>                          |               |               |               |               |               |               |
| Retirement                                     |               |               |               |               |               |               |
| • Actuarial accrued liability                  | \$12,803,510  | \$11,076,457  | \$4,649,047   | \$3,704,456   | \$17,452,557  | \$14,780,913  |
| • Unfunded accrued liability on AVAR           | \$6,038,637   | \$4,541,084   | \$2,410,727   | \$1,565,337   | \$8,449,364   | \$6,106,421   |
| • Funded ratio on AVAR                         | 52.8%         | 59.0%         | 48.1%         | 57.7%         | 51.6%         | 58.7%         |
| • Unfunded accrued liability on MVAR           | \$6,116,273   | \$4,970,270   | \$2,431,051   | \$1,700,787   | \$8,547,324   | \$6,671,057   |
| • Funded ratio on MVAR                         | 52.2%         | 55.1%         | 47.7%         | 54.1%         | 51.0%         | 54.9%         |
| Insurance                                      |               |               |               |               |               |               |
| • Actuarial accrued liability                  | \$3,355,151   | \$2,988,121   | \$1,788,433   | \$1,558,818   | \$5,143,584   | \$4,546,939   |
| • Unfunded accrued liability on AVAI           | \$1,127,750   | \$908,310     | \$591,653     | \$423,034     | \$1,719,403   | \$1,331,344   |
| • Funded ratio on AVAI                         | 66.4%         | 69.6%         | 66.9%         | 72.9%         | 66.6%         | 70.7%         |
| • Unfunded accrued liability on MVAI           | \$1,142,615   | \$1,044,364   | \$599,432     | \$496,216     | \$1,742,047   | \$1,540,580   |
| • Funded ratio on MVAI                         | 65.9%         | 65.0%         | 66.5%         | 68.2%         | 66.1%         | 66.1%         |
| <b>Membership:</b>                             |               |               |               |               |               |               |
| • Number of                                    |               |               |               |               |               |               |
| - Active Members                               | 82,198        | 80,664        | 9,495         | 9,084         | 91,693        | 89,748        |
| - Retirees and Beneficiaries                   | 59,013        | 56,339        | 8,998         | 8,563         | 68,011        | 64,902        |
| - Inactive Members                             | 85,031        | 82,292        | 3,198         | 2,830         | 88,229        | 85,122        |
| - Total  | 226,242       | 219,295       | 21,691        | 20,477        | 247,933       | 239,772       |
| • Projected payroll of active members          | \$2,452,407   | \$2,352,762   | \$541,633     | \$492,851     | \$2,994,040   | \$2,845,612   |
| • Average salary of active members             | \$29,835      | \$29,167      | \$57,044      | \$54,255      | \$32,653      | \$31,707      |

## Executive Summary (Continued)

### Non-Hazardous Retirement Fund

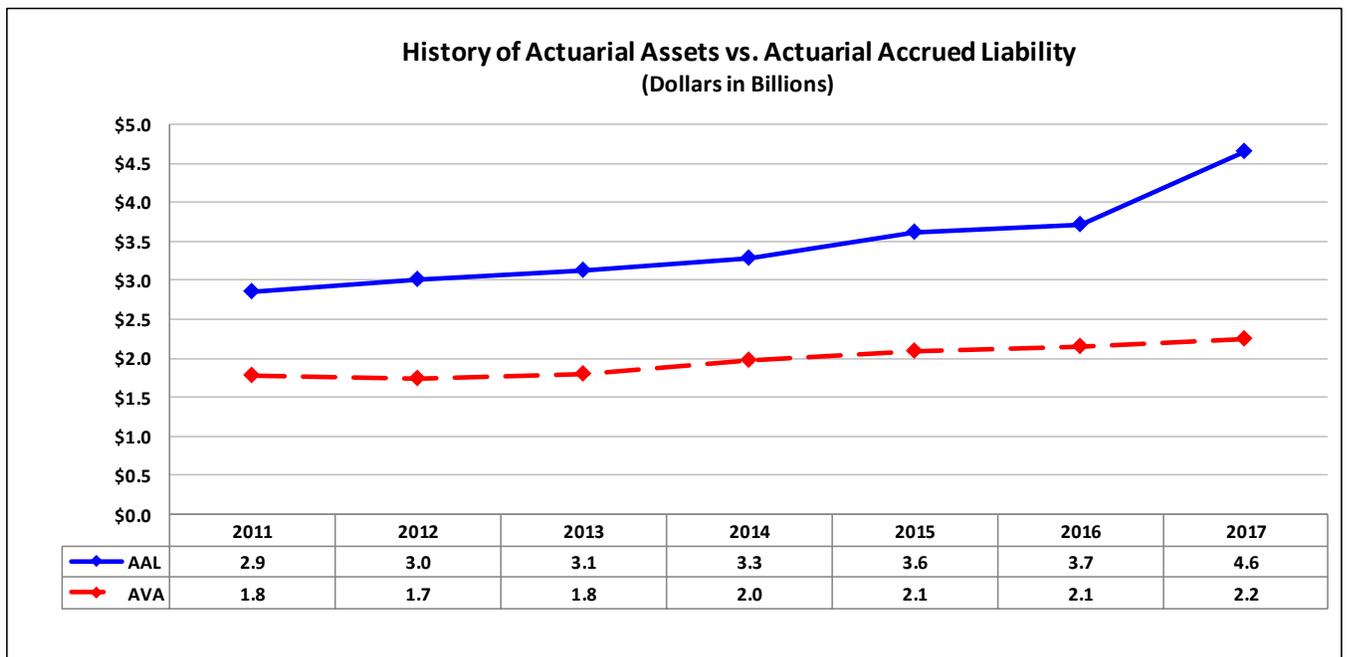
The unfunded actuarial accrued liability for the non-hazardous retirement fund increased by \$1.498 billion since the prior year's valuation to \$6.039 billion. The largest source of this increase is the result of the decrease in the assumed rate of investment return which resulted in a \$1.406 billion increase in the unfunded liability. Below is a chart with the historical actuarial value of assets and actuarial accrued liability for the non-hazardous fund. The divergence in the assets and liability over the last seven years has generally been due to a combination of the actual investment experience being less than the fund's expected investment return assumption, and a decrease in the assumed rate of return in 2015 and again in 2017.



## Executive Summary (Continued)

### Hazardous Retirement Fund

The unfunded actuarial accrued liability for the hazardous retirement fund increased by \$0.845 billion since the prior year's valuation to \$2.411 billion. The largest source of this increase is the result of the decrease in the assumed rate of investment return which resulted in a \$0.540 billion increase in the unfunded liability. Below is a chart with the historical actuarial value of assets and actuarial accrued liability for the hazardous retirement fund. The divergence in the assets and liability over the last seven years has generally been due to a combination of the actual contribution rates being less than the fund's expected investment return assumption, and a decrease in the assumed rate of return in 2015 and again in 2017.



# SECTION 2



## DISCUSSION

## Discussion

The County Employees Retirement System (CERS) is a defined benefit pension fund that provides pensions and health care coverage for employees of state government, non-teaching staff at regional state supported universities, local health departments, regional mental health/mental retardation agencies, and other quasi-state agencies. CERS includes both non-hazardous and hazardous duty benefits. This report presents the result of the June 30, 2017 actuarial funding valuation for both the Retirement and Insurance Funds.

The primary purposes of the valuation report are to depict the current financial condition of the System, determine the annual required contribution, and analyze changes in the System's financial condition. In addition, the report provides various summaries of the data.

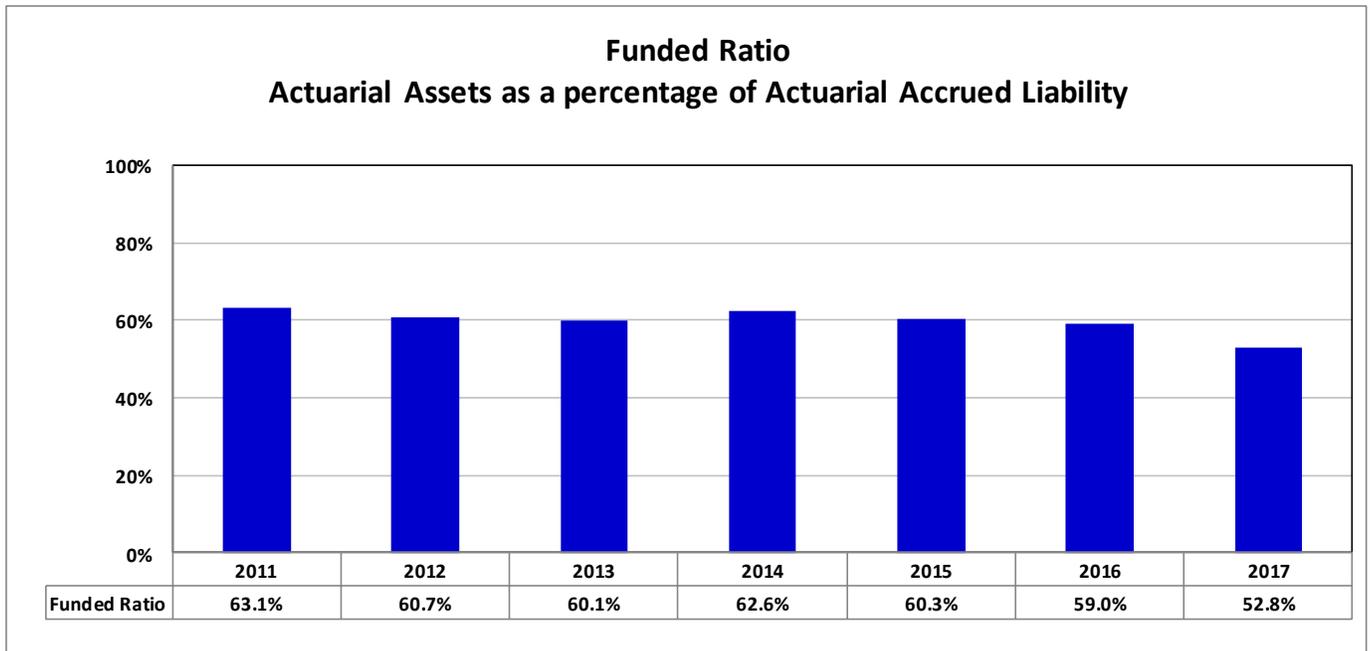
The actuarially determined contribution rates consist of two components: a normal cost rate and an amortization cost to finance the unfunded actuarial accrued liability. The normal cost rate is the theoretical amount which would be required to pay the members' benefits, based on the current plan provisions, if this amount had been contributed from each member's entry date and if the fund's experience exactly followed the actuarial assumptions. This is the amount it should cost to provide the benefits for an average new member. Since members contribute to the fund, only the excess of the normal rate over the member contribution rate is included in the employer contribution rate. The amortization cost is the amount, expressed as a percentage of payroll, necessary to amortize the unfunded actuarial accrued liability. The payroll growth rate and discount rate assumptions are selected by the Board. The funding period is specified in Section 61.565 of Kentucky Statute.

All of the actuarial and financial tables referenced by the other sections of this Report appear in Section 3. Section 4 provides member data and statistical information. Appendices A and B provide summaries of the principle actuarial assumptions and methods and plan provisions. Finally, Appendix C provides a glossary of technical terms that are used throughout this report.

## Funding Progress

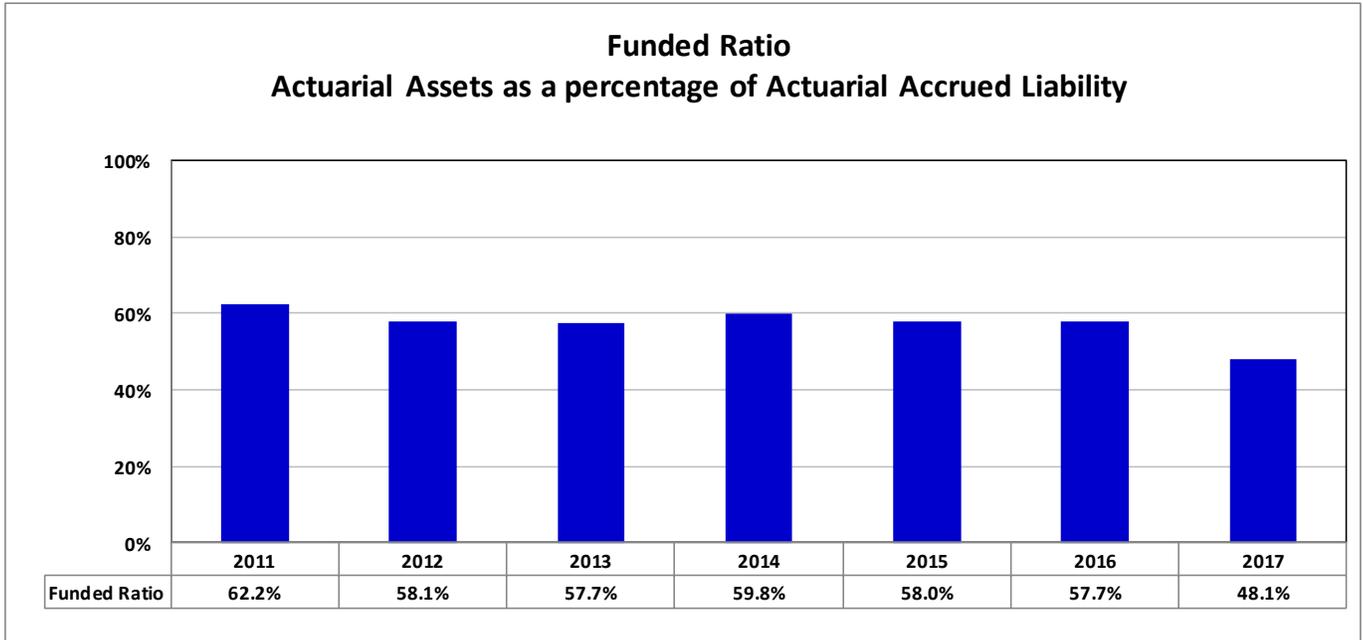
The following charts provide a seven-year history of the funds' funded ratio (i.e. the Actuarial Value of Assets divided by the Actuarial Accrued Liability). The decline in the funded ratio over the last seven years for the retirement funds has generally been due to actual investment experience being less than the investment return assumption, and a decrease in the assumed rate of return in 2015 and again in 2017.

### Non-Hazardous Retirement Fund



## Funding Progress (Continued)

### Hazardous Retirement Fund



Assuming the actuarial determined contributions are actually paid in future years, then absent future unfavorable investment or demographic experience we expect the funded ratio to begin improving. Also, the dollar amount of the unfunded actuarial accrued liability, or the difference between the actuarial accrued liability and the actuarial value of assets, is expected to decrease after those higher contribution rates become effective. Table 9, Schedule of Funding Progress, in the following section of the report provides additional detail regarding the funding progress of the Retirement System.

## Asset Gains/ (Losses)

The actuarial value of assets (“AVA”) is based on a smoothed market value of assets, using a systematic approach to phase-in the difference between the actual and expected investment return on the market value of assets (adjusted for receipts and disbursements during the year). This is appropriate because it dampens the short-term volatility inherent in investment markets. The returns are computed net of investment expenses. The actuarial value of assets for the Non-Hazardous Retirement Fund increased from \$6.535 billion to \$6.765 billion since the prior valuation. Table 7 in the following section of the report provides the development of the actuarial value of assets.

The rate of return on the market value of assets on a dollar-weighted basis for fiscal year 2017 was a 13.7% for the non-hazardous retirement fund which is greater than the 7.50% expected annual return during that fiscal year. The return on an actuarial (smoothed) asset value was 7.3%. This difference in the estimated return on market value and actuarial value illustrates the smoothing effect of the asset valuation method.

The market value of assets is \$0.078 billion less than the actuarial value of assets, which signifies that the retirement system is in a position of deferred losses. Therefore, unless the System experiences investment returns in excess of the assumed rate of return in an amount that is at least equal to the outstanding deferred losses, the future recognition of these deferred losses is expected to increase the unfunded actuarial accrued liability.

Table 6 in the following section of this report provides asset information that was included in the annual financial statements of the System. Also, Tables 6 and 7 shows the estimated yield on a market value basis and on the actuarial asset valuation method.

## Actuarial Gains/ (Losses)

The annual actuarial valuation is a snapshot analysis of the benefit liabilities, assets and funded position of the System as of the first day of the plan year. In any one fiscal year, the experience can be better or worse from that which is assumed or expected. The actuarial assumptions do not necessarily attempt to model what the experience will be for any one given fiscal year, but instead try to model the overall experience over many years. Therefore, as long as the actual experience of the retirement system is reasonably close to the current assumptions, the long-term funding requirements of the System will remain relatively consistent.

Below are tables that separately show a reconciliation of the actuarial gains / (loss) since the prior actuarial valuation for the retirement and health insurance funds, which include the effect of asset and liability gains and losses, changes in assumptions, changes in plan provisions, etc.

### Retirement Experience Gain or (Loss) (Dollar amounts expressed in thousands)

|   | Non-Hazardous  | Hazardous    |
|---|----------------|--------------|
| <b>A. Calculation of total actuarial gain or loss</b>         |                |              |
| 1. Unfunded actuarial accrued liability (UAAL), previous year | \$ 4,541,084   | \$ 1,565,337 |
| 2. Normal cost and administrative expenses                    | 215,394        | 60,296       |
| 3. Less: contributions for the year                           | (484,268)      | (176,048)    |
| 4. Interest accrual   | 330,499        | 113,060      |
| 5. Expected UAAL (Sum of Items 1 - 4)                         | \$ 4,602,709   | \$ 1,562,645 |
| 6. Actual UAAL as of June 30, 2017                            | \$ 6,038,637   | \$ 2,410,727 |
| 7. Total gain (loss) for the year (Item 5 - Item 6)           | \$ (1,435,928) | \$ (848,082) |
| <b>B. Source of gains and losses</b>                          |                |              |
| 8. Asset gain (loss) for the year                             | \$ (14,524)    | \$ (4,511)   |
| 9. Liability experience gain (loss) for the year              | (15,568)       | (303,768)    |
| 10. Assumption change   | (1,405,836)    | (539,803)    |
| 11. Total   | \$ (1,435,928) | \$ (848,082) |

The accrued liability for the non-hazardous retirement fund was less than 1% higher than expected, resulting in a \$16 million liability loss. This \$16 million increase is comprised of a \$230 million decrease due to differences in liability calculations between GRS and the fund's prior actuary and a \$246 million increase due the fund's experience during the last year. The accrued liability for the hazardous retirement fund was about 8% higher than expected, resulting in a \$304 million liability loss. This \$304 million increase is comprised of a \$113 million increase due to differences in liability calculations between GRS and the fund's prior actuary and a \$191 million increase due the fund's experience during the last year. The experience loss for both funds is primarily due to higher than expected salary increases during the past year.

## Actuarial Gains/ (Losses) (Continued)

### Insurance Experience Gain or (Loss) (Dollar amounts expressed in thousands)

|   | Non-Hazardous | Hazardous    |
|---|---------------|--------------|
| A. Calculation of total actuarial gain or loss                |               |              |
| 1. Unfunded actuarial accrued liability (UAAL), previous year | \$ 908,310    | \$ 423,034   |
| 2. Normal cost and administrative expenses                    | 71,947        | 24,437       |
| 3. Less: contributions for the year                           | (129,870)     | (53,245)     |
| 4. Interest accrual   | 65,951        | 30,647       |
| 5. Expected UAAL (Sum of Items 1 - 4)                         | \$ 916,338    | \$ 424,873   |
| 6. Actual UAAL as of June 30, 2017                            | \$ 1,127,750  | \$ 591,653   |
| 7. Total gain (loss) for the year (Item 5 - Item 6)           | \$ (211,412)  | \$ (166,780) |
| B. Source of gains and losses                                 |               |              |
| 8. Asset gain (loss) for the year                             | \$ (10,030)   | \$ (5,509)   |
| 9. Liability experience gain (loss) for the year              | 157,234       | 59,536       |
| 10. Assumption change   | (358,616)     | (220,807)    |
| 11. Total   | \$ (211,412)  | \$ (166,780) |

The 2018 premiums were known at the time of the valuation and were incorporated into the liability measurement. Premiums were lower than expected and resulted in a \$155 million liability experience gain for the non-hazardous insurance fund and a \$118 million liability experience gain for the hazardous insurance fund.

## Actuarial Assumptions and Methods

In determining costs and liabilities, actuaries use assumptions about the future, such as rates of salary increase, probabilities of retirement, termination, death and disability, and an annual investment return assumption. An experience study was conducted as of June 30, 2013 and the next experience study will be conducted as of June 30, 2018. However, the Board has the authority to review the assumptions on a more frequent basis and adopt new assumptions prior to the next scheduled experience study. Since the last actuarial valuation, the Board made the following changes in assumptions:

- Decrease the assumed rate of return to 6.25% for the retirement and health insurance funds.
- Decrease the price inflation assumption to 2.30% for the retirement and health insurance funds.
- Decrease the payroll growth assumption (used for amortizing the unfunded accrued liability) to 2.00% for retirement and health insurance funds.
- Decrease in the individual salary increase assumption and health care trend assumption that corresponds with the 0.95% decrease in the price inflation assumption.

Appendix A includes a summary of the actuarial assumptions and methods used in this valuation. It is our opinion that the assumptions are internally consistent, reasonable, and reflect anticipated future experience of the System. The next experience study will be conducted no later than as of June 30, 2018.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or 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. This report does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

## Benefit Provisions

Appendix B of this report includes a summary of the benefit provisions for CERS. There were no legislative changes enacted since the previous valuation that had a measurable effect on the current valuation.

This valuation reflects all benefits promised to CERS members, either by the statutes or by the Board. There are no ancillary benefits that might be deemed a CERS liability if continued beyond the availability of funding by the current funding source.

## **SECTION 3**

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### **ACTUARIAL TABLES**

## Actuarial Tables

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# **RETIREMENT BENEFITS**

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## **ACTUARIAL TABLES**

## Development of Unfunded Actuarial Accrued Liability Retirement Benefits

(Dollar amounts expressed in thousands)

|  | June 30, 2017        |                  |
|--|----------------------|------------------|
|  | Non-Hazardous<br>(1) | Hazardous<br>(2) |
| 1. Projected payroll of active members                               | \$ 2,452,407         | \$ 541,633       |
| 2. Present value of future pay                                       | \$ 19,236,003        | \$ 3,404,412     |
| 3. Normal cost rate  |                      |                  |
| a. Total normal cost rate  | 10.05%               | 14.52%           |
| b. Less: member contribution rate                                    | -5.00%               | -8.00%           |
| c. Employer normal cost rate   | 5.05%                | 6.52%            |
| 4. Actuarial accrued liability for active members                    |                      |                  |
| a. Present value of future benefits                                  | \$ 6,904,473         | \$ 2,204,933     |
| b. Less: present value of future normal costs                        | (1,832,645)          | (466,487)        |
| c. Actuarial accrued liability                                       | \$ 5,071,828         | \$ 1,738,446     |
| 5. Total actuarial accrued liability                                 |                      |                  |
| a. Retirees and beneficiaries  | \$ 7,313,076         | \$ 2,851,704     |
| b. Inactive members  | 418,606              | 58,897           |
| c. Active members (Item 4c)  | 5,071,828            | 1,738,446        |
| d. Total   | \$ 12,803,510        | \$ 4,649,047     |
| 6. Actuarial value of assets   | \$ 6,764,873         | \$ 2,238,320     |
| 7. Unfunded actuarial accrued liability (UAAL)<br>(Item 5d - Item 6) | \$ 6,038,637         | \$ 2,410,727     |
| 8. Funded Ratio  | 52.8%                | 48.1%            |

**Actuarial Present Value of Future Benefits**  
**Retirement Benefits**  
(Dollar amounts expressed in thousands)

|   | June 30, 2017        |                     |
|---|----------------------|---------------------|
|   | Non-Hazardous<br>(1) | Hazardous<br>(2)    |
| 1. Active members                                   |                      |                     |
| a. Service retirement                               | \$ 6,359,838         | \$ 1,881,864        |
| b. Deferred termination benefits and refunds        | 355,125              | 261,612             |
| c. Survivor benefits                                | 47,123               | 10,337              |
| d. Disability benefits                              | 142,387              | 51,120              |
| e. Total  | <u>\$ 6,904,473</u>  | <u>\$ 2,204,933</u> |
| 2. Retired members                                  |                      |                     |
| a. Service retirement                               | \$ 6,424,305         | \$ 2,588,548        |
| b. Disability retirement                            | 479,815              | 108,370             |
| c. Beneficiaries                                    | 408,956              | 154,786             |
| d. Total  | <u>\$ 7,313,076</u>  | <u>\$ 2,851,704</u> |
| 3. Inactive members                                 |                      |                     |
| a. Vested terminations                              | \$ 339,599           | \$ 51,652           |
| b. Nonvested terminations                           | 79,007               | 7,245               |
| c. Total  | <u>\$ 418,606</u>    | <u>\$ 58,897</u>    |
| 4. Total actuarial present value of future benefits | <u>\$ 14,636,155</u> | <u>\$ 5,115,534</u> |

## Development of Required Contribution Rate Retirement Benefits

|  | June 30, 2017        |                  |
|--|----------------------|------------------|
|  | Non-Hazardous<br>(1) | Hazardous<br>(2) |
| 1. Total normal cost rate                    |                      |                  |
| a. Service retirement                        | 7.91%                | 8.94%            |
| b. Deferred termination benefits and refunds | 1.72%                | 4.91%            |
| c. Survivor benefits                         | 0.08%                | 0.11%            |
| d. Disability benefits                       | <u>0.34%</u>         | <u>0.56%</u>     |
| e. Total                                     | 10.05%               | 14.52%           |
| 2. Less: member contribution rate            | <u>-5.00%</u>        | <u>-8.00%</u>    |
| 3. Total employer normal cost rate           | 5.05%                | 6.52%            |
| 4. Administrative expenses                   | <u>0.80%</u>         | <u>0.26%</u>     |
| 5. Net employer normal cost rate             | 5.85%                | 6.78%            |
| 6. UAAL amortization contribution            | 15.99%               | 28.91%           |
| 7. Total recommended employer contribution   | 21.84%               | 35.69%           |

**Actuarial Balance Sheet**  
**Non-Hazardous Members Retirement**  
(Dollar amounts expressed in thousands)

|  | June 30, 2017 | June 30, 2016 |
|--|---------------|---------------|
|  | (1)           | (2)           |
| 1. Assets - Present and Expected Future Resources  |               |               |
| a. Current assets (actuarial value)  | \$ 6,764,873  | \$ 6,535,372  |
| b. Present value of future member contributions  | \$ 961,800    | \$ 1,002,005  |
| c. Present value of future employer contributions  |               |               |
| i. Normal cost contributions   | \$ 870,845    | \$ 525,861    |
| ii. Unfunded accrued liability contributions   | 6,038,637     | 4,541,085     |
| iii. Total future employer contributions   | \$ 6,909,482  | \$ 5,066,946  |
| d. Total assets  | \$ 14,636,155 | \$ 12,604,323 |
| 2. Liabilities - Present Value of Expected Future Benefit Payments                           |               |               |
| a. Active members  |               |               |
| i. Present value of future normal costs  | \$ 1,832,645  | \$ 1,527,866  |
| ii. Accrued liability  | 5,071,828     | 4,290,927     |
| iii. Total present value of future benefits  | \$ 6,904,473  | \$ 5,818,793  |
| b. Present value of benefits payable on account of current retired members and beneficiaries | \$ 7,313,076  | \$ 6,410,537  |
| c. Present value of benefits payable on account of current inactive members                  | \$ 418,606    | \$ 374,993    |
| d. Total liabilities   | \$ 14,636,155 | \$ 12,604,323 |

**Actuarial Balance Sheet**  
**Hazardous Members Retirement**  
(Dollar amounts expressed in thousands)

|  | June 30, 2017<br>(1) | June 30, 2016<br>(2) |
|--|----------------------|----------------------|
| 1. Assets - Present and Expected Future Resources  |                      |                      |
| a. Current assets (actuarial value)  | \$ 2,238,320         | \$ 2,139,119         |
| b. Present value of future member contributions  | \$ 272,353           | \$ 281,802           |
| c. Present value of future employer contributions  |                      |                      |
| i. Normal cost contributions   | \$ 194,134           | \$ 98,917            |
| ii. Unfunded accrued liability contributions   | 2,410,727            | 1,565,338            |
| iii. Total future employer contributions   | \$ 2,604,861         | \$ 1,664,255         |
| d. Total assets  | \$ 5,115,534         | \$ 4,085,176         |
| 2. Liabilities - Present Value of Expected Future Benefit Payments                           |                      |                      |
| a. Active members  |                      |                      |
| i. Present value of future normal costs  | \$ 466,487           | \$ 380,719           |
| ii. Accrued liability  | 1,738,446            | 1,315,745            |
| iii. Total present value of future benefits  | \$ 2,204,933         | \$ 1,696,464         |
| b. Present value of benefits payable on account of current retired members and beneficiaries | \$ 2,851,704         | \$ 2,338,063         |
| c. Present value of benefits payable on account of current inactive members                  | \$ 58,897            | \$ 50,649            |
| d. Total liabilities   | \$ 5,115,534         | \$ 4,085,176         |

**Reconciliation of Retirement Net Assets**  
(Dollar amounts expressed in thousands)

|  | Year Ending          |                  |
|--|----------------------|------------------|
|  | June 30, 2017        | June 30, 2017    |
|  | (1)                  | (2)              |
|  | <b>Non-Hazardous</b> | <b>Hazardous</b> |
| 1. Value of assets at beginning of year                  | \$ 6,106,187         | \$ 2,003,669     |
| 2. Revenue for the year                                  |                      |                  |
| a. Contributions   |                      |                  |
| i. Member contributions                                  | \$ 150,715           | \$ 60,101        |
| ii. Employer contributions                               | 331,492              | 114,316          |
| iii. Other contributions (less 401h)                     | 2,061                | 1,632            |
| iii. Total   | \$ 484,268           | \$ 176,048       |
| b. Income  |                      |                  |
| i. Interest, dividends, and other income                 | \$ 185,883           | \$ 60,591        |
| ii. Investment expenses                                  | (48,166)             | (15,765)         |
| iii. Net   | \$ 137,717           | \$ 44,825        |
| c. Net realized and unrealized gains (losses)            | 680,564              | 224,173          |
| d. Total revenue   | \$ 1,302,550         | \$ 445,047       |
| 3. Expenditures for the year                             |                      |                  |
| a. Disbursements   |                      |                  |
| i. Refunds   | \$ 14,430            | \$ 2,315         |
| ii. Regular annuity benefits                             | 687,461              | 226,984          |
| iii. Other benefit payments                              | 0                    | 0                |
| iv. Transfers to other systems                           | 0                    | 0                |
| v. Total   | \$ 701,891           | \$ 229,299       |
| b. Administrative expenses and depreciation              | 19,609               | 1,421            |
| c. Total expenditures                                    | \$ 721,500           | \$ 230,720       |
| 4. Increase in net assets<br>(Item 2. - Item 3.)         | \$ 581,050           | \$ 214,327       |
| 5. Value of assets at end of year<br>(Item 1. + Item 4.) | \$ 6,687,237         | \$ 2,217,996     |
| 6. Net external cash flow                                |                      |                  |
| a. Dollar amount   | \$ (237,231)         | \$ (54,672)      |
| b. Percentage of market value                            | -3.7%                | -2.6%            |
| 7. Estimated annual return on net assets                 | 13.7%                | 13.6%            |

**Development of Actuarial Value of Assets**  
**Non-Hazardous Members Retirement**  
(Dollar amounts expressed in thousands)\*

| Year Ending   | June 30, 2017  |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
|---|--|--------------------------------|--|--------------------------------|------------------------------------|----|------|------------|-----------|----|------|-----------|-----------|----|------|-----------|----------|----|------|---------|--------|----|------|---------|--------|----|-------|--|-----------|
| 1. Actuarial value of assets at beginning of year   | \$ 6,535,372   |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| 2. Market value of assets at beginning of year  | \$ 6,106,187   |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| 3. Net new investments  |  |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| a. Contributions  | \$ 484,268   |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| b. Benefit payments   | (701,891)  |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| c. Administrative expenses  | (19,609)   |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| d. Subtotal   | \$ (237,231)   |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| 4. Market value of assets at end of year  | \$ 6,687,237   |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| 5. Net earnings (Item 4. - Item 2. - Item 3.d.)   | \$ 818,281   |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| 6. Assumed investment return rate for fiscal year   | 7.50%  |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| 7. Expected return for immediate recognition  | \$ 449,068   |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| 8. Excess return for phased recognition   | \$ 369,213   |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| 9. Phased-in recognition, 20% of excess return on assets for prior years:                       |  |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
|   | <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;"></th> <th style="text-align: center;"><u>Fiscal Year</u><br/><u>Ending June 30,</u></th> <th style="text-align: center;"><u>Excess</u><br/><u>Return</u></th> <th style="text-align: center;"><u>Recognized</u><br/><u>Amount</u></th> </tr> </thead> <tbody> <tr> <td style="padding-left: 20px;">a.</td> <td style="text-align: center;">2017</td> <td style="text-align: right;">\$ 369,213</td> <td style="text-align: right;">\$ 73,843</td> </tr> <tr> <td style="padding-left: 20px;">b.</td> <td style="text-align: center;">2016</td> <td style="text-align: right;">(515,652)</td> <td style="text-align: right;">(103,130)</td> </tr> <tr> <td style="padding-left: 20px;">c.</td> <td style="text-align: center;">2015</td> <td style="text-align: right;">(386,073)</td> <td style="text-align: right;">(77,215)</td> </tr> <tr> <td style="padding-left: 20px;">d.</td> <td style="text-align: center;">2014</td> <td style="text-align: right;">454,067</td> <td style="text-align: right;">90,813</td> </tr> <tr> <td style="padding-left: 20px;">e.</td> <td style="text-align: center;">2013</td> <td style="text-align: right;">166,764</td> <td style="text-align: right;">33,353</td> </tr> <tr> <td style="padding-left: 20px;">f.</td> <td style="text-align: center;">Total</td> <td></td> <td style="text-align: right; border-top: 1px solid black;">\$ 17,664</td> </tr> </tbody> </table> |                                | <u>Fiscal Year</u><br><u>Ending June 30,</u> | <u>Excess</u><br><u>Return</u> | <u>Recognized</u><br><u>Amount</u> | a. | 2017 | \$ 369,213 | \$ 73,843 | b. | 2016 | (515,652) | (103,130) | c. | 2015 | (386,073) | (77,215) | d. | 2014 | 454,067 | 90,813 | e. | 2013 | 166,764 | 33,353 | f. | Total |  | \$ 17,664 |
|   | <u>Fiscal Year</u><br><u>Ending June 30,</u>   | <u>Excess</u><br><u>Return</u> | <u>Recognized</u><br><u>Amount</u>           |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| a.  | 2017   | \$ 369,213                     | \$ 73,843                                    |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| b.  | 2016   | (515,652)                      | (103,130)                                    |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| c.  | 2015   | (386,073)                      | (77,215)                                     |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| d.  | 2014   | 454,067                        | 90,813                                       |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| e.  | 2013   | 166,764                        | 33,353                                       |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| f.  | Total  |                                | \$ 17,664                                    |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| 10. Actuarial value of assets as of June 30, 2017<br>(Item 1. + Item 3.d. + Item 7.+ Item 9.f.) | \$ 6,764,873   |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| 11. Ratio of actuarial value to market value  | 101.2%   |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |
| 12. Estimated annual return on actuarial value of assets  | 7.3%   |                                |  |                                |                                    |    |      |            |           |    |      |           |           |    |      |           |          |    |      |         |        |    |      |         |        |    |       |  |           |

\* Amounts may not add due to rounding

**Development of Actuarial Value of Assets**  
**Hazardous Members Retirement**  
(Dollar amounts expressed in thousands)\*

| Year Ending   | June 30, 2017   |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
|---|---|--------------------------------|--|--------------------------------|------------------------------------|----|------|------------|-----------|----|------|-----------|----------|----|------|-----------|----------|----|------|---------|--------|----|------|--------|-------|----|-------|--|----------|
| 1. Actuarial value of assets at beginning of year   | \$ 2,139,119  |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| 2. Market value of assets at beginning of year  | \$ 2,003,669  |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| 3. Net new investments  |   |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| a. Contributions  | \$ 176,048  |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| b. Benefit payments   | (229,299)   |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| c. Administrative expenses  | (1,421)   |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| d. Subtotal   | \$ (54,672)   |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| 4. Market value of assets at end of year  | \$ 2,217,996  |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| 5. Net earnings (Item 4. - Item 2. - Item 3.d.)   | \$ 268,999  |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| 6. Assumed investment return rate for fiscal year   | 7.50%   |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| 7. Expected return for immediate recognition  | \$ 148,225  |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| 8. Excess return for phased recognition   | \$ 120,774  |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| 9. Phased-in recognition, 20% of excess return on assets for prior years:                       |   |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
|   | <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;"></th> <th style="text-align: center;"><u>Fiscal Year</u><br/><u>Ending June 30,</u></th> <th style="text-align: center;"><u>Excess</u><br/><u>Return</u></th> <th style="text-align: center;"><u>Recognized</u><br/><u>Amount</u></th> </tr> </thead> <tbody> <tr> <td style="padding-left: 20px;">a.</td> <td style="text-align: center;">2017</td> <td style="text-align: right;">\$ 120,774</td> <td style="text-align: right;">\$ 24,155</td> </tr> <tr> <td style="padding-left: 20px;">b.</td> <td style="text-align: center;">2016</td> <td style="text-align: right;">(162,540)</td> <td style="text-align: right;">(32,508)</td> </tr> <tr> <td style="padding-left: 20px;">c.</td> <td style="text-align: center;">2015</td> <td style="text-align: right;">(122,554)</td> <td style="text-align: right;">(24,511)</td> </tr> <tr> <td style="padding-left: 20px;">d.</td> <td style="text-align: center;">2014</td> <td style="text-align: right;">148,014</td> <td style="text-align: right;">29,603</td> </tr> <tr> <td style="padding-left: 20px;">e.</td> <td style="text-align: center;">2013</td> <td style="text-align: right;">44,546</td> <td style="text-align: right;">8,909</td> </tr> <tr> <td style="padding-left: 20px;">f.</td> <td style="text-align: center;">Total</td> <td></td> <td style="text-align: right; border-top: 1px solid black;">\$ 5,648</td> </tr> </tbody> </table> |                                | <u>Fiscal Year</u><br><u>Ending June 30,</u> | <u>Excess</u><br><u>Return</u> | <u>Recognized</u><br><u>Amount</u> | a. | 2017 | \$ 120,774 | \$ 24,155 | b. | 2016 | (162,540) | (32,508) | c. | 2015 | (122,554) | (24,511) | d. | 2014 | 148,014 | 29,603 | e. | 2013 | 44,546 | 8,909 | f. | Total |  | \$ 5,648 |
|   | <u>Fiscal Year</u><br><u>Ending June 30,</u>  | <u>Excess</u><br><u>Return</u> | <u>Recognized</u><br><u>Amount</u>           |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| a.  | 2017  | \$ 120,774                     | \$ 24,155                                    |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| b.  | 2016  | (162,540)                      | (32,508)                                     |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| c.  | 2015  | (122,554)                      | (24,511)                                     |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| d.  | 2014  | 148,014                        | 29,603                                       |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| e.  | 2013  | 44,546                         | 8,909  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| f.  | Total   |                                | \$ 5,648                                     |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| 10. Actuarial value of assets as of June 30, 2017<br>(Item 1. + Item 3.d. + Item 7.+ Item 9.f.) | \$ 2,238,320  |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| 11. Ratio of actuarial value to market value  | 100.9%  |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |
| 12. Estimated annual return on actuarial value of assets  | 7.3%  |                                |  |                                |                                    |    |      |            |           |    |      |           |          |    |      |           |          |    |      |         |        |    |      |        |       |    |       |  |          |

\* Amounts may not add due to rounding

**Schedule of Funding Progress**  
**Retirement Benefits**  
(Dollar amounts expressed in thousands)

| June 30,<br>(1)              | Actuarial Value of<br>Assets (AVA)<br>(2) | Actuarial Accrued<br>Liability (AAL)<br>(3) | Unfunded Actuarial<br>Accrued Liability<br>(UAAL) (3) - (2)<br>(4) | Funded Ratio<br>(2)/(3)<br>(5) | Annual Covered<br>Payroll<br>(6) | UAAL as % of<br>Payroll (4)/(6)<br>(7) |
|------------------------------|---|---|--|--------------------------------|----------------------------------|--|
| <b>Non-Hazardous Members</b> |   |   |  |                                |                                  |  |
| 2011                         | \$ 5,629,611                              | \$ 8,918,085                                | \$ 3,288,474   | 63.1%                          | \$ 2,276,596                     | 144.4%                                 |
| 2012                         | 5,547,236                                 | 9,139,568                                   | 3,592,332  | 60.7%                          | 2,236,546                        | 160.6%                                 |
| 2013                         | 5,637,094                                 | 9,378,876                                   | 3,741,782  | 60.1%                          | 2,236,277                        | 167.3%                                 |
| 2014                         | 6,117,134                                 | 9,772,523                                   | 3,655,389  | 62.6%                          | 2,272,270                        | 160.9%                                 |
| 2015                         | 6,474,849                                 | 10,740,325                                  | 4,265,477  | 60.3%                          | 2,296,716                        | 185.7%                                 |
| 2016                         | 6,535,372                                 | 11,076,457                                  | 4,541,084  | 59.0%                          | 2,352,762                        | 193.0%                                 |
| 2017                         | 6,764,873                                 | 12,803,510                                  | 6,038,637  | 52.8%                          | 2,452,407                        | 246.2%                                 |
| <b>Hazardous Members</b>     |   |   |  |                                |                                  |  |
| 2011                         | \$ 1,779,545                              | \$ 2,859,041                                | \$ 1,079,496   | 62.2%                          | \$ 466,964                       | 231.2%                                 |
| 2012                         | 1,747,379                                 | 3,009,992                                   | 1,262,613  | 58.1%                          | 464,229                          | 272.0%                                 |
| 2013                         | 1,801,691                                 | 3,124,206                                   | 1,322,514  | 57.7%                          | 461,673                          | 286.5%                                 |
| 2014                         | 1,967,640                                 | 3,288,826                                   | 1,321,186  | 59.8%                          | 479,164                          | 275.7%                                 |
| 2015                         | 2,096,783                                 | 3,613,308                                   | 1,516,525  | 58.0%                          | 483,641                          | 313.6%                                 |
| 2016                         | 2,139,119                                 | 3,704,456                                   | 1,565,337  | 57.7%                          | 492,851                          | 317.6%                                 |
| 2017                         | 2,238,320                                 | 4,649,047                                   | 2,410,727  | 48.1%                          | 541,633                          | 445.1%                                 |
| <b>Total CERS Members</b>    |   |   |  |                                |                                  |  |
| 2011                         | \$ 7,409,156                              | \$ 11,777,126                               | \$ 4,367,970   | 62.9%                          | \$ 2,743,560                     | 159.2%                                 |
| 2012                         | 7,294,615                                 | 12,149,560                                  | 4,854,945  | 60.0%                          | 2,700,775                        | 179.8%                                 |
| 2013                         | 7,438,785                                 | 12,503,082                                  | 5,064,297  | 59.5%                          | 2,697,950                        | 187.7%                                 |
| 2014                         | 8,084,774                                 | 13,061,349                                  | 4,976,575  | 61.9%                          | 2,751,434                        | 180.9%                                 |
| 2015                         | 8,571,632                                 | 14,353,633                                  | 5,782,001  | 59.7%                          | 2,780,357                        | 208.0%                                 |
| 2016                         | 8,674,491                                 | 14,780,913                                  | 6,106,422  | 58.7%                          | 2,845,613                        | 214.6%                                 |
| 2017                         | 9,003,193                                 | 17,452,557                                  | 8,449,364  | 51.6%                          | 2,994,040                        | 282.2%                                 |

## Summary of Principal Assumptions and Methods

Below is a summary of the principal economic assumptions, cost method, and the method for financing the unfunded actuarial accrued liability:

|  |  |  |
|--|--|--|
| Valuation date:                            | Non-Hazardous<br>June 30, 2017   | Hazardous<br>June 30, 2017   |
| Actuarial cost method:                     | Entry Age Normal   | Entry Age Normal   |
| Amortization method:                       | Level percentage of payroll<br>(2% payroll growth assumed)   | Level percentage of payroll<br>(2% payroll growth assumed)   |
| Amortization period for contribution rate: | 26-year closed period  | 26-year closed period  |
| Asset valuation method:                    | 5-Year Smoothed Market   | 5-Year Smoothed Market   |
| Actuarial assumptions:                     |  |  |
| Investment rate of return                  | 6.25%  | 6.25%  |
| Projected salary increases                 | 3.30% to 11.55%<br>(varies by service)   | 3.05% to 18.55%<br>(varies by service)   |
| Inflation                                  | 2.30%  | 2.30%  |
| Post-retirement benefit adjustments        | 0.00%  | 0.00%  |
| Retiree Mortality                          | RP-2000 Combined Mortality Table<br>for Males and Females, projected<br>using scale BB to 2013<br>(set back one year for females). | RP-2000 Combined Mortality Table<br>for Males and Females, projected<br>using scale BB to 2013<br>(set back one year for females). |

**Solvency Test**  
**Retirement Benefits**  
(Dollar amounts expressed in thousands)

| June 30,                     | Actuarial Accrued Liability |                                 |                                    |                  | Portion of Aggregate Accrued Liabilities Covered by Assets |         |             |
|------------------------------|-----------------------------|---------------------------------|------------------------------------|------------------|--|---------|-------------|
|                              | Active Member Contributions | Retired Members & Beneficiaries | Active Members (Employer Financed) | Valuation Assets | Active   | Retired | ER Financed |
|                              | (1)                         | (2)                             | (3)                                | (4)              | (5)  | (6)     | (7)         |
| <b>Non-Hazardous Members</b> |                             |                                 |                                    |                  |  |         |             |
| 2008                         | \$ 963,214                  | \$ 4,058,767                    | \$ 2,282,237                       | \$ 5,731,502     | 100.0%   | 100.0%  | 31.1%       |
| 2009                         | 991,629                     | 4,542,483                       | 2,378,802                          | 5,650,790        | 100.0%   | 100.0%  | 4.9%        |
| 2010                         | 1,063,747                   | 4,890,659                       | 2,504,616                          | 5,546,857        | 100.0%   | 91.7%   | 0.0%        |
| 2011                         | 1,110,967                   | 5,209,784                       | 2,597,334                          | 5,629,611        | 100.0%   | 86.7%   | 0.0%        |
| 2012                         | 1,117,549                   | 5,416,933                       | 2,605,085                          | 5,547,236        | 100.0%   | 81.8%   | 0.0%        |
| 2013                         | 1,149,611                   | 5,638,371                       | 2,590,894                          | 5,637,094        | 100.0%   | 79.6%   | 0.0%        |
| 2014                         | 1,204,383                   | 5,873,279                       | 2,694,860                          | 6,117,134        | 100.0%   | 83.6%   | 0.0%        |
| 2015                         | 1,216,585                   | 6,489,863                       | 3,033,878                          | 6,474,849        | 100.0%   | 81.0%   | 0.0%        |
| 2016                         | 1,231,027                   | 6,785,530                       | 3,059,900                          | 6,535,372        | 100.0%   | 78.2%   | 0.0%        |
| 2017                         | 1,277,432                   | 7,731,682                       | 3,794,396                          | 6,764,873        | 100.0%   | 71.0%   | 0.0%        |
| <b>Hazardous Members</b>     |                             |                                 |                                    |                  |  |         |             |
| 2008                         | \$ 338,324                  | \$ 1,406,982                    | \$ 657,815                         | \$ 1,750,867     | 100.0%   | 100.0%  | 0.8%        |
| 2009                         | 350,309                     | 1,540,263                       | 687,873                            | 1,751,488        | 100.0%   | 91.0%   | 0.0%        |
| 2010                         | 369,613                     | 1,622,684                       | 679,855                            | 1,749,464        | 100.0%   | 85.0%   | 0.0%        |
| 2011                         | 382,072                     | 1,768,512                       | 708,457                            | 1,779,545        | 100.0%   | 79.0%   | 0.0%        |
| 2012                         | 381,672                     | 1,889,884                       | 738,435                            | 1,747,379        | 100.0%   | 72.3%   | 0.0%        |
| 2013                         | 390,471                     | 1,988,030                       | 745,705                            | 1,801,691        | 100.0%   | 71.0%   | 0.0%        |
| 2014                         | 415,070                     | 2,077,517                       | 796,239                            | 1,967,640        | 100.0%   | 74.7%   | 0.0%        |
| 2015                         | 422,359                     | 2,297,703                       | 893,246                            | 2,096,783        | 100.0%   | 72.9%   | 0.0%        |
| 2016                         | 428,713                     | 2,388,712                       | 887,031                            | 2,139,119        | 100.0%   | 71.6%   | 0.0%        |
| 2017                         | 458,808                     | 2,910,601                       | 1,279,638                          | 2,238,320        | 100.0%   | 61.1%   | 0.0%        |

# **INSURANCE BENEFITS**

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## **ACTUARIAL TABLES**

## Development of Unfunded Actuarial Accrued Liability Insurance Benefits

(Dollar amounts expressed in thousands)

|  | June 30, 2017        |                  |
|--|----------------------|------------------|
|  | Non-Hazardous<br>(1) | Hazardous<br>(2) |
| 1. Projected payroll of active members                               | \$ 2,452,407         | \$ 541,633       |
| 2. Present value of future pay                                       | \$ 19,055,637        | \$ 3,402,207     |
| 3. Normal cost rate  |                      |                  |
| a. Total normal cost rate  | 3.57%                | 5.38%            |
| b. Less: member contribution rate                                    | -0.41%               | -0.35%           |
| c. Employer normal cost rate   | 3.16%                | 5.03%            |
| 4. Actuarial accrued liability for active members                    |                      |                  |
| a. Present value of future benefits                                  | \$ 2,390,844         | \$ 944,509       |
| b. Less: present value of future normal costs                        | (639,131)            | (150,840)        |
| c. Actuarial accrued liability                                       | \$ 1,751,713         | \$ 793,669       |
| 5. Total actuarial accrued liability                                 |                      |                  |
| a. Retirees and beneficiaries  | \$ 1,445,497         | \$ 973,103       |
| b. Inactive members  | 157,941              | 21,661           |
| c. Active members (Item 4c)  | 1,751,713            | 793,669          |
| d. Total   | \$ 3,355,151         | \$ 1,788,433     |
| 6. Actuarial value of assets   | \$ 2,227,401         | \$ 1,196,780     |
| 7. Unfunded actuarial accrued liability (UAAL)<br>(Item 5d - Item 6) | \$ 1,127,750         | \$ 591,653       |
| 8. Funded Ratio  | 66.4%                | 66.9%            |

## Development of Required Contribution Rate Insurance Benefits

|  | June 30, 2017        |                  |
|--|----------------------|------------------|
|  | Non-Hazardous<br>(1) | Hazardous<br>(2) |
| 1. Total normal cost rate                  | 3.57%                | 5.38%            |
| 2. Less: member contribution rate          | <u>-0.41%</u>        | <u>-0.35%</u>    |
| 3. Total employer normal cost rate         | 3.16%                | 5.03%            |
| 4. Administrative expenses                 | <u>0.03%</u>         | <u>0.07%</u>     |
| 5. Net employer normal cost rate           | 3.19%                | 5.10%            |
| 6. UAAL amortization contribution          | 3.02%                | 7.07%            |
| 7. Total recommended employer contribution | 6.21%                | 12.17%           |

**Actuarial Balance Sheet**  
**Non-Hazardous Members Insurance**  
(Dollar amounts expressed in thousands)

|  | June 30, 2017 | June 30, 2016 |
|--|---------------|---------------|
|  | (1)           | (2)           |
| 1. Assets - Present and Expected Future Resources  |               |               |
| a. Current assets (actuarial value)  | \$ 2,227,401  | \$ 2,079,811  |
| b. Present value of future member contributions  | \$ 94,725     | \$ 79,503     |
| c. Present value of future employer contributions  |               |               |
| i. Normal cost contributions   | \$ 544,406    | \$ 441,836    |
| ii. Unfunded accrued liability contributions   | 1,127,750     | 908,310       |
| iii. Total future employer contributions   | \$ 1,672,156  | \$ 1,350,146  |
| d. Total assets  | \$ 3,994,282  | \$ 3,509,460  |
| 2. Liabilities - Present Value of Expected Future Benefit Payments                           |               |               |
| a. Active members  |               |               |
| i. Present value of future normal costs  | \$ 639,131    | \$ 521,339    |
| ii. Accrued liability  | 1,751,713     | 1,503,184     |
| iii. Total present value of future benefits  | \$ 2,390,844  | \$ 2,024,523  |
| b. Present value of benefits payable on account of current retired members and beneficiaries | \$ 1,445,497  | \$ 1,326,305  |
| c. Present value of benefits payable on account of current inactive members                  | \$ 157,941    | \$ 158,632    |
| d. Total liabilities   | \$ 3,994,282  | \$ 3,509,460  |

**Actuarial Balance Sheet**  
**Hazardous Members Insurance**  
(Dollar amounts expressed in thousands)

|  | June 30, 2017<br>(1) | June 30, 2016<br>(2) |
|--|----------------------|----------------------|
| 1. Assets - Present and Expected Future Resources  |                      |                      |
| a. Current assets (actuarial value)  | \$ 1,196,780         | \$ 1,135,784         |
| b. Present value of future member contributions  | \$ 16,300            | \$ 13,096            |
| c. Present value of future employer contributions  |                      |                      |
| i. Normal cost contributions   | \$ 134,540           | \$ 124,881           |
| ii. Unfunded accrued liability contributions   | 591,653              | 423,034              |
| iii. Total future employer contributions   | \$ 726,193           | \$ 547,915           |
| d. Total assets  | \$ 1,939,273         | \$ 1,696,795         |
| 2. Liabilities - Present Value of Expected Future Benefit Payments                           |                      |                      |
| a. Active members  |                      |                      |
| i. Present value of future normal costs  | \$ 150,840           | \$ 137,977           |
| ii. Accrued liability  | 793,669              | 679,458              |
| iii. Total present value of future benefits  | \$ 944,509           | \$ 817,435           |
| b. Present value of benefits payable on account of current retired members and beneficiaries | \$ 973,103           | \$ 855,273           |
| c. Present value of benefits payable on account of current inactive members                  | \$ 21,661            | \$ 24,087            |
| d. Total liabilities   | \$ 1,939,273         | \$ 1,696,795         |

**Reconciliation of Insurance Net Assets**  
(Dollar amounts expressed in thousands)

|  | Year Ending          |                     |
|--|----------------------|---------------------|
|  | June 30, 2017        | June 30, 2017       |
|  | (1)                  | (2)                 |
|  | <b>Non-Hazardous</b> | <b>Hazardous</b>    |
| 1. Value of assets at beginning of year                  | \$ 1,943,757         | \$ 1,062,602        |
| 2. Revenue for the year                                  |                      |                     |
| a. Contributions   |                      |                     |
| i. Member contributions                                  | \$ 9,158             | \$ 1,708            |
| ii. Employer contributions                               | 117,310              | 50,743              |
| iii. Other contributions                                 | 3,402                | 794                 |
| iii. Total   | <u>\$ 129,870</u>    | <u>\$ 53,245</u>    |
| b. Income  |                      |                     |
| i. Interest, dividends, and other income                 | \$ 58,208            | \$ 32,002           |
| ii. Investment expenses                                  | (16,245)             | (8,992)             |
| iii. Net   | <u>\$ 41,963</u>     | <u>\$ 23,010</u>    |
| c. Net realized and unrealized gains (losses)            | <u>225,241</u>       | <u>121,393</u>      |
| d. Total revenue   | <u>\$ 397,074</u>    | <u>\$ 197,648</u>   |
| 3. Expenditures for the year                             |                      |                     |
| a. Disbursements   |                      |                     |
| i. Refunds   | \$ 0                 | \$ 0                |
| ii. Healthcare premium subsidies                         | 124,573              | 70,407              |
| iii. Other benefit payments                              | 2,934                | 461                 |
| iv. Transfers to other systems                           | 0                    | 0                   |
| v. Total   | <u>\$ 127,506</u>    | <u>\$ 70,868</u>    |
| b. Administrative expenses and depreciation              | <u>789</u>           | <u>381</u>          |
| c. Total expenditures                                    | <u>\$ 128,295</u>    | <u>\$ 71,249</u>    |
| 4. Increase in net assets<br>(Item 2. - Item 3.)         | <u>\$ 268,779</u>    | <u>\$ 126,399</u>   |
| 5. Value of assets at end of year<br>(Item 1. + Item 4.) | <u>\$ 2,212,536</u>  | <u>\$ 1,189,001</u> |
| 6. Net external cash flow                                |                      |                     |
| a. Dollar amount   | \$ 1,574             | \$ (18,004)         |
| b. Percentage of market value                            | 0.1%                 | -1.6%               |
| 7. Estimated annual return on net assets                 | 13.7%                | 13.7%               |



**Development of Actuarial Value of Assets**  
**Hazardous Members Insurance**  
(Dollar amounts expressed in thousands)\*

| Year Ending   | June 30, 2017   |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
|---|---|--------------------------------|--|--------------------------------|------------------------------------|----|------|-----------|-----------|----|------|----------|----------|----|------|----------|----------|----|------|--------|--------|----|------|--------|-------|----|-------|--|---------|
| 1. Actuarial value of assets at beginning of year   | \$ 1,135,784  |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| 2. Market value of assets at beginning of year  | \$ 1,062,602  |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| 3. Net new investments  |   |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| a. Contributions  | \$ 53,245   |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| b. Benefit payments   | (70,868)  |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| c. Administrative expenses  | (381)   |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| d. Subtotal   | \$ (18,004)   |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| 4. Market value of assets at end of year  | \$ 1,189,001  |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| 5. Net earnings (Item 4. - Item 2. - Item 3.d.)   | \$ 144,403  |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| 6. Assumed investment return rate for fiscal year   | 7.50%   |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| 7. Expected return for immediate recognition  | \$ 79,020   |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| 8. Excess return for phased recognition   | \$ 65,383   |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| 9. Phased-in recognition, 20% of excess return on assets for prior years:                       |   |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
|   | <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;"></th> <th style="text-align: center;"><u>Fiscal Year</u><br/><u>Ending June 30,</u></th> <th style="text-align: center;"><u>Excess</u><br/><u>Return</u></th> <th style="text-align: center;"><u>Recognized</u><br/><u>Amount</u></th> </tr> </thead> <tbody> <tr> <td style="padding-left: 20px;">a.</td> <td style="text-align: center;">2017</td> <td style="text-align: right;">\$ 65,383</td> <td style="text-align: right;">\$ 13,077</td> </tr> <tr> <td style="padding-left: 20px;">b.</td> <td style="text-align: center;">2016</td> <td style="text-align: right;">(78,507)</td> <td style="text-align: right;">(15,701)</td> </tr> <tr> <td style="padding-left: 20px;">c.</td> <td style="text-align: center;">2015</td> <td style="text-align: right;">(60,152)</td> <td style="text-align: right;">(12,030)</td> </tr> <tr> <td style="padding-left: 20px;">d.</td> <td style="text-align: center;">2014</td> <td style="text-align: right;">55,401</td> <td style="text-align: right;">11,080</td> </tr> <tr> <td style="padding-left: 20px;">e.</td> <td style="text-align: center;">2013</td> <td style="text-align: right;">17,771</td> <td style="text-align: right;">3,554</td> </tr> <tr> <td style="padding-left: 20px;">f.</td> <td style="text-align: center;">Total</td> <td></td> <td style="text-align: right; border-top: 1px solid black;">\$ (21)</td> </tr> </tbody> </table> |                                | <u>Fiscal Year</u><br><u>Ending June 30,</u> | <u>Excess</u><br><u>Return</u> | <u>Recognized</u><br><u>Amount</u> | a. | 2017 | \$ 65,383 | \$ 13,077 | b. | 2016 | (78,507) | (15,701) | c. | 2015 | (60,152) | (12,030) | d. | 2014 | 55,401 | 11,080 | e. | 2013 | 17,771 | 3,554 | f. | Total |  | \$ (21) |
|   | <u>Fiscal Year</u><br><u>Ending June 30,</u>  | <u>Excess</u><br><u>Return</u> | <u>Recognized</u><br><u>Amount</u>           |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| a.  | 2017  | \$ 65,383                      | \$ 13,077                                    |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| b.  | 2016  | (78,507)                       | (15,701)                                     |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| c.  | 2015  | (60,152)                       | (12,030)                                     |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| d.  | 2014  | 55,401                         | 11,080                                       |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| e.  | 2013  | 17,771                         | 3,554  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| f.  | Total   |                                | \$ (21)                                      |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| 10. Actuarial value of assets as of June 30, 2017<br>(Item 1. + Item 3.d. + Item 7.+ Item 9.f.) | \$ 1,196,780  |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| 11. Ratio of actuarial value to market value  | 100.7%  |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |
| 12. Estimated annual return on actuarial value of assets  | 7.0%  |                                |  |                                |                                    |    |      |           |           |    |      |          |          |    |      |          |          |    |      |        |        |    |      |        |       |    |       |  |         |

\* Amounts may not add due to rounding

**Schedule of Funding Progress**  
**Insurance Benefits**  
(Dollar amounts expressed in thousands)

| June 30,<br>(1)              | Actuarial Value of<br>Assets (AVA)<br>(2) | Actuarial Accrued<br>Liability (AAL)<br>(3) | Unfunded Actuarial<br>Accrued Liability<br>(UAAL) (3) - (2)<br>(4) | Funded Ratio<br>(2)/(3)<br>(5) | Annual Covered<br>Payroll<br>(6) | UAAL as % of<br>Payroll (4)/(6)<br>(7) |
|------------------------------|---|---|--|--------------------------------|----------------------------------|--|
| <b>Non-Hazardous Members</b> |   |   |  |                                |                                  |  |
| 2011                         | \$ 1,433,451                              | \$ 3,073,973                                | \$ 1,640,522   | 46.6%                          | \$ 2,276,596                     | 72.1%                                  |
| 2012                         | 1,512,854                                 | 2,370,771                                   | 857,917  | 63.8%                          | 2,236,546                        | 38.4%                                  |
| 2013                         | 1,628,244                                 | 2,443,894                                   | 815,650  | 66.6%                          | 2,236,277                        | 36.5%                                  |
| 2014                         | 1,831,199                                 | 2,616,915                                   | 785,715  | 70.0%                          | 2,272,270                        | 34.6%                                  |
| 2015                         | 1,997,456                                 | 2,907,827                                   | 910,371  | 68.7%                          | 2,296,716                        | 39.6%                                  |
| 2016                         | 2,079,811                                 | 2,988,121                                   | 908,310  | 69.6%                          | 2,352,762                        | 38.6%                                  |
| 2017                         | 2,227,401                                 | 3,355,151                                   | 1,127,750  | 66.4%                          | 2,452,407                        | 46.0%                                  |
| <b>Hazardous Members</b>     |   |   |  |                                |                                  |  |
| 2011                         | \$ 770,790                                | \$ 1,647,703                                | \$ 876,912   | 46.8%                          | \$ 466,964                       | 187.8%                                 |
| 2012                         | 829,041                                   | 1,364,843                                   | 535,802  | 60.7%                          | 464,229                          | 115.4%                                 |
| 2013                         | 892,774                                   | 1,437,333                                   | 544,558  | 62.1%                          | 461,673                          | 118.0%                                 |
| 2014                         | 997,733                                   | 1,493,864                                   | 496,131  | 66.8%                          | 479,164                          | 103.5%                                 |
| 2015                         | 1,087,707                                 | 1,504,015                                   | 416,308  | 72.3%                          | 483,641                          | 86.1%                                  |
| 2016                         | 1,135,784                                 | 1,558,818                                   | 423,034  | 72.9%                          | 492,851                          | 85.8%                                  |
| 2017                         | 1,196,780                                 | 1,788,433                                   | 591,653  | 66.9%                          | 541,633                          | 109.2%                                 |
| <b>Total CERS Members</b>    |   |   |  |                                |                                  |  |
| 2011                         | \$ 2,204,241                              | \$ 4,721,676                                | \$ 2,517,435   | 46.7%                          | \$ 2,743,560                     | 91.8%                                  |
| 2012                         | 2,341,895                                 | 3,735,614                                   | 1,393,719  | 62.7%                          | 2,700,775                        | 51.6%                                  |
| 2013                         | 2,521,018                                 | 3,881,227                                   | 1,360,209  | 65.0%                          | 2,697,950                        | 50.4%                                  |
| 2014                         | 2,828,932                                 | 4,110,779                                   | 1,281,847  | 68.8%                          | 2,751,434                        | 46.6%                                  |
| 2015                         | 3,085,163                                 | 4,411,842                                   | 1,326,679  | 69.9%                          | 2,780,357                        | 47.7%                                  |
| 2016                         | 3,215,595                                 | 4,546,939                                   | 1,331,344  | 70.7%                          | 2,845,613                        | 46.8%                                  |
| 2017                         | 3,424,181                                 | 5,143,584                                   | 1,719,403  | 66.6%                          | 2,994,040                        | 57.4%                                  |

**Solvency Test  
Insurance Benefits**  
(Dollar amounts expressed in thousands)

| June 30,<br>(1)              | Actuarial Accrued Liability        |  |   |                         | Portion of Aggregate Accrued Liabilities Covered by Assets |                |                    |
|------------------------------|------------------------------------|--|---|-------------------------|--|----------------|--------------------|
|                              | Active Member Contributions<br>(2) | Retired Members & Beneficiaries<br>(3) | Active Members (Employer Financed)<br>(4) | Valuation Assets<br>(5) | Active<br>(6)  | Retired<br>(7) | ER Financed<br>(8) |
| <b>Non-Hazardous Members</b> |                                    |  |   |                         |  |                |                    |
| 2008                         | \$ -                               | \$ 1,521,450                           | \$ 2,061,743                              | \$ 1,168,883            | 100.0%   | 76.8%          | 0.0%               |
| 2009                         | -                                  | 1,478,783                              | 1,591,603                                 | 1,216,632               | 100.0%   | 82.3%          | 0.0%               |
| 2010                         | -                                  | 1,526,533                              | 1,631,807                                 | 1,293,039               | 100.0%   | 84.7%          | 0.0%               |
| 2011                         | -                                  | 1,460,808                              | 1,613,165                                 | 1,433,451               | 100.0%   | 98.1%          | 0.0%               |
| 2012                         | -                                  | 1,146,908                              | 1,223,864                                 | 1,512,854               | 100.0%   | 100.0%         | 29.9%              |
| 2013                         | -                                  | 1,205,599                              | 1,238,295                                 | 1,628,244               | 100.0%   | 100.0%         | 34.1%              |
| 2014                         | -                                  | 1,318,183                              | 1,298,732                                 | 1,831,199               | 100.0%   | 100.0%         | 39.5%              |
| 2015                         | -                                  | 1,372,597                              | 1,535,231                                 | 1,997,456               | 100.0%   | 100.0%         | 40.7%              |
| 2016                         | -                                  | 1,484,937                              | 1,503,184                                 | 2,079,811               | 100.0%   | 100.0%         | 39.6%              |
| 2017                         | -                                  | 1,603,438                              | 1,751,713                                 | 2,227,401               | 100.0%   | 100.0%         | 35.6%              |
| <b>Hazardous Members</b>     |                                    |  |   |                         |  |                |                    |
| 2008                         | \$ -                               | \$ 722,435                             | \$ 1,047,348                              | \$ 613,526              | 100.0%   | 84.9%          | 0.0%               |
| 2009                         | -                                  | 725,900                                | 867,648                                   | 651,131                 | 100.0%   | 89.7%          | 0.0%               |
| 2010                         | -                                  | 814,300                                | 860,403                                   | 692,770                 | 100.0%   | 85.1%          | 0.0%               |
| 2011                         | -                                  | 771,631                                | 876,071                                   | 770,790                 | 100.0%   | 99.9%          | 0.0%               |
| 2012                         | -                                  | 575,099                                | 789,744                                   | 829,041                 | 100.0%   | 100.0%         | 32.2%              |
| 2013                         | -                                  | 660,955                                | 776,377                                   | 892,774                 | 100.0%   | 100.0%         | 29.9%              |
| 2014                         | -                                  | 700,312                                | 793,553                                   | 997,733                 | 100.0%   | 100.0%         | 37.5%              |
| 2015                         | -                                  | 790,714                                | 713,301                                   | 1,087,707               | 100.0%   | 100.0%         | 41.6%              |
| 2016                         | -                                  | 879,360                                | 679,458                                   | 1,135,784               | 100.0%   | 100.0%         | 37.7%              |
| 2017                         | -                                  | 994,764                                | 793,669                                   | 1,196,780               | 100.0%   | 100.0%         | 25.5%              |

# SECTION 4

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## MEMBERSHIP INFORMATION

## Membership Tables

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**Summary of Membership Data**  
(Total dollar amounts expressed in thousands)

|   | Non-Hazardous<br>June 30, 2017<br>(1) | Hazardous<br>June 30, 2017<br>(2) | Total<br>June 30, 2017<br>(3) |
|---|---------------------------------------|-----------------------------------|-------------------------------|
| 1. Active members                           |                                       |                                   |                               |
| a. Males                                    | 29,300                                | 8,355                             | 37,655                        |
| b. Females                                  | 52,898                                | 1,140                             | 54,038                        |
| c. Total members                            | 82,198                                | 9,495                             | 91,693                        |
| d. Total annualized prior year salaries     | \$ 2,452,407                          | \$ 541,633                        | \$ 2,994,040                  |
| e. Average salary                           | \$ 29,835                             | \$ 57,044                         | \$ 32,653                     |
| f. Average age                              | 47.9                                  | 39.2                              | 47.0                          |
| g. Average service                          | 9.4                                   | 10.5                              | 9.5                           |
| h. Member contributions with interest       | \$ 1,277,432                          | \$ 458,808                        | \$ 1,736,240                  |
| i. Average contributions with interest      | \$ 15,541                             | \$ 48,321                         | \$ 18,935                     |
| 2. Vested inactive members                  |                                       |                                   |                               |
| a. Number                                   | 14,563                                | 795                               | 15,358                        |
| b. Total annual deferred benefits           | \$ 61,920                             | \$ 7,090                          | \$ 69,010                     |
| c. Average annual deferred benefit          | \$ 4,252                              | \$ 8,918                          | \$ 4,493                      |
| d. Average age at the valuation date        | 51.0                                  | 43.5                              | N/A                           |
| 3. Nonvested inactive members               |                                       |                                   |                               |
| a. Number                                   | 70,468                                | 2,403                             | 72,871                        |
| b. Total member contributions with interest | \$ 79,007                             | \$ 7,245                          | \$ 86,252                     |
| c. Average contributions with interest      | \$ 1,121                              | \$ 3,015                          | \$ 1,184                      |
| 4. Service retirees                         |                                       |                                   |                               |
| a. Number                                   | 49,575                                | 7,402                             | 56,977                        |
| b. Total annual benefits                    | \$ 574,210                            | \$ 202,267                        | \$ 776,476                    |
| c. Average annual benefit                   | \$ 11,583                             | \$ 27,326                         | \$ 13,628                     |
| d. Average age at the valuation date        | 70.2                                  | 61.8                              | 69.1                          |
| 5. Disabled retirees                        |                                       |                                   |                               |
| a. Number                                   | 4,089                                 | 551                               | 4,640                         |
| b. Total annual benefits                    | \$ 45,906                             | \$ 9,102                          | \$ 55,008                     |
| c. Average annual benefit                   | \$ 11,227                             | \$ 16,519                         | \$ 11,855                     |
| d. Average age at the valuation date        | 64.9                                  | 56.1                              | 63.8                          |
| 6. Beneficiaries                            |                                       |                                   |                               |
| a. Number                                   | 5,349                                 | 1,045                             | 6,394                         |
| b. Total annual benefits                    | \$ 47,352                             | \$ 15,312                         | \$ 62,664                     |
| c. Average annual benefit                   | \$ 8,852                              | \$ 14,653                         | \$ 9,800                      |
| d. Average age at the valuation date        | 68.7                                  | 57.6                              | 66.9                          |

## Summary of Historical Active Membership

| June 30,<br>(1)              | Active Members |   | Covered Payroll               |   | Average Annual Pay |   |
|------------------------------|----------------|---|-------------------------------|---|--------------------|---|
|                              | Number<br>(2)  | Percent<br>Increase<br>/(Decrease)<br>(3) | Amount in<br>Thousands<br>(4) | Percent<br>Increase<br>/(Decrease)<br>(5) | Amount<br>(6)      | Percent<br>Increase<br>/(Decrease)<br>(7) |
| <b>Non-Hazardous Members</b> |                |   |                               |   |                    |   |
| 2011                         | 85,285         |   | \$ 2,276,596                  |   | \$ 26,694          | 1.1%                                      |
| 2012                         | 83,052         | -2.6%                                     | 2,236,546                     | -1.8%                                     | 26,929             | 0.9%                                      |
| 2013                         | 81,815         | -1.5%                                     | 2,236,277                     | 0.0%                                      | 27,333             | 1.5%                                      |
| 2014                         | 81,115         | -0.9%                                     | 2,272,270                     | 1.6%                                      | 28,013             | 2.5%                                      |
| 2015                         | 80,852         | -0.3%                                     | 2,296,716                     | 1.1%                                      | 28,406             | 1.4%                                      |
| 2016                         | 80,664         | -0.2%                                     | 2,352,762                     | 2.4%                                      | 29,167             | 2.7%                                      |
| 2017                         | 82,198         | 1.9%                                      | 2,452,407                     | 4.2%                                      | 29,835             | 2.3%                                      |
| <b>Hazardous Members</b>     |                |   |                               |   |                    |   |
| 2011                         | 9,407          |   | \$ 466,964                    |   | \$ 49,640          | 1.7%                                      |
| 2012                         | 9,130          | -2.9%                                     | 464,229                       | -0.6%                                     | 50,847             | 2.4%                                      |
| 2013                         | 9,123          | -0.1%                                     | 461,673                       | -0.6%                                     | 50,605             | -0.5%                                     |
| 2014                         | 9,194          | 0.8%                                      | 479,164                       | 3.8%                                      | 52,117             | 3.0%                                      |
| 2015                         | 9,172          | -0.2%                                     | 483,641                       | 0.9%                                      | 52,730             | 1.2%                                      |
| 2016                         | 9,084          | -1.0%                                     | 492,851                       | 1.9%                                      | 54,255             | 2.9%                                      |
| 2017                         | 9,495          | 4.5%                                      | 541,633                       | 9.9%                                      | 57,044             | 5.1%                                      |

**Distribution of Active Members by Age and by Years of Service**  
**Non-Hazardous Members**

| Attained Age | Years of Credited Service |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    | Total              |                    |
|--------------|---------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|              | 0                         | 1                  | 2                  | 3                  | 4                  | 5-9                | 10-14              | 15-19              | 20-24              | 25-29              | 30-34              | 35 & Over          |                    |                    |
|              | Count & Avg. Comp.        | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. |                    |
| Under 20     | 116<br>\$14,326           | 7<br>\$20,495      | 1<br>\$25,247      | 1<br>\$15,310      | 0<br>\$0           | 125<br>\$14,767    |
| 20-24        | 1,351<br>\$17,383         | 612<br>\$22,843    | 266<br>\$23,709    | 123<br>\$26,240    | 47<br>\$29,907     | 18<br>\$25,874     | 3<br>\$16,613      | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 2,420<br>\$20,215  |
| 25-29        | 1,582<br>\$19,345         | 1,109<br>\$23,682  | 790<br>\$27,440    | 501<br>\$29,359    | 352<br>\$30,263    | 582<br>\$33,560    | 16<br>\$38,969     | 0<br>\$0           | 1<br>\$1,200       | 1<br>\$81,174      | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 4,934<br>\$25,161  |
| 30-34        | 1,283<br>\$19,226         | 1,014<br>\$23,836  | 818<br>\$26,668    | 576<br>\$29,352    | 430<br>\$30,813    | 1,498<br>\$34,525  | 531<br>\$38,953    | 15<br>\$41,565     | 1<br>\$51,262      | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 6,166<br>\$28,201  |
| 35-39        | 1,278<br>\$19,047         | 1,020<br>\$23,701  | 835<br>\$24,171    | 611<br>\$26,175    | 516<br>\$26,741    | 1,809<br>\$33,253  | 1,301<br>\$39,101  | 552<br>\$43,592    | 20<br>\$51,552     | 1<br>\$41,188      | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 7,943<br>\$29,542  |
| 40-44        | 1,059<br>\$18,791         | 888<br>\$23,316    | 857<br>\$24,911    | 602<br>\$25,920    | 546<br>\$26,785    | 2,128<br>\$30,914  | 1,651<br>\$35,728  | 1,251<br>\$43,282  | 402<br>\$49,477    | 17<br>\$55,976     | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 9,401<br>\$31,054  |
| 45-49        | 1,007<br>\$20,234         | 826<br>\$23,468    | 760<br>\$25,262    | 624<br>\$26,974    | 544<br>\$26,008    | 2,421<br>\$29,657  | 2,273<br>\$32,898  | 1,805<br>\$38,637  | 934<br>\$46,954    | 215<br>\$55,357    | 17<br>\$67,469     | 0<br>\$0           | 0<br>\$0           | 11,426<br>\$31,784 |
| 50-54        | 853<br>\$19,382           | 695<br>\$23,427    | 630<br>\$25,908    | 490<br>\$27,947    | 477<br>\$27,997    | 2,208<br>\$29,404  | 2,395<br>\$31,373  | 2,586<br>\$32,917  | 1,315<br>\$39,261  | 508<br>\$50,616    | 116<br>\$59,930    | 9<br>\$73,413      | 9<br>\$73,413      | 12,282<br>\$31,454 |
| 55-59        | 661<br>\$20,195           | 583<br>\$23,952    | 596<br>\$25,332    | 432<br>\$25,256    | 447<br>\$26,217    | 1,926<br>\$29,067  | 2,353<br>\$31,559  | 2,625<br>\$32,162  | 1,812<br>\$35,606  | 652<br>\$42,975    | 138<br>\$54,148    | 48<br>\$62,781     | 48<br>\$62,781     | 12,273<br>\$31,185 |
| 60-64        | 491<br>\$16,295           | 361<br>\$22,479    | 422<br>\$23,690    | 340<br>\$25,346    | 353<br>\$24,708    | 1,707<br>\$27,935  | 1,698<br>\$32,639  | 1,777<br>\$33,653  | 1,299<br>\$34,327  | 586<br>\$40,617    | 133<br>\$50,505    | 54<br>\$61,433     | 54<br>\$61,433     | 9,221<br>\$30,885  |
| 65 & Over    | 385<br>\$14,237           | 295<br>\$16,715    | 330<br>\$20,233    | 218<br>\$18,403    | 248<br>\$19,458    | 1,263<br>\$23,624  | 1,340<br>\$29,223  | 908<br>\$31,674    | 528<br>\$32,543    | 337<br>\$35,438    | 91<br>\$41,754     | 64<br>\$53,298     | 64<br>\$53,298     | 6,007<br>\$26,639  |
| Total        | 10,066<br>\$18,716        | 7,410<br>\$23,227  | 6,305<br>\$25,162  | 4,518<br>\$26,676  | 3,960<br>\$26,894  | 15,560<br>\$30,070 | 13,561<br>\$33,181 | 11,519<br>\$35,305 | 6,312<br>\$38,458  | 2,317<br>\$44,218  | 495<br>\$52,703    | 175<br>\$59,444    | 175<br>\$59,444    | 82,198<br>\$29,835 |

**Distribution of Active Members by Age and by Years of Service**  
**Hazardous Members**

| Attained Age | Years of Credited Service |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    | Total              |                   |
|--------------|---------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|
|              | 0                         | 1                  | 2                  | 3                  | 4                  | 5-9                | 10-14              | 15-19              | 20-24              | 25-29              | 30-34              | 35 & Over          |                    |                   |
|              | Count & Avg. Comp.        | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. | Count & Avg. Comp. |                   |
| Under 20     | 3<br>\$32,735             | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 1<br>\$44,742      | 0<br>\$0           | 4<br>\$35,737     |
| 20-24        | 218<br>\$31,003           | 116<br>\$39,289    | 39<br>\$45,030     | 12<br>\$44,626     | 6<br>\$40,612      | 1<br>\$35,991      | 0<br>\$0           | 392<br>\$35,427   |
| 25-29        | 225<br>\$33,707           | 240<br>\$43,742    | 215<br>\$48,733    | 214<br>\$47,619    | 170<br>\$48,478    | 218<br>\$53,071    | 2<br>\$47,869      | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 1,284<br>\$45,683 |
| 30-34        | 127<br>\$34,262           | 115<br>\$44,426    | 143<br>\$49,280    | 123<br>\$51,712    | 166<br>\$50,189    | 729<br>\$56,473    | 263<br>\$59,511    | 1<br>\$78,551      | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 1,667<br>\$52,848 |
| 35-39        | 60<br>\$34,233            | 46<br>\$45,393     | 57<br>\$47,850     | 51<br>\$48,995     | 75<br>\$53,001     | 429<br>\$56,157    | 707<br>\$61,242    | 225<br>\$65,500    | 18<br>\$79,916     | 1<br>\$51,518      | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 1,669<br>\$58,095 |
| 40-44        | 31<br>\$32,514            | 29<br>\$42,658     | 23<br>\$48,240     | 24<br>\$48,336     | 22<br>\$45,818     | 228<br>\$54,912    | 453<br>\$60,684    | 639<br>\$68,155    | 198<br>\$75,959    | 12<br>\$90,285     | 0<br>\$0           | 0<br>\$0           | 0<br>\$0           | 1,659<br>\$63,416 |
| 45-49        | 26<br>\$29,061            | 25<br>\$43,628     | 22<br>\$41,978     | 15<br>\$48,781     | 24<br>\$48,469     | 141<br>\$54,823    | 280<br>\$57,217    | 521<br>\$64,009    | 321<br>\$77,251    | 55<br>\$85,461     | 7<br>\$90,942      | 0<br>\$0           | 0<br>\$0           | 1,437<br>\$63,952 |
| 50-54        | 17<br>\$31,956            | 11<br>\$40,026     | 8<br>\$44,821      | 13<br>\$40,538     | 14<br>\$48,595     | 97<br>\$56,610     | 163<br>\$60,409    | 204<br>\$64,701    | 116<br>\$70,819    | 103<br>\$79,994    | 15<br>\$89,348     | 0<br>\$0           | 0<br>\$0           | 761<br>\$64,233   |
| 55-59        | 2<br>\$45,805             | 12<br>\$41,635     | 7<br>\$42,363      | 2<br>\$55,669      | 6<br>\$37,587      | 51<br>\$55,263     | 101<br>\$58,958    | 92<br>\$60,316     | 54<br>\$62,812     | 25<br>\$77,335     | 13<br>\$99,484     | 1<br>\$116,630     | 1<br>\$60,880      | 366<br>\$60,880   |
| 60-64        | 3<br>\$50,435             | 3<br>\$59,964      | 1<br>\$59,368      | 1<br>\$31,649      | 1<br>\$35,411      | 31<br>\$52,091     | 63<br>\$57,870     | 34<br>\$63,589     | 20<br>\$69,574     | 14<br>\$80,378     | 6<br>\$69,058      | 6<br>\$98,627      | 6<br>\$62,312      | 183<br>\$62,312   |
| 65 & Over    | 1<br>\$27,189             | 1<br>\$39,776      | 1<br>\$22,217      | 1<br>\$42,993      | 0<br>\$0           | 7<br>\$45,213      | 31<br>\$54,424     | 23<br>\$65,878     | 1<br>\$44,373      | 3<br>\$41,976      | 3<br>\$90,783      | 1<br>\$121,853     | 1<br>\$57,747      | 73<br>\$57,747    |
| Total        | 713<br>\$32,852           | 598<br>\$43,043    | 516<br>\$48,019    | 456<br>\$48,663    | 485<br>\$49,379    | 1,932<br>\$55,567  | 2,063<br>\$59,957  | 1,739<br>\$65,636  | 728<br>\$74,614    | 213<br>\$81,030    | 44<br>\$89,928     | 8<br>\$103,781     | 9,495<br>\$57,044  |                   |

**Distribution of Annuitant Monthly Benefit by Status and Age**  
**Non-Hazardous Retirees and Beneficiaries**  
(Dollar amounts expressed in thousands)

| Current Age<br>(1) | Retirement                  |                                    | Disability                  |                                    | Survivors & Beneficiaries   |                                    | Total                       |                                    |
|--------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|
|                    | Number of Annuitants<br>(2) | Total Annual Benefit Amount<br>(3) | Number of Annuitants<br>(4) | Total Annual Benefit Amount<br>(5) | Number of Annuitants<br>(6) | Total Annual Benefit Amount<br>(7) | Number of Annuitants<br>(8) | Total Annual Benefit Amount<br>(9) |
| Under 50           | 276                         | \$ 6,258                           | 213                         | \$ 2,578                           | 605                         | \$ 4,743                           | 1,094                       | \$ 13,579                          |
| 50 - 54            | 1,208                       | 28,709                             | 313                         | 4,114                              | 240                         | 2,148                              | 1,761                       | 34,971                             |
| 55 - 59            | 4,139                       | 72,231                             | 702                         | 8,721                              | 408                         | 4,126                              | 5,249                       | 85,078                             |
| 60 - 64            | 8,320                       | 114,696                            | 904                         | 10,600                             | 596                         | 6,021                              | 9,820                       | 131,317                            |
| 65 - 69            | 12,190                      | 141,556                            | 821                         | 9,118                              | 764                         | 7,691                              | 13,775                      | 158,365                            |
| 70 - 74            | 9,753                       | 96,987                             | 550                         | 5,542                              | 740                         | 7,020                              | 11,043                      | 109,549                            |
| 75 - 79            | 6,764                       | 61,869                             | 368                         | 3,508                              | 741                         | 6,511                              | 7,873                       | 71,888                             |
| 80 - 84            | 4,007                       | 32,317                             | 166                         | 1,394                              | 568                         | 4,645                              | 4,741                       | 38,356                             |
| 85 - 89            | 1,990                       | 14,382                             | 46                          | 291                                | 408                         | 2,856                              | 2,444                       | 17,529                             |
| 90 And Over        | 928                         | 5,204                              | 6                           | 39                                 | 279                         | 1,591                              | 1,213                       | 6,834                              |
| <b>Total</b>       | <b>49,575</b>               | <b>\$ 574,210</b>                  | <b>4,089</b>                | <b>\$ 45,906</b>                   | <b>5,349</b>                | <b>\$ 47,352</b>                   | <b>59,013</b>               | <b>\$ 667,468</b>                  |

**Distribution of Annuitant Monthly Benefit by Status and Age  
Hazardous Retirees and Beneficiaries  
(Dollar amounts expressed in thousands)**

| Current Age<br>(1) | Retirement                  |                                    | Disability                  |                                    | Survivors & Beneficiaries   |                                    | Total                       |                                    |
|--------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|
|                    | Number of Annuitants<br>(2) | Total Annual Benefit Amount<br>(3) | Number of Annuitants<br>(4) | Total Annual Benefit Amount<br>(5) | Number of Annuitants<br>(6) | Total Annual Benefit Amount<br>(7) | Number of Annuitants<br>(8) | Total Annual Benefit Amount<br>(9) |
| Under 50           | 830                         | \$ 26,495                          | 164                         | \$ 2,943                           | 256                         | \$ 1,918                           | 1,250                       | \$ 31,356                          |
| 50 - 54            | 1,167                       | 37,679                             | 99                          | 1,725                              | 68                          | 1,169                              | 1,334                       | 40,573                             |
| 55 - 59            | 1,193                       | 34,754                             | 89                          | 1,506                              | 103                         | 1,587                              | 1,385                       | 37,847                             |
| 60 - 64            | 1,398                       | 37,634                             | 96                          | 1,391                              | 132                         | 2,087                              | 1,626                       | 41,112                             |
| 65 - 69            | 1,387                       | 34,980                             | 66                          | 982                                | 143                         | 2,674                              | 1,596                       | 38,636                             |
| 70 - 74            | 806                         | 17,744                             | 27                          | 415                                | 147                         | 2,557                              | 980                         | 20,716                             |
| 75 - 79            | 397                         | 8,215                              | 2                           | 25                                 | 95                          | 1,751                              | 494                         | 9,991                              |
| 80 - 84            | 158                         | 3,217                              | 7                           | 95                                 | 60                          | 899                                | 225                         | 4,211                              |
| 85 - 89            | 56                          | 1,341                              | 0                           | -                                  | 35                          | 551                                | 91                          | 1,892                              |
| 90 And Over        | 10                          | 207                                | 1                           | 20                                 | 6                           | 119                                | 17                          | 346                                |
| <b>Total</b>       | <b>7,402</b>                | <b>\$ 202,267</b>                  | <b>551</b>                  | <b>\$ 9,102</b>                    | <b>1,045</b>                | <b>\$ 15,312</b>                   | <b>8,998</b>                | <b>\$ 226,680</b>                  |

### Non-Hazardous Retired Lives Summary

| Form of Payment<br>(1)          | Male Lives    |                                  | Female Lives  |                                  | Total         |                                  |
|---------------------------------|---------------|----------------------------------|---------------|----------------------------------|---------------|----------------------------------|
|                                 | Number<br>(2) | Monthly<br>Benefit Amount<br>(3) | Number<br>(4) | Monthly<br>Benefit Amount<br>(5) | Number<br>(6) | Monthly<br>Benefit Amount<br>(7) |
| Basic                           | 5,433         | \$ 5,654,324                     | 19,324        | \$ 14,240,228                    | 24,757        | \$ 19,894,552                    |
| Joint & Survivor:               |               |                                  |               |                                  |               |                                  |
| 100% to Beneficiary             | 3,081         | 3,496,419                        | 1,680         | 1,056,228                        | 4,761         | 4,552,647                        |
| 66 2/3% to Beneficiary          | 817           | 1,516,140                        | 612           | 653,305                          | 1,429         | 2,169,445                        |
| 50% to Beneficiary              | 1,144         | 1,857,408                        | 1,603         | 1,863,468                        | 2,747         | 3,720,877                        |
| Pop-up Option                   | 4,111         | 6,488,014                        | 3,697         | 3,906,152                        | 7,808         | 10,394,165                       |
| Social Security Option:         |               |                                  |               |                                  |               |                                  |
| Age 62 Basic                    | 257           | 448,542                          | 535           | 553,209                          | 792           | 1,001,752                        |
| Age 62 Survivorship             | 598           | 1,057,324                        | 355           | 350,888                          | 953           | 1,408,212                        |
| Partial Deferred (Old Plan)     | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Widows Age 60                   | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 5 Years Certain                 | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 10 Years Certain                | 1             | 3,007                            | 1             | 236                              | 2             | 3,243                            |
| 10 Years Certain & Life         | 1,424         | 1,460,646                        | 3,480         | 2,649,787                        | 4,904         | 4,110,433                        |
| 15 Years Certain & Life         | 649           | 662,254                          | 859           | 650,927                          | 1,508         | 1,313,181                        |
| 20 Years Certain & Life         | 482           | 651,052                          | 745           | 565,567                          | 1,227         | 1,216,619                        |
| Refund                          | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Partial Lump Sum Option (PLSO): |               |                                  |               |                                  |               |                                  |
| 12 Month Basic                  | 96            | 114,040                          | 365           | 312,783                          | 461           | 426,822                          |
| 24 Month Basic                  | 59            | 40,600                           | 243           | 194,946                          | 302           | 235,546                          |
| 36 Month Basic                  | 253           | 124,069                          | 708           | 322,323                          | 961           | 446,392                          |
| 12 Month Survivor               | 144           | 176,456                          | 92            | 93,158                           | 236           | 269,615                          |
| 24 Month Survivor               | 89            | 91,577                           | 60            | 40,491                           | 149           | 132,067                          |
| 36 Month Survivor               | 390           | 254,202                          | 277           | 126,566                          | 667           | 380,768                          |
| <b>Total:</b>                   | <b>19,028</b> | <b>\$ 24,096,075</b>             | <b>34,636</b> | <b>\$ 27,580,261</b>             | <b>53,664</b> | <b>\$ 51,676,336</b>             |

## Hazardous Retired Lives Summary

| Form of Payment<br>(1)          | Male Lives    |                                  | Female Lives  |                                  | Total         |                                  |
|---------------------------------|---------------|----------------------------------|---------------|----------------------------------|---------------|----------------------------------|
|                                 | Number<br>(2) | Monthly<br>Benefit Amount<br>(3) | Number<br>(4) | Monthly<br>Benefit Amount<br>(5) | Number<br>(6) | Monthly<br>Benefit Amount<br>(7) |
| Basic                           | 1,095         | \$ 2,239,751                     | 328           | \$ 503,186                       | 1,423         | \$ 2,742,937                     |
| Joint & Survivor:               |               |                                  |               |                                  |               |                                  |
| 100% to Beneficiary             | 898           | 1,900,096                        | 39            | 49,096                           | 937           | 1,949,192                        |
| 66 2/3% to Beneficiary          | 325           | 816,348                          | 13            | 27,475                           | 338           | 843,823                          |
| 50% to Beneficiary              | 467           | 1,129,014                        | 43            | 96,969                           | 510           | 1,225,984                        |
| Pop-up Option                   | 3,090         | 7,872,075                        | 147           | 289,025                          | 3,237         | 8,161,100                        |
| Social Security Option:         |               |                                  |               |                                  |               |                                  |
| Age 62 Basic                    | 108           | 173,877                          | 13            | 13,278                           | 121           | 187,155                          |
| Age 62 Survivorship             | 292           | 467,388                          | 19            | 32,804                           | 311           | 500,192                          |
| Partial Deferred (Old Plan)     | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Widows Age 60                   | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 5 Years Certain                 | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 10 Years Certain                | 85            | 145,525                          | 5             | 5,333                            | 90            | 150,858                          |
| 10 Years Certain & Life         | 225           | 469,925                          | 66            | 119,374                          | 291           | 589,299                          |
| 15 Years Certain & Life         | 91            | 175,897                          | 17            | 28,006                           | 108           | 203,903                          |
| 20 Years Certain & Life         | 156           | 324,566                          | 29            | 45,859                           | 185           | 370,425                          |
| Refund                          | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Partial Lump Sum Option (PLSO): |               |                                  |               |                                  |               |                                  |
| 12 Month Basic                  | 23            | 37,037                           | 9             | 12,127                           | 32            | 49,164                           |
| 24 Month Basic                  | 20            | 42,799                           | 6             | 6,336                            | 26            | 49,135                           |
| 36 Month Basic                  | 53            | 85,377                           | 20            | 23,431                           | 73            | 108,808                          |
| 12 Month Survivor               | 57            | 146,314                          | 4             | 8,080                            | 61            | 154,394                          |
| 24 Month Survivor               | 68            | 110,450                          | 2             | 2,220                            | 70            | 112,670                          |
| 36 Month Survivor               | 134           | 208,725                          | 6             | 6,249                            | 140           | 214,973                          |
| <b>Total:</b>                   | <b>7,187</b>  | <b>\$ 16,345,163</b>             | <b>766</b>    | <b>\$ 1,268,848</b>              | <b>7,953</b>  | <b>\$ 17,614,011</b>             |

### Non-Hazardous Beneficiary Lives Summary

| Form of Payment<br>(1)          | Male Lives    |                                  | Female Lives  |                                  | Total         |                                  |
|---------------------------------|---------------|----------------------------------|---------------|----------------------------------|---------------|----------------------------------|
|                                 | Number<br>(2) | Monthly<br>Benefit Amount<br>(3) | Number<br>(4) | Monthly<br>Benefit Amount<br>(5) | Number<br>(6) | Monthly<br>Benefit Amount<br>(7) |
| Basic                           | 16            | \$ 4,408                         | 42            | \$ 25,711                        | 58            | \$ 30,119                        |
| Joint & Survivor:               |               |                                  |               |                                  |               |                                  |
| 100% to Beneficiary             | 534           | 320,572                          | 1,578         | 1,073,177                        | 2,112         | 1,393,748                        |
| 66 2/3% to Beneficiary          | 86            | 54,726                           | 242           | 189,302                          | 328           | 244,028                          |
| 50% to Beneficiary              | 154           | 60,896                           | 412           | 235,493                          | 566           | 296,389                          |
| Pop-up Option                   | 260           | 232,093                          | 675           | 682,333                          | 935           | 914,425                          |
| Social Security Option:         |               |                                  |               |                                  |               |                                  |
| Age 62 Basic                    | 0             | 0                                | 5             | 4,806                            | 5             | 4,806                            |
| Age 62 Survivorship             | 44            | 49,846                           | 147           | 176,382                          | 191           | 226,228                          |
| Partial Deferred (Old Plan)     | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Widows Age 60                   | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 5 Years Certain                 | 94            | 64,720                           | 109           | 72,951                           | 203           | 137,671                          |
| 10 Years Certain                | 142           | 86,298                           | 172           | 141,416                          | 314           | 227,714                          |
| 10 Years Certain & Life         | 58            | 39,911                           | 79            | 59,000                           | 137           | 98,910                           |
| 15 Years Certain & Life         | 41            | 38,912                           | 68            | 55,007                           | 109           | 93,919                           |
| 20 Years Certain & Life         | 55            | 37,304                           | 62            | 62,091                           | 117           | 99,395                           |
| Refund                          | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Partial Lump Sum Option (PLSO): |               |                                  |               |                                  |               |                                  |
| 12 Month Basic                  | 0             | 0                                | 1             | 395                              | 1             | 395                              |
| 24 Month Basic                  | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 36 Month Basic                  | 1             | 149                              | 1             | 152                              | 2             | 301                              |
| 12 Month Survivor               | 11            | 7,150                            | 46            | 46,720                           | 57            | 53,869                           |
| 24 Month Survivor               | 15            | 14,462                           | 30            | 28,682                           | 45            | 43,144                           |
| 36 Month Survivor               | 48            | 24,467                           | 121           | 56,451                           | 169           | 80,918                           |
| <b>Total:</b>                   | <b>1,559</b>  | <b>\$ 1,035,914</b>              | <b>3,790</b>  | <b>\$ 2,910,068</b>              | <b>5,349</b>  | <b>\$ 3,945,982</b>              |

### Hazardous Beneficiary Lives Summary

| Form of Payment<br>(1)          | Male Lives    |                                  | Female Lives  |                                  | Total         |                                  |
|---------------------------------|---------------|----------------------------------|---------------|----------------------------------|---------------|----------------------------------|
|                                 | Number<br>(2) | Monthly<br>Benefit Amount<br>(3) | Number<br>(4) | Monthly<br>Benefit Amount<br>(5) | Number<br>(6) | Monthly<br>Benefit Amount<br>(7) |
| Basic                           | 11            | \$ 5,268                         | 40            | \$ 30,031                        | 51            | \$ 35,299                        |
| Joint & Survivor:               |               |                                  |               |                                  |               |                                  |
| 100% to Beneficiary             | 43            | 37,391                           | 229           | 285,889                          | 272           | 323,280                          |
| 66 2/3% to Beneficiary          | 10            | 9,658                            | 51            | 70,709                           | 61            | 80,367                           |
| 50% to Beneficiary              | 17            | 13,273                           | 68            | 66,619                           | 85            | 79,892                           |
| Pop-up Option                   | 62            | 75,205                           | 259           | 415,988                          | 321           | 491,193                          |
| Social Security Option:         |               |                                  |               |                                  |               |                                  |
| Age 62 Basic                    | 0             | 0                                | 1             | 310                              | 1             | 310                              |
| Age 62 Survivorship             | 7             | 12,994                           | 101           | 136,037                          | 108           | 149,031                          |
| Partial Deferred (Old Plan)     | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Widows Age 60                   | 0             | 0                                | 3             | 2,669                            | 3             | 2,669                            |
| 5 Years Certain                 | 2             | 2,495                            | 0             | 0                                | 2             | 2,495                            |
| 10 Years Certain                | 29            | 24,957                           | 9             | 7,349                            | 38            | 32,306                           |
| 10 Years Certain & Life         | 5             | 3,627                            | 7             | 5,858                            | 12            | 9,485                            |
| 15 Years Certain & Life         | 3             | 998                              | 5             | 1,440                            | 8             | 2,438                            |
| 20 Years Certain & Life         | 5             | 2,742                            | 11            | 9,683                            | 16            | 12,424                           |
| Refund                          | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Partial Lump Sum Option (PLSO): |               |                                  |               |                                  |               |                                  |
| 12 Month Basic                  | 0             | 0                                | 1             | 2,192                            | 1             | 2,192                            |
| 24 Month Basic                  | 0             | 0                                | 1             | 1,467                            | 1             | 1,467                            |
| 36 Month Basic                  | 2             | 562                              | 3             | 1,619                            | 5             | 2,181                            |
| 12 Month Survivor               | 1             | 579                              | 6             | 4,611                            | 7             | 5,189                            |
| 24 Month Survivor               | 2             | 1,468                            | 10            | 7,091                            | 12            | 8,560                            |
| 36 Month Survivor               | 10            | 8,827                            | 31            | 26,389                           | 41            | 35,215                           |
| <b>Total:</b>                   | <b>209</b>    | <b>\$ 200,043</b>                | <b>836</b>    | <b>\$ 1,075,951</b>              | <b>1,045</b>  | <b>\$ 1,275,994</b>              |

**Schedule of Retirants Added to And Removed from Rolls**  
(Dollar amounts except average allowance expressed in thousands)

| Year Ended           | Added to | Removed    | Rolls End of the Year |                 | % Increase in Annual Benefit | Average Annual Benefit |
|----------------------|----------|------------|-----------------------|-----------------|------------------------------|------------------------|
|                      | Rolls    | from Rolls | Number                | Annual Benefits |                              |                        |
| (1)                  | Number   | Number     | (4)                   | (5)             | (6)                          | (7)                    |
| <b>Non-Hazardous</b> |          |            |                       |                 |                              |                        |
| 2011                 | 3,250    | 1,077      | 43,211                | \$ 483,594      |                              | \$ 11,191              |
| 2012                 | 3,300    | 1,207      | 45,304                | 515,008         | 6.5%                         | 11,368                 |
| 2013                 | 3,570    | 1,198      | 47,676                | 557,979         | 8.3%                         | 11,704                 |
| 2014                 | 3,480    | 1,221      | 49,935                | 582,958         | 4.5%                         | 11,674                 |
| 2015                 | 4,020    | 1,304      | 52,651                | 617,551         | 5.9%                         | 11,729                 |
| 2016                 | 4,409    | 721        | 56,339                | 661,217         | 7.1%                         | 11,736                 |
| 2017                 | 4,141    | 1,467      | 59,013                | 667,468         | 0.9%                         | 11,311                 |
| <b>Hazardous</b>     |          |            |                       |                 |                              |                        |
| 2011                 | 502      | 102        | 6,468                 | \$ 160,259      |                              | \$ 24,777              |
| 2012                 | 483      | 73         | 6,878                 | 173,221         | 8.1%                         | 25,185                 |
| 2013                 | 519      | 104        | 7,293                 | 182,635         | 5.4%                         | 25,043                 |
| 2014                 | 469      | 116        | 7,646                 | 191,008         | 4.6%                         | 24,981                 |
| 2015                 | 526      | 138        | 8,034                 | 202,153         | 5.8%                         | 25,162                 |
| 2016                 | 604      | 75         | 8,563                 | 215,302         | 6.5%                         | 25,143                 |
| 2017                 | 576      | 141        | 8,998                 | 226,681         | 5.3%                         | 25,192                 |

## **APPENDIX A**

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### **ACTUARIAL ASSUMPTIONS AND METHODS**

## Summary of Actuarial Methods and Assumptions

The following presents a summary of the actuarial assumptions and methods used in the valuation of the County Employees Retirement System.

**In general, the assumptions and methods used in the valuation are based on the actuarial experience study for the five-year period ending June 30, 2013, submitted April 30, 2014, and adopted by the Board on December 4, 2014. The investment return, price inflation, and payroll growth assumption were adopted by the Board in May and July 2017 for use with the June 30, 2017 valuation in order to reflect future economic expectations.**

### *Investment return rate:*

Assumed annual rate of 6.25% net of investment expenses for the retirement funds and the insurance funds

### *Price Inflation:*

Assumed annual rate of 2.30%

### *Payroll Growth Assumption (used for amortization of unfunded accrued liabilities):*

Assumed annual rate of 2.00%

### *Rates of Annual Salary Increase:*

Assumed rates of annual salary increases are shown below.

| Service Years | Annual Rates of Salary Increases |           |                                |                |           |
|---------------|----------------------------------|-----------|--------------------------------|----------------|-----------|
|               | Merit & Seniority                |           | Price Inflation & Productivity | Total Increase |           |
|               | Non-Hazardous                    | Hazardous |                                | Non-Hazardous  | Hazardous |
| 0             | 8.50%                            | 15.50%    | 3.05%                          | 11.55%         | 18.55%    |
| 1             | 5.00%                            | 6.00%     | 3.05%                          | 8.05%          | 9.05%     |
| 2             | 1.50%                            | 2.00%     | 3.05%                          | 4.55%          | 5.05%     |
| 3             | 1.50%                            | 1.25%     | 3.05%                          | 4.55%          | 4.30%     |
| 4             | 1.00%                            | 1.00%     | 3.05%                          | 4.05%          | 4.05%     |
| 5             | 1.00%                            | 0.50%     | 3.05%                          | 4.05%          | 3.55%     |
| 6             | 0.75%                            | 0.00%     | 3.05%                          | 3.80%          | 3.05%     |
| 7             | 0.75%                            | 0.00%     | 3.05%                          | 3.80%          | 3.05%     |
| 8             | 0.50%                            | 0.00%     | 3.05%                          | 3.55%          | 3.05%     |
| 9             | 0.50%                            | 0.00%     | 3.05%                          | 3.55%          | 3.05%     |
| 10 & Over     | 0.25%                            | 0.00%     | 3.05%                          | 3.30%          | 3.05%     |

Retirement rates:

Assumed annual rates of retirement are shown below. Rates are only applicable for members who are eligible for a service retirement.

| Age | Non-Hazardous                                      |   | Service | Hazardous  |   |
|-----|--|---|---------|--|---|
|     | Members participating before 9/1/2008 <sup>1</sup> | Members participating on or after 9/1/2008 <sup>2</sup> |         | Members participating before 9/1/2008 <sup>3</sup> | Members participating on or after 9/1/2008 <sup>4</sup> |
| 55  | 5.0%   |   | 20      | 22.5%  |   |
| 56  | 6.0%   |   | 21      | 22.5%  |   |
| 57  | 7.0%   |   | 22      | 22.5%  |   |
| 58  | 7.0%   |   | 23      | 22.5%  |   |
| 59  | 8.0%   |   | 24      | 30.0%  |   |
| 60  | 9.0%   | 9.0%  | 25      | 33.0%  | 22.5%   |
| 61  | 15.0%  | 15.0%   | 26      | 33.0%  | 22.5%   |
| 62  | 18.0%  | 18.0%   | 27      | 36.0%  | 22.5%   |
| 63  | 18.0%  | 18.0%   | 28      | 39.0%  | 22.5%   |
| 64  | 18.0%  | 18.0%   | 29      | 55.0%  | 30.0%   |
| 65  | 18.0%  | 18.0%   | 30      | 33.0%  | 33.0%   |
| 66  | 18.0%  | 18.0%   | 31      | 33.0%  | 33.0%   |
| 67  | 18.0%  | 18.0%   | 32      | 50.0%  | 36.0%   |
| 68  | 18.0%  | 18.0%   | 33      | 40.0%  | 39.0%   |
| 69  | 18.0%  | 18.0%   | 34      | 40.0%  | 55.0%   |
| 70  | 18.0%  | 18.0%   | 35      | 40.0%  | 33.0%   |
| 71  | 18.0%  | 18.0%   | 36      | 40.0%  | 33.0%   |
| 72  | 18.0%  | 18.0%   | 37      | 40.0%  | 50.0%   |
| 73  | 18.0%  | 18.0%   | 38      | 40.0%  | 40.0%   |
| 74  | 18.0%  | 18.0%   | 39      | 40.0%  | 40.0%   |
| 75  | 100.0%   | 100.0%  | 40      | 40.0%  | 40.0%   |

<sup>1</sup> If service is at least 27 years, the rate is 30%.

<sup>2</sup> If age plus service is at least 87, the rate is 30%.

<sup>3</sup> The annual rate of service retirement is 100% at age 62.

<sup>4</sup> The annual rate of service retirement is 100% at age 60.

*Disability rates:*

An abbreviated table with assumed rates of disability is show below.

| Age | Non-Hazardous |        | Hazardous |        |
|-----|---------------|--------|-----------|--------|
|     | Male          | Female | Male      | Female |
| 20  | 0.02%         | 0.02%  | 0.05%     | 0.05%  |
| 30  | 0.03%         | 0.03%  | 0.09%     | 0.09%  |
| 40  | 0.07%         | 0.07%  | 0.20%     | 0.20%  |
| 50  | 0.19%         | 0.19%  | 0.56%     | 0.56%  |
| 60  | 0.49%         | 0.49%  | 1.46%     | 1.46%  |

*Withdrawal rates (for causes other than death, disability or retirement):*

Assumed annual rates of withdrawal are shown below.

| Service Years | Annual Rates of Withdrawal |           |
|---------------|----------------------------|-----------|
|               | Non-Hazardous              | Hazardous |
| 0             | 28.00%                     | 20.50%    |
| 1             | 16.00%                     | 13.00%    |
| 2             | 12.00%                     | 10.50%    |
| 3             | 10.00%                     | 9.00%     |
| 4             | 8.00%                      | 8.00%     |
| 5             | 6.00%                      | 7.00%     |
| 6             | 5.00%                      | 7.00%     |
| 7             | 5.00%                      | 6.00%     |
| 8-13          | 4.00%                      | 6.00%     |
| 14 & Over     | 3.00%                      | 6.00%     |

*Mortality Assumption:*

Pre-retirement mortality: RP-2000 Combined Mortality Table projected with Scale BB to 2013. Male mortality rates are multiplied by 50% and female mortality rates are multiplied by 30%.

Post-retirement mortality (non-disabled): RP-2000 Combined Mortality Table projected with Scale BB to 2013. Female mortality rates are set back one year.

Post-retirement mortality (disabled): RP-2000 Combined Disabled Mortality Table projected with Scale BB to 2013. Male mortality rates are set back four years.

At the time of the last experience study, performed as of June 30, 2013, this mortality assumption provided 37% and 19% margin for future improvement for males and females, respectively. *Marital status:*

100% of employees are assumed to be married, with the female spouse 3 years younger than the male spouse.

*Line of Duty Disability*

0% of disabilities are assumed to occur in the line of duty

*Line of Duty Death*

25% of deaths are assumed to occur in the line of duty

*Dependent Children:*

For members in the Hazardous Plan who receive a duty-related death benefit, the member is assumed to be survived by two dependent children, each age 6 with payments for 15 years.

*Form of Payment:*

Members are assumed to elect a life-only annuity at retirement.

*Actuarial Cost Method:*

Entry Age Normal, Level Percentage of Pay. The Entry Age Normal actuarial cost method allocates the System's actuarial present value of future benefits to various periods based upon service. The portion of the present value of future benefits allocated to years of service prior to the valuation date is the actuarial accrued liability, and the portion allocated to years following the valuation date is the present value of future normal costs. The normal cost is determined for each active member as the level percent of pay necessary to fully fund the expected benefits to be earned over the career of each individual active member. The normal cost is partially funded with active member contributions with the remainder funded by employer contributions.

*Health Care Age Related Morbidity/Claims Utilization:*

To model the impact of aging on the underlying health care costs for Medicare retirees, the valuation relied on the Society of Actuaries' 2013 Study "Health Care Costs – From Birth to Death". Table 4 (Development of Plan Specific Medicare Age Curve) was used to model the impact of aging for ages 65 and over.

Health Care Cost Trend Rates<sup>1</sup>:

| January 1     | Non-Medicare Plans | Medicare Plans | Dollar Contribution <sup>2</sup> |
|---------------|--------------------|----------------|----------------------------------|
| 2019          | 7.25%              | 5.10%          | 1.50%                            |
| 2020          | 7.00%              | 5.00%          | 1.50%                            |
| 2021          | 6.75%              | 4.90%          | 1.50%                            |
| 2022          | 6.50%              | 4.80%          | 1.50%                            |
| 2023          | 6.25%              | 4.70%          | 1.50%                            |
| 2024          | 6.00%              | 4.60%          | 1.50%                            |
| 2025          | 5.75%              | 4.50%          | 1.50%                            |
| 2026          | 5.50%              | 4.40%          | 1.50%                            |
| 2027          | 5.25%              | 4.30%          | 1.50%                            |
| 2028          | 5.00%              | 4.20%          | 1.50%                            |
| 2029          | 4.75%              | 4.10%          | 1.50%                            |
| 2030          | 4.50%              | 4.05%          | 1.50%                            |
| 2031          | 4.25%              | 4.05%          | 1.50%                            |
| 2032 & Beyond | 4.05%              | 4.05%          | 1.50%                            |

<sup>1</sup>All increases are assumed to occur on January 1. The 2018 premiums were known at the time of the valuation and were incorporated into the liability measurement using a trend of 1.232% for Non-Medicare plans and a trend of 0.00% for Medicare plans at January 1, 2018.

<sup>2</sup>Applies to members participating on or after July 1, 2003

Health care trend assumptions are based on the model issued by the Society of Actuaries "Getzen model of Long-Run Medical Cost Trends for the SOA; Thomas E. Getzen, iHEA and Temple University 2014 © Society of Actuaries.

The underlying assumptions used to develop the health care trend rates include:

- A short run period-this is a period for which anticipated health care trend rates are manually set based on local information as well as plan-specific and carrier information.
- Long term real GDP growth- 1.75%
- Long term rate of inflation- 2.30%
- Long term nominal GDP growth – 4.05%
- Year that excess rate converges to 0- 15 years from the valuation

Health care trend rates are thus the manually set rates for the short run period and rates which decline to an ultimate trend rate which equals the assumed nominal long term GDP growth rate.

*Health Care Participation Assumptions:*

- Members are assumed to elect health coverage at retirement at the following participation rates.

| Service at Retirement | Members participating before 7/1/2003* | Members participating between 7/1/2003 and 9/1/2008 | Members participating after 9/1/2008 |
|-----------------------|--|---|--------------------------------------|
| Under 10              | 50%                                    | 100%  | 100%                                 |
| 10-14                 | 75%                                    | 100%  | 100%                                 |
| 15-19                 | 90%                                    | 100%  | 100%                                 |
| Over 20               | 100%                                   | 100%  | 100%                                 |

\* 100% of members with a duty disability or a duty death (in service) benefit are assumed to elect coverage at retirement.

- Future retirees are assumed to have a similar distribution by plan type as the current retirees.

| Medicare Plan | June 30, 2017 Participation* |
|---------------|------------------------------|
| Medical Only  | 7%                           |
| Essential     | 8%                           |
| Premium       | 84%                          |

\* May not add due to rounding

| Non-Medicare Plan | June 30, 2017 Participation |
|-------------------|-----------------------------|
| Standard PPO      | 14%                         |
| Standard CDHP     | 2%                          |
| LivingWell CDHP   | 22%                         |
| LivingWell PPO    | 62%                         |

- 50% of deferred vested members participating before July 1, 2003 are assumed to elect health coverage at retirement. 100% of deferred vested members participating after July 1, 2003 are assumed to elect health coverage at retirement. Deferred vested members with non-hazardous service are assumed to begin health coverage at age 55 for members participating before September 1, 2008, and at age 60 for members participating on or after September 1, 2008. Deferred vested members with hazardous service are assumed to begin health coverage at age 50.
- 50% of future retirees, with hazardous service, are assumed to elect spouse health care coverage. No dependent coverage is assumed for members who only have non-hazardous service. 100% of spouses with health care coverage are assumed to continue coverage after the member's death.

### *Excise (“Cadillac”) Tax:*

For taxable years beginning after December 31, 2019, a 40% excise tax will be required to be paid (by the employer and/or insurer) on the aggregate cost of the health plan in excess of certain legislated thresholds. For 2018, the thresholds are \$850 per month for individual coverage and \$2,292 per month for family coverage.

Both Actuarial Standard of Practice No. 6 and GASB Statement Nos. 74 and 75 reference this tax, and, in accordance with these standards an estimate of the impact of the Cadillac tax has been included in this valuation.

Assumptions and methods used to determine the impact of the Cadillac Tax include:

- 2018 thresholds of \$850/\$2,292 were indexed annually by 2.30%.
- Premium data submitted was not adjusted for permissible exclusions to the Cadillac Tax.
- There were no special adjustments to the dollar limit other than those permissible for non-Medicare retirees over 55.

In this valuation, the impact of the Cadillac Tax has been calculated by increasing the employer paid premiums for Non-Medicare retirees, who became participants before July 1, 2003, by 3.6%. Non-Medicare retirees who became participants after July 1, 2003 receive dollar subsidies per year of service, which are not expected to exceed the overall Non-Medicare premiums. As a result, the costs attributable to the Cadillac Tax for members who became participants after July 1, 2003 will be paid by the retirees.

### *Changes in Assumptions since the prior valuation:*

1. The assumed investment return was changed from 7.50% to 6.25%.
2. The price inflation assumption was changed from 3.25% to 2.30%, which also resulted in a 0.95% decrease in the salary increase assumption at all years of service and a 0.95% decrease in the health care cost trend rates.
3. The payroll growth assumption (used for the amortization of unfunded actuarial accrued liabilities) was changed from 4.00% to 2.00%.

## Development of Baseline Claims Cost

For non-Medicare retirees, the initial per capita costs were based on the plan premiums effective January 1, 2017, and are used for both current and future retirees. An inherent assumption in this methodology is that the projected future retirees will have a similar distribution by plan type as the current retirees. The spouse/dependent premium of \$862.64 for non-Medicare retirees is based on a blending of Family and Couple premiums for the current retirees that have over 4 years of hazardous service. The fully-insured premiums KRS pays the Kentucky Employees' Health Plan (KEHP) are blended rates based on the combined experience of active and retired members. Because the average cost of providing health care benefits to retirees under age 65 is higher than the average cost of providing health care benefits to active employees, there is an implicit rate subsidy for the non-Medicare eligible retirees. Actuarial Standard of Practice No. 6 (ASOP No. 6) requires aging subsidies (or implicit rate subsidies) to be recognized. However, the KRS health insurance trusts are only used to reimburse KEHP for the employer's portion of the blended premiums. Said another way, the trusts are not used to fund the difference between the underlying retiree claims and the blended KEHP premiums. As a result, the retiree health care liabilities developed in this report for the non-Medicare retirees are based solely on the premiums charged by KEHP, without any age-adjustment. GASB Statements No. 74 and No. 75 prohibit such a deviation from ASOP No. 6. The liabilities developed in this report are solely for the purpose of funding the benefits paid by the health insurance funds and are not appropriate for financial statement disclosures required by GASB. GRS provides separate GASB reports to KRS which include the liabilities associated with the implicit rate subsidy.

| <b>FOR THOSE NOT ELIGIBLE FOR MEDICARE</b> |               |                          |
|--|---------------|--------------------------|
| <b>AGE</b>                                 | <b>MEMBER</b> | <b>SPOUSE/DEPENDENTS</b> |
| <65  | \$711.22      | \$862.64                 |

For Medicare retirees, the initial per capita costs were estimated based on the plan premiums effective January 1, 2017, and are used for both current and future retirees. An inherent assumption in this methodology is that the projected future retirees will have a similar distribution by plan type as the current retirees. Age graded and sex distinct premiums are utilized for retirees over the age of 65. These costs are appropriate for the unique age and sex distribution currently existing. Over the future years covered by this valuation, the age and sex distribution will most likely change. Therefore, our process "distributes" the average premium over all age/sex combinations and assigns a unique premium for each combination. The age/sex specific costs more accurately reflect the health care utilization and cost at that age.

| <b>FOR THOSE ELIGIBLE FOR MEDICARE</b> |             |               |
|--|-------------|---------------|
| <b>AGE</b>                             | <b>MALE</b> | <b>FEMALE</b> |
| 65                                     | \$208.66    | \$196.81      |
| 75                                     | 244.13      | 238.22        |
| 85                                     | 258.16      | 261.20        |

Appendix B of the report provides a full schedule of premiums.

Mehdi Riazi is a Member of the American Academy of Actuaries (MAAA) and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.



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Mehdi Riazi, FSA, EA, MAAA

## **APPENDIX B**

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### **BENEFIT PROVISIONS**

# Summary of Benefit Provisions for County Employees Retirement System (CERS)

## CERS Non-Hazardous Employees

*Retirement: Tier 1, Participation before 9/1/2008*

|                               |  |
|-------------------------------|--|
| Normal Retirement Eligibility | Age 65 with at least 1 month of service credit; or<br>Any age with at least 27 years of service  |
| Benefit Amount                | <p>If a member has at least 48 months of service, the monthly benefit is 2.00% times final average compensation times years of service. For members who began participating prior to 8/1/2004, the monthly benefit is 2.20% times final average compensation times years of service.</p> <p>If a member has less than 48 months of service, the monthly benefit is the actuarial equivalent of two times the member's contributions with interest.</p> <p>Final average compensation is based on the member's highest 5 years of compensation.</p> |
| Early Retirement Eligibility  | Any age (prior to age 65) with at least 25 years of service; or<br>Age 55 with at least 5 years of service   |
| Early Retirement Reduction    | Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement eligibility precedes the member's normal retirement date.   |

## CERS Non-Hazardous Employees (continued)

### *Retirement: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014*

|                               |  |
|-------------------------------|--|
| Normal Retirement Eligibility | Age 65 with at least 5 years of service; or Rule of 87 (Age 57 or older if age plus service equals 87)                     |
| Benefit Amount                | The monthly benefit is equal to the applicable benefit multiplier times final average compensation times years of service. |

| Years of Service | Benefit Multiplier |
|------------------|--------------------|
| 10 or less       | 1.10%              |
| 10-20            | 1.30%              |
| 20-26            | 1.50%              |
| 26-30            | 1.75%              |
| Greater than 30* | 2.00%              |

\* The 2.00% benefit multiplier only applies to service credit in excess of 30 years. If a member has greater than 30 years of service at retirement, service prior to 30 years will be multiplied by the 1.75% benefit multiplier.

Final compensation is based on the member's last 5 years of compensation.

|                              |  |
|------------------------------|--|
| Early Retirement Eligibility | Age 60 with at least 10 years of service   |
| Early Retirement Reduction   | Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility. |

### *Retirement: Tier 3, Participation on or after 1/1/2014*

|                               |   |
|-------------------------------|---|
| Normal Retirement Eligibility | Age 65 with at least 5 years of service; or Rule of 87 (Age 57 or older if age plus service equals 87)  |
| Benefit Amount                | Each year that the member is active, a 4.00% employer pay credit and the employee's 5.00% contribution will be credited to each member's hypothetical cash balance account. The hypothetical account will earn interest at a minimum rate of 4%, annually. If the System's geometric average net investment return for the previous five years exceeds 4%, then the hypothetical account will be credited with an additional amount of interest in that year equal to 75% of the amount of the return which exceeds 4%. All interest credits will be applied to the hypothetical account balance on June 30 based on the account balance as of June 30 of the previous year.<br><br>At retirement, the member's hypothetical account balance may be converted into an annuity based on an actuarial factor. |
| Early Retirement Eligibility  | N/A   |

## CERS Non-Hazardous Employees (continued)

### *Deferred Vested Benefit: Tier 1, Participation before 9/1/2008*

|                |   |
|----------------|---|
| Eligibility    | At least 1 month of service credit  |
| Benefit Amount | Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age |

### *Deferred Vested Benefit: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014*

|                |   |
|----------------|---|
| Eligibility    | 5 years of service  |
| Benefit Amount | Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age |

### *Deferred Vested Benefit Tier 3, Participation on or after 1/1/2014*

|                |  |
|----------------|--|
| Eligibility    | 5 years of service   |
| Benefit Amount | At termination of employment, members may choose to leave their account balance with the System and retire once they are eligible. The hypothetical account balance will earn 4% annual interest after termination. Members may also choose to withdrawal their entire accumulated balance. If a member does not have 5 years of service at termination, the member is eligible to receive a partial refund of their account balance. This refund includes the member's contributions with interest. |

### *Disability Retirement: Participation before 8/1/2004*

|                    |  |
|--------------------|--|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)  |
| Disability Benefit | Disability benefits are calculated in the same manner as the normal retirement benefit with years of service and final compensation being determined as of the date of disability, except that service credit shall be added to the person's total service beginning with the last date of paid employment and continuing to the member's 65th birthday, with total service not exceeding 25 years. Total service credit added shall not be greater than the member's actual service at disability. For members with at least 25 years of service on the last day of paid employment but less than 27 years of service, total service shall be 27 years. For members with 27 or more years of service credit, actual service will be used. |

## CERS Non-Hazardous Employees (continued)

### *Disability Retirement: Participation on or after 8/1/2004 but before 1/1/2014*

|                    |   |
|--------------------|---|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)   |
| Disability Benefit | The higher of 20% of the member's final monthly rate of pay or the member's normal retirement benefit (without reduction for early retirement) with years and final compensation being determined as of the date of disability. |

### *Disability Retirement: Participation on or after 1/1/2014*

|                    |   |
|--------------------|---|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)   |
| Disability Benefit | The higher of 20% of the member's final monthly rate of pay or the member's retirement benefit calculated at the member's normal retirement date. |

### *Line of Duty Disability Benefit*

|                    |  |
|--------------------|--|
| Disability Benefit | If the disability is a direct result of an act in the line of duty, the benefit shall not be less than 25% of the member's final monthly rate of pay. Additionally, each eligible dependent child will receive 10% of the member's monthly final rate of pay up to a maximum of 40%. |
|--------------------|--|

### *Pre-Retirement Death Benefit*

|                |  |
|----------------|--|
| Eligibility    | Eligible for early or normal retirement; or<br>Under age 55 with at least 60 months of service and actively working at the time of death; or<br>At least 144 months of service, if no longer actively working  |
| Spouse Benefit | The member's retirement benefit calculated in the same manner as if the member had retired on the day of the member's death and elected a 100% joint and survivor benefit. The benefit is actuarially reduced if the member dies prior to their normal retirement age. |

### *Pre-Retirement Death Benefit (Death in the Line of Duty)*

|                |   |
|----------------|---|
| Eligibility    | One month of service credit   |
| Spouse Benefit | A \$10,000 lump sum payment plus a monthly payment of 25% of the deceased member's final monthly rate of pay. A spouse may also elect the non-line of duty death benefit. |
| Child Benefit  | Each eligible dependent child will receive 10% of the member's final monthly rate of pay up to a maximum of 40%.  |

## CERS Non-Hazardous Employees (continued)

### *Post-Retirement Death Benefit*

|               |   |
|---------------|---|
| Eligibility   | 48 months of service, and in receipt of retirement benefits |
| Death Benefit | A \$5,000 lump sum payment                                  |

### *Member Contributions*

|  |   |
|--|---|
| Tier 1, Participation before 9/1/2008                          | 5% of creditable compensation. Members who do not receive a retirement benefit are entitled to a full refund of contributions with interest. The annual interest rate is set by the KRS board, not less than 2.0%.  |
| Tier 2, Participation on or after 9/1/2008 but before 1/1/2014 | 5% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest. The annual interest rate is 2.5%. |
| Tier 3, Participation after 1/1/2014                           | 5% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest.                                   |

### *Changes since the Prior Valuation*

None.

## CERS Hazardous Employees

### *Retirement: Tier 1, Participation before 9/1/2008*

|                               |  |
|-------------------------------|--|
| Normal Retirement Eligibility | Age 55 with at least 1 month of service credit; or<br>Any age with at least 20 years of service  |
| Benefit Amount                | If a member has at least 60 months of service, the monthly benefit is 2.50% times final average compensation times years of service.<br><br>If a member has less than 60 months of service, the monthly benefit is the actuarial equivalent of two times the member's contributions with interest.<br><br>Final average compensation is based on the member's highest 3 years of compensation. |
| Early Retirement Eligibility  | Age 50 with at least 15 years of service   |
| Early Retirement Reduction    | Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility.   |

## CERS Hazardous Employees (continued)

### *Retirement: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014*

|                               |  |
|-------------------------------|--|
| Normal Retirement Eligibility | Age 60 with at least 5 years of service; or<br>Any age with at least 25 years of service                                   |
| Benefit Amount                | The monthly benefit is equal to the applicable benefit multiplier times final average compensation times years of service. |

| Years of Service | Benefit Multiplier |
|------------------|--------------------|
| 10 or less       | 1.30%              |
| 10-20            | 1.50%              |
| 20-25            | 2.25%              |
| Greater than 25  | 2.50%              |

Final average compensation is based on the member's highest 3 years of compensation.

|                              |  |
|------------------------------|--|
| Early Retirement Eligibility | Age 50 with at least 15 years of service   |
| Early Retirement Reduction   | Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility. |

### *Retirement: Tier 3, Participation on or after 1/1/2014*

|                               |   |
|-------------------------------|---|
| Normal Retirement Eligibility | Age 60 with at least 5 years of service; or<br>Any age with at least 25 years of service  |
| Benefit Amount                | Each year that the member is active, a 7.50% employer pay credit and the employee's 8.00% contribution will be credited to each member's hypothetical cash balance account. The hypothetical account will earn interest at a minimum rate of 4%, annually. If the System's geometric average net investment return for the previous five years exceeds 4%, then the hypothetical account will be credited with an additional amount of interest in that year equal to 75% of the amount of the return which exceeds 4%. All interest credits will be applied to the hypothetical account balance on June 30 based on the account balance as of June 30 of the previous year.<br><br>At retirement, the member's hypothetical account balance may be converted into an annuity based on an actuarial factor. |
| Early Retirement Eligibility  | N/A   |

## CERS Hazardous Employees (continued)

### *Deferred Vested Benefit: Tier 1, Participation before 9/1/2008*

|                |   |
|----------------|---|
| Eligibility    | At least 1 month of service credit  |
| Benefit Amount | Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age |

### *Deferred Vested Benefit: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014*

|                |   |
|----------------|---|
| Eligibility    | 5 years of service  |
| Benefit Amount | Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age |

### *Deferred Vested Benefit Tier 3, Participation on or after 1/1/2014*

|                |  |
|----------------|--|
| Eligibility    | 5 years of service   |
| Benefit Amount | At termination of employment, members may choose to leave their account balance with the System and retire once they are eligible. The hypothetical account balance will earn 4% annual interest after termination. Members may also choose to withdrawal their entire accumulated balance. If a member does not have 5 years of service at termination, the member is eligible to receive a partial refund of their account balance. This refund includes the member's contributions with interest. |

### *Disability Retirement: Participation before 8/1/2004*

|                    |  |
|--------------------|--|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)  |
| Disability Benefit | Disability benefits are calculated in the same manner as the normal retirement benefit with years of service and final compensation being determined as of the date of disability, except that if the member has less than 20 years of service at disability, service credit shall be added to the person's total service beginning with the last date of paid employment and continuing to the member's 55 <sup>th</sup> birthday, with total service not exceeding 20 years. Total service credit added shall not be greater than the member's actual service at disability. |

## CERS Hazardous Employees (continued)

### *Disability Retirement: Participation on or after 8/1/2004 but before 1/1/2014*

|                    |   |
|--------------------|---|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)   |
| Disability Benefit | The higher of 25% of the member's final monthly rate of pay or the member's normal retirement benefit (without reduction for early retirement) with years and final compensation being determined as of the date of disability. |

### *Disability Retirement: Participation on or after 1/1/2014*

|                    |   |
|--------------------|---|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)   |
| Disability Benefit | The higher of 25% of the member's final monthly rate of pay or the member's retirement benefit calculated at the member's normal retirement date. |

### *Line of Duty Disability Benefit*

|                    |  |
|--------------------|--|
| Disability Benefit | If the disability is a direct result of an act in the line of duty, the benefit shall not be less than 25% of the member's final monthly rate of pay. Additionally, each eligible dependent child will receive 10% of the member's monthly final rate of pay up to a maximum of 40%. |
|--------------------|--|

### *Pre-Retirement Death Benefit*

|                |  |
|----------------|--|
| Eligibility    | Eligible for early or normal retirement; or<br>Under age 55 with at least 60 months of service and actively working at the time of death; or<br>At least 144 months of service, if no longer actively working  |
| Spouse Benefit | The member's retirement benefit calculated in the same manner as if the member had retired on the day of the member's death and elected a 100% joint and survivor benefit. The benefit is actuarially reduced if the member dies prior to their normal retirement age. |

### *Pre-Retirement Death Benefit (Death in the Line of Duty)*

|                    |  |
|--------------------|--|
| Eligibility        | One month of service credit  |
| Spouse Benefit     | A \$10,000 lump sum payment plus a monthly payment of 25% of the deceased member's final monthly rate of pay. A spouse may also elect the non-line of duty death benefit.        |
| Non-Spouse Benefit | If the beneficiary is only one person who is a dependent receiving at least 50% of his or her support from the member, the beneficiary may elect a lump sum payment of \$10,000. |
| Child Benefit      | Each eligible dependent child will receive 10% of the member's final monthly rate of pay up to a maximum of 40%.   |

## CERS Hazardous Employees (continued)

### *Post-Retirement Death Benefit*

|               |   |
|---------------|---|
| Eligibility   | 48 months of service, and in receipt of retirement benefits |
| Death Benefit | A \$5,000 lump sum payment                                  |

### *Member Contributions*

|  |   |
|--|---|
| Tier 1, Participation before 9/1/2008                          | 8% of creditable compensation. Members who do not receive a retirement benefit are entitled to a full refund of contributions with interest. The annual interest rate is set by the KRS board, not less than 2.0%.  |
| Tier 2, Participation on or after 9/1/2008 but before 1/1/2014 | 8% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest. The annual interest rate is 2.5%. |
| Tier 3, Participation after 1/1/2014                           | 8% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest.                                   |

### *Changes since the Prior Valuation*

None.

## Summary of Main Retiree Insurance Benefit Provisions

### Insurance Tier 1: Participation began before 7/1/2003

**Benefit Eligibility**                      Recipient of a retirement allowance

**Benefit Amount**

| Non-Hazardous Service | Percentage of Member Premium Paid by Retirement System | Hazardous Service | Percentage of Member & Dependent Premium Paid by Retirement System |
|-----------------------|--|-------------------|--|
| Less than 4 years     | 0%   | Less than 4 years | 0%   |
| 4 – 9 years           | 25%  | 4 – 9 years       | 25%  |
| 10 – 14 years         | 50%  | 10 – 14 years     | 50%  |
| 15 – 19 years         | 75%  | 15 – 19 years     | 75%  |
| 20 or more years      | 100%   | 20 or more years  | 100%   |

The percentage paid by the retirement system is applied to the ‘contribution’ plan selected by the KRS Board.

**Duty Disability Retirement**      If disability was a result of injuries sustained while in the line of duty, the member receives 100% of the maximum contribution for the member and dependents. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.

**Duty Death in Service**            If an active employee’s death was a result of injuries sustained while in the line of duty, the member’s spouse and children receive 100% of the maximum contribution. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.

**Non-Duty Death in Service**      If the surviving spouses is in receipt of a pension allowance, he or she is eligible for continued health coverage. The percentage of the premium paid for by the retirement system is based on the member’s years of hazardous service at the time of death.

**Surviving Spouse of a Retiree**    A surviving spouse of a retiree, who is in receipt of a pension allowance, will receive a premium subsidy based on the member’s years of hazardous service.

**Hazardous employees who retired prior to August 1, 1998**    System’s contribution for spouse and dependents is based on total service.

## **Insurance Tier 2: Participation began on or after 7/1/2003, but before 9/1/2008**

|                                   |   |
|-----------------------------------|---|
| <b>Benefit Eligibility</b>        | Recipient of a retirement allowance with at least 120 months of service at retirement   |
| <b>Non-Hazardous Subsidy</b>      | Monthly contribution of \$10 for each year of earned service. The monthly contribution is increased by 1.5% each July 1. As of July 1, 2017, the Non-Hazardous monthly contribution was \$13.18/year of service. Upon the retiree's death, the surviving spouse may continue coverage (if in receipt of a retirement allowance) but will be 100% responsible for the premiums.                                    |
| <b>Hazardous Subsidy</b>          | Monthly contribution of \$15 for each year of earned hazardous service. The monthly contribution is increased by 1.5% each July 1. As of July 1, 2017, the Non-Hazardous monthly contribution was \$19.77/year of service. Upon the retiree's death, the surviving spouse of a hazardous duty member will receive a monthly contribution of \$10 (\$13.18 as of July 1, 2017) for each year of hazardous service. |
| <b>Duty Disability Retirement</b> | If disability was a result of injuries sustained while in the line of duty, the member receives a benefit equal to at least 20 times the Non-Hazardous monthly contribution. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.  |
| <b>Duty Death in Service</b>      | If an active employee's death was a result of injuries sustained while in the line of duty, the member's spouse and children receive a benefit equal to at least 20 times the Non-Hazardous monthly contribution. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.   |
| <b>Non-Duty Death in Service</b>  | If the surviving spouse is in receipt of a pension allowance, he or she is eligible for continued health coverage. The percentage of the premium paid for by the retirement system is based on the member's years of hazardous service at the time of death.  |

## **Insurance Tier 3: Participation began on or after 9/1/2008**

Tier 3 insurance benefits are identical to Tier 2, except Tier 3 members are required to have at least 180 months of service in order to be eligible.

## Monthly Health Plan Premiums – Effective January 1, 2018

| Plan Option     | Non-Medicare Plan Options |             |            |            |              |
|-----------------|---------------------------|-------------|------------|------------|--------------|
|                 | Single                    | Parent Plus | Couple     | Family     | Family X-Ref |
| LivingWell PPO* | \$729.34                  | \$1,037.08  | \$1,589.10 | \$1,767.60 | \$876.68     |
| LivingWell CDHP | 709.46                    | 978.50      | 1,325.64   | 1,479.76   | 818.96       |
| Standard PPO    | 685.38                    | 975.90      | 1,497.18   | 1,666.26   | 824.54       |
| Standard CDHP   | 682.80                    | 940.64      | 1,450.02   | 1,615.30   | 800.94       |

| Medicare Plan Options   |          |
|---|----------|
| Kentucky Retirement Systems - Medical Only Plan                 | \$165.01 |
| Kentucky Retirement Systems – Medicare Advantage/Essential Plan | 75.56    |
| Kentucky Retirement Systems – Medicare Advantage/Premium Plan*  | 252.21   |

\*For 2018, the contribution plans selected by the KRS Board were the LivingWell PPO plan option for non-Medicare retirees and the Medicare Advantage Premium plan option for Medicare retirees.

## Dollar Contribution Amount for Insurance Tier 2 and Tier 3

Monthly contribution amounts per year of service as of July 1, 2017.

| Non-Hazardous Service | Hazardous Service |
|-----------------------|-------------------|
| \$13.18               | \$19.77           |

# APPENDIX C



## GLOSSARY

## Glossary

**Actuarial Accrued Liability (AAL):** That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of Future Plan Benefits which is not provided for by future Normal Costs. It is equal to the Actuarial Present Value of Future Plan Benefits minus the actuarial present value of future Normal Costs.

**Actuarial Assumptions:** Assumptions as to future experience under the Fund. These include assumptions about the occurrence of future events affecting costs or liabilities, such as:

- mortality, withdrawal, disablement, and retirement;
- future increases in salary;
- future rates of investment earnings and future investment and administrative expenses;
- characteristics of members not specified in the data, such as marital status;
- characteristics of future members;
- future elections made by members; and
- other relevant items.

**Actuarial Cost Method or Funding Method:** A procedure for allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability. These items are used to determine the ADC.

**Actuarial Gain or Actuarial Loss:** A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two Actuarial Valuation dates. Through the actuarial assumptions, rates of decrements, rates of salary increases, and rates of fund earnings have been forecasted. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., the fund's assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results that produce actuarial liabilities which are larger than projected. Actuarial gains will shorten the time required for funding of the actuarial balance sheet deficiency while actuarial losses will lengthen the funding period.

**Actuarially Equivalent:** Of equal actuarial present value, determined as of a given date and based on a given set of Actuarial Assumptions.

**Actuarial Present Value (APV):** The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. For purposes of this standard, each such amount or series of amounts is:

- a. adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.)
- b. multiplied by the probability of the occurrence of an event (such as survival, death, disability, termination of employment, etc.) on which the payment is conditioned, and
- c. discounted according to an assumed rate (or rates) of return to reflect the time value of money.

**Actuarial Present Value of Future Plan Benefits:** The Actuarial Present Value of those benefit amounts which are expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future compensation and service credits. The Actuarial Present Value of Future Plan Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive, non-retired members either entitled to a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.

**Actuarial Valuation:** The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial valuation for a governmental retirement system typically also includes calculations that provide the financial information of the plan, such as the funded ratio, unfunded actuarial accrued liability and the ADC.

**Actuarial Value of Assets or Valuation Assets:** The value of the Fund's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly actuaries use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the ADC.

**Actuarially Determined:** Values which have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the law.

**Actuarially Determined Contribution (ADC):** The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation. The ADC consists of the Employer Normal Cost and the Amortization Payment.

**Amortization Method:** A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the stream of payments increases at the assumed rate at which total covered payroll of all active members will increase.

**Amortization Payment:** The portion of the pension plan contribution or ADC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

**Closed Amortization Period:** A specific number of years that is counted down by one each year, and therefore declines to zero with the passage of time. For example if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc. See Funding Period and Open Amortization Period.

**Decrements:** Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or termination.

**Defined Benefit Plan:** A retirement plan that is not a Defined Contribution Plan. Typically a defined benefit plan is one in which benefits are defined by a formula applied to the member's compensation and/or years of service.

**Defined Contribution Plan:** A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, and the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.

**Employer Normal Cost:** The portion of the Normal Cost to be paid by the employers. This is equal to the Normal Cost less expected member contributions.

**Experience Study:** A periodic review and analysis of the actual experience of the Fund which may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified as deemed appropriate by the Actuary.

**Funded Ratio:** The ratio of the actuarial value of assets (AVA) to the actuarial accrued liability (AAL). Plans sometimes calculate a market funded ratio, using the market value of assets (MVA), rather than the AVA.

**Funding Period or Amortization Period:** The term "Funding Period" is used two ways. In the first sense, it is the period used in calculating the Amortization Payment as a component of the ADC. This funding period specified in State statute. In the second sense, it is a calculated item: the number of years in the future that will theoretically be required to amortize (i.e., pay off or eliminate) the Unfunded Actuarial Accrued Liability, based on a statutory employer contribution rate, and assuming no future actuarial gains or losses.

**GASB:** Governmental Accounting Standards Board.

**GASB 67 and GASB 68:** Governmental Accounting Standards Board Statements No. 67 and No. 68. These are the governmental accounting standards that set the accounting and reporting rules for public retirement systems and the employers that sponsor, participate in, or contribute to them. Statement No. 67 sets the accounting rules for the financial reporting of the retirement systems, while Statement No. 68 sets the rules for the employers that sponsor, participate in, or contribute to public retirement systems.

**Normal Cost:** That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method. Any payment in respect of an Unfunded

Actuarial Accrued Liability is not part of Normal Cost (see Amortization Payment). For pension plan benefits which are provided in part by employee contributions, Normal Cost refers to the total of employee contributions and employer Normal Cost unless otherwise specifically stated. Under the entry age normal cost method, the Normal Cost is intended to be the level cost (when expressed as a percentage of pay) needed to fund the benefits of a member from hire until ultimate termination, death, disability or retirement.

**Open Amortization Period:** An open amortization period is one which is used to determine the Amortization Payment but may not decrease by exactly one year in the subsequent year's actuarial valuation. For instance, if the initial period is set as 30 years, the same 30-year period is used in determining the Amortization Period each year.

**Unfunded Actuarial Accrued Liability:** The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus.

**Valuation Date or Actuarial Valuation Date:** The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Plan Benefits is determined. The expected benefits to be paid in the future are discounted to this date.

# State Police Retirement System (SPRS)

Actuarial Valuation Report  
as of June 30, 2017



December 4, 2017

Board of Trustees  
Kentucky Retirement Systems  
Perimeter Park West  
1260 Louisville Road  
Frankfort, KY 40601

**Subject: Actuarial Valuation as of June 30, 2017**

Dear Trustees of the Board:

This report describes the current actuarial condition of the State Police Retirement System (SPRS), determines the required employer contribution rates, and analyzes changes in the System's financial condition. In addition, the report provides various summaries of the data. Separate reports are issued with regard to valuation results determined in accordance with Governmental Accounting Standards Board (GASB) Statements 67, 68, 74 and 75. Results of this report should not be used for any other purpose without consultation with the undersigned. Valuations are prepared annually as of June 30, the first day of the plan year for KRS. This report was prepared at the request of the Board of Trustees of the Kentucky Retirement System (Board) and is intended for use by the KRS staff and those designated or approved by the Board.

#### **FINANCING OBJECTIVES AND FUNDING POLICY**

The employer contribution rate is determined in accordance with Section 61.565 of Kentucky Statute. As specified by the Statute, the employer contribution rate is determined based on a closed thirty-year amortization period beginning July 1, 2013. As a result, the amortization period used in the 2017 actuarial valuation is 26 years. The contribution rate determined by this actuarial valuation becomes effective twelve months after the valuation date and is effective for two fiscal years. In other words, the contribution rate determined by this June 30, 2017 actuarial valuation will be used by the Board to certify the Commonwealth's contribution rates for the fiscal year July 1, 2018 and ending June 30, 2020.

If new legislation is enacted between the valuation date and the date the contribution rate becomes effective, the Board may adjust the calculated rate before certifying them, in order to reflect this new legislation. Such adjustments are based on information supplied by the actuary.

#### **ASSUMPTIONS AND METHODS**

Kentucky Statutes also requires that an actuarial investigation be performed at least every five years to review the economic and demographic assumptions. An experience study was conducted

as of June 30, 2013 and the next experience study will be conducted as of June 30, 2018. However, the Board has the authority to review the assumptions on a more frequent basis and adopt new assumptions prior to the next scheduled experience study. Subsequent to the last actuarial valuation the Board decreased the price inflation assumption to 2.30%, and decreased the assumed rate of return to 5.25% for the Retirement Fund and to 6.25% for the Health Insurance Fund. Finally, the amortization of the unfunded actuarial accrued liability will be based on a 0.00% payroll growth assumption (i.e. amortized on a level dollar basis) for the Retirement and Health Insurance funds, but employers will continue to contribute to the System as a percentage of expected covered payroll. It is our opinion that the current assumptions are internally consistent and reasonably reflect the anticipated future experience of the System.

The results of the actuarial valuation are dependent on the actuarial assumptions used. Actual results can, and almost certainly will, differ as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rate, and funding periods. The actuarial calculations are intended to provide information for rational decision making.

#### **BENEFIT PROVISIONS**

The benefit provisions reflected in this valuation are those which were in effect on June 30, 2017. There were no legislative changes enacted since the previous valuation that had a measurable effect on the current valuation.

#### **DATA**

Member data for retired, active and inactive members was supplied as of June 30, 2017, by the KRS staff. The staff also supplied asset information as of June 30, 2017. We did not audit this data, but we did apply a number of tests to the data, and we concluded that it was reasonable and consistent with the prior year's data. GRS is not responsible for the accuracy or completeness of the information provided to us by KRS.

#### **CERTIFICATION**

We certify that the information presented herein is accurate and fairly portrays the actuarial position of SPRS as of June 30, 2017.

All of our work conforms with generally accepted actuarial principles and practices, and is in conformity with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of Kentucky Code of Laws and, where applicable, the Internal Revenue Code, ERISA, and the Statements of the Governmental Accounting Standards Board.

The undersigned are independent actuaries and consultants. Mr. Newton and Mr. White are Enrolled Actuaries. All three of the undersigned are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries. All of the undersigned are experienced in performing valuations for large public retirement systems.

Sincerely,

**Gabriel, Roeder, Smith & Co.**



Joseph P. Newton, FSA, MAAA, EA  
Senior Consultant



Daniel J. White, FSA, MAAA, EA  
Senior Consultant



Jamie Shaw, ASA, MAAA  
Consultant

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# SECTION 1

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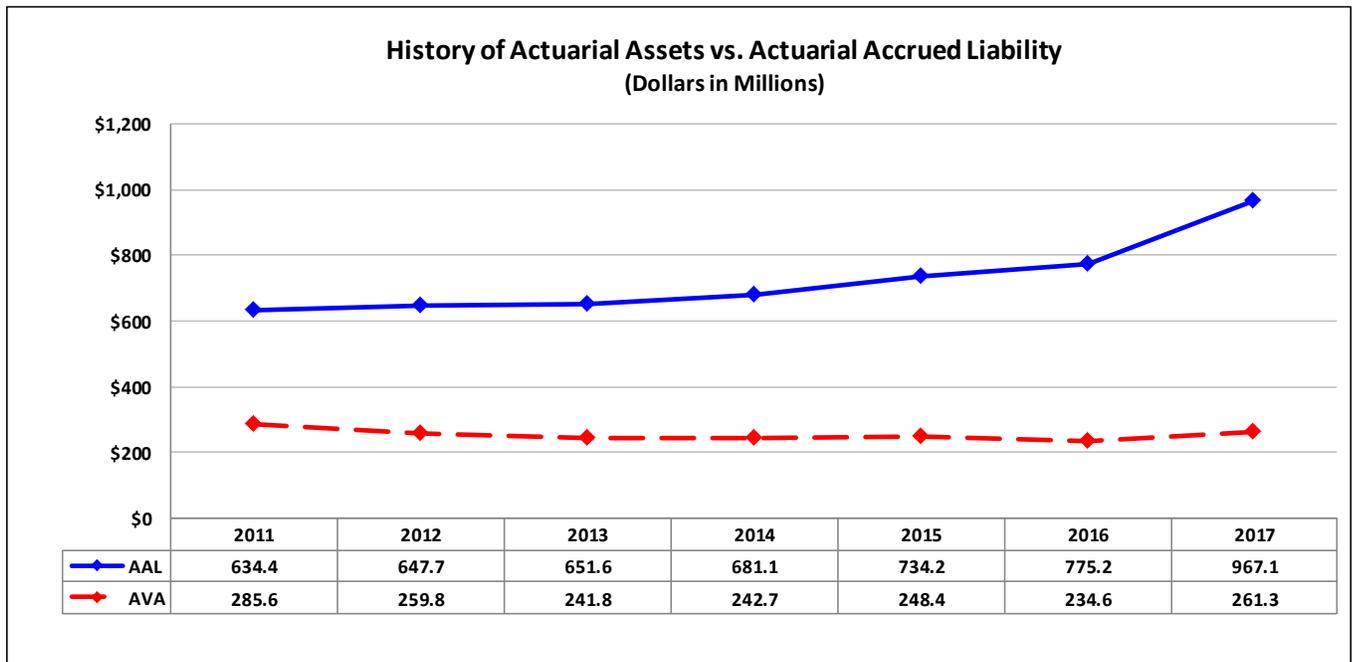
## EXECUTIVE SUMMARY

**Summary of Principal Results**  
(Dollar amounts expressed in thousands)

|  | SPRS          |               |
|--|---------------|---------------|
|  | June 30, 2017 | June 30, 2016 |
| <b>Contributions for next fiscal year:</b>     |               |               |
| Retirement                                     | 119.05%       | 71.57%        |
| Insurance                                      | <u>27.23%</u> | <u>18.10%</u> |
| Total  | 146.28%       | 89.67%        |
| <b>Assets:</b>                                 |               |               |
| Retirement                                     |               |               |
| • Actuarial value (AVAR)                       | \$261,320     | \$234,568     |
| • Market value (MVAR)                          | \$255,737     | \$217,594     |
| • Ratio of actuarial to market value of assets | 102.2%        | 107.8%        |
| Insurance                                      |               |               |
| • Actuarial value (AVAI)                       | \$180,464     | \$172,704     |
| • Market value (MVAI)                          | \$178,838     | \$161,366     |
| • Ratio of actuarial to market value of assets | 100.9%        | 107.0%        |
| <b>Funded Status:</b>                          |               |               |
| Retirement                                     |               |               |
| • Actuarial accrued liability                  | \$967,145     | \$775,160     |
| • Unfunded accrued liability on AVAR           | \$705,825     | \$540,593     |
| • Funded ratio on AVAR                         | 27.0%         | 30.3%         |
| • Unfunded accrued liability on MVAR           | \$711,408     | \$557,566     |
| • Funded ratio on MVAR                         | 26.4%         | 28.1%         |
| Insurance                                      |               |               |
| • Actuarial accrued liability                  | \$276,641     | \$257,197     |
| • Unfunded accrued liability on AVAI           | \$96,177      | \$84,494      |
| • Funded ratio on AVAI                         | 65.2%         | 67.1%         |
| • Unfunded accrued liability on MVAI           | \$97,803      | \$95,831      |
| • Funded ratio on MVAI                         | 64.6%         | 62.7%         |
| <b>Membership:</b>                             |               |               |
| • Number of                                    |               |               |
| - Active Members                               | 903           | 908           |
| - Retirees and Beneficiaries                   | 1,536         | 1,515         |
| - Inactive Members                             | <u>480</u>    | <u>455</u>    |
| - Total  | 2,919         | 2,878         |
| • Projected payroll of active members          | \$48,598      | \$45,551      |
| • Average salary of active members             | \$53,818      | \$50,166      |

## Executive Summary (Continued)

The unfunded actuarial accrued liability increased by \$165.2 million since the prior year's valuation to \$705.8 million. The largest source of this increase is the result of the decrease in the assumed rate of investment return which resulted in a \$136.6 million increase in the unfunded liability. Below is a chart with the historical actuarial value of assets and actuarial accrued liability. The divergence in the assets and liability over the last seven years has generally been due to a combination of the actual investment experience being less than the fund's expected investment return assumption, a decrease in the assumed rate of return in 2015, 2016 and again in 2017, and contributions that were insufficient to amortize the unfunded actuarial accrued liability.



## SECTION 2

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### DISCUSSION

## Discussion

The State Police Retirement System (SPRS) is a defined benefit pension fund that provides pensions and health care coverage for uniformed state police officers. SPRS includes both non-hazardous and hazardous duty benefits. This report presents the result of the June 30, 2017 actuarial funding valuation for both the Retirement Plan and Insurance Funds.

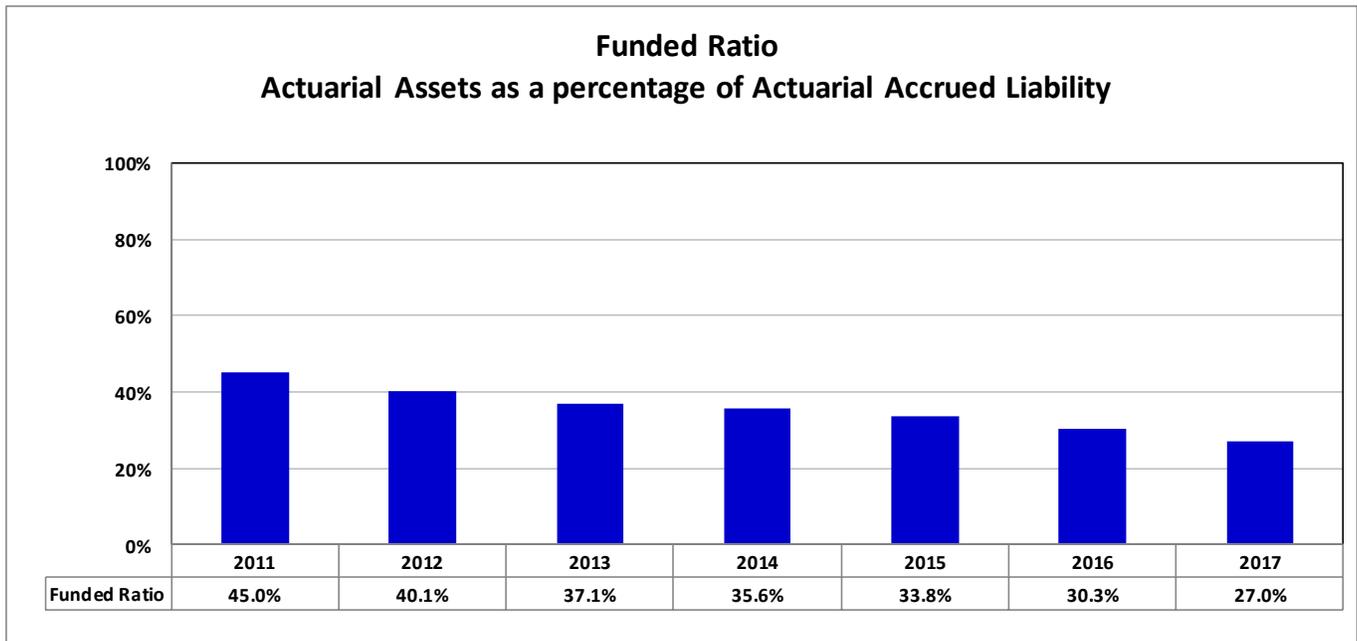
The primary purposes of the valuation report are to depict the current financial condition of the System, determine the annual required contribution, and analyze changes in the System's financial condition. In addition, the report provides various summaries of the data.

The actuarially determined contribution rates consist of two components: a normal cost rate and an amortization cost to finance the unfunded actuarial accrued liability. The normal cost rate is the theoretical amount which would be required to pay the members' benefits, based on the current plan provisions, if this amount had been contributed from each member's entry date and if the fund's experience exactly followed the actuarial assumptions. This is the amount it should cost to provide the benefits for an average new member. Since members contribute to the fund, only the excess of the normal rate over the member contribution rate is included in the employer contribution rate. The amortization cost is the amount, expressed as a percentage of payroll, necessary to amortize the unfunded actuarial accrued liability. The payroll growth rate and discount rate assumptions are selected by the Board. The funding period is specified in Section 61.565 of Kentucky Statute.

All of the actuarial and financial tables referenced by the other sections of this Report appear in Section 3. Section 4 provides member data and statistical information. Appendices A and B provide summaries of the principle actuarial assumptions and methods and plan provisions. Finally, Appendix C provides a glossary of technical terms that are used throughout this report.

## Funding Progress

The following charts provide a seven-year history of the funds' funded ratio (i.e. the Actuarial Value of Assets divided by the Actuarial Accrued Liability). The decline in the funded ratio over the last seven years for the retirement funds has generally been due to actual contributions being insufficient to finance the unfunded actuarial accrued liability, actual investment experience being less than the investment return assumption, a decrease in the assumed rate of return in 2015, 2016 and again in 2017.



Assuming the actuarial determined contributions are actually paid in future years, then absent future unfavorable experience we expect the funded ratio to begin improving. Also, the dollar amount of the unfunded actuarial accrued liability, or the difference between the actuarial accrued liability and the actuarial value of assets, is expected to decrease after the higher contribution rates determined by the actuarial valuation become effective. Table 9, Schedule of Funding Progress, in the following section of the report provides additional detail regarding the funding progress of the Retirement System.

## Asset Gains/ (Losses)

The actuarial value of assets (“AVA”) is based on a smoothed market value of assets, using a systematic approach to phase-in the difference between the actual and expected investment return on the market value of assets (adjusted for receipts and disbursements during the year). This is appropriate because it dampens the short-term volatility inherent in investment markets. The returns are computed net of investment expenses. The actuarial value of assets for the retirement fund increased from \$234.6 million to \$261.3 million since the prior valuation. Table 7 in the following section of the report provides the development of the actuarial value of assets.

The rate of return on the market value of assets on a dollar-weighted basis for fiscal year 2017 was a 12.0% which is greater than the 6.75% expected annual return during that fiscal year. The return on an actuarial (smoothed) asset value was 6.4%. This difference in the estimated return on market value and actuarial value illustrates the smoothing effect of the asset valuation method.

The market value of assets is \$5.6 million less than the actuarial value of assets, which signifies that the retirement fund is in a position of deferred losses. Therefore, unless the fund experiences investment returns in excess of the assumed rate of return in an amount that is at least equal to the outstanding deferred losses, the future recognition of these deferred losses is expected to increase the unfunded actuarial accrued liability.

Table 6 in the following section of this report provides asset information that was included in the annual financial statements of the System. Also, Tables 6 and 7 shows the estimated yield on a market value basis and on the actuarial asset valuation method.

## Actuarial Gains/ (Losses)

The annual actuarial valuation is a snapshot analysis of the benefit liabilities, assets and funded position of the System as of the first day of the plan year. In any one fiscal year, the experience can be better or worse from that which is assumed or expected. The actuarial assumptions do not necessarily attempt to model what the experience will be for any one given fiscal year, but instead try to model the overall experience over many years. Therefore, as long as the actual experience of the retirement system is reasonably close to the current assumptions, the long-term funding requirements of the System will remain relatively consistent.

Below are tables that separately show a reconciliation of the actuarial gains / (loss) since the prior actuarial valuation for the retirement and health insurance funds, which include the effect of asset and liability gains and losses, changes in assumptions, changes in plan provisions, etc.

### Experience Gain or (Loss) (Dollar amounts expressed in thousands)

|   | Retirement   | Insurance  |
|---|--------------|------------|
| A. Calculation of total actuarial gain or loss                |              |            |
| 1. Unfunded actuarial accrued liability (UAAL), previous year | \$ 540,593   | \$ 84,494  |
| 2. Normal cost and administrative expenses                    | 8,653        | 4,886      |
| 3. Less: contributions for the year                           | (68,587)     | (9,353)    |
| 4. Interest accrual   | 34,467       | 6,169      |
| 5. Expected UAAL (Sum of Items 1 - 4)                         | \$ 515,126   | \$ 86,196  |
| 6. Actual UAAL as of June 30,2017                             | \$ 705,825   | \$ 96,177  |
| 7. Total gain (loss) for the year (Item 5 - Item 6)           | \$ (190,699) | \$ (9,981) |
| B. Source of gains and losses                                 |              |            |
| 8. Asset gain (loss) for the year                             | \$ (914)     | \$ (839)   |
| 9. Liability experience gain (loss) for the year              | (53,157)     | 24,070     |
| 10. Assumption change   | (136,628)    | (33,212)   |
| 11. Total   | \$ (190,699) | \$ (9,981) |

The accrued liability for the retirement fund was about 7% higher than expected, resulting in a \$53 million liability loss. This \$53 million increase is comprised of a \$29 million increase due to differences in liability calculations between GRS and the fund's prior actuary and a \$24 million increase due to the fund's experience during the last year. The experience loss is primarily due to higher than expected salary increases during the past year. The 2018 insurance premiums were known at the time of the valuation and were incorporated into the liability measurement. Premiums were lower than expected and resulted in a \$19 million liability experience gain for the insurance fund.

## Actuarial Assumptions and Methods

In determining costs and liabilities, actuaries use assumptions about the future, such as rates of salary increase, probabilities of retirement, termination, death and disability, and an annual investment return assumption. An experience study was conducted as of June 30, 2013 and the next experience study will be conducted as of June 30, 2018. However, the Board has the authority to review the assumptions on a more frequent basis and adopt new assumptions prior to the next scheduled experience study. Since the last actuarial valuation, the Board made the following changes in assumptions:

- Decrease the assumed rate of return to 5.25% for the retirement fund and to 6.25% for the health insurance fund.
- Decrease the price inflation assumption to 2.30% for the retirement and health insurance funds.
- Amortize the unfunded actuarial accrued liability for the retirement and health insurance funds on a level dollar basis, converted to a percentage of the expected covered payroll.
- Decrease in the individual salary increase assumption and health care trend assumption that corresponds with the 0.95% decrease in the price inflation assumption.

Appendix A includes a summary of the actuarial assumptions and methods used in this valuation. It is our opinion that the assumptions are internally consistent, reasonable, and reflect anticipated future experience of the System. The next experience study will be conducted no later than as of June 30, 2018.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or 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. This report does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

## Benefit Provisions

Appendix B of this report includes a summary of the benefit provisions for SPRS. There were no legislative changes enacted since the previous valuation that had a measurable effect on the current valuation.

This valuation reflects all benefits promised to SPRS members, either by the statutes or by the Board. There are no ancillary benefits that might be deemed a SPRS liability if continued beyond the availability of funding by the current funding source.

## **SECTION 3**

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### **ACTUARIAL TABLES**

## Actuarial Tables

| <u>TABLE<br/>NUMBER</u> | <u>PAGE</u> | <u>CONTENT OF TABLE</u>                               |
|-------------------------|-------------|---|
| 1                       | 13          | DEVELOPMENT OF UNFUNDED ACTUARIAL ACCRUED LIABILITY   |
| 2                       | 14          | ACTUARIAL PRESENT VALUE OF FUTURE BENEFITS            |
| 3                       | 15          | DEVELOPMENT OF REQUIRED CONTRIBUTION RATE             |
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## Development of Unfunded Actuarial Accrued Liability

(Dollar amounts expressed in thousands)

|  | June 30, 2017     |                  |
|--|-------------------|------------------|
|  | Retirement<br>(1) | Insurance<br>(2) |
| 1. Projected payroll of active members                               | \$ 48,598         | \$ 48,164        |
| 2. Present value of future pay                                       | \$ 424,190        | \$ 390,888       |
| 3. Normal cost rate  |                   |                  |
| a. Total normal cost rate  | 23.84%            | 11.48%           |
| b. Less: member contribution rate                                    | -8.00%            | -0.30%           |
| c. Employer normal cost rate   | 15.84%            | 11.18%           |
| 4. Actuarial accrued liability for active members                    |                   |                  |
| a. Present value of future benefits                                  | \$ 286,843        | \$ 122,992       |
| b. Less: present value of future normal costs                        | (93,680)          | (32,741)         |
| c. Actuarial accrued liability                                       | \$ 193,163        | \$ 90,251        |
| 5. Total actuarial accrued liability                                 |                   |                  |
| a. Retirees and beneficiaries  | \$ 766,899        | \$ 183,156       |
| b. Inactive members  | 7,083             | 3,234            |
| c. Active members (Item 4c)  | 193,163           | 90,251           |
| d. Total   | \$ 967,145        | \$ 276,641       |
| 6. Actuarial value of assets   | \$ 261,320        | \$ 180,464       |
| 7. Unfunded actuarial accrued liability (UAAL)<br>(Item 5d - Item 6) | \$ 705,825        | \$ 96,177        |
| 8. Funded Ratio  | 27.0%             | 65.2%            |

**Actuarial Present Value of Future Benefits**  
(Dollar amounts expressed in thousands)

|    |  | June 30, 2017     |                  |
|----|--|-------------------|------------------|
|    |  | Retirement<br>(1) | Insurance<br>(2) |
| 1. | Active members                                   |                   |                  |
|    | a. Service retirement                            | \$ 264,685        |                  |
|    | b. Deferred termination benefits and refunds     | 14,923            |                  |
|    | c. Survivor benefits                             | 1,266             |                  |
|    | d. Disability benefits                           | 5,969             |                  |
|    | e. Total   | \$ 286,843        | \$ 122,992       |
| 2. | Retired members                                  |                   |                  |
|    | a. Service retirement                            | \$ 701,038        |                  |
|    | b. Disability retirement                         | 12,152            |                  |
|    | c. Beneficiaries                                 | 53,709            |                  |
|    | d. Total   | \$ 766,899        | \$ 183,156       |
| 3. | Inactive members                                 |                   |                  |
|    | a. Vested terminations                           | \$ 6,563          | \$ 3,234         |
|    | b. Nonvested terminations                        | 520               | N/A              |
|    | c. Total   | \$ 7,083          | \$ 3,234         |
| 4. | Total actuarial present value of future benefits | \$ 1,060,825      | \$ 309,382       |

## Development of Required Contribution Rate

|  | June 30, 2017     |                  |
|--|-------------------|------------------|
|  | Retirement<br>(1) | Insurance<br>(2) |
| 1. Total normal cost rate                    |                   |                  |
| a. Service retirement                        | 20.08%            |                  |
| b. Deferred termination benefits and refunds | 2.82%             |                  |
| c. Survivor benefits                         | 0.16%             |                  |
| d. Disability benefits                       | <u>0.78%</u>      |                  |
| e. Total                                     | 23.84%            | 11.48%           |
| 2. Less: member contribution rate            | <u>-8.00%</u>     | <u>-0.30%</u>    |
| 3. Total employer normal cost rate           | 15.84%            | 11.18%           |
| 4. Administrative expenses                   | <u>0.37%</u>      | <u>0.14%</u>     |
| 5. Net employer normal cost rate             | 16.21%            | 11.32%           |
| 6. UAAL amortization contribution            | 102.84%           | 15.91%           |
| 7. Total recommended employer contribution   | 119.05%           | 27.23%           |

**Actuarial Balance Sheet**  
**Retirement Benefits**  
(Dollar amounts expressed in thousands)

|  | June 30, 2017 | June 30, 2016 |
|--|---------------|---------------|
|  | (1)           | (2)           |
| 1. Assets - Present and Expected Future Resources  |               |               |
| a. Current assets (actuarial value)  | \$ 261,320    | \$ 234,568    |
| b. Present value of future member contributions  | \$ 33,935     | \$ 34,858     |
| c. Present value of future employer contributions  |               |               |
| i. Normal cost contributions   | \$ 59,745     | \$ 41,787     |
| ii. Unfunded accrued liability contributions   | 705,825       | 540,592       |
| iii. Total future employer contributions   | \$ 765,570    | \$ 582,379    |
| d. Total assets  | \$ 1,060,825  | \$ 851,805    |
| 2. Liabilities - Present Value of Expected Future Benefit Payments                           |               |               |
| a. Active members  |               |               |
| i. Present value of future normal costs  | \$ 93,680     | \$ 76,645     |
| ii. Accrued liability  | 193,163       | 138,661       |
| iii. Total present value of future benefits  | \$ 286,843    | \$ 215,306    |
| b. Present value of benefits payable on account of current retired members and beneficiaries | \$ 766,899    | \$ 630,842    |
| c. Present value of benefits payable on account of current inactive members                  | \$ 7,083      | \$ 5,657      |
| d. Total liabilities   | \$ 1,060,825  | \$ 851,805    |

**Actuarial Balance Sheet**  
**Insurance Benefits**  
(Dollar amounts expressed in thousands)

|  | June 30, 2017 | June 30, 2016 |
|--|---------------|---------------|
|  | (1)           | (2)           |
| 1. Assets - Present and Expected Future Resources  |               |               |
| a. Current assets (actuarial value)  | \$ 180,464    | \$ 172,704    |
| b. Present value of future member contributions  | \$ 1,905      | \$ 1,699      |
| c. Present value of future employer contributions  |               |               |
| i. Normal cost contributions   | \$ 30,836     | \$ 21,316     |
| ii. Unfunded accrued liability contributions   | 96,177        | 84,494        |
| iii. Total future employer contributions   | \$ 127,013    | \$ 105,810    |
| d. Total assets  | \$ 309,382    | \$ 280,213    |
| 2. Liabilities - Present Value of Expected Future Benefit Payments                           |               |               |
| a. Active members  |               |               |
| i. Present value of future normal costs  | \$ 32,741     | \$ 23,015     |
| ii. Accrued liability  | 90,251        | 80,103        |
| iii. Total present value of future benefits  | \$ 122,992    | \$ 103,118    |
| b. Present value of benefits payable on account of current retired members and beneficiaries | \$ 183,156    | \$ 171,155    |
| c. Present value of benefits payable on account of current inactive members                  | \$ 3,234      | \$ 5,940      |
| d. Total liabilities   | \$ 309,382    | \$ 280,213    |

**Reconciliation of System Net Assets**  
(Dollar amounts expressed in thousands)

|  | June 30, 2017<br>(1)<br><b>Retirement</b> | June 30, 2017<br>(2)<br><b>Insurance</b> |
|--|---|--|
| 1. Value of assets at beginning of year                  | \$ 217,594                                | \$ 161,366                               |
| 2. Revenue for the year                                  |   |  |
| a. Contributions   |   |  |
| i. Member contributions                                  | \$ 5,348                                  | \$ 131                                   |
| ii. Employer contributions                               | 38,029                                    | 9,222                                    |
| iii. Other contributions (less 401h)                     | 25,210                                    | 0  |
| iii. Total   | \$ 68,587                                 | \$ 9,353                                 |
| b. Income  |   |  |
| i. Interest, dividends, and other income                 | \$ 7,263                                  | \$ 4,896                                 |
| ii. Investment expenses                                  | (1,722)                                   | (1,362)                                  |
| iii. Net   | \$ 5,540                                  | \$ 3,533                                 |
| c. Net realized and unrealized gains (losses)            | 21,156                                    | 18,135                                   |
| d. Total revenue   | \$ 95,284                                 | \$ 31,021                                |
| 3. Expenditures for the year                             |   |  |
| a. Disbursements   |   |  |
| i. Refunds   | \$ 26                                     | \$ 0                                     |
| ii. Regular annuity benefits                             | 56,934                                    | 13,405                                   |
| iii. Other benefit payments                              | 0   | 78                                       |
| iv. Transfers to other systems                           | 0   | 0  |
| v. Total   | \$ 56,960                                 | \$ 13,483                                |
| b. Administrative expenses and depreciation              | 181                                       | 66                                       |
| c. Total expenditures                                    | \$ 57,141                                 | \$ 13,549                                |
| 4. Increase in net assets<br>(Item 2. - Item 3.)         | \$ 38,143                                 | \$ 17,472                                |
| 5. Value of assets at end of year<br>(Item 1. + Item 4.) | \$ 255,737                                | \$ 178,838                               |
| 6. Net external cash flow                                |   |  |
| a. Dollar amount   | \$ 11,446                                 | \$ (4,196)                               |
| b. Percentage of market value                            | 4.8%                                      | -2.5%                                    |
| 7. Estimated annual return on net assets                 | 12.0%                                     | 13.6%                                    |

**Development of Actuarial Value of Assets**  
**Retirement Benefits**  
(Dollar amounts expressed in thousands)\*

| Year Ending   | June 30, 2017  |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
|---|--|--------------------------------|------------------|----------------------|---------|-----------|----------|---------|----------|---------|---------|----------|---------|---------|--------|-------|---------|-------|-----|----------|--|--------|
| 1. Actuarial value of assets at beginning of year   | \$ 234,568   |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| 2. Market value of assets at beginning of year  | \$ 217,594   |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| 3. Net new investments  |  |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| a. Contributions  | \$ 68,587  |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| b. Benefit payments   | (56,960)   |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| c. Administrative expenses  | (181)  |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| d. Subtotal   | \$ 11,446  |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| 4. Market value of assets at end of year  | \$ 255,737   |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| 5. Net earnings (Item 4. - Item 2. - Item 3.d.)   | \$ 26,697  |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| 6. Assumed investment return rate for fiscal year   | 6.75%  |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| 7. Expected return for immediate recognition  | \$ 15,074  |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| 8. Excess return for phased recognition   | \$ 11,623  |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| 9. Phased-in recognition, 20% of excess return on assets for prior years:                       |  |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
|   | <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; vertical-align: bottom;">Fiscal Year<br/>Ending June 30,</th> <th style="text-align: right; vertical-align: bottom;">Excess<br/>Return</th> <th style="text-align: right; vertical-align: bottom;">Recognized<br/>Amount</th> </tr> </thead> <tbody> <tr> <td style="padding-left: 20px;">a. 2017</td> <td style="text-align: right;">\$ 11,623</td> <td style="text-align: right;">\$ 2,325</td> </tr> <tr> <td style="padding-left: 20px;">b. 2016</td> <td style="text-align: right;">(21,455)</td> <td style="text-align: right;">(4,291)</td> </tr> <tr> <td style="padding-left: 20px;">c. 2015</td> <td style="text-align: right;">(16,122)</td> <td style="text-align: right;">(3,224)</td> </tr> <tr> <td style="padding-left: 20px;">d. 2014</td> <td style="text-align: right;">22,202</td> <td style="text-align: right;">4,440</td> </tr> <tr> <td style="padding-left: 20px;">e. 2013</td> <td style="text-align: right;">4,918</td> <td style="text-align: right;">984</td> </tr> <tr> <td style="padding-left: 20px;">f. Total</td> <td></td> <td style="text-align: right; border-top: 1px solid black;">\$ 233</td> </tr> </tbody> </table> | Fiscal Year<br>Ending June 30, | Excess<br>Return | Recognized<br>Amount | a. 2017 | \$ 11,623 | \$ 2,325 | b. 2016 | (21,455) | (4,291) | c. 2015 | (16,122) | (3,224) | d. 2014 | 22,202 | 4,440 | e. 2013 | 4,918 | 984 | f. Total |  | \$ 233 |
| Fiscal Year<br>Ending June 30,  | Excess<br>Return   | Recognized<br>Amount           |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| a. 2017   | \$ 11,623  | \$ 2,325                       |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| b. 2016   | (21,455)   | (4,291)                        |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| c. 2015   | (16,122)   | (3,224)                        |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| d. 2014   | 22,202   | 4,440                          |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| e. 2013   | 4,918  | 984                            |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| f. Total  |  | \$ 233                         |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| 10. Actuarial value of assets as of June 30, 2017<br>(Item 1. + Item 3.d. + Item 7.+ Item 9.f.) | \$ 261,320   |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| 11. Ratio of actuarial value to market value  | 102.2%   |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |
| 12. Estimated annual return on actuarial value of assets  | 6.4%   |                                |                  |                      |         |           |          |         |          |         |         |          |         |         |        |       |         |       |     |          |  |        |

\* Amounts may not add due to rounding

**Development of Actuarial Value of Assets**  
**Insurance Benefits**  
(Dollar amounts expressed in thousands)\*

| Year Ending   | June 30, 2017   |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
|---|---|--------------------------------|--|--------------------------------|------------------------------------|----|------|----------|----------|----|------|----------|---------|----|------|---------|---------|----|------|-------|-------|----|------|-------|-----|----|-------|--|-------|
| 1. Actuarial value of assets at beginning of year   | \$ 172,704  |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| 2. Market value of assets at beginning of year  | \$ 161,366  |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| 3. Net new investments  |   |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| a. Contributions  | \$ 9,353  |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| b. Benefit payments   | (13,483)  |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| c. Administrative expenses  | (66)  |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| d. Subtotal   | \$ (4,196)  |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| 4. Market value of assets at end of year  | \$ 178,838  |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| 5. Net earnings (Item 4. - Item 2. - Item 3.d.)   | \$ 21,668   |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| 6. Assumed investment return rate for fiscal year   | 7.50%   |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| 7. Expected return for immediate recognition  | \$ 11,945   |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| 8. Excess return for phased recognition   | \$ 9,723  |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| 9. Phased-in recognition, 20% of excess return on assets for prior years:                       |   |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
|   | <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;"></th> <th style="text-align: center;"><u>Fiscal Year</u><br/><u>Ending June 30,</u></th> <th style="text-align: center;"><u>Excess</u><br/><u>Return</u></th> <th style="text-align: center;"><u>Recognized</u><br/><u>Amount</u></th> </tr> </thead> <tbody> <tr> <td style="padding-left: 20px;">a.</td> <td style="text-align: center;">2017</td> <td style="text-align: right;">\$ 9,723</td> <td style="text-align: right;">\$ 1,945</td> </tr> <tr> <td style="padding-left: 20px;">b.</td> <td style="text-align: center;">2016</td> <td style="text-align: right;">(12,288)</td> <td style="text-align: right;">(2,458)</td> </tr> <tr> <td style="padding-left: 20px;">c.</td> <td style="text-align: center;">2015</td> <td style="text-align: right;">(9,762)</td> <td style="text-align: right;">(1,952)</td> </tr> <tr> <td style="padding-left: 20px;">d.</td> <td style="text-align: center;">2014</td> <td style="text-align: right;">9,368</td> <td style="text-align: right;">1,874</td> </tr> <tr> <td style="padding-left: 20px;">e.</td> <td style="text-align: center;">2013</td> <td style="text-align: right;">3,015</td> <td style="text-align: right;">603</td> </tr> <tr> <td style="padding-left: 20px;">f.</td> <td style="text-align: center;">Total</td> <td></td> <td style="text-align: right; border-top: 1px solid black;">\$ 11</td> </tr> </tbody> </table> |                                | <u>Fiscal Year</u><br><u>Ending June 30,</u> | <u>Excess</u><br><u>Return</u> | <u>Recognized</u><br><u>Amount</u> | a. | 2017 | \$ 9,723 | \$ 1,945 | b. | 2016 | (12,288) | (2,458) | c. | 2015 | (9,762) | (1,952) | d. | 2014 | 9,368 | 1,874 | e. | 2013 | 3,015 | 603 | f. | Total |  | \$ 11 |
|   | <u>Fiscal Year</u><br><u>Ending June 30,</u>  | <u>Excess</u><br><u>Return</u> | <u>Recognized</u><br><u>Amount</u>           |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| a.  | 2017  | \$ 9,723                       | \$ 1,945                                     |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| b.  | 2016  | (12,288)                       | (2,458)                                      |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| c.  | 2015  | (9,762)                        | (1,952)                                      |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| d.  | 2014  | 9,368                          | 1,874  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| e.  | 2013  | 3,015                          | 603  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| f.  | Total   |                                | \$ 11  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| 10. Actuarial value of assets as of June 30, 2017<br>(Item 1. + Item 3.d. + Item 7.+ Item 9.f.) | \$ 180,464  |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| 11. Ratio of actuarial value to market value  | 100.9%  |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |
| 12. Estimated annual return on actuarial value of assets  | 7.0%  |                                |  |                                |                                    |    |      |          |          |    |      |          |         |    |      |         |         |    |      |       |       |    |      |       |     |    |       |  |       |

\* Amounts may not add due to rounding

**Schedule of Funding Progress**  
(Dollar amounts expressed in thousands)

| June 30,<br>(1)   | Actuarial Value of<br>Assets (AVA)<br>(2) | Actuarial Accrued<br>Liability (AAL)<br>(3) | Unfunded Actuarial<br>Accrued Liability<br>(UAAL) (3) - (2)<br>(4) | Funded Ratio<br>(2)/(3)<br>(5) | Annual Covered<br>Payroll<br>(6) | UAAL as % of<br>Payroll (4)/(6)<br>(7) |
|-------------------|---|---|--|--------------------------------|----------------------------------|--|
| <b>Retirement</b> |   |   |  |                                |                                  |  |
| 2011              | \$ 285,581                                | \$ 634,379                                  | \$ 348,799   | 45.0%                          | \$ 48,693                        | 716.3%                                 |
| 2012              | 259,792                                   | 647,689                                     | 387,897  | 40.1%                          | 48,373                           | 801.9%                                 |
| 2013              | 241,800                                   | 651,581                                     | 409,780  | 37.1%                          | 45,256                           | 905.5%                                 |
| 2014              | 242,742                                   | 681,118                                     | 438,377  | 35.6%                          | 44,616                           | 982.6%                                 |
| 2015              | 248,388                                   | 734,156                                     | 485,769  | 33.8%                          | 45,765                           | 1061.4%                                |
| 2016              | 234,568                                   | 775,160                                     | 540,593  | 30.3%                          | 45,551                           | 1186.8%                                |
| 2017              | 261,320                                   | 967,145                                     | 705,825  | 27.0%                          | 48,598                           | 1452.4%                                |
| <b>Insurance</b>  |   |   |  |                                |                                  |  |
| 2011              | \$ 123,687                                | \$ 438,428                                  | \$ 314,741   | 28.2%                          | \$ 48,693                        | 646.4%                                 |
| 2012              | 124,372                                   | 333,904                                     | 209,532  | 37.2%                          | 48,373                           | 433.2%                                 |
| 2013              | 136,321                                   | 222,327                                     | 86,006   | 61.3%                          | 45,256                           | 190.0%                                 |
| 2014              | 155,595                                   | 234,271                                     | 78,676   | 66.4%                          | 44,616                           | 176.3%                                 |
| 2015              | 167,775                                   | 254,839                                     | 87,064   | 65.8%                          | 45,765                           | 190.2%                                 |
| 2016              | 172,704                                   | 257,197                                     | 84,493   | 67.1%                          | 45,551                           | 185.5%                                 |
| 2017              | 180,464                                   | 276,641                                     | 96,177   | 65.2%                          | 48,598                           | 197.9%                                 |

## Summary of Principal Assumptions and Methods

Below is a summary of the principal economic assumptions, cost method, and the method for financing the unfunded actuarial accrued liability:

|  |  |
|--|--|
| Valuation date:                            | June 30, 2017  |
| Actuarial cost method:                     | Entry Age Normal   |
| Amortization method:                       | Level percentage of payroll<br>(0% payroll growth assumed)   |
| Amortization period for contribution rate: | 26-year closed period  |
| Asset valuation method:                    | 5-Year Smoothed Market   |
| Actuarial assumptions:                     |  |
| Investment rate of return                  | 5.25%  |
| Projected salary increases                 | 3.05% to 15.55%<br>(varies by service)   |
| Inflation                                  | 2.30%  |
| Post-retirement benefit adjustments        | 0.00%  |
| Retiree Mortality                          | RP-2000 Combined Mortality Table<br>for Males and Females, projected<br>using scale BB to 2013<br>(set back one year for females). |

**Solvency Test**  
(Dollar amounts expressed in thousands)

| June 30,          | Actuarial Accrued Liability       |                                       |  |  | Valuation<br>Assets | Portion of Aggregate Accrued<br>Liabilities Covered by Assets |         |             |
|-------------------|-----------------------------------|---------------------------------------|--|--|---------------------|---|---------|-------------|
|                   | Active<br>Member<br>Contributions | Retired<br>Members &<br>Beneficiaries | Active<br>Members<br>(Employer Financed) |  |                     | Active  | Retired | ER Financed |
|                   | (1)                               | (2)                                   | (3)                                      |  |                     | (4)   | (5)     | (6)         |
| <b>Retirement</b> |                                   |                                       |  |  |                     |   |         |             |
| 2008              | \$ 41,391                         | \$ 426,311                            | \$ 119,426                               |  | \$ 350,891          | 100.0%  | 72.6%   | 0.0%        |
| 2009              | 41,664                            | 459,585                               | 101,079                                  |  | 329,967             | 100.0%  | 62.7%   | 0.0%        |
| 2010              | 42,012                            | 475,893                               | 94,541                                   |  | 304,577             | 100.0%  | 55.2%   | 0.0%        |
| 2011              | 43,574                            | 499,194                               | 91,611                                   |  | 285,581             | 100.0%  | 48.5%   | 0.0%        |
| 2012              | 41,139                            | 523,017                               | 83,533                                   |  | 259,792             | 100.0%  | 41.8%   | 0.0%        |
| 2013              | 39,788                            | 535,720                               | 76,072                                   |  | 241,800             | 100.0%  | 37.7%   | 0.0%        |
| 2014              | 41,831                            | 563,011                               | 76,276                                   |  | 242,742             | 100.0%  | 35.7%   | 0.0%        |
| 2015              | 41,567                            | 605,855                               | 86,734                                   |  | 248,388             | 100.0%  | 34.1%   | 0.0%        |
| 2016              | 41,871                            | 636,499                               | 96,791                                   |  | 234,568             | 100.0%  | 30.3%   | 0.0%        |
| 2017              | 44,798                            | 773,982                               | 148,365                                  |  | 261,320             | 100.0%  | 28.0%   | 0.0%        |
| <b>Insurance</b>  |                                   |                                       |  |  |                     |   |         |             |
| 2008              | \$ -                              | \$ 178,655                            | \$ 266,452                               |  | \$ 123,961          | 100.0%  | 69.4%   | 0.0%        |
| 2009              | -                                 | 167,091                               | 196,940                                  |  | 123,527             | 100.0%  | 73.9%   | 0.0%        |
| 2010              | -                                 | 253,581                               | 181,380                                  |  | 121,175             | 100.0%  | 47.8%   | 0.0%        |
| 2011              | -                                 | 252,440                               | 185,988                                  |  | 123,687             | 100.0%  | 49.0%   | 0.0%        |
| 2012              | -                                 | 190,259                               | 143,645                                  |  | 124,372             | 100.0%  | 65.4%   | 0.0%        |
| 2013              | -                                 | 139,509                               | 82,818                                   |  | 136,321             | 100.0%  | 97.7%   | 0.0%        |
| 2014              | -                                 | 143,402                               | 90,869                                   |  | 155,595             | 100.0%  | 100.0%  | 13.4%       |
| 2015              | -                                 | 170,447                               | 84,392                                   |  | 167,775             | 100.0%  | 98.4%   | 0.0%        |
| 2016              | -                                 | 177,094                               | 80,103                                   |  | 172,704             | 100.0%  | 97.5%   | 0.0%        |
| 2017              | -                                 | 186,390                               | 90,251                                   |  | 180,464             | 100.0%  | 96.8%   | 0.0%        |

# SECTION 4

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## MEMBERSHIP INFORMATION

## Membership Tables

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**Summary of Membership Data**  
(Total dollar amounts expressed in thousands)

|   |    | June 30, 2017 |
|---|----|---------------|
|   |    | (1)           |
| 1. Active members                           |    |               |
| a. Males                                    |    | 873           |
| b. Females                                  |    | 30            |
| c. Total members                            |    | 903           |
| d. Total annualized prior year salaries     | \$ | 48,598        |
| e. Average salary                           | \$ | 53,819        |
| f. Average age                              |    | 37.5          |
| g. Average service                          |    | 10.6          |
| h. Member contributions with interest       | \$ | 44,798        |
| i. Average contributions with interest      | \$ | 49,610        |
| 2. Vested inactive members                  |    |               |
| a. Number                                   |    | 86            |
| b. Total annual deferred benefits           | \$ | 762           |
| c. Average annual deferred benefit          | \$ | 8,860         |
| d. Average age at the valuation date        |    | 42.5          |
| 3. Nonvested inactive members               |    |               |
| a. Number                                   |    | 394           |
| b. Total member contributions with interest | \$ | 520           |
| c. Average contributions with interest      | \$ | 1,320         |
| 4. Service retirees                         |    |               |
| a. Number                                   |    | 1,279         |
| b. Total annual benefits                    | \$ | 50,871        |
| c. Average annual benefit                   | \$ | 39,774        |
| d. Average age at the valuation date        |    | 62.7          |
| 5. Disabled retirees                        |    |               |
| a. Number                                   |    | 53            |
| b. Total annual benefits                    | \$ | 968           |
| c. Average annual benefit                   | \$ | 18,264        |
| d. Average age at the valuation date        |    | 59.2          |
| 6. Beneficiaries                            |    |               |
| a. Number                                   |    | 204           |
| b. Total annual benefits                    | \$ | 5,414         |
| c. Average annual benefit                   | \$ | 26,539        |
| d. Average age at the valuation date        |    | 65.6          |

## Summary of Historical Active Membership

| June 30,<br>(1) | Active Members |   | Covered Payroll               |   | Average Annual Pay |   |
|-----------------|----------------|---|-------------------------------|---|--------------------|---|
|                 | Number<br>(2)  | Percent<br>Increase<br>/(Decrease)<br>(3) | Amount in<br>Thousands<br>(4) | Percent<br>Increase<br>/(Decrease)<br>(5) | Amount<br>(6)      | Percent<br>Increase<br>/(Decrease)<br>(7) |
| 2011            | 965            |   | \$ 48,693                     |   | \$ 50,459          | -5.9%                                     |
| 2012            | 907            | -6.0%                                     | 48,373                        | -0.7%                                     | 53,333             | 5.7%                                      |
| 2013            | 902            | -0.6%                                     | 45,256                        | -6.4%                                     | 50,173             | -5.9%                                     |
| 2014            | 855            | -5.2%                                     | 44,616                        | -1.4%                                     | 52,182             | 4.0%                                      |
| 2015            | 937            | 9.6%                                      | 45,765                        | 2.6%                                      | 48,842             | -6.4%                                     |
| 2016            | 908            | -3.1%                                     | 45,551                        | -0.5%                                     | 50,166             | 2.7%                                      |
| 2017            | 903            | -0.6%                                     | 48,598                        | 6.7%                                      | 53,818             | 7.3%                                      |

**Distribution of Active Members by Age and by Years of Service**  
**SPRS Members**

| Attained Age | Years of Credited Service |                       |                        |                      |                       |                        |                        |                        |                       |                       |                      |                      | Total Count & Avg. Comp. |
|--------------|---------------------------|-----------------------|------------------------|----------------------|-----------------------|------------------------|------------------------|------------------------|-----------------------|-----------------------|----------------------|----------------------|--------------------------|
|              | 0                         | 1                     | 2                      | 3                    | 4                     | 5-9                    | 10-14                  | 15-19                  | 20-24                 | 25-29                 | 30-34                | 35 & Over            |                          |
|              | Count & Avg. Comp.        | Count & Avg. Comp.    | Count & Avg. Comp.     | Count & Avg. Comp.   | Count & Avg. Comp.    | Count & Avg. Comp.     | Count & Avg. Comp.     | Count & Avg. Comp.     | Count & Avg. Comp.    | Count & Avg. Comp.    | Count & Avg. Comp.   | Count & Avg. Comp.   | Count & Avg. Comp.       |
| Under 20     | 0<br>\$0                  | 0<br>\$0              | 0<br>\$0               | 0<br>\$0             | 0<br>\$0              | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 0<br>\$0              | 0<br>\$0              | 0<br>\$0             | 0<br>\$0             | 0<br>\$0                 |
| 20-24        | 0<br>\$0                  | 12<br>\$40,371        | 6<br>\$43,380          | 0<br>\$0             | 0<br>\$0              | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 0<br>\$0              | 0<br>\$0              | 0<br>\$0             | 0<br>\$0             | 0<br>\$0                 |
| 25-29        | 25<br>\$22,825            | 18<br>\$40,529        | 55<br>\$44,672         | 0<br>\$0             | 25<br>\$48,998        | 17<br>\$51,062         | 0<br>\$0               | 0<br>\$0               | 0<br>\$0              | 0<br>\$0              | 0<br>\$0             | 0<br>\$0             | 0<br>\$0                 |
| 30-34        | 20<br>\$16,057            | 6<br>\$40,948         | 29<br>\$45,202         | 1<br>\$39,698        | 22<br>\$47,655        | 100<br>\$51,068        | 10<br>\$56,122         | 0<br>\$0               | 0<br>\$0              | 0<br>\$0              | 0<br>\$0             | 0<br>\$0             | 0<br>\$0                 |
| 35-39        | 9<br>\$22,827             | 0<br>\$0              | 6<br>\$45,436          | 0<br>\$0             | 3<br>\$49,809         | 49<br>\$49,915         | 80<br>\$56,411         | 26<br>\$60,343         | 0<br>\$0              | 0<br>\$0              | 0<br>\$0             | 0<br>\$0             | 0<br>\$0                 |
| 40-44        | 2<br>\$22,149             | 0<br>\$0              | 5<br>\$45,211          | 0<br>\$0             | 5<br>\$48,158         | 30<br>\$51,595         | 51<br>\$56,493         | 81<br>\$64,186         | 27<br>\$72,557        | 2<br>\$69,627         | 0<br>\$0             | 0<br>\$0             | 0<br>\$0                 |
| 45-49        | 2<br>\$22,149             | 0<br>\$0              | 1<br>\$64,883          | 0<br>\$0             | 0<br>\$0              | 4<br>\$50,882          | 25<br>\$54,766         | 51<br>\$63,631         | 42<br>\$75,548        | 9<br>\$81,048         | 0<br>\$0             | 0<br>\$0             | 0<br>\$0                 |
| 50-54        | 0<br>\$0                  | 0<br>\$0              | 0<br>\$0               | 0<br>\$0             | 0<br>\$0              | 4<br>\$51,067          | 8<br>\$58,215          | 6<br>\$66,255          | 9<br>\$75,995         | 6<br>\$77,682         | 0<br>\$0             | 0<br>\$0             | 0<br>\$0                 |
| 55-59        | 0<br>\$0                  | 0<br>\$0              | 0<br>\$0               | 0<br>\$0             | 0<br>\$0              | 1<br>\$50,718          | 5<br>\$55,218          | 3<br>\$57,405          | 0<br>\$0              | 0<br>\$0              | 1<br>\$93,660        | 0<br>\$0             | 0<br>\$0                 |
| 60-64        | 0<br>\$0                  | 0<br>\$0              | 0<br>\$0               | 0<br>\$0             | 0<br>\$0              | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 1<br>\$76,333         | 0<br>\$0              | 1<br>\$93,357        | 1<br>\$80,489        | 1<br>\$83,393            |
| 65 & Over    | 0<br>\$0                  | 0<br>\$0              | 0<br>\$0               | 0<br>\$0             | 0<br>\$0              | 0<br>\$0               | 0<br>\$0               | 0<br>\$0               | 0<br>\$0              | 0<br>\$0              | 0<br>\$0             | 1<br>\$87,068        | 1<br>\$87,068            |
| <b>Total</b> | <b>58</b><br>\$20,445     | <b>36</b><br>\$40,546 | <b>102</b><br>\$45,016 | <b>1</b><br>\$39,698 | <b>55</b><br>\$48,428 | <b>205</b><br>\$50,864 | <b>179</b><br>\$56,236 | <b>167</b><br>\$63,371 | <b>79</b><br>\$74,586 | <b>17</b><br>\$78,517 | <b>2</b><br>\$93,509 | <b>2</b><br>\$83,779 | <b>903</b><br>\$53,819   |

**Distribution of Annuitant Monthly Benefit by Status and Age  
Retirees and Beneficiaries  
(Dollar amounts expressed in thousands)**

| Current Age<br>(1) | Retirement                  |                                    | Disability                  |                                    | Survivors & Beneficiaries   |                                    | Total                       |                                    |
|--------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|
|                    | Number of Annuitants<br>(2) | Total Annual Benefit Amount<br>(3) | Number of Annuitants<br>(4) | Total Annual Benefit Amount<br>(5) | Number of Annuitants<br>(6) | Total Annual Benefit Amount<br>(7) | Number of Annuitants<br>(8) | Total Annual Benefit Amount<br>(9) |
| Under 50           | 180                         | \$ 6,808                           | 15                          | \$ 300                             | 31                          | \$ 442                             | 226                         | \$ 7,550                           |
| 50 - 54            | 169                         | 6,693                              | 6                           | 92                                 | 7                           | 112                                | 182                         | 6,897                              |
| 55 - 59            | 159                         | 6,625                              | 6                           | 111                                | 12                          | 278                                | 177                         | 7,014                              |
| 60 - 64            | 190                         | 8,004                              | 9                           | 111                                | 22                          | 511                                | 221                         | 8,626                              |
| 65 - 69            | 280                         | 11,130                             | 6                           | 135                                | 30                          | 798                                | 316                         | 12,063                             |
| 70 - 74            | 151                         | 5,969                              | 6                           | 111                                | 38                          | 1,122                              | 195                         | 7,202                              |
| 75 - 79            | 84                          | 2,909                              | 2                           | 45                                 | 19                          | 691                                | 105                         | 3,645                              |
| 80 - 84            | 41                          | 1,577                              | 3                           | 64                                 | 24                          | 784                                | 68                          | 2,425                              |
| 85 - 89            | 21                          | 918                                | 0                           | -                                  | 17                          | 580                                | 38                          | 1,498                              |
| 90 And Over        | 4                           | 238                                | 0                           | -                                  | 4                           | 95                                 | 8                           | 333                                |
| <b>Total</b>       | <b>1,279</b>                | <b>\$ 50,871</b>                   | <b>53</b>                   | <b>\$ 968</b>                      | <b>204</b>                  | <b>\$ 5,414</b>                    | <b>1,536</b>                | <b>\$ 57,253</b>                   |

## Retired Lives Summary

| Form of Payment<br>(1)          | Male Lives    |                                  | Female Lives  |                                  | Total         |                                  |
|---------------------------------|---------------|----------------------------------|---------------|----------------------------------|---------------|----------------------------------|
|                                 | Number<br>(2) | Monthly<br>Benefit Amount<br>(3) | Number<br>(4) | Monthly<br>Benefit Amount<br>(5) | Number<br>(6) | Monthly<br>Benefit Amount<br>(7) |
| Basic                           | 145           | \$ 435,328                       | 15            | \$ 46,122                        | 160           | \$ 481,450                       |
| Joint & Survivor:               |               |                                  |               |                                  |               |                                  |
| 100% to Beneficiary             | 140           | 456,888                          | 1             | 4,814                            | 141           | 461,702                          |
| 66 2/3% to Beneficiary          | 87            | 332,233                          | 2             | 7,542                            | 89            | 339,775                          |
| 50% to Beneficiary              | 82            | 294,980                          | 1             | 2,605                            | 83            | 297,585                          |
| Pop-up Option                   | 582           | 2,063,324                        | 4             | 10,805                           | 586           | 2,074,130                        |
| Social Security Option:         |               |                                  |               |                                  |               |                                  |
| Age 62 Basic                    | 30            | 75,359                           | 0             | 0                                | 30            | 75,359                           |
| Age 62 Survivorship             | 121           | 232,365                          | 1             | 5,287                            | 122           | 237,652                          |
| Partial Deferred (Old Plan)     | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Widows Age 60                   | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 5 Years Certain                 | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 10 Years Certain                | 5             | 16,014                           | 0             | 0                                | 5             | 16,014                           |
| 10 Years Certain & Life         | 34            | 112,610                          | 3             | 6,759                            | 37            | 119,369                          |
| 15 Years Certain & Life         | 17            | 47,678                           | 1             | 3,919                            | 18            | 51,597                           |
| 20 Years Certain & Life         | 38            | 117,233                          | 2             | 3,979                            | 40            | 121,211                          |
| Refund                          | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Partial Lump Sum Option (PLSO): |               |                                  |               |                                  |               |                                  |
| 12 Month Basic                  | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 24 Month Basic                  | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 36 Month Basic                  | 0             | 0                                | 2             | 466                              | 2             | 466                              |
| 12 Month Survivor               | 6             | 20,781                           | 0             | 0                                | 6             | 20,781                           |
| 24 Month Survivor               | 4             | 5,953                            | 0             | 0                                | 4             | 5,953                            |
| 36 Month Survivor               | 9             | 16,914                           | 0             | 0                                | 9             | 16,914                           |
| <b>Total:</b>                   | <b>1,300</b>  | <b>\$ 4,227,662</b>              | <b>32</b>     | <b>\$ 92,297</b>                 | <b>1,332</b>  | <b>\$ 4,319,959</b>              |

## Beneficiary Lives Summary

| Form of Payment<br>(1)          | Male Lives    |                                  | Female Lives  |                                  | Total         |                                  |
|---------------------------------|---------------|----------------------------------|---------------|----------------------------------|---------------|----------------------------------|
|                                 | Number<br>(2) | Monthly<br>Benefit Amount<br>(3) | Number<br>(4) | Monthly<br>Benefit Amount<br>(5) | Number<br>(6) | Monthly<br>Benefit Amount<br>(7) |
| Basic                           | 2             | \$ 820                           | 7             | \$ 5,405                         | 9             | \$ 6,225                         |
| Joint & Survivor:               |               |                                  |               |                                  |               |                                  |
| 100% to Beneficiary             | 7             | 8,333                            | 58            | 153,735                          | 65            | 162,068                          |
| 66 2/3% to Beneficiary          | 3             | 2,775                            | 11            | 22,098                           | 14            | 24,874                           |
| 50% to Beneficiary              | 3             | 6,341                            | 16            | 22,951                           | 19            | 29,292                           |
| Pop-up Option                   | 7             | 19,746                           | 36            | 96,976                           | 43            | 116,722                          |
| Social Security Option:         |               |                                  |               |                                  |               |                                  |
| Age 62 Basic                    | 0             | 0                                | 2             | 2,281                            | 2             | 2,281                            |
| Age 62 Survivorship             | 1             | 3,897                            | 41            | 80,941                           | 42            | 84,838                           |
| Partial Deferred (Old Plan)     | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Widows Age 60                   | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 5 Years Certain                 | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 10 Years Certain                | 1             | 2,038                            | 1             | 2,038                            | 2             | 4,076                            |
| 10 Years Certain & Life         | 0             | 0                                | 1             | 389                              | 1             | 389                              |
| 15 Years Certain & Life         | 0             | 0                                | 1             | 721                              | 1             | 721                              |
| 20 Years Certain & Life         | 1             | 6,686                            | 4             | 5,611                            | 5             | 12,297                           |
| Refund                          | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| Partial Lump Sum Option (PLSO): |               |                                  |               |                                  |               |                                  |
| 12 Month Basic                  | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 24 Month Basic                  | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 36 Month Basic                  | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 12 Month Survivor               | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| 24 Month Survivor               | 0             | 0                                | 1             | 7,351                            | 1             | 7,351                            |
| 36 Month Survivor               | 0             | 0                                | 0             | 0                                | 0             | 0                                |
| <b>Total:</b>                   | <b>25</b>     | <b>\$ 50,636</b>                 | <b>179</b>    | <b>\$ 400,499</b>                | <b>204</b>    | <b>\$ 451,135</b>                |

**Schedule of Retirants Added to And Removed from Rolls**  
(Dollar amounts except average allowance expressed in thousands)

| Year Ended | Added to Rolls | Removed from Rolls | Rolls End of the Year |                     | % Increase in Annual Benefit | Average Annual Benefit |
|------------|----------------|--------------------|-----------------------|---------------------|------------------------------|------------------------|
| (1)        | Number (2)     | Number (3)         | Number (4)            | Annual Benefits (5) | (6)                          | (7)                    |
| 2011       | 52             | 12                 | 1,263                 | \$ 47,467           |                              | \$ 37,583              |
| 2012       | 52             | 16                 | 1,299                 | 49,887              | 5.1%                         | 38,404                 |
| 2013       | 63             | 16                 | 1,346                 | 50,906              | 2.0%                         | 37,820                 |
| 2014       | 95             | 28                 | 1,413                 | 53,432              | 5.0%                         | 37,815                 |
| 2015       | 62             | 15                 | 1,460                 | 54,930              | 2.8%                         | 37,623                 |
| 2016       | 65             | 10                 | 1,515                 | 56,650              | 3.1%                         | 37,393                 |
| 2017       | 30             | 9                  | 1,536                 | 57,253              | 1.1%                         | 37,274                 |

## **APPENDIX A**

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### **ACTUARIAL ASSUMPTIONS AND METHODS**

## Summary of Actuarial Methods and Assumptions

The following presents a summary of the actuarial assumptions and methods used in the valuation of the State Police Retirement System.

**In general, the assumptions and methods used in the valuation are based on the actuarial experience study for the five-year period ending June 30, 2013, submitted April 30, 2014, and adopted by the Board on December 4, 2014. The investment return, price inflation, and payroll growth assumption were adopted by the Board in May and July 2017 for use with the June 30, 2017 valuation in order to reflect future economic expectations.**

### *Investment return rate:*

Assumed annual rate of 5.25% net of investment expenses for the retirement fund

Assumed annual rate of 6.25% net of investment expenses for the insurance fund

### *Price Inflation:*

Assumed annual rate of 2.30%

### *Rates of Annual Salary Increase:*

Assumed rates of annual salary increases are shown below.

| Service Years | Annual Rates of Salary Increases |                                |                |
|---------------|----------------------------------|--------------------------------|----------------|
|               | Merit & Seniority                | Price Inflation & Productivity | Total Increase |
| 0             | 12.50%                           | 3.05%                          | 15.55%         |
| 1             | 7.50%                            | 3.05%                          | 10.55%         |
| 2             | 5.50%                            | 3.05%                          | 8.55%          |
| 3             | 4.50%                            | 3.05%                          | 7.55%          |
| 4             | 3.50%                            | 3.05%                          | 6.55%          |
| 5             | 2.50%                            | 3.05%                          | 5.55%          |
| 6             | 2.00%                            | 3.05%                          | 5.05%          |
| 7             | 2.00%                            | 3.05%                          | 5.05%          |
| 8             | 1.00%                            | 3.05%                          | 4.05%          |
| 9             | 0.50%                            | 3.05%                          | 3.55%          |
| 10 & Over     | 0.00%                            | 3.05%                          | 3.05%          |

*Retirement rates:*

Assumed annual rates of retirement are shown below. Rates are only applicable for members who are eligible for a service retirement.

| Service | Members participating before 9/1/2008 <sup>1</sup> | Members participating on or after 9/1/2008 <sup>2</sup> |
|---------|--|---|
| 20      | 22.0%  |   |
| 21      | 22.0%  |   |
| 22      | 22.0%  |   |
| 23      | 28.0%  |   |
| 24      | 28.0%  |   |
| 25      | 28.0%  | 22.0%   |
| 26      | 28.0%  | 22.0%   |
| 27      | 28.0%  | 22.0%   |
| 28      | 44.0%  | 28.0%   |
| 29      | 44.0%  | 28.0%   |
| 30      | 44.0%  | 28.0%   |
| 31      | 58.0%  | 28.0%   |
| 32      | 58.0%  | 28.0%   |
| 33      | 58.0%  | 44.0%   |
| 34      | 58.0%  | 44.0%   |
| 35      | 58.0%  | 44.0%   |
| 36      | 58.0%  | 58.0%   |
| 37      | 58.0%  | 58.0%   |
| 38      | 58.0%  | 58.0%   |
| 39      | 58.0%  | 58.0%   |
| 40      | 58.0%  | 58.0%   |

<sup>1</sup> The annual rate of service retirement is 100% at age 55.

<sup>2</sup> The annual rate of service retirement is 100% at age 60.

*Disability rates:*

An abbreviated table with assumed rates of disability is show below.

| Age | Annual Rates of Disability |        |
|-----|----------------------------|--------|
|     | Male                       | Female |
| 20  | 0.05%                      | 0.05%  |
| 30  | 0.09%                      | 0.09%  |
| 40  | 0.20%                      | 0.20%  |
| 50  | 0.56%                      | 0.56%  |
| 60  | 1.46%                      | 1.46%  |

*Withdrawal rates (for causes other than death, disability or retirement):*

Assumed annual rates of withdrawal are shown below.

| Service  | Annual Rates of Withdrawal |
|----------|----------------------------|
| 0        | 20.00%                     |
| 1        | 7.00%                      |
| 2-8      | 3.00%                      |
| 9 & Over | 2.50%                      |

*Mortality Assumption:*

Pre-retirement mortality: RP-2000 Combined Mortality Table projected with Scale BB to 2013. Male mortality rates are multiplied by 50% and female mortality rates are multiplied by 30%.

Post-retirement mortality (non-disabled): RP-2000 Combined Mortality Table projected with Scale BB to 2013. Female mortality rates are set back one year.

Post-retirement mortality (disabled): RP-2000 Combined Disabled Mortality Table projected with Scale BB to 2013. Male mortality rates are set back four years.

At the time of the last experience study performed as of June 30, 2013, this mortality assumption provided 37% and 19% margin for future improvement for males and females, respectively.

*Marital status:*

100% of employees are assumed to be married, with the female spouse 3 years younger than the male spouse.

*Line of Duty Disability*

0% of disabilities are assumed to occur in the line of duty

*Line of Duty Death*

25% of deaths are assumed to occur in the line of duty

*Dependent Children:*

For members in the Hazardous Plan who receive a duty-related death benefit, the member is assumed to be survived by two dependent children, each age 6 with payments for 15 years.

*Form of Payment:*

Members are assumed to elect a life-only annuity at retirement.

*Actuarial Cost Method:*

Entry Age Normal, Level Percentage of Pay. The Entry Age Normal actuarial cost method allocates the System's actuarial present value of future benefits to various periods based upon service. The portion of the present value of future benefits allocated to years of service prior to the valuation date is the actuarial accrued liability, and the portion allocated to years following the valuation date is the present value of future normal costs. The normal cost is determined for each active member as the level percent of pay necessary to fully fund the expected benefits to be earned over the career of each individual active member. The normal cost is partially funded with active member contributions with the remainder funded by employer contributions.

*Health Care Age Related Morbidity/Claims Utilization:*

To model the impact of aging on the underlying health care costs for Medicare retirees, the valuation relied on the Society of Actuaries' 2013 Study "Health Care Costs – From Birth to Death". Table 4 (Development of Plan Specific Medicare Age Curve) was used to model the impact of aging for ages 65 and over.

Health Care Cost Trend Rates<sup>1</sup>:

| Year          | Non-Medicare Plans | Medicare Plans | Dollar Contribution <sup>2</sup> |
|---------------|--------------------|----------------|----------------------------------|
| 2019          | 7.25%              | 5.10%          | 1.50%                            |
| 2020          | 7.00%              | 5.00%          | 1.50%                            |
| 2021          | 6.75%              | 4.90%          | 1.50%                            |
| 2022          | 6.50%              | 4.80%          | 1.50%                            |
| 2023          | 6.25%              | 4.70%          | 1.50%                            |
| 2024          | 6.00%              | 4.60%          | 1.50%                            |
| 2025          | 5.75%              | 4.50%          | 1.50%                            |
| 2026          | 5.50%              | 4.40%          | 1.50%                            |
| 2027          | 5.25%              | 4.30%          | 1.50%                            |
| 2028          | 5.00%              | 4.20%          | 1.50%                            |
| 2029          | 4.75%              | 4.10%          | 1.50%                            |
| 2030          | 4.50%              | 4.05%          | 1.50%                            |
| 2031          | 4.25%              | 4.05%          | 1.50%                            |
| 2032 & Beyond | 4.05%              | 4.05%          | 1.50%                            |

<sup>1</sup>All increases are assumed to occur on January 1. The 2018 premiums were known at the time of the valuation and were incorporated into the liability measurement using a trend of 1.232% for Non-Medicare plans and a trend of 0.00% for Medicare plans at January 1, 2018.

<sup>2</sup>Applies to members participating on or after July 1, 2003

Health care trend assumptions are based on the model issued by the Society of Actuaries "Getzen model of Long-Run Medical Cost Trends for the SOA; Thomas E. Getzen, iHEA and Temple University 2014 © Society of Actuaries.

The underlying assumptions used to develop the health care trend rates include:

- A short run period-this is a period for which anticipated health care trend rates are manually set based on local information as well as plan-specific and carrier information.
- Long term real GDP growth- 1.75%
- Long term rate of inflation- 2.30%
- Long term nominal GDP growth – 4.05%
- Year that excess rate converges to 0- 15 years from the valuation

Health care trend rates are thus the manually set rates for the short run period and rates which decline to an ultimate trend rate which equals the assumed nominal long term GDP growth rate.

*Health Care Participation Assumptions:*

- Members are assumed to elect health coverage at retirement at the following participation rates.

| Service at Retirement | Members participating before 7/1/2003* | Members participating between 7/1/2003 and 9/1/2008 | Members participating after 9/1/2008 |
|-----------------------|--|---|--------------------------------------|
| Under 10              | 50%                                    | 100%  | 100%                                 |
| 10-14                 | 75%                                    | 100%  | 100%                                 |
| 15-19                 | 90%                                    | 100%  | 100%                                 |
| Over 20               | 100%                                   | 100%  | 100%                                 |

\* 100% of members with a duty disability or a duty death (in service) benefit are assumed to elect coverage at retirement.

- Future retirees are assumed to have a similar distribution by plan type as the current retirees.

| Medicare Plan | June 30, 2017 Participation* |
|---------------|------------------------------|
| Medical Only  | 7%                           |
| Essential     | 8%                           |
| Premium       | 84%                          |

\* May not add due to rounding

| Non-Medicare Plan | June 30, 2017 Participation |
|-------------------|-----------------------------|
| Standard PPO      | 14%                         |
| Standard CDHP     | 2%                          |
| LivingWell CDHP   | 22%                         |
| LivingWell PPO    | 62%                         |

- 50% of deferred vested members participating before July 1, 2003 are assumed to elect health coverage at retirement. 100% of deferred vested members participating after July 1, 2003 are assumed to elect health coverage at retirement. Deferred vested members with non-hazardous service are assumed to begin health coverage at age 55 for members participating before September 1, 2008, and at age 60 for members participating on or after September 1, 2008. Deferred vested members with hazardous service are assumed to begin health coverage at age 50.
- 50% of future retirees, with hazardous service, are assumed to elect spouse health care coverage. No dependent coverage is assumed for members who only have non-hazardous service. 100% of spouses with health care coverage are assumed to continue coverage after the member's death.

### *Excise (“Cadillac”) Tax:*

For taxable years beginning after December 31, 2019, a 40% excise tax will be required to be paid (by the employer and/or insurer) on the aggregate cost of the health plan in excess of certain legislated thresholds. For 2018, the thresholds are \$850 per month for individual coverage and \$2,292 per month for family coverage.

Both Actuarial Standard of Practice No. 6 and GASB Statement Nos. 74 and 75 reference this tax, and, in accordance with these standards an estimate of the impact of the Cadillac tax has been included in this valuation.

Assumptions and methods used to determine the impact of the Cadillac Tax include:

- 2018 thresholds of \$850/\$2,292 were indexed annually by 2.30%.
- Premium data submitted was not adjusted for permissible exclusions to the Cadillac Tax.
- There were no special adjustments to the dollar limit other than those permissible for non-Medicare retirees over 55.

In this valuation, the impact of the Cadillac Tax has been calculated by increasing the employer paid premiums for Non-Medicare retirees, who became participants before July 1, 2003, by 3.6%. Non-Medicare retirees who became participants after July 1, 2003 receive dollar subsidies per year of service, which are not expected to exceed the overall Non-Medicare premiums. As a result, the costs attributable to the Cadillac Tax for members who became participants after July 1, 2003 will be paid by the retirees.

### *Changes in Assumptions since the prior valuation:*

1. The assumed investment return was changed from 6.75% to 5.25% for the retirement fund and from 7.50% to 6.25% for the insurance fund.
2. The price inflation assumption was changed from 3.25% to 2.30%, which also resulted in a 0.95% decrease in the salary increase assumption at all years of service and a 0.95% decrease in the health care cost trend rates.
3. The amortization method for unfunded accrued liabilities was changed to a level dollar basis (which is then converted to a percentage of expected covered payroll) from a level percentage of pay basis.

## Development of Baseline Claims Cost

For non-Medicare retirees, the initial per capita costs were based on the plan premiums effective January 1, 2017, and are used for both current and future retirees. An inherent assumption in this methodology is that the projected future retirees will have a similar distribution by plan type as the current retirees. The spouse/dependent premium of \$862.64 for non-Medicare retirees is based on a blending of Family and Couple premiums for the current retirees that have over 4 years of hazardous service. The fully-insured premiums KRS pays the Kentucky Employees' Health Plan (KEHP) are blended rates based on the combined experience of active and retired members. Because the average cost of providing health care benefits to retirees under age 65 is higher than the average cost of providing health care benefits to active employees, there is an implicit rate subsidy for the non-Medicare eligible retirees. Actuarial Standard of Practice No. 6 (ASOP No. 6) requires aging subsidies (or implicit rate subsidies) to be recognized. However, the KRS health insurance trusts are only used to reimburse KEHP for the employer's portion of the blended premiums. Said another way, the trusts are not used to fund the difference between the underlying retiree claims and the blended KEHP premiums. As a result, the retiree health care liabilities developed in this report for the non-Medicare retirees are based solely on the premiums charged by KEHP, without any age-adjustment. GASB Statements No. 74 and No. 75 prohibit such a deviation from ASOP No. 6. The liabilities developed in this report are solely for the purpose of funding the benefits paid by the health insurance funds and are not appropriate for financial statement disclosures required by GASB. GRS provides separate GASB reports to KRS which include the liabilities associated with the implicit rate subsidy.

| <b>FOR THOSE NOT ELIGIBLE FOR MEDICARE</b> |               |                          |
|--|---------------|--------------------------|
| <b>AGE</b>                                 | <b>MEMBER</b> | <b>SPOUSE/DEPENDENTS</b> |
| <65  | \$711.22      | \$862.64                 |

For Medicare retirees, the initial per capita costs were estimated based on the plan premiums effective January 1, 2017, and are used for both current and future retirees. An inherent assumption in this methodology is that the projected future retirees will have a similar distribution by plan type as the current retirees. Age graded and sex distinct premiums are utilized for retirees over the age of 65. These costs are appropriate for the unique age and sex distribution currently existing. Over the future years covered by this valuation, the age and sex distribution will most likely change. Therefore, our process "distributes" the average premium over all age/sex combinations and assigns a unique premium for each combination. The age/sex specific costs more accurately reflect the health care utilization and cost at that age.

| <b>FOR THOSE ELIGIBLE FOR MEDICARE</b> |             |               |
|--|-------------|---------------|
| <b>AGE</b>                             | <b>MALE</b> | <b>FEMALE</b> |
| 65                                     | \$208.66    | \$196.81      |
| 75                                     | 244.13      | 238.22        |
| 85                                     | 258.16      | 261.20        |

Appendix B of the report provides a full schedule of premiums.

Mehdi Riazi is a Member of the American Academy of Actuaries (MAAA) and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.



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Mehdi Riazi, FSA, EA, MAAA

## **APPENDIX B**

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### **BENEFIT PROVISIONS**

# Summary of Benefit Provisions for State Police Retirement System (SPRS)

## SPRS Employees

*Retirement: Tier 1, Participation before 9/1/2008*

|                               |   |
|-------------------------------|---|
| Normal Retirement Eligibility | Age 55 with at least 1 month of service credit; or<br>Any age with at least 20 years of service   |
| Benefit Amount                | <p>If a member has at least 60 months of service, the monthly benefit is 2.50% times final average compensation times years of service.</p> <p>If a member has less than 60 months of service, the monthly benefit is the actuarial equivalent of two times the member's contributions with interest.</p> <p>Final average compensation is based on the member's highest 3 years of compensation.</p> |
| Early Retirement Eligibility  | Age 50 with at least 15 years of service  |
| Early Retirement Reduction    | Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement eligibility precedes the member's normal retirement date.  |

## SPRS Employees (continued)

### *Retirement: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014*

|                               |  |
|-------------------------------|--|
| Normal Retirement Eligibility | Age 60 with at least 5 years of service; or<br>Any age with at least 25 years of service                                   |
| Benefit Amount                | The monthly benefit is equal to the applicable benefit multiplier times final average compensation times years of service. |

| Years of Service | Benefit Multiplier |
|------------------|--------------------|
| 10 or less       | 1.10%              |
| 10-20            | 1.30%              |
| 20-25            | 1.50%              |
| Greater than 25* | 2.00%              |

Final compensation is based on the member's highest 3 years of compensation.

|                              |  |
|------------------------------|--|
| Early Retirement Eligibility | Age 50 with at least 15 years of service   |
| Early Retirement Reduction   | Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility. |

### *Retirement: Tier 3, Participation on or after 1/1/2014*

|                               |   |
|-------------------------------|---|
| Normal Retirement Eligibility | Age 60 with at least 5 years of service; or<br>Any age with at least 25 years of service  |
| Benefit Amount                | Each year that the member is active, a 7.50% employer pay credit and the employee's 5.00% contribution will be credited to each member's hypothetical cash balance account. The hypothetical account will earn interest at a minimum rate of 4%, annually. If the System's geometric average net investment return for the previous five years exceeds 4%, then the hypothetical account will be credited with an additional amount of interest in that year equal to 75% of the amount of the return which exceeds 4%. All interest credits will be applied to the hypothetical account balance on June 30 based on the account balance as of June 30 of the previous year.<br><br>At retirement, the member's hypothetical account balance may be converted into an annuity based on an actuarial factor. |
| Early Retirement Eligibility  | N/A   |

## SPRS Employees (continued)

### *Deferred Vested Benefit: Tier 1, Participation before 9/1/2008*

|                |   |
|----------------|---|
| Eligibility    | At least 1 month of service credit  |
| Benefit Amount | Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age |

### *Deferred Vested Benefit: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014*

|                |   |
|----------------|---|
| Eligibility    | 5 years of service  |
| Benefit Amount | Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age |

### *Deferred Vested Benefit Tier 3, Participation on or after 1/1/2014*

|                |  |
|----------------|--|
| Eligibility    | 5 years of service   |
| Benefit Amount | At termination of employment, members may choose to leave their account balance with the System and retire once they are eligible. The hypothetical account balance will earn 4% annual interest after termination. Members may also choose to withdrawal their entire accumulated balance. If a member does not have 5 years of service at termination, the member is eligible to receive a partial refund of their account balance. This refund includes the member's contributions with interest. |

### *Disability Retirement: Participation before 8/1/2004*

|                    |  |
|--------------------|--|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)  |
| Disability Benefit | Disability benefits are calculated in the same manner as the normal retirement benefit with years of service and final compensation being determined as of the date of disability, except that if the member has less than 20 years of service at disability, service credit shall be added to the person's total service beginning with the last date of paid employment and continuing to the member's 55 <sup>th</sup> birthday, with total service not exceeding 20 years. Total service credit added shall not be greater than the member's actual service at disability. |

## SPRS Employees (continued)

### *Disability Retirement: Participation on or after 8/1/2004 but before 1/1/2014*

|                    |   |
|--------------------|---|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)   |
| Disability Benefit | The higher of 25% of the member's final monthly rate of pay or the member's normal retirement benefit (without reduction for early retirement) with years and final compensation being determined as of the date of disability. |

### *Disability Retirement: Participation on or after 1/1/2014*

|                    |   |
|--------------------|---|
| Eligibility        | 60 months of service (requirement is waived if line of duty disability)   |
| Disability Benefit | The higher of 25% of the member's final monthly rate of pay or the member's retirement benefit calculated at the member's normal retirement date. |

### *Line of Duty Disability Benefit*

|                    |  |
|--------------------|--|
| Disability Benefit | If the disability is a direct result of an act in the line of duty, the benefit shall not be less than 25% of the member's final monthly rate of pay. Additionally, each eligible dependent child will receive 10% of the member's monthly final rate of pay up to a maximum of 40%. |
|--------------------|--|

### *Pre-Retirement Death Benefit*

|                |  |
|----------------|--|
| Eligibility    | Eligible for early or normal retirement; or<br>Under age 55 with at least 60 months of service and actively working at the time of death; or<br>At least 144 months of service, if no longer actively working  |
| Spouse Benefit | The member's retirement benefit calculated in the same manner as if the member had retired on the day of the member's death and elected a 100% joint and survivor benefit. The benefit is actuarially reduced if the member dies prior to their normal retirement age. |

### *Pre-Retirement Death Benefit (Death in the Line of Duty)*

|                    |  |
|--------------------|--|
| Eligibility        | One month of service credit  |
| Spouse Benefit     | A \$10,000 lump sum payment plus a monthly payment of 25% of the deceased member's final monthly rate of pay. A spouse may also elect the non-line of duty death benefit.        |
| Non-Spouse Benefit | If the beneficiary is only one person who is a dependent receiving at least 50% of his or her support from the member, the beneficiary may elect a lump sum payment of \$10,000. |
| Child Benefit      | Each eligible dependent child will receive 10% of the member's final monthly rate of pay up to a maximum of 40%.   |

## SPRS Employees (continued)

### *Post-Retirement Death Benefit*

|               |   |
|---------------|---|
| Eligibility   | 48 months of service, and in receipt of retirement benefits |
| Death Benefit | A \$5,000 lump sum payment                                  |

### *Member Contributions*

|  |   |
|--|---|
| Tier 1, Participation before 9/1/2008                          | 8% of creditable compensation. Members who do not receive a retirement benefit are entitled to a full refund of contributions with interest. The annual interest rate is set by the KRS board, not less than 2.0%.  |
| Tier 2, Participation on or after 9/1/2008 but before 1/1/2014 | 8% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest. The annual interest rate is 2.5%. |
| Tier 3, Participation after 1/1/2014                           | 8% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest.                                   |

### *Changes since the Prior Valuation*

None.

## Summary of Main Retiree Insurance Benefit Provisions

### Insurance Tier 1: Participation began before 7/1/2003

**Benefit Eligibility**                      Recipient of a retirement allowance

**Benefit Amount**

| Non-Hazardous Service | Percentage of Member Premium Paid by Retirement System | Hazardous Service | Percentage of Member & Dependent Premium Paid by Retirement System |
|-----------------------|--|-------------------|--|
| Less than 4 years     | 0%   | Less than 4 years | 0%   |
| 4 – 9 years           | 25%  | 4 – 9 years       | 25%  |
| 10 – 14 years         | 50%  | 10 – 14 years     | 50%  |
| 15 – 19 years         | 75%  | 15 – 19 years     | 75%  |
| 20 or more years      | 100%   | 20 or more years  | 100%   |

The percentage paid by the retirement system is applied to the ‘contribution’ plan selected by the KRS Board.

**Duty Disability Retirement**      If disability was a result of injuries sustained while in the line of duty, the member receives 100% of the maximum contribution for the member and dependents.

**Duty Death in Service**              If an active employee’s death was a result of injuries sustained while in the line of duty, the member’s spouse and children receive 100% of the maximum contribution.

**Non-Duty Death in Service**      If the surviving spouses is in receipt of a pension allowance, he or she is eligible for continued health coverage. The percentage of the premium paid for by the retirement system is based on the member’s years of hazardous service at the time of death.

**Surviving Spouse of a Retiree**      A surviving spouse of a retiree, who is in receipt of a pension allowance, will receive a premium subsidy based on the member’s years of hazardous service.

**Hazardous employees who retired prior to August 1, 1998**      System’s contribution for spouse and dependents is based on total service.

## Insurance Tier 2: Participation began on or after 7/1/2003, but before 9/1/2008

|                                   |   |
|-----------------------------------|---|
| <b>Benefit Eligibility</b>        | Recipient of a retirement allowance with at least 120 months of service at retirement   |
| <b>Non-Hazardous Subsidy</b>      | Monthly contribution of \$10 for each year of earned non-hazardous service. The monthly contribution is increased by 1.5% each July 1. As of July 1, 2017, the Non-Hazardous monthly contribution was \$13.18/year of service. Upon the retiree's death, the surviving spouse may continue coverage (if in receipt of a retirement allowance) but will be 100% responsible for the premiums.                      |
| <b>Hazardous Subsidy</b>          | Monthly contribution of \$15 for each year of earned hazardous service. The monthly contribution is increased by 1.5% each July 1. As of July 1, 2017, the Non-Hazardous monthly contribution was \$19.77/year of service. Upon the retiree's death, the surviving spouse of a hazardous duty member will receive a monthly contribution of \$10 (\$13.18 as of July 1, 2017) for each year of hazardous service. |
| <b>Duty Disability Retirement</b> | If disability was a result of injuries sustained while in the line of duty, the member receives a benefit equal to at least 20 times the Non-Hazardous monthly contribution.  |
| <b>Duty Death in Service</b>      | If an active employee's death was a result of injuries sustained while in the line of duty, the member's spouse and children receive a benefit equal to at least 20 times the Non-Hazardous monthly contribution.   |
| <b>Non-Duty Death in Service</b>  | If the surviving spouse is in receipt of a pension allowance, he or she is eligible for continued health coverage. The percentage of the premium paid for by the retirement system is based on the member's years of hazardous service at the time of death.  |

## Insurance Tier 3: Participation began on or after 9/1/2008

Tier 3 insurance benefits are identical to Tier 2, except Tier 3 members are required to have at least 180 months of service in order to be eligible.

## Monthly Health Plan Premiums – Effective January 1, 2018

| Plan Option     | Non-Medicare Plan Options |             |            |            |              |
|-----------------|---------------------------|-------------|------------|------------|--------------|
|                 | Single                    | Parent Plus | Couple     | Family     | Family X-Ref |
| LivingWell PPO* | \$729.34                  | \$1,037.08  | \$1,589.10 | \$1,767.60 | \$876.68     |
| LivingWell CDHP | 709.46                    | 978.50      | 1,325.64   | 1,479.76   | 818.96       |
| Standard PPO    | 685.38                    | 975.90      | 1,497.18   | 1,666.26   | 824.54       |
| Standard CDHP   | 682.80                    | 940.64      | 1,450.02   | 1,615.30   | 800.94       |

| Medicare Plan Options   |          |
|---|----------|
| Kentucky Retirement Systems - Medical Only Plan                 | \$165.01 |
| Kentucky Retirement Systems – Medicare Advantage/Essential Plan | 75.56    |
| Kentucky Retirement Systems – Medicare Advantage/Premium Plan*  | 252.21   |

\*For 2018, the contribution plans selected by the KRS Board were the LivingWell PPO plan option for non-Medicare retirees and the Medicare Advantage Premium plan option for Medicare retirees.

## Dollar Contribution Amount for Insurance Tier 2 and Tier 3

Monthly contribution amounts per year of service as of July 1, 2017.

| Non-Hazardous Service | Hazardous Service |
|-----------------------|-------------------|
| \$13.18               | \$19.77           |

Note: Non-Hazardous benefits are applicable to SPRS members with prior service in a Non-Hazardous System.

**APPENDIX C**

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**GLOSSARY**

## Glossary

**Actuarial Accrued Liability (AAL):** That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of Future Plan Benefits which is not provided for by future Normal Costs. It is equal to the Actuarial Present Value of Future Plan Benefits minus the actuarial present value of future Normal Costs.

**Actuarial Assumptions:** Assumptions as to future experience under the Fund. These include assumptions about the occurrence of future events affecting costs or liabilities, such as:

- mortality, withdrawal, disablement, and retirement;
- future increases in salary;
- future rates of investment earnings and future investment and administrative expenses;
- characteristics of members not specified in the data, such as marital status;
- characteristics of future members;
- future elections made by members; and
- other relevant items.

**Actuarial Cost Method or Funding Method:** A procedure for allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability. These items are used to determine the ADC.

**Actuarial Gain or Actuarial Loss:** A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two Actuarial Valuation dates. Through the actuarial assumptions, rates of decrements, rates of salary increases, and rates of fund earnings have been forecasted. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., the fund's assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results that produce actuarial liabilities which are larger than projected. Actuarial gains will shorten the time required for funding of the actuarial balance sheet deficiency while actuarial losses will lengthen the funding period.

**Actuarially Equivalent:** Of equal actuarial present value, determined as of a given date and based on a given set of Actuarial Assumptions.

**Actuarial Present Value (APV):** The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. For purposes of this standard, each such amount or series of amounts is:

- a. adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.)
- b. multiplied by the probability of the occurrence of an event (such as survival, death, disability, termination of employment, etc.) on which the payment is conditioned, and
- c. discounted according to an assumed rate (or rates) of return to reflect the time value of money.

**Actuarial Present Value of Future Plan Benefits:** The Actuarial Present Value of those benefit amounts which are expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future compensation and service credits. The Actuarial Present Value of Future Plan Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive, non-retired members either entitled to a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.

**Actuarial Valuation:** The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial valuation for a governmental retirement system typically also includes calculations that provide the financial information of the plan, such as the funded ratio, unfunded actuarial accrued liability and the ADC.

**Actuarial Value of Assets or Valuation Assets:** The value of the Fund's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly actuaries use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the ADC.

**Actuarially Determined:** Values which have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the law.

**Actuarially Determined Contribution (ADC):** The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation. The ADC consists of the Employer Normal Cost and the Amortization Payment.

**Amortization Method:** A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the stream of payments increases at the assumed rate at which total covered payroll of all active members will increase.

**Amortization Payment:** The portion of the pension plan contribution or ADC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

**Closed Amortization Period:** A specific number of years that is counted down by one each year, and therefore declines to zero with the passage of time. For example if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc. See Funding Period and Open Amortization Period.

**Decrements:** Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or termination.

**Defined Benefit Plan:** A retirement plan that is not a Defined Contribution Plan. Typically a defined benefit plan is one in which benefits are defined by a formula applied to the member's compensation and/or years of service.

**Defined Contribution Plan:** A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, and the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.

**Employer Normal Cost:** The portion of the Normal Cost to be paid by the employers. This is equal to the Normal Cost less expected member contributions.

**Experience Study:** A periodic review and analysis of the actual experience of the Fund which may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified as deemed appropriate by the Actuary.

**Funded Ratio:** The ratio of the actuarial value of assets (AVA) to the actuarial accrued liability (AAL). Plans sometimes calculate a market funded ratio, using the market value of assets (MVA), rather than the AVA.

**Funding Period or Amortization Period:** The term "Funding Period" is used two ways. In the first sense, it is the period used in calculating the Amortization Payment as a component of the ADC. This funding period is specified in State statute. In the second sense, it is a calculated item: the number of years in the future that will theoretically be required to amortize (i.e., pay off or eliminate) the Unfunded Actuarial Accrued Liability, based on a statutory employer contribution rate, and assuming no future actuarial gains or losses.

**GASB:** Governmental Accounting Standards Board.

**GASB 67 and GASB 68:** Governmental Accounting Standards Board Statements No. 67 and No. 68. These are the governmental accounting standards that set the accounting and reporting rules for public retirement systems and the employers that sponsor, participate in, or contribute to them. Statement No. 67 sets the accounting rules for the financial reporting of the retirement systems, while Statement No. 68 sets the rules for the employers that sponsor, participate in, or contribute to public retirement systems.

**Normal Cost:** That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method. Any payment in respect of an Unfunded

Actuarial Accrued Liability is not part of Normal Cost (see Amortization Payment). For pension plan benefits which are provided in part by employee contributions, Normal Cost refers to the total of employee contributions and employer Normal Cost unless otherwise specifically stated. Under the entry age normal cost method, the Normal Cost is intended to be the level cost (when expressed as a percentage of pay) needed to fund the benefits of a member from hire until ultimate termination, death, disability or retirement.

**Open Amortization Period:** An open amortization period is one which is used to determine the Amortization Payment but may not decrease by exactly one year in the subsequent year's actuarial valuation. For instance, if the initial period is set as 30 years, the same 30-year period is used in determining the Amortization Period each year.

**Unfunded Actuarial Accrued Liability:** The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus.

**Valuation Date or Actuarial Valuation Date:** The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Plan Benefits is determined. The expected benefits to be paid in the future are discounted to this date.

December 4, 2017

Board of Trustees  
Kentucky Retirement Systems  
Perimeter Park West  
1260 Louisville Road  
Frankfort, KY 40601

**Re: Sensitivity Analysis Based on Results of the June 30, 2017 Actuarial Valuation**

Dear Members of the Board:

Per Kentucky State Statute 61.670, we are providing this supplemental information regarding the sensitivity of the valuation results to changes in some of the economic assumptions. Specifically, the attached tables show the impact for the KERS retirement system due to changes in the investment return assumption, the inflation rate assumption, or the payroll growth rate assumption.

**Background**

Investment Assumption

The investment return assumption is used to discount future expected benefit payments to the valuation date in order to determine the liabilities of the plans. The lower the investment return assumption, the less the benefit payments are discounted and the higher the valuation liability. The current investment return assumption is 5.25% for the KERS non-hazardous retirement fund and 6.25% for the KERS hazardous retirement fund and both KERS insurance funds. The sensitivity analysis shows the financial impact of a 1.00% increase and a 1.00% decrease in the investment return assumption. For purposes of this sensitivity analysis, the inflation assumption and payroll growth assumption remain unchanged from the valuation assumption.

Inflation Assumption

The inflation assumption underlies most of the other economic assumptions, including the investment return, salary increases, and payroll growth rate. This is a macroeconomic assumption and as such the same assumption is used in the valuation of each of the retirement systems. The current assumption is 2.30% for all funds. The sensitivity analysis shows the financial impact of a 0.25% increase and a 0.25% decrease in the inflation assumption. Note, the change in the inflation assumption results in a corresponding change in the investment return assumption, the payroll growth rate assumption, and the healthcare trend assumption that is used in the valuation of the health insurance funds.

### Payroll Growth Assumption

Participating employers of KERS make contributions to the system as a percentage of the covered payroll. Therefore, as payroll changes over time these amortization payments will also change. If actual covered payroll increases at a rate that is less than assumed, then the retirement system receives less money than expected to finance the unfunded liability, which means the contribution rates in future years will be required to increase in order to finance the unfunded liability over the same time period. The current payroll growth assumption is 0.00% for all the KERS retirement and insurance funds. The analysis shows the impact of a 1.00% increase and a 1.00% decrease in the payroll growth assumption. Please note that the payroll growth assumption does not impact the valuation liabilities, unfunded liability, and funded status of the system. Rather, this assumption only impacts the amortization rate for financing the existing unfunded actuarial accrued liability and the recommended employer contribution. For purposes of this analysis, the investment return assumption and the inflation assumption are held at their current valuation assumptions.

### **Certification**

The information provided in this report compliments the information provided in the June 30, 2017 actuarial valuation report. Please refer to the June 30, 2017 actuarial valuation report for additional discussion of the actuarial valuation, including the nature of actuarial calculations and more information related to participant data, economic and demographic assumptions, and benefit provisions.

Actual results can, and almost certainly will, differ as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rate, and funding periods. The actuarial calculations are intended to provide information for rational decision making. The purpose of this information is to provide stakeholders the financial sensitivity of the unfunded liability and contribution rates to changes in the inflation, assumed rate of return, and discount rate.

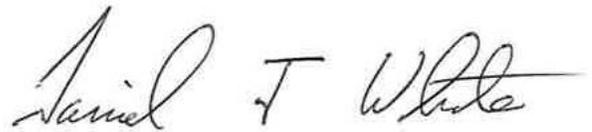
The undersigned are independent actuaries and consultants. Mr. Newton and Mr. White are Enrolled Actuaries. All three of the undersigned are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries. All of the undersigned are experienced in performing valuations for large public retirement systems.

This communication shall not be construed to provide tax advice, legal advice or investment advice.

Sincerely,



Joseph P. Newton, FSA, EA, MAAA  
Pension Market Leader and Actuary



Daniel J. White, FSA, EA, MAAA  
Senior Consultant



Janie Shaw, ASA, MAAA  
Consultant

**Sensitivity Analysis - Discount Rate**  
**Non-Hazardous Members**  
(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Discount Rate<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Discount Rate<br>(4) |
|--------------------------------------|----------------------------------|-----------------------------|----------------------------------|
| Payroll Growth Rate                  | 0.00%                            | 0.00%                       | 0.00%                            |
| Inflation Rate                       | 2.30%                            | 2.30%                       | 2.30%                            |
| Discount Rate - Retirement           | 4.25%                            | 5.25%                       | 6.25%                            |
| Discount Rate - Insurance            | 5.25%                            | 6.25%                       | 7.25%                            |
| <b>Retirement</b>                    |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 17,501,838                    | \$ 15,591,641               | \$ 14,002,077                    |
| Actuarial Value of Assets            | 2,123,623                        | 2,123,623                   | 2,123,623                        |
| Unfunded Actuarial Accrued Liability | 15,378,215                       | 13,468,018                  | 11,878,454                       |
| Funded Ratio                         | 12.1%                            | 13.6%                       | 15.2%                            |
| Total Recommended Contribution Rate  | 76.70%                           | 71.03%                      | 66.43%                           |
| <b>Insurance</b>                     |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 3,027,049                     | \$ 2,683,496                | \$ 2,398,595                     |
| Actuarial Value of Assets            | 823,918                          | 823,918                     | 823,918                          |
| Unfunded Actuarial Accrued Liability | 2,203,131                        | 1,859,578                   | 1,574,677                        |
| Funded Ratio                         | 27.2%                            | 30.7%                       | 34.4%                            |
| Total Recommended Contribution Rate  | 14.10%                           | 12.40%                      | 10.94%                           |
| <b>Combined Non-Hazardous</b>        |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 20,528,887                    | \$ 18,275,137               | \$ 16,400,672                    |
| Actuarial Value of Assets            | 2,947,541                        | 2,947,541                   | 2,947,541                        |
| Unfunded Actuarial Accrued Liability | 17,581,346                       | 15,327,596                  | 13,453,131                       |
| Funded Ratio                         | 14.4%                            | 16.1%                       | 18.0%                            |
| Total Recommended Contribution Rate  | 90.80%                           | 83.43%                      | 77.37%                           |

**Sensitivity Analysis - Inflation Rate**  
**Non-Hazardous Members**  
(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Inflation Rate<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Inflation Rate<br>(4) |
|--------------------------------------|-----------------------------------|-----------------------------|-----------------------------------|
| Payroll Growth Rate                  | -0.25%                            | 0.00%                       | 0.25%                             |
| Inflation Rate                       | 2.05%                             | 2.30%                       | 2.55%                             |
| Discount Rate - Retirement           | 5.00%                             | 5.25%                       | 5.50%                             |
| Discount Rate - Insurance            | 6.00%                             | 6.25%                       | 6.50%                             |
| <b>Retirement</b>                    |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 16,002,991                     | \$ 15,591,641               | \$ 15,198,200                     |
| Actuarial Value of Assets            | 2,123,623                         | 2,123,623                   | 2,123,623                         |
| Unfunded Actuarial Accrued Liability | 13,879,368                        | 13,468,018                  | 13,074,577                        |
| Funded Ratio                         | 13.3%                             | 13.6%                       | 14.0%                             |
| Total Recommended Contribution Rate  | 73.51%                            | 71.03%                      | 68.66%                            |
| <b>Insurance</b>                     |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 2,699,129                      | \$ 2,683,496                | \$ 2,668,652                      |
| Actuarial Value of Assets            | 823,918                           | 823,918                     | 823,918                           |
| Unfunded Actuarial Accrued Liability | 1,875,211                         | 1,859,578                   | 1,844,734                         |
| Funded Ratio                         | 30.5%                             | 30.7%                       | 30.9%                             |
| Total Recommended Contribution Rate  | 12.57%                            | 12.40%                      | 12.24%                            |
| <b>Combined Non-Hazardous</b>        |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 18,702,120                     | \$ 18,275,137               | \$ 17,866,852                     |
| Actuarial Value of Assets            | 2,947,541                         | 2,947,541                   | 2,947,541                         |
| Unfunded Actuarial Accrued Liability | 15,754,579                        | 15,327,596                  | 14,919,311                        |
| Funded Ratio                         | 15.8%                             | 16.1%                       | 16.5%                             |
| Total Recommended Contribution Rate  | 86.08%                            | 83.43%                      | 80.90%                            |

**Sensitivity Analysis - Payroll Growth**  
**Non-Hazardous Members**  
(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Payroll Growth<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Payroll Growth<br>(4) |
|--------------------------------------|-----------------------------------|-----------------------------|-----------------------------------|
| Payroll Growth Rate                  | -1.00%                            | 0.00%                       | 1.00%                             |
| Inflation Rate                       | 2.30%                             | 2.30%                       | 2.30%                             |
| Discount Rate - Retirement           | 5.25%                             | 5.25%                       | 5.25%                             |
| Discount Rate - Insurance            | 6.25%                             | 6.25%                       | 6.25%                             |
| <b>Retirement</b>                    |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 15,591,641                     | \$ 15,591,641               | \$ 15,591,641                     |
| Actuarial Value of Assets            | 2,123,623                         | 2,123,623                   | 2,123,623                         |
| Unfunded Actuarial Accrued Liability | 13,468,018                        | 13,468,018                  | 13,468,018                        |
| Funded Ratio                         | 13.6%                             | 13.6%                       | 13.6%                             |
| Total Recommended Contribution Rate  | 77.81%                            | 71.03%                      | 64.70%                            |
| <b>Insurance</b>                     |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 2,683,496                      | \$ 2,683,496                | \$ 2,683,496                      |
| Actuarial Value of Assets            | 823,918                           | 823,918                     | 823,918                           |
| Unfunded Actuarial Accrued Liability | 1,859,578                         | 1,859,578                   | 1,859,578                         |
| Funded Ratio                         | 30.7%                             | 30.7%                       | 30.7%                             |
| Total Recommended Contribution Rate  | 13.39%                            | 12.40%                      | 11.47%                            |
| <b>Combined Non-Hazardous</b>        |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 18,275,137                     | \$ 18,275,137               | \$ 18,275,137                     |
| Actuarial Value of Assets            | 2,947,541                         | 2,947,541                   | 2,947,541                         |
| Unfunded Actuarial Accrued Liability | 15,327,596                        | 15,327,596                  | 15,327,596                        |
| Funded Ratio                         | 16.1%                             | 16.1%                       | 16.1%                             |
| Total Recommended Contribution Rate  | 91.20%                            | 83.43%                      | 76.17%                            |

**Sensitivity Analysis - Discount Rate**  
**Hazardous Members**  
(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Discount Rate<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Discount Rate<br>(4) |
|--------------------------------------|----------------------------------|-----------------------------|----------------------------------|
| Payroll Growth Rate                  | 0.00%                            | 0.00%                       | 0.00%                            |
| Inflation Rate                       | 2.30%                            | 2.30%                       | 2.30%                            |
| Discount Rate - Retirement           | 5.25%                            | 6.25%                       | 7.25%                            |
| Discount Rate - Insurance            | 5.25%                            | 6.25%                       | 7.25%                            |
| <b>Retirement</b>                    |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 1,259,563                     | \$ 1,121,420                | \$ 1,006,780                     |
| Actuarial Value of Assets            | 607,159                          | 607,159                     | 607,159                          |
| Unfunded Actuarial Accrued Liability | 652,404                          | 514,261                     | 399,621                          |
| Funded Ratio                         | 48.2%                            | 54.1%                       | 60.3%                            |
| Total Recommended Contribution Rate  | 42.70%                           | 34.39%                      | 27.07%                           |
| <b>Insurance</b>                     |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 474,187                       | \$ 419,439                  | \$ 374,457                       |
| Actuarial Value of Assets            | 493,458                          | 493,458                     | 493,458                          |
| Unfunded Actuarial Accrued Liability | (19,271)                         | (74,019)                    | (119,001)                        |
| Funded Ratio                         | 104.1%                           | 117.6%                      | 131.8%                           |
| Total Recommended Contribution Rate  | 7.19%                            | 2.46%                       | -1.86%                           |
| <b>Combined Hazardous</b>            |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 1,733,750                     | \$ 1,540,859                | \$ 1,381,237                     |
| Actuarial Value of Assets            | 1,100,617                        | 1,100,617                   | 1,100,617                        |
| Unfunded Actuarial Accrued Liability | 633,133                          | 440,242                     | 280,620                          |
| Funded Ratio                         | 63.5%                            | 71.4%                       | 79.7%                            |
| Total Recommended Contribution Rate  | 49.89%                           | 36.85%                      | 25.21%                           |

**Sensitivity Analysis - Inflation Rate**  
**Hazardous Members**  
(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Inflation Rate<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Inflation Rate<br>(4) |
|--------------------------------------|-----------------------------------|-----------------------------|-----------------------------------|
| Payroll Growth Rate                  | -0.25%                            | 0.00%                       | 0.25%                             |
| Inflation Rate                       | 2.05%                             | 2.30%                       | 2.55%                             |
| Discount Rate - Retirement           | 6.00%                             | 6.25%                       | 6.50%                             |
| Discount Rate - Insurance            | 6.00%                             | 6.25%                       | 6.50%                             |
| <b>Retirement</b>                    |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 1,150,681                      | \$ 1,121,420                | \$ 1,093,448                      |
| Actuarial Value of Assets            | 607,159                           | 607,159                     | 607,159                           |
| Unfunded Actuarial Accrued Liability | 543,522                           | 514,261                     | 486,289                           |
| Funded Ratio                         | 52.8%                             | 54.1%                       | 55.5%                             |
| Total Recommended Contribution Rate  | 36.49%                            | 34.39%                      | 32.38%                            |
| <b>Insurance</b>                     |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 422,418                        | \$ 419,439                  | \$ 416,625                        |
| Actuarial Value of Assets            | 493,458                           | 493,458                     | 493,458                           |
| Unfunded Actuarial Accrued Liability | (71,040)                          | (74,019)                    | (76,833)                          |
| Funded Ratio                         | 116.8%                            | 117.6%                      | 118.4%                            |
| Total Recommended Contribution Rate  | 2.84%                             | 2.46%                       | 2.12%                             |
| <b>Combined Hazardous</b>            |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 1,573,099                      | \$ 1,540,859                | \$ 1,510,073                      |
| Actuarial Value of Assets            | 1,100,617                         | 1,100,617                   | 1,100,617                         |
| Unfunded Actuarial Accrued Liability | 472,482                           | 440,242                     | 409,456                           |
| Funded Ratio                         | 70.0%                             | 71.4%                       | 72.9%                             |
| Total Recommended Contribution Rate  | 39.33%                            | 36.85%                      | 34.50%                            |

**Sensitivity Analysis - Payroll Growth**  
**Hazardous Members**  
(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Payroll Growth<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Payroll Growth<br>(4) |
|--------------------------------------|-----------------------------------|-----------------------------|-----------------------------------|
| Payroll Growth Rate                  | -1.00%                            | 0.00%                       | 1.00%                             |
| Inflation Rate                       | 2.30%                             | 2.30%                       | 2.30%                             |
| Discount Rate - Retirement           | 6.25%                             | 6.25%                       | 6.25%                             |
| Discount Rate - Insurance            | 6.25%                             | 6.25%                       | 6.25%                             |
| <b>Retirement</b>                    |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 1,121,420                      | \$ 1,121,420                | \$ 1,121,420                      |
| Actuarial Value of Assets            | 607,159                           | 607,159                     | 607,159                           |
| Unfunded Actuarial Accrued Liability | 514,261                           | 514,261                     | 514,261                           |
| Funded Ratio                         | 54.1%                             | 54.1%                       | 54.1%                             |
| Total Recommended Contribution Rate  | 36.94%                            | 34.39%                      | 32.00%                            |
| <b>Insurance</b>                     |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 419,439                        | \$ 419,439                  | \$ 419,439                        |
| Actuarial Value of Assets            | 493,458                           | 493,458                     | 493,458                           |
| Unfunded Actuarial Accrued Liability | (74,019)                          | (74,019)                    | (74,019)                          |
| Funded Ratio                         | 117.6%                            | 117.6%                      | 117.6%                            |
| Total Recommended Contribution Rate  | 2.11%                             | 2.46%                       | 2.80%                             |
| <b>Combined Hazardous</b>            |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 1,540,859                      | \$ 1,540,859                | \$ 1,540,859                      |
| Actuarial Value of Assets            | 1,100,617                         | 1,100,617                   | 1,100,617                         |
| Unfunded Actuarial Accrued Liability | 440,242                           | 440,242                     | 440,242                           |
| Funded Ratio                         | 71.4%                             | 71.4%                       | 71.4%                             |
| Total Recommended Contribution Rate  | 39.05%                            | 36.85%                      | 34.80%                            |

December 4, 2017

Board of Trustees  
Kentucky Retirement Systems  
Perimeter Park West  
1260 Louisville Road  
Frankfort, KY 40601

**Re: Sensitivity Analysis Based on Results of the June 30, 2017 Actuarial Valuation**

Dear Members of the Board:

Per Kentucky State Statute 61.670, we are providing this supplemental information regarding the sensitivity of the valuation results to changes in some of the economic assumptions. Specifically, the attached tables show the impact for the CERS retirement system due to changes in the investment return assumption, the inflation rate assumption, or the payroll growth rate assumption.

**Background**

Investment Assumption

The investment return assumption is used to discount future expected benefit payments to the valuation date in order to determine the liabilities of the plans. The lower the investment return assumption, the less the benefit payments are discounted and the higher the valuation liability. The current investment return assumption is 6.25% for the CERS non-hazardous and hazardous retirement and insurance funds. The sensitivity analysis shows the financial impact of a 1.00% increase and a 1.00% decrease in the investment return assumption. For purposes of this sensitivity analysis, the inflation assumption and payroll growth assumption remain unchanged from the valuation assumption.

Inflation Assumption

The inflation assumption underlies most of the other economic assumptions, including the investment return, salary increases, and payroll growth rate. This is a macroeconomic assumption and as such the same assumption is used in the valuation of each of the retirement systems. The current assumption is 2.30% for all funds. The sensitivity analysis shows the financial impact of a 0.25% increase and a 0.25% decrease in the inflation assumption. Note, the change in the inflation assumption results in a corresponding change in the investment return assumption, the payroll growth rate assumption, and the healthcare trend assumption that is used in the valuation of the health insurance funds.

### Payroll Growth Assumption

Participating employers of CERS make contributions to the system as a percentage of the covered payroll. Therefore, as payroll changes over time these amortization payments will also change. If actual covered payroll increases at a rate that is less than assumed, then the retirement system receives less money than expected to finance the unfunded liability, which means the contribution rates in future years will be required to increase in order to finance the unfunded liability over the same time period. The current payroll growth assumption is 2.00% for all the CERS retirement and insurance funds. The analysis shows the impact of a 1.00% increase and a 1.00% decrease in the payroll growth assumption. Please note that the payroll growth assumption does not impact the valuation liabilities, unfunded liability, and funded status of the system. Rather, this assumption only impacts the amortization rate for financing the existing unfunded actuarial accrued liability and the recommended employer contribution. For purposes of this analysis, the investment return assumption and the inflation assumption are held at their current valuation assumptions.

### **Certification**

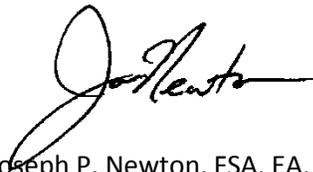
The information provided in this report compliments the information provided in the June 30, 2017 actuarial valuation report. Please refer to the June 30, 2017 actuarial valuation report for additional discussion of the actuarial valuation, including the nature of actuarial calculations and more information related to participant data, economic and demographic assumptions, and benefit provisions.

Actual results can, and almost certainly will, differ as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rate, and funding periods. The actuarial calculations are intended to provide information for rational decision making. The purpose of this information is to provide stakeholders the financial sensitivity of the unfunded liability and contribution rates to changes in the inflation, assumed rate of return, and discount rate.

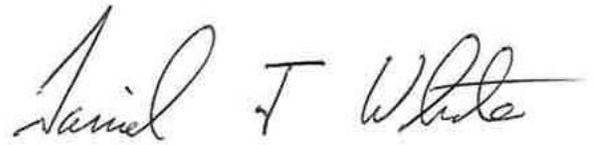
The undersigned are independent actuaries and consultants. Mr. Newton and Mr. White are Enrolled Actuaries. All three of the undersigned are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries. All of the undersigned are experienced in performing valuations for large public retirement systems.

This communication shall not be construed to provide tax advice, legal advice or investment advice.

Sincerely,



Joseph P. Newton, FSA, EA, MAAA  
Pension Market Leader and Actuary



Daniel J. White, FSA, EA, MAAA  
Senior Consultant



Jamie Shaw, ASA, MAAA  
Consultant

**Sensitivity Analysis - Discount Rate**  
**Non-Hazardous Members**  
(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Discount Rate<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Discount Rate<br>(4) |
|--------------------------------------|----------------------------------|-----------------------------|----------------------------------|
| Payroll Growth Rate                  | 2.00%                            | 2.00%                       | 2.00%                            |
| Inflation Rate                       | 2.30%                            | 2.30%                       | 2.30%                            |
| Discount Rate - Retirement           | 5.25%                            | 6.25%                       | 7.25%                            |
| Discount Rate - Insurance            | 5.25%                            | 6.25%                       | 7.25%                            |
| <b>Retirement</b>                    |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 14,361,475                    | \$ 12,803,510               | \$ 11,499,054                    |
| Actuarial Value of Assets            | 6,764,873                        | 6,764,873                   | 6,764,873                        |
| Unfunded Actuarial Accrued Liability | 7,596,602                        | 6,038,637                   | 4,734,181                        |
| Funded Ratio                         | 47.1%                            | 52.8%                       | 58.8%                            |
| Total Recommended Contribution Rate  | 26.58%                           | 21.84%                      | 17.67%                           |
| <b>Insurance</b>                     |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 3,798,688                     | \$ 3,355,151                | \$ 2,987,083                     |
| Actuarial Value of Assets            | 2,227,401                        | 2,227,401                   | 2,227,401                        |
| Unfunded Actuarial Accrued Liability | 1,571,287                        | 1,127,750                   | 759,682                          |
| Funded Ratio                         | 58.6%                            | 66.4%                       | 74.6%                            |
| Total Recommended Contribution Rate  | 8.03%                            | 6.21%                       | 4.62%                            |
| <b>Combined Non-Hazardous</b>        |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 18,160,163                    | \$ 16,158,661               | \$ 14,486,137                    |
| Actuarial Value of Assets            | 8,992,274                        | 8,992,274                   | 8,992,274                        |
| Unfunded Actuarial Accrued Liability | 9,167,889                        | 7,166,387                   | 5,493,863                        |
| Funded Ratio                         | 49.5%                            | 55.6%                       | 62.1%                            |
| Total Recommended Contribution Rate  | 34.61%                           | 28.05%                      | 22.29%                           |

**Sensitivity Analysis - Inflation Rate**  
**Non-Hazardous Members**  
(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Inflation Rate<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Inflation Rate<br>(4) |
|--------------------------------------|-----------------------------------|-----------------------------|-----------------------------------|
| Payroll Growth Rate                  | 1.75%                             | 2.00%                       | 2.25%                             |
| Inflation Rate                       | 2.05%                             | 2.30%                       | 2.55%                             |
| Discount Rate - Retirement           | 6.00%                             | 6.25%                       | 6.50%                             |
| Discount Rate - Insurance            | 6.00%                             | 6.25%                       | 6.50%                             |
| <b>Retirement</b>                    |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 13,121,425                     | \$ 12,803,510               | \$ 12,498,722                     |
| Actuarial Value of Assets            | 6,764,873                         | 6,764,873                   | 6,764,873                         |
| Unfunded Actuarial Accrued Liability | 6,356,552                         | 6,038,637                   | 5,733,849                         |
| Funded Ratio                         | 51.6%                             | 52.8%                       | 54.1%                             |
| Total Recommended Contribution Rate  | 23.04%                            | 21.84%                      | 20.69%                            |
| <b>Insurance</b>                     |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 3,382,139                      | \$ 3,355,151                | \$ 3,329,648                      |
| Actuarial Value of Assets            | 2,227,401                         | 2,227,401                   | 2,227,401                         |
| Unfunded Actuarial Accrued Liability | 1,154,738                         | 1,127,750                   | 1,102,247                         |
| Funded Ratio                         | 65.9%                             | 66.4%                       | 66.9%                             |
| Total Recommended Contribution Rate  | 6.40%                             | 6.21%                       | 6.04%                             |
| <b>Combined Non-Hazardous</b>        |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 16,503,564                     | \$ 16,158,661               | \$ 15,828,370                     |
| Actuarial Value of Assets            | 8,992,274                         | 8,992,274                   | 8,992,274                         |
| Unfunded Actuarial Accrued Liability | 7,511,290                         | 7,166,387                   | 6,836,096                         |
| Funded Ratio                         | 54.5%                             | 55.6%                       | 56.8%                             |
| Total Recommended Contribution Rate  | 29.44%                            | 28.05%                      | 26.73%                            |

**Sensitivity Analysis - Payroll Growth**  
**Non-Hazardous Members**  
(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Payroll Growth<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Payroll Growth<br>(4) |
|--------------------------------------|-----------------------------------|-----------------------------|-----------------------------------|
| Payroll Growth Rate                  | 1.00%                             | 2.00%                       | 3.00%                             |
| Inflation Rate                       | 2.30%                             | 2.30%                       | 2.30%                             |
| Discount Rate - Retirement           | 6.25%                             | 6.25%                       | 6.25%                             |
| Discount Rate - Insurance            | 6.25%                             | 6.25%                       | 6.25%                             |
| <b>Retirement</b>                    |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 12,803,510                     | \$ 12,803,510               | \$ 12,803,510                     |
| Actuarial Value of Assets            | 6,764,873                         | 6,764,873                   | 6,764,873                         |
| Unfunded Actuarial Accrued Liability | 6,038,637                         | 6,038,637                   | 6,038,637                         |
| Funded Ratio                         | 52.8%                             | 52.8%                       | 52.8%                             |
| Total Recommended Contribution Rate  | 23.61%                            | 21.84%                      | 20.19%                            |
| <b>Insurance</b>                     |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 3,355,151                      | \$ 3,355,151                | \$ 3,355,151                      |
| Actuarial Value of Assets            | 2,227,401                         | 2,227,401                   | 2,227,401                         |
| Unfunded Actuarial Accrued Liability | 1,127,750                         | 1,127,750                   | 1,127,750                         |
| Funded Ratio                         | 66.4%                             | 66.4%                       | 66.4%                             |
| Total Recommended Contribution Rate  | 6.55%                             | 6.21%                       | 5.90%                             |
| <b>Combined Non-Hazardous</b>        |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 16,158,661                     | \$ 16,158,661               | \$ 16,158,661                     |
| Actuarial Value of Assets            | 8,992,274                         | 8,992,274                   | 8,992,274                         |
| Unfunded Actuarial Accrued Liability | 7,166,387                         | 7,166,387                   | 7,166,387                         |
| Funded Ratio                         | 55.6%                             | 55.6%                       | 55.6%                             |
| Total Recommended Contribution Rate  | 30.16%                            | 28.05%                      | 26.09%                            |

**Sensitivity Analysis - Discount Rate**  
**Hazardous Members**  
(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Discount Rate<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Discount Rate<br>(4) |
|--------------------------------------|----------------------------------|-----------------------------|----------------------------------|
| Payroll Growth Rate                  | 2.00%                            | 2.00%                       | 2.00%                            |
| Inflation Rate                       | 2.30%                            | 2.30%                       | 2.30%                            |
| Discount Rate - Retirement           | 5.25%                            | 6.25%                       | 7.25%                            |
| Discount Rate - Insurance            | 5.25%                            | 6.25%                       | 7.25%                            |
| <b>Retirement</b>                    |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 5,253,887                     | \$ 4,649,047                | \$ 4,149,262                     |
| Actuarial Value of Assets            | 2,238,320                        | 2,238,320                   | 2,238,320                        |
| Unfunded Actuarial Accrued Liability | 3,015,567                        | 2,410,727                   | 1,910,942                        |
| Funded Ratio                         | 42.6%                            | 48.1%                       | 53.9%                            |
| Total Recommended Contribution Rate  | 43.30%                           | 35.69%                      | 29.11%                           |
| <b>Insurance</b>                     |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 2,026,503                     | \$ 1,788,433                | \$ 1,593,138                     |
| Actuarial Value of Assets            | 1,196,780                        | 1,196,780                   | 1,196,780                        |
| Unfunded Actuarial Accrued Liability | 829,723                          | 591,653                     | 396,358                          |
| Funded Ratio                         | 59.1%                            | 66.9%                       | 75.1%                            |
| Total Recommended Contribution Rate  | 15.77%                           | 12.17%                      | 8.98%                            |
| <b>Combined Hazardous</b>            |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 7,280,390                     | \$ 6,437,480                | \$ 5,742,400                     |
| Actuarial Value of Assets            | 3,435,100                        | 3,435,100                   | 3,435,100                        |
| Unfunded Actuarial Accrued Liability | 3,845,290                        | 3,002,380                   | 2,307,300                        |
| Funded Ratio                         | 47.2%                            | 53.4%                       | 59.8%                            |
| Total Recommended Contribution Rate  | 59.07%                           | 47.86%                      | 38.09%                           |

**Sensitivity Analysis - Inflation Rate**  
**Hazardous Members**  
(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Inflation Rate<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Inflation Rate<br>(4) |
|--------------------------------------|-----------------------------------|-----------------------------|-----------------------------------|
| Payroll Growth Rate                  | 1.75%                             | 2.00%                       | 2.25%                             |
| Inflation Rate                       | 2.05%                             | 2.30%                       | 2.55%                             |
| Discount Rate - Retirement           | 6.00%                             | 6.25%                       | 6.50%                             |
| Discount Rate - Insurance            | 6.00%                             | 6.25%                       | 6.50%                             |
| <b>Retirement</b>                    |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 4,775,734                      | \$ 4,649,047                | \$ 4,528,024                      |
| Actuarial Value of Assets            | 2,238,320                         | 2,238,320                   | 2,238,320                         |
| Unfunded Actuarial Accrued Liability | 2,537,414                         | 2,410,727                   | 2,289,704                         |
| Funded Ratio                         | 46.9%                             | 48.1%                       | 49.4%                             |
| Total Recommended Contribution Rate  | 37.77%                            | 35.69%                      | 33.70%                            |
| <b>Insurance</b>                     |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 1,798,060                      | \$ 1,788,433                | \$ 1,779,274                      |
| Actuarial Value of Assets            | 1,196,780                         | 1,196,780                   | 1,196,780                         |
| Unfunded Actuarial Accrued Liability | 601,280                           | 591,653                     | 582,494                           |
| Funded Ratio                         | 66.6%                             | 66.9%                       | 67.3%                             |
| Total Recommended Contribution Rate  | 12.41%                            | 12.17%                      | 11.94%                            |
| <b>Combined Hazardous</b>            |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 6,573,794                      | \$ 6,437,480                | \$ 6,307,298                      |
| Actuarial Value of Assets            | 3,435,100                         | 3,435,100                   | 3,435,100                         |
| Unfunded Actuarial Accrued Liability | 3,138,694                         | 3,002,380                   | 2,872,198                         |
| Funded Ratio                         | 52.3%                             | 53.4%                       | 54.5%                             |
| Total Recommended Contribution Rate  | 50.18%                            | 47.86%                      | 45.64%                            |

**Sensitivity Analysis - Payroll Growth**  
**Hazardous Members**  
(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Payroll Growth<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Payroll Growth<br>(4) |
|--------------------------------------|-----------------------------------|-----------------------------|-----------------------------------|
| Payroll Growth Rate                  | 1.00%                             | 2.00%                       | 3.00%                             |
| Inflation Rate                       | 2.30%                             | 2.30%                       | 2.30%                             |
| Discount Rate - Retirement           | 6.25%                             | 6.25%                       | 6.25%                             |
| Discount Rate - Insurance            | 6.25%                             | 6.25%                       | 6.25%                             |
| <b>Retirement</b>                    |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 4,649,047                      | \$ 4,649,047                | \$ 4,649,047                      |
| Actuarial Value of Assets            | 2,238,320                         | 2,238,320                   | 2,238,320                         |
| Unfunded Actuarial Accrued Liability | 2,410,727                         | 2,410,727                   | 2,410,727                         |
| Funded Ratio                         | 48.1%                             | 48.1%                       | 48.1%                             |
| Total Recommended Contribution Rate  | 38.90%                            | 35.69%                      | 32.70%                            |
| <b>Insurance</b>                     |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 1,788,433                      | \$ 1,788,433                | \$ 1,788,433                      |
| Actuarial Value of Assets            | 1,196,780                         | 1,196,780                   | 1,196,780                         |
| Unfunded Actuarial Accrued Liability | 591,653                           | 591,653                     | 591,653                           |
| Funded Ratio                         | 66.9%                             | 66.9%                       | 66.9%                             |
| Total Recommended Contribution Rate  | 12.95%                            | 12.17%                      | 11.44%                            |
| <b>Combined Hazardous</b>            |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 6,437,480                      | \$ 6,437,480                | \$ 6,437,480                      |
| Actuarial Value of Assets            | 3,435,100                         | 3,435,100                   | 3,435,100                         |
| Unfunded Actuarial Accrued Liability | 3,002,380                         | 3,002,380                   | 3,002,380                         |
| Funded Ratio                         | 53.4%                             | 53.4%                       | 53.4%                             |
| Total Recommended Contribution Rate  | 51.85%                            | 47.86%                      | 44.14%                            |



December 4, 2017

Board of Trustees  
Kentucky Retirement Systems  
Perimeter Park West  
1260 Louisville Road  
Frankfort, KY 40601

**Re: Sensitivity Analysis Based on Results of the June 30, 2017 Actuarial Valuation**

Dear Members of the Board:

Per Kentucky State Statute 61.670, we are providing this supplemental information regarding the sensitivity of the valuation results to changes in some of the economic assumptions. Specifically, the attached tables show the impact for the SPRS retirement system due to changes in the investment return assumption, the inflation rate assumption, or the payroll growth rate assumption.

**Background**

Investment Assumption

The investment return assumption is used to discount future expected benefit payments to the valuation date in order to determine the liabilities of the plans. The lower the investment return assumption, the less the benefit payments are discounted and the higher the valuation liability. The current investment return assumption is 5.25% for the SPRS retirement fund and 6.25% for the SPRS insurance fund. The sensitivity analysis shows the financial impact of a 1.00% increase and a 1.00% decrease in the investment return assumption. For purposes of this sensitivity analysis, the inflation assumption and payroll growth assumption remain unchanged from the valuation assumption.

Inflation Assumption

The inflation assumption underlies most of the other economic assumptions, including the investment return, salary increases, and payroll growth rate. This is a macroeconomic assumption and as such the same assumption is used in the valuation of each of the retirement systems. The current assumption is 2.30% for all funds. The sensitivity analysis shows the financial impact of a 0.25% increase and a 0.25% decrease in the inflation assumption. Note, the change in the inflation assumption results in a corresponding change in the investment return assumption, the payroll growth rate assumption, and the healthcare trend assumption that is used in the valuation of the health insurance funds.

### Payroll Growth Assumption

Participating employers of SPRS make contributions to the system as a percentage of the covered payroll. Therefore, as payroll changes over time these amortization payments will also change. If actual covered payroll increases at a rate that is less than assumed, then the retirement system receives less money than expected to finance the unfunded liability, which means the contribution rates in future years will be required to increase in order to finance the unfunded liability over the same time period. The current payroll growth assumption is 0.00% for the SPRS retirement and insurance funds. The analysis shows the impact of a 1.00% increase and a 1.00% decrease in the payroll growth assumption. Please note that the payroll growth assumption does not impact the valuation liabilities, unfunded liability, and funded status of the system. Rather, this assumption only impacts the amortization rate for financing the existing unfunded actuarial accrued liability and the recommended employer contribution. For purposes of this analysis, the investment return assumption and the inflation assumption are held at their current valuation assumptions.

### **Certification**

The information provided in this report compliments the information provided in the June 30, 2017 actuarial valuation report. Please refer to the June 30, 2017 actuarial valuation report for additional discussion of the actuarial valuation, including the nature of actuarial calculations and more information related to participant data, economic and demographic assumptions, and benefit provisions.

Actual results can, and almost certainly will, differ as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rate, and funding periods. The actuarial calculations are intended to provide information for rational decision making. The purpose of this information is to provide stakeholders the financial sensitivity of the unfunded liability and contribution rates to changes in the inflation, assumed rate of return, and discount rate.

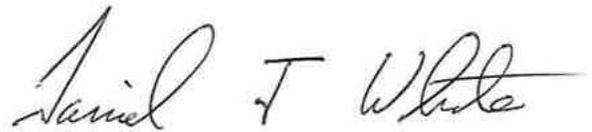
The undersigned are independent actuaries and consultants. Mr. Newton and Mr. White are Enrolled Actuaries. All three of the undersigned are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries. All of the undersigned are experienced in performing valuations for large public retirement systems.

This communication shall not be construed to provide tax advice, legal advice or investment advice.

Sincerely,



Joseph P. Newton, FSA, EA, MAAA  
Pension Market Leader and Actuary



Daniel J. White, FSA, EA, MAAA  
Senior Consultant



Jamie Shaw, ASA, MAAA  
Consultant

## Sensitivity Analysis - Discount Rate

(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Discount Rate<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Discount Rate<br>(4) |
|--------------------------------------|----------------------------------|-----------------------------|----------------------------------|
| Payroll Growth Rate                  | 0.00%                            | 0.00%                       | 0.00%                            |
| Inflation Rate                       | 2.30%                            | 2.30%                       | 2.30%                            |
| Discount Rate - Retirement           | 4.25%                            | 5.25%                       | 6.25%                            |
| Discount Rate - Insurance            | 5.25%                            | 6.25%                       | 7.25%                            |
| <b>Retirement</b>                    |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 1,089,826                     | \$ 967,145                  | \$ 866,311                       |
| Actuarial Value of Assets            | 261,320                          | 261,320                     | 261,320                          |
| Unfunded Actuarial Accrued Liability | 828,506                          | 705,825                     | 604,991                          |
| Funded Ratio                         | 24.0%                            | 27.0%                       | 30.2%                            |
| Total Recommended Contribution Rate  | 132.59%                          | 119.05%                     | 107.52%                          |
| <b>Insurance</b>                     |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 311,618                       | \$ 276,641                  | \$ 247,763                       |
| Actuarial Value of Assets            | 180,464                          | 180,464                     | 180,464                          |
| Unfunded Actuarial Accrued Liability | 131,154                          | 96,177                      | 67,299                           |
| Funded Ratio                         | 57.9%                            | 65.2%                       | 72.8%                            |
| Total Recommended Contribution Rate  | 34.45%                           | 27.23%                      | 20.79%                           |
| <b>Combined</b>                      |                                  |                             |                                  |
| Actuarial Accrued Liability          | \$ 1,401,444                     | \$ 1,243,786                | \$ 1,114,074                     |
| Actuarial Value of Assets            | 441,784                          | 441,784                     | 441,784                          |
| Unfunded Actuarial Accrued Liability | 959,660                          | 802,002                     | 672,290                          |
| Funded Ratio                         | 31.5%                            | 35.5%                       | 39.7%                            |
| Total Recommended Contribution Rate  | 167.04%                          | 146.28%                     | 128.31%                          |

## Sensitivity Analysis - Inflation Rate

(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Inflation Rate<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Inflation Rate<br>(4) |
|--------------------------------------|-----------------------------------|-----------------------------|-----------------------------------|
| Payroll Growth Rate                  | -0.25%                            | 0.00%                       | 0.25%                             |
| Inflation Rate                       | 2.05%                             | 2.30%                       | 2.55%                             |
| Discount Rate - Retirement           | 5.00%                             | 5.25%                       | 5.50%                             |
| Discount Rate - Insurance            | 6.00%                             | 6.25%                       | 6.50%                             |
| <b>Retirement</b>                    |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 994,172                        | \$ 967,145                  | \$ 941,392                        |
| Actuarial Value of Assets            | 261,320                           | 261,320                     | 261,320                           |
| Unfunded Actuarial Accrued Liability | 732,852                           | 705,825                     | 680,072                           |
| Funded Ratio                         | 26.3%                             | 27.0%                       | 27.8%                             |
| Total Recommended Contribution Rate  | 124.15%                           | 119.05%                     | 114.20%                           |
| <b>Insurance</b>                     |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 277,760                        | \$ 276,641                  | \$ 275,568                        |
| Actuarial Value of Assets            | 180,464                           | 180,464                     | 180,464                           |
| Unfunded Actuarial Accrued Liability | 97,296                            | 96,177                      | 95,104                            |
| Funded Ratio                         | 65.0%                             | 65.2%                       | 65.5%                             |
| Total Recommended Contribution Rate  | 27.61%                            | 27.23%                      | 26.88%                            |
| <b>Combined</b>                      |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 1,271,932                      | \$ 1,243,786                | \$ 1,216,960                      |
| Actuarial Value of Assets            | 441,784                           | 441,784                     | 441,784                           |
| Unfunded Actuarial Accrued Liability | 830,148                           | 802,002                     | 775,176                           |
| Funded Ratio                         | 34.7%                             | 35.5%                       | 36.3%                             |
| Total Recommended Contribution Rate  | 151.76%                           | 146.28%                     | 141.08%                           |

**Sensitivity Analysis - Payroll Growth**  
(Dollar amounts expressed in thousands)

| (1)                                  | Decrease<br>Payroll Growth<br>(2) | Valuation<br>Results<br>(3) | Increase<br>Payroll Growth<br>(4) |
|--------------------------------------|-----------------------------------|-----------------------------|-----------------------------------|
| Payroll Growth Rate                  | -1.00%                            | 0.00%                       | 1.00%                             |
| Inflation Rate                       | 2.30%                             | 2.30%                       | 2.30%                             |
| Discount Rate - Retirement           | 5.25%                             | 5.25%                       | 5.25%                             |
| Discount Rate - Insurance            | 6.25%                             | 6.25%                       | 6.25%                             |
| <b>Retirement</b>                    |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 967,145                        | \$ 967,145                  | \$ 967,145                        |
| Actuarial Value of Assets            | 261,320                           | 261,320                     | 261,320                           |
| Unfunded Actuarial Accrued Liability | 705,825                           | 705,825                     | 705,825                           |
| Funded Ratio                         | 27.0%                             | 27.0%                       | 27.0%                             |
| Total Recommended Contribution Rate  | 130.15%                           | 119.05%                     | 108.69%                           |
| <b>Insurance</b>                     |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 276,641                        | \$ 276,641                  | \$ 276,641                        |
| Actuarial Value of Assets            | 180,464                           | 180,464                     | 180,464                           |
| Unfunded Actuarial Accrued Liability | 96,177                            | 96,177                      | 96,177                            |
| Funded Ratio                         | 65.2%                             | 65.2%                       | 65.2%                             |
| Total Recommended Contribution Rate  | 28.87%                            | 27.23%                      | 25.69%                            |
| <b>Combined</b>                      |                                   |                             |                                   |
| Actuarial Accrued Liability          | \$ 1,243,786                      | \$ 1,243,786                | \$ 1,243,786                      |
| Actuarial Value of Assets            | 441,784                           | 441,784                     | 441,784                           |
| Unfunded Actuarial Accrued Liability | 802,002                           | 802,002                     | 802,002                           |
| Funded Ratio                         | 35.5%                             | 35.5%                       | 35.5%                             |
| Total Recommended Contribution Rate  | 159.02%                           | 146.28%                     | 134.38%                           |

**Projected Cost of the Retirement and Insurance  
Current Plan - Non-hazardous**

**Kentucky Retirement Systems**  
**KERS Non-Hazardous Retirement Fund**  
**Current Plan**  
**(\$ in Millions)**

| Fiscal Year<br>Beginning<br>July 1, | Actuarial<br>Accrued<br>Liability | Actuarial<br>Value of<br>Assets | Unfunded<br>Actuarial<br>Accrued Liability | Funded<br>Ratio<br>(3) / (2) | Employer<br>Contribution | Member<br>Contribution | Covered<br>Payroll | Employer<br>Contribution as %<br>of Covered Payroll | Employer<br>Actuarially<br>Determined<br>Contribution Rate |
|-------------------------------------|-----------------------------------|---------------------------------|--|------------------------------|--------------------------|------------------------|--------------------|---|--|
| (1)                                 | (2)                               | (3)                             | (4)  | (5)                          | (6)                      | (7)                    | (8)                | (9)   | (10)   |
| 2017                                | \$ 15,592                         | \$ 2,124                        | \$ 13,468                                  | 14%                          | \$ 629                   | \$ 77                  | \$ 1,532           | 41.06%  | 41.98%   |
| 2018                                | 15,629                            | 2,038                           | 13,591                                     | 13%                          | 1,101                    | 78                     | 1,551              | 71.03%  | 71.03%   |
| 2019                                | 15,645                            | 2,296                           | 13,349                                     | 15%                          | 1,118                    | 79                     | 1,574              | 71.03%  | 69.79%   |
| 2020                                | 15,643                            | 2,601                           | 13,042                                     | 17%                          | 1,097                    | 80                     | 1,601              | 68.54%  | 68.54%   |
| 2021                                | 15,624                            | 2,924                           | 12,700                                     | 19%                          | 1,116                    | 81                     | 1,628              | 68.54%  | 67.18%   |
| 2022                                | 15,587                            | 3,253                           | 12,334                                     | 21%                          | 1,086                    | 83                     | 1,656              | 65.54%  | 65.54%   |
| 2023                                | 15,535                            | 3,556                           | 11,979                                     | 23%                          | 1,105                    | 84                     | 1,686              | 65.54%  | 64.13%   |
| 2024                                | 15,466                            | 3,886                           | 11,580                                     | 25%                          | 1,075                    | 86                     | 1,718              | 62.57%  | 62.57%   |
| 2025                                | 15,383                            | 4,193                           | 11,190                                     | 27%                          | 1,095                    | 88                     | 1,751              | 62.57%  | 61.15%   |
| 2026                                | 15,285                            | 4,530                           | 10,755                                     | 30%                          | 1,064                    | 89                     | 1,785              | 59.60%  | 59.60%   |
| 2027                                | 15,172                            | 4,845                           | 10,327                                     | 32%                          | 1,084                    | 91                     | 1,819              | 59.60%  | 58.21%   |
| 2028                                | 15,052                            | 5,199                           | 9,853                                      | 35%                          | 1,052                    | 93                     | 1,854              | 56.71%  | 56.71%   |
| 2029                                | 14,918                            | 5,533                           | 9,385                                      | 37%                          | 1,072                    | 95                     | 1,891              | 56.71%  | 55.37%   |
| 2030                                | 14,769                            | 5,901                           | 8,868                                      | 40%                          | 1,040                    | 96                     | 1,929              | 53.90%  | 53.90%   |
| 2031                                | 14,609                            | 6,254                           | 8,355                                      | 43%                          | 1,062                    | 99                     | 1,970              | 53.90%  | 52.59%   |
| 2032                                | 14,440                            | 6,649                           | 7,791                                      | 46%                          | 1,028                    | 101                    | 2,012              | 51.10%  | 51.10%   |
| 2033                                | 14,262                            | 7,033                           | 7,229                                      | 49%                          | 1,051                    | 103                    | 2,056              | 51.10%  | 49.82%   |
| 2034                                | 14,077                            | 7,463                           | 6,614                                      | 53%                          | 1,015                    | 105                    | 2,101              | 48.33%  | 48.33%   |
| 2035                                | 13,884                            | 7,884                           | 6,000                                      | 57%                          | 1,038                    | 107                    | 2,147              | 48.33%  | 47.09%   |
| 2036                                | 13,689                            | 8,358                           | 5,331                                      | 61%                          | 1,003                    | 110                    | 2,198              | 45.62%  | 45.62%   |

Notes and assumptions:

The projection is based on the results of the June 30, 2017 actuarial valuation.

The employer actuarially determined contribution rate for a particular year is determined by the prior year's actuarial valuation.

The employer contribution amount shown does not include the \$87 million additional contribution budgeted to be paid in fiscal year beginning 2017.

**Kentucky Retirement Systems**  
**CERS Non-Hazardous Retirement Fund**  
**Current Plan**  
**(\$ in Millions)**

| Fiscal Year<br>Beginning<br>July 1, | Actuarial<br>Accrued<br>Liability | Actuarial<br>Value of<br>Assets | Unfunded<br>Actuarial<br>Accrued Liability | Funded<br>Ratio<br>(3) / (2) | Employer<br>Contribution | Member<br>Contribution | Covered<br>Payroll | Employer<br>Contribution as %<br>of Covered Payroll | Employer<br>Actuarially<br>Determined<br>Contribution Rate |
|-------------------------------------|-----------------------------------|---------------------------------|--|------------------------------|--------------------------|------------------------|--------------------|---|--|
| (1)                                 | (2)                               | (3)                             | (4)  | (5)                          | (6)                      | (7)                    | (8)                | (9)   | (10)   |
| 2017                                | \$ 12,804                         | \$ 6,765                        | \$ 6,039                                   | 53%                          | \$ 355                   | \$ 123                 | \$ 2,452           | 14.48%  | 14.48%   |
| 2018                                | 13,121                            | 6,902                           | 6,219                                      | 53%                          | 546                      | 125                    | 2,500              | 21.84%  | 21.84%   |
| 2019                                | 13,421                            | 7,122                           | 6,299                                      | 53%                          | 548                      | 127                    | 2,547              | 21.50%  | 21.50%   |
| 2020                                | 13,704                            | 7,412                           | 6,292                                      | 54%                          | 558                      | 130                    | 2,594              | 21.53%  | 21.53%   |
| 2021                                | 13,970                            | 7,805                           | 6,165                                      | 56%                          | 563                      | 132                    | 2,642              | 21.33%  | 21.33%   |
| 2022                                | 14,218                            | 8,119                           | 6,099                                      | 57%                          | 561                      | 135                    | 2,690              | 20.86%  | 20.86%   |
| 2023                                | 14,445                            | 8,419                           | 6,026                                      | 58%                          | 565                      | 137                    | 2,740              | 20.64%  | 20.64%   |
| 2024                                | 14,652                            | 8,711                           | 5,941                                      | 59%                          | 570                      | 140                    | 2,790              | 20.43%  | 20.43%   |
| 2025                                | 14,836                            | 8,996                           | 5,840                                      | 61%                          | 575                      | 142                    | 2,842              | 20.22%  | 20.22%   |
| 2026                                | 14,998                            | 9,273                           | 5,725                                      | 62%                          | 580                      | 145                    | 2,894              | 20.03%  | 20.03%   |
| 2027                                | 15,136                            | 9,541                           | 5,595                                      | 63%                          | 585                      | 147                    | 2,948              | 19.84%  | 19.84%   |
| 2028                                | 15,259                            | 9,813                           | 5,446                                      | 64%                          | 591                      | 150                    | 3,003              | 19.67%  | 19.67%   |
| 2029                                | 15,359                            | 10,079                          | 5,280                                      | 66%                          | 597                      | 153                    | 3,062              | 19.50%  | 19.50%   |
| 2030                                | 15,438                            | 10,344                          | 5,094                                      | 67%                          | 604                      | 156                    | 3,124              | 19.34%  | 19.34%   |
| 2031                                | 15,496                            | 10,611                          | 4,885                                      | 68%                          | 611                      | 159                    | 3,187              | 19.18%  | 19.18%   |
| 2032                                | 15,536                            | 10,882                          | 4,654                                      | 70%                          | 619                      | 163                    | 3,254              | 19.03%  | 19.03%   |
| 2033                                | 15,558                            | 11,161                          | 4,397                                      | 72%                          | 627                      | 166                    | 3,323              | 18.88%  | 18.88%   |
| 2034                                | 15,565                            | 11,450                          | 4,115                                      | 74%                          | 636                      | 170                    | 3,394              | 18.74%  | 18.74%   |
| 2035                                | 15,556                            | 11,753                          | 3,803                                      | 76%                          | 645                      | 173                    | 3,467              | 18.61%  | 18.61%   |
| 2036                                | 15,535                            | 12,073                          | 3,462                                      | 78%                          | 655                      | 177                    | 3,545              | 18.49%  | 18.49%   |

Notes and assumptions:

The projection is based on the results of the June 30, 2017 actuarial valuation.

The employer actuarially determined contribution rate for a particular year is determined by the prior year's actuarial valuation.

**Kentucky Retirement Systems**  
**KERS Non-Hazardous Insurance Fund**  
**Current Plan**  
**(\$ in Millions)**

| Fiscal Year<br>Beginning<br>July 1, | Actuarial<br>Accrued<br>Liability | Actuarial<br>Value of<br>Assets | Unfunded<br>Actuarial<br>Accrued Liability | Funded<br>Ratio<br>(3) / (2) | Employer<br>Contribution | Member<br>Contribution | Covered<br>Payroll | Employer<br>Contribution as %<br>of Covered Payroll | Employer<br>Actuarially<br>Determined<br>Contribution Rate |
|-------------------------------------|-----------------------------------|---------------------------------|--|------------------------------|--------------------------|------------------------|--------------------|---|--|
| (1)                                 | (2)                               | (3)                             | (4)  | (5)                          | (6)                      | (7)                    | (8)                | (9)   | (10)   |
| 2017                                | \$ 2,683                          | \$ 824                          | \$ 1,859                                   | 31%                          | \$ 128                   | \$ 5                   | \$ 1,524           | 8.41%   | 8.41%  |
| 2018                                | 2,760                             | 874                             | 1,886                                      | 32%                          | 191                      | 6                      | 1,541              | 12.40%  | 12.40%   |
| 2019                                | 2,837                             | 975                             | 1,862                                      | 34%                          | 194                      | 7                      | 1,564              | 12.40%  | 12.09%   |
| 2020                                | 2,907                             | 1,087                           | 1,820                                      | 37%                          | 188                      | 8                      | 1,590              | 11.81%  | 11.81%   |
| 2021                                | 2,972                             | 1,202                           | 1,770                                      | 40%                          | 191                      | 9                      | 1,617              | 11.81%  | 11.50%   |
| 2022                                | 3,032                             | 1,311                           | 1,721                                      | 43%                          | 182                      | 10                     | 1,645              | 11.09%  | 11.09%   |
| 2023                                | 3,085                             | 1,411                           | 1,674                                      | 46%                          | 186                      | 10                     | 1,675              | 11.09%  | 10.77%   |
| 2024                                | 3,133                             | 1,512                           | 1,621                                      | 48%                          | 178                      | 11                     | 1,706              | 10.44%  | 10.44%   |
| 2025                                | 3,174                             | 1,604                           | 1,570                                      | 51%                          | 181                      | 12                     | 1,738              | 10.44%  | 10.12%   |
| 2026                                | 3,208                             | 1,698                           | 1,510                                      | 53%                          | 173                      | 13                     | 1,772              | 9.76%   | 9.76%  |
| 2027                                | 3,235                             | 1,781                           | 1,454                                      | 55%                          | 176                      | 14                     | 1,806              | 9.76%   | 9.47%  |
| 2028                                | 3,254                             | 1,864                           | 1,390                                      | 57%                          | 168                      | 15                     | 1,841              | 9.13%   | 9.13%  |
| 2029                                | 3,264                             | 1,937                           | 1,327                                      | 59%                          | 171                      | 15                     | 1,877              | 9.13%   | 8.82%  |
| 2030                                | 3,265                             | 2,010                           | 1,255                                      | 62%                          | 162                      | 16                     | 1,915              | 8.48%   | 8.48%  |
| 2031                                | 3,259                             | 2,072                           | 1,187                                      | 64%                          | 166                      | 17                     | 1,956              | 8.48%   | 8.23%  |
| 2032                                | 3,248                             | 2,139                           | 1,109                                      | 66%                          | 158                      | 18                     | 1,998              | 7.92%   | 7.92%  |
| 2033                                | 3,233                             | 2,200                           | 1,033                                      | 68%                          | 162                      | 19                     | 2,041              | 7.92%   | 7.68%  |
| 2034                                | 3,215                             | 2,268                           | 947  | 71%                          | 155                      | 20                     | 2,085              | 7.42%   | 7.42%  |
| 2035                                | 3,195                             | 2,332                           | 863  | 73%                          | 158                      | 20                     | 2,132              | 7.42%   | 7.20%  |
| 2036                                | 3,175                             | 2,406                           | 769  | 76%                          | 151                      | 21                     | 2,183              | 6.94%   | 6.94%  |

Notes and assumptions:

The projection is based on the results of the June 30, 2017 actuarial valuation.

The employer actuarially determined contribution rate for a particular year is determined by the prior year's actuarial valuation.

**Kentucky Retirement Systems**  
**CERS Non-Hazardous Insurance Fund**  
**Current Plan**  
**(\$ in Millions)**

| Fiscal Year<br>Beginning<br>July 1, | Actuarial<br>Accrued<br>Liability | Actuarial<br>Value of<br>Assets | Unfunded<br>Actuarial<br>Accrued Liability | Funded<br>Ratio<br>(3) / (2) | Employer<br>Contribution | Member<br>Contribution | Covered<br>Payroll | Employer<br>Contribution as %<br>of Covered Payroll | Employer<br>Actuarially<br>Determined<br>Contribution Rate |
|-------------------------------------|-----------------------------------|---------------------------------|--|------------------------------|--------------------------|------------------------|--------------------|---|--|
| (1)                                 | (2)                               | (3)                             | (4)  | (5)                          | (6)                      | (7)                    | (8)                | (9)   | (10)   |
| 2017                                | \$ 3,355                          | \$ 2,227                        | \$ 1,128                                   | 66%                          | \$ 114                   | \$ 10                  | \$ 2,429           | 4.70%   | 4.70%  |
| 2018                                | 3,514                             | 2,343                           | 1,171                                      | 67%                          | 154                      | 11                     | 2,477              | 6.21%   | 6.21%  |
| 2019                                | 3,667                             | 2,475                           | 1,192                                      | 67%                          | 153                      | 13                     | 2,524              | 6.06%   | 6.06%  |
| 2020                                | 3,813                             | 2,623                           | 1,190                                      | 69%                          | 154                      | 14                     | 2,572              | 5.98%   | 5.98%  |
| 2021                                | 3,951                             | 2,798                           | 1,153                                      | 71%                          | 153                      | 15                     | 2,619              | 5.84%   | 5.84%  |
| 2022                                | 4,081                             | 2,941                           | 1,140                                      | 72%                          | 150                      | 17                     | 2,668              | 5.62%   | 5.62%  |
| 2023                                | 4,202                             | 3,077                           | 1,125                                      | 73%                          | 149                      | 18                     | 2,718              | 5.48%   | 5.48%  |
| 2024                                | 4,315                             | 3,206                           | 1,109                                      | 74%                          | 148                      | 19                     | 2,768              | 5.35%   | 5.35%  |
| 2025                                | 4,419                             | 3,330                           | 1,089                                      | 75%                          | 147                      | 20                     | 2,820              | 5.21%   | 5.21%  |
| 2026                                | 4,514                             | 3,447                           | 1,067                                      | 76%                          | 146                      | 22                     | 2,873              | 5.08%   | 5.08%  |
| 2027                                | 4,600                             | 3,558                           | 1,042                                      | 77%                          | 145                      | 23                     | 2,926              | 4.96%   | 4.96%  |
| 2028                                | 4,676                             | 3,663                           | 1,013                                      | 78%                          | 144                      | 24                     | 2,982              | 4.83%   | 4.83%  |
| 2029                                | 4,745                             | 3,763                           | 982  | 79%                          | 144                      | 26                     | 3,040              | 4.72%   | 4.72%  |
| 2030                                | 4,807                             | 3,860                           | 947  | 80%                          | 143                      | 27                     | 3,102              | 4.60%   | 4.60%  |
| 2031                                | 4,862                             | 3,954                           | 908  | 81%                          | 143                      | 28                     | 3,166              | 4.51%   | 4.51%  |
| 2032                                | 4,912                             | 4,047                           | 865  | 82%                          | 143                      | 29                     | 3,232              | 4.42%   | 4.42%  |
| 2033                                | 4,958                             | 4,140                           | 818  | 84%                          | 144                      | 31                     | 3,301              | 4.35%   | 4.35%  |
| 2034                                | 5,002                             | 4,236                           | 766  | 85%                          | 144                      | 32                     | 3,372              | 4.28%   | 4.28%  |
| 2035                                | 5,045                             | 4,336                           | 709  | 86%                          | 146                      | 33                     | 3,445              | 4.23%   | 4.23%  |
| 2036                                | 5,089                             | 4,443                           | 646  | 87%                          | 147                      | 34                     | 3,522              | 4.18%   | 4.18%  |

Notes and assumptions:

The projection is based on the results of the June 30, 2017 actuarial valuation.

The employer actuarially determined contribution rate for a particular year is determined by the prior year's actuarial valuation.

**Projected Cost of the Retirement and Insurance  
Current Plan - Hazardous**

**Kentucky Retirement Systems**  
**KERS Hazardous Retirement Fund**  
**Current Plan**  
**(\$ in Millions)**

| Fiscal Year<br>Beginning<br>July 1, | Actuarial<br>Accrued<br>Liability | Actuarial<br>Value of<br>Assets | Unfunded<br>Actuarial<br>Accrued Liability | Funded<br>Ratio<br>(3) / (2) | Employer<br>Contribution | Member<br>Contribution | Covered<br>Payroll | Employer<br>Contribution as %<br>of Covered Payroll | Employer<br>Actuarially<br>Determined<br>Contribution Rate |
|-------------------------------------|-----------------------------------|---------------------------------|--|------------------------------|--------------------------|------------------------|--------------------|---|--|
| (1)                                 | (2)                               | (3)                             | (4)  | (5)                          | (6)                      | (7)                    | (8)                | (9)   | (10)   |
| 2017                                | \$ 1,121                          | \$ 607                          | \$ 514                                     | 54%                          | \$ 35                    | \$ 13                  | \$ 162             | 21.44%  | 20.48%   |
| 2018                                | 1,155                             | 637                             | 518  | 55%                          | 57                       | 13                     | 166                | 34.39%  | 34.39%   |
| 2019                                | 1,186                             | 669                             | 517  | 56%                          | 58                       | 14                     | 170                | 34.39%  | 33.30%   |
| 2020                                | 1,217                             | 709                             | 508  | 58%                          | 57                       | 14                     | 174                | 32.60%  | 32.60%   |
| 2021                                | 1,247                             | 757                             | 490  | 61%                          | 58                       | 14                     | 179                | 32.60%  | 31.64%   |
| 2022                                | 1,276                             | 801                             | 475  | 63%                          | 55                       | 15                     | 183                | 30.23%  | 30.23%   |
| 2023                                | 1,305                             | 841                             | 464  | 64%                          | 57                       | 15                     | 188                | 30.23%  | 29.28%   |
| 2024                                | 1,333                             | 884                             | 449  | 66%                          | 55                       | 15                     | 193                | 28.30%  | 28.30%   |
| 2025                                | 1,360                             | 925                             | 435  | 68%                          | 56                       | 16                     | 197                | 28.30%  | 27.39%   |
| 2026                                | 1,386                             | 967                             | 419  | 70%                          | 53                       | 16                     | 202                | 26.47%  | 26.47%   |
| 2027                                | 1,410                             | 1,007                           | 403  | 71%                          | 55                       | 16                     | 206                | 26.47%  | 25.63%   |
| 2028                                | 1,434                             | 1,048                           | 386  | 73%                          | 52                       | 17                     | 211                | 24.72%  | 24.72%   |
| 2029                                | 1,456                             | 1,087                           | 369  | 75%                          | 53                       | 17                     | 216                | 24.72%  | 23.96%   |
| 2030                                | 1,478                             | 1,128                           | 350  | 76%                          | 51                       | 18                     | 222                | 23.16%  | 23.16%   |
| 2031                                | 1,500                             | 1,169                           | 331  | 78%                          | 53                       | 18                     | 229                | 23.16%  | 22.48%   |
| 2032                                | 1,524                             | 1,214                           | 310  | 80%                          | 51                       | 19                     | 236                | 21.75%  | 21.75%   |
| 2033                                | 1,549                             | 1,260                           | 289  | 81%                          | 53                       | 19                     | 242                | 21.75%  | 21.14%   |
| 2034                                | 1,576                             | 1,310                           | 266  | 83%                          | 51                       | 20                     | 249                | 20.47%  | 20.47%   |
| 2035                                | 1,605                             | 1,362                           | 243  | 85%                          | 52                       | 20                     | 256                | 20.47%  | 19.91%   |
| 2036                                | 1,634                             | 1,417                           | 217  | 87%                          | 51                       | 21                     | 263                | 19.29%  | 19.29%   |

Notes and assumptions:

The projection is based on the results of the June 30, 2017 actuarial valuation.

The employer actuarially determined contribution rate for a particular year is determined by the prior year's actuarial valuation.

The employer contribution amount shown does not include the \$10 million additional contribution budgeted to be paid in fiscal year beginning 2017.

**Kentucky Retirement Systems**  
**CERS Hazardous Retirement Fund**  
**Current Plan**  
**(\$ in Millions)**

| Fiscal Year<br>Beginning<br>July 1, | Actuarial<br>Accrued<br>Liability | Actuarial<br>Value of<br>Assets | Unfunded<br>Actuarial<br>Accrued Liability | Funded<br>Ratio<br>(3) / (2) | Employer<br>Contribution | Member<br>Contribution | Covered<br>Payroll | Employer<br>Contribution as %<br>of Covered Payroll | Employer<br>Actuarially<br>Determined<br>Contribution Rate |
|-------------------------------------|-----------------------------------|---------------------------------|--|------------------------------|--------------------------|------------------------|--------------------|---|--|
| (1)                                 | (2)                               | (3)                             | (4)  | (5)                          | (6)                      | (7)                    | (8)                | (9)   | (10)   |
| 2017                                | \$ 4,649                          | \$ 2,238                        | \$ 2,411                                   | 48%                          | \$ 120                   | \$ 43                  | \$ 542             | 22.20%  | 22.20%   |
| 2018                                | 4,771                             | 2,293                           | 2,478                                      | 48%                          | 192                      | 43                     | 537                | 35.69%  | 35.69%   |
| 2019                                | 4,880                             | 2,376                           | 2,504                                      | 49%                          | 193                      | 43                     | 538                | 35.95%  | 35.95%   |
| 2020                                | 4,978                             | 2,478                           | 2,500                                      | 50%                          | 197                      | 43                     | 542                | 36.42%  | 36.42%   |
| 2021                                | 5,066                             | 2,610                           | 2,456                                      | 52%                          | 199                      | 44                     | 546                | 36.48%  | 36.48%   |
| 2022                                | 5,145                             | 2,712                           | 2,433                                      | 53%                          | 199                      | 44                     | 551                | 36.06%  | 36.06%   |
| 2023                                | 5,214                             | 2,809                           | 2,405                                      | 54%                          | 201                      | 45                     | 558                | 35.95%  | 35.95%   |
| 2024                                | 5,274                             | 2,902                           | 2,372                                      | 55%                          | 202                      | 45                     | 565                | 35.81%  | 35.81%   |
| 2025                                | 5,325                             | 2,992                           | 2,333                                      | 56%                          | 204                      | 46                     | 573                | 35.66%  | 35.66%   |
| 2026                                | 5,367                             | 3,079                           | 2,288                                      | 57%                          | 207                      | 47                     | 582                | 35.49%  | 35.49%   |
| 2027                                | 5,400                             | 3,164                           | 2,236                                      | 59%                          | 209                      | 47                     | 592                | 35.32%  | 35.32%   |
| 2028                                | 5,426                             | 3,248                           | 2,178                                      | 60%                          | 212                      | 48                     | 602                | 35.14%  | 35.14%   |
| 2029                                | 5,444                             | 3,333                           | 2,111                                      | 61%                          | 215                      | 49                     | 614                | 34.96%  | 34.96%   |
| 2030                                | 5,457                             | 3,420                           | 2,037                                      | 63%                          | 218                      | 50                     | 628                | 34.75%  | 34.75%   |
| 2031                                | 5,466                             | 3,512                           | 1,954                                      | 64%                          | 222                      | 51                     | 642                | 34.54%  | 34.54%   |
| 2032                                | 5,472                             | 3,611                           | 1,861                                      | 66%                          | 225                      | 53                     | 657                | 34.33%  | 34.33%   |
| 2033                                | 5,478                             | 3,719                           | 1,759                                      | 68%                          | 229                      | 54                     | 672                | 34.12%  | 34.12%   |
| 2034                                | 5,483                             | 3,837                           | 1,646                                      | 70%                          | 233                      | 55                     | 688                | 33.92%  | 33.92%   |
| 2035                                | 5,489                             | 3,967                           | 1,522                                      | 72%                          | 238                      | 56                     | 705                | 33.73%  | 33.73%   |
| 2036                                | 5,495                             | 4,110                           | 1,385                                      | 75%                          | 242                      | 58                     | 721                | 33.56%  | 33.56%   |

Notes and assumptions:

The projection is based on the results of the June 30, 2017 actuarial valuation.

The employer actuarially determined contribution rate for a particular year is determined by the prior year's actuarial valuation.

**Kentucky Retirement Systems**  
**SPRS Retirement Fund**  
**Current Plan**  
**(\$ in Millions)**

| Fiscal Year<br>Beginning<br>July 1, | Actuarial<br>Accrued<br>Liability | Actuarial<br>Value of<br>Assets | Unfunded<br>Actuarial<br>Accrued Liability | Funded<br>Ratio<br>(3) / (2) | Employer<br>Contribution | Member<br>Contribution | Covered<br>Payroll | Employer<br>Contribution as %<br>of Covered Payroll | Employer<br>Actuarially<br>Determined<br>Contribution Rate |
|-------------------------------------|-----------------------------------|---------------------------------|--|------------------------------|--------------------------|------------------------|--------------------|---|--|
| (1)                                 | (2)                               | (3)                             | (4)  | (5)                          | (6)                      | (7)                    | (8)                | (9)   | (10)   |
| 2017                                | \$ 967                            | \$ 261                          | \$ 706                                     | 27%                          | \$ 35                    | \$ 4                   | \$ 49              | 72.47%  | 71.57%   |
| 2018                                | 970                               | 264                             | 706  | 27%                          | 58                       | 4                      | 49                 | 119.05%   | 119.05%  |
| 2019                                | 972                               | 275                             | 697  | 28%                          | 59                       | 4                      | 50                 | 119.05%   | 117.69%  |
| 2020                                | 972                               | 290                             | 682  | 30%                          | 58                       | 4                      | 50                 | 116.24%   | 116.24%  |
| 2021                                | 972                               | 308                             | 664  | 32%                          | 59                       | 4                      | 51                 | 116.24%   | 114.50%  |
| 2022                                | 970                               | 325                             | 645  | 34%                          | 58                       | 4                      | 52                 | 111.48%   | 111.48%  |
| 2023                                | 967                               | 341                             | 626  | 35%                          | 59                       | 4                      | 53                 | 111.48%   | 109.03%  |
| 2024                                | 964                               | 358                             | 606  | 37%                          | 57                       | 4                      | 54                 | 106.31%   | 106.31%  |
| 2025                                | 959                               | 373                             | 586  | 39%                          | 58                       | 4                      | 55                 | 106.31%   | 103.75%  |
| 2026                                | 953                               | 390                             | 563  | 41%                          | 56                       | 4                      | 56                 | 101.12%   | 101.12%  |
| 2027                                | 946                               | 405                             | 541  | 43%                          | 58                       | 5                      | 57                 | 101.12%   | 98.44%   |
| 2028                                | 938                               | 423                             | 515  | 45%                          | 56                       | 5                      | 59                 | 95.24%  | 95.24%   |
| 2029                                | 930                               | 440                             | 490  | 47%                          | 57                       | 5                      | 60                 | 95.24%  | 92.43%   |
| 2030                                | 922                               | 459                             | 463  | 50%                          | 55                       | 5                      | 62                 | 89.36%  | 89.36%   |
| 2031                                | 914                               | 477                             | 437  | 52%                          | 57                       | 5                      | 64                 | 89.36%  | 86.61%   |
| 2032                                | 905                               | 499                             | 406  | 55%                          | 55                       | 5                      | 65                 | 83.53%  | 83.53%   |
| 2033                                | 897                               | 519                             | 378  | 58%                          | 56                       | 5                      | 67                 | 83.53%  | 81.10%   |
| 2034                                | 888                               | 544                             | 344  | 61%                          | 54                       | 6                      | 69                 | 78.24%  | 78.24%   |
| 2035                                | 880                               | 567                             | 313  | 64%                          | 55                       | 6                      | 71                 | 78.24%  | 75.87%   |
| 2036                                | 872                               | 595                             | 277  | 68%                          | 53                       | 6                      | 73                 | 73.29%  | 73.29%   |

Notes and assumptions:

The projection is based on the results of the June 30, 2017 actuarial valuation.

The employer actuarially determined contribution rate for a particular year is determined by the prior year's actuarial valuation.

The employer contribution amount shown does not include the \$10 million additional contribution budgeted to be paid in fiscal year beginning 2017.

**Kentucky Retirement Systems**  
**KERS Hazardous Insurance Fund**  
**Current Plan**  
**(\$ in Millions)**

| Fiscal Year<br>Beginning<br>July 1, | Actuarial<br>Accrued<br>Liability | Actuarial<br>Value of<br>Assets | Unfunded<br>Actuarial<br>Accrued Liability | Funded<br>Ratio<br>(3) / (2) | Employer<br>Contribution | Member<br>Contribution | Covered<br>Payroll | Employer<br>Contribution as %<br>of Covered Payroll | Employer<br>Actuarial<br>Determined<br>Contribution Rate |
|-------------------------------------|-----------------------------------|---------------------------------|--|------------------------------|--------------------------|------------------------|--------------------|---|--|
| (1)                                 | (2)                               | (3)                             | (4)  | (5)                          | (6)                      | (7)                    | (8)                | (9)   | (10)   |
| 2017                                | \$ 419                            | \$ 493                          | \$ (74)                                    | 118%                         | \$ 4                     | \$ 1                   | \$ 162             | 2.26%   | 1.34%  |
| 2018                                | 436                               | 507                             | (71)                                       | 116%                         | 4                        | 1                      | 165                | 2.46%   | 2.46%  |
| 2019                                | 453                               | 516                             | (63)                                       | 114%                         | 4                        | 1                      | 169                | 2.46%   | 2.15%  |
| 2020                                | 468                               | 529                             | (61)                                       | 113%                         | 4                        | 1                      | 174                | 2.11%   | 2.11%  |
| 2021                                | 482                               | 548                             | (66)                                       | 114%                         | 4                        | 1                      | 178                | 2.11%   | 1.84%  |
| 2022                                | 494                               | 559                             | (65)                                       | 113%                         | 2                        | 1                      | 183                | 1.21%   | 1.21%  |
| 2023                                | 504                               | 568                             | (64)                                       | 113%                         | 2                        | 1                      | 187                | 1.21%   | 0.91%  |
| 2024                                | 513                               | 575                             | (62)                                       | 112%                         | 1                        | 1                      | 192                | 0.65%   | 0.65%  |
| 2025                                | 520                               | 581                             | (61)                                       | 112%                         | 1                        | 2                      | 197                | 0.65%   | 0.50%  |
| 2026                                | 525                               | 585                             | (60)                                       | 111%                         | 1                        | 2                      | 201                | 0.35%   | 0.35%  |
| 2027                                | 530                               | 587                             | (57)                                       | 111%                         | 1                        | 2                      | 206                | 0.35%   | 0.25%  |
| 2028                                | 534                               | 589                             | (55)                                       | 110%                         | 0                        | 2                      | 210                | 0.14%   | 0.14%  |
| 2029                                | 537                               | 590                             | (53)                                       | 110%                         | 0                        | 2                      | 216                | 0.14%   | 0.09%  |
| 2030                                | 540                               | 590                             | (50)                                       | 109%                         | 0                        | 2                      | 222                | 0.07%   | 0.07%  |
| 2031                                | 543                               | 590                             | (47)                                       | 109%                         | 0                        | 2                      | 228                | 0.07%   | 0.10%  |
| 2032                                | 546                               | 590                             | (44)                                       | 108%                         | 0                        | 2                      | 235                | 0.15%   | 0.15%  |
| 2033                                | 550                               | 590                             | (40)                                       | 107%                         | 0                        | 2                      | 242                | 0.15%   | 0.20%  |
| 2034                                | 554                               | 591                             | (37)                                       | 107%                         | 1                        | 2                      | 249                | 0.25%   | 0.25%  |
| 2035                                | 559                               | 592                             | (33)                                       | 106%                         | 1                        | 3                      | 255                | 0.25%   | 0.31%  |
| 2036                                | 565                               | 594                             | (29)                                       | 105%                         | 1                        | 3                      | 262                | 0.39%   | 0.39%  |

Notes and assumptions:

The projection is based on the results of the June 30, 2017 actuarial valuation.

The employer actuarially determined contribution rate for a particular year is determined by the prior year's actuarial valuation.

**Kentucky Retirement Systems**  
**CERS Hazardous Insurance Fund**  
**Current Plan**  
**(\$ in Millions)**

| Fiscal Year<br>Beginning<br>July 1, | Actuarial<br>Accrued<br>Liability | Actuarial<br>Value of<br>Assets | Unfunded<br>Actuarial<br>Accrued Liability | Funded<br>Ratio<br>(3) / (2) | Employer<br>Contribution | Member<br>Contribution | Covered<br>Payroll | Employer<br>Contribution as %<br>of Covered Payroll | Employer<br>Actuarially<br>Determined<br>Contribution Rate |
|-------------------------------------|-----------------------------------|---------------------------------|--|------------------------------|--------------------------|------------------------|--------------------|---|--|
| (1)                                 | (2)                               | (3)                             | (4)  | (5)                          | (6)                      | (7)                    | (8)                | (9)   | (10)   |
| 2017                                | \$ 1,788                          | \$ 1,197                        | \$ 591                                     | 67%                          | \$ 51                    | \$ 2                   | \$ 541             | 9.35%   | 9.35%  |
| 2018                                | 1,853                             | 1,243                           | 610  | 67%                          | 65                       | 2                      | 536                | 12.17%  | 12.17%   |
| 2019                                | 1,912                             | 1,290                           | 622  | 67%                          | 64                       | 3                      | 538                | 11.97%  | 11.97%   |
| 2020                                | 1,962                             | 1,343                           | 619  | 68%                          | 64                       | 3                      | 541                | 11.83%  | 11.83%   |
| 2021                                | 2,005                             | 1,405                           | 600  | 70%                          | 63                       | 3                      | 546                | 11.52%  | 11.52%   |
| 2022                                | 2,038                             | 1,446                           | 592  | 71%                          | 61                       | 4                      | 551                | 11.00%  | 11.00%   |
| 2023                                | 2,061                             | 1,478                           | 583  | 72%                          | 59                       | 4                      | 558                | 10.66%  | 10.66%   |
| 2024                                | 2,075                             | 1,501                           | 574  | 72%                          | 59                       | 4                      | 565                | 10.37%  | 10.37%   |
| 2025                                | 2,081                             | 1,517                           | 564  | 73%                          | 58                       | 5                      | 573                | 10.12%  | 10.12%   |
| 2026                                | 2,078                             | 1,526                           | 552  | 73%                          | 58                       | 5                      | 582                | 9.89%   | 9.89%  |
| 2027                                | 2,068                             | 1,528                           | 540  | 74%                          | 57                       | 5                      | 591                | 9.71%   | 9.71%  |
| 2028                                | 2,052                             | 1,527                           | 525  | 74%                          | 58                       | 5                      | 602                | 9.57%   | 9.57%  |
| 2029                                | 2,031                             | 1,522                           | 509  | 75%                          | 58                       | 6                      | 614                | 9.43%   | 9.43%  |
| 2030                                | 2,008                             | 1,517                           | 491  | 76%                          | 59                       | 6                      | 627                | 9.33%   | 9.33%  |
| 2031                                | 1,982                             | 1,511                           | 471  | 76%                          | 59                       | 6                      | 641                | 9.24%   | 9.24%  |
| 2032                                | 1,954                             | 1,506                           | 448  | 77%                          | 60                       | 6                      | 656                | 9.16%   | 9.16%  |
| 2033                                | 1,927                             | 1,503                           | 424  | 78%                          | 61                       | 7                      | 672                | 9.09%   | 9.09%  |
| 2034                                | 1,899                             | 1,502                           | 397  | 79%                          | 62                       | 7                      | 688                | 9.03%   | 9.03%  |
| 2035                                | 1,873                             | 1,506                           | 367  | 80%                          | 63                       | 7                      | 704                | 8.98%   | 8.98%  |
| 2036                                | 1,849                             | 1,515                           | 334  | 82%                          | 64                       | 7                      | 721                | 8.93%   | 8.93%  |

Notes and assumptions:

The projection is based on the results of the June 30, 2017 actuarial valuation.

The employer actuarially determined contribution rate for a particular year is determined by the prior year's actuarial valuation.

**Kentucky Retirement Systems**  
**SPRS Insurance Fund**  
**Current Plan**  
**(\$ in Millions)**

| Fiscal Year<br>Beginning<br>July 1, | Actuarial<br>Accrued<br>Liability | Actuarial<br>Value of<br>Assets | Unfunded<br>Actuarial<br>Accrued Liability | Funded<br>Ratio<br>(3) / (2) | Employer<br>Contribution | Member<br>Contribution | Covered<br>Payroll | Employer<br>Contribution as %<br>of Covered Payroll | Employer<br>Actuarially<br>Determined<br>Contribution Rate |
|-------------------------------------|-----------------------------------|---------------------------------|--|------------------------------|--------------------------|------------------------|--------------------|---|--|
| (1)                                 | (2)                               | (3)                             | (4)  | (5)                          | (6)                      | (7)                    | (8)                | (9)   | (10)   |
| 2017                                | \$ 277                            | \$ 180                          | \$ 97                                      | 65%                          | \$ 9                     | \$ 0                   | \$ 48              | 18.77%  | 18.10%   |
| 2018                                | 286                               | 186                             | 100  | 65%                          | 13                       | 0                      | 48                 | 27.23%  | 27.23%   |
| 2019                                | 295                               | 195                             | 100  | 66%                          | 13                       | 0                      | 49                 | 27.23%  | 26.34%   |
| 2020                                | 302                               | 205                             | 97   | 68%                          | 13                       | 0                      | 49                 | 25.64%  | 25.64%   |
| 2021                                | 309                               | 216                             | 93   | 70%                          | 13                       | 0                      | 50                 | 25.64%  | 24.57%   |
| 2022                                | 314                               | 224                             | 90   | 71%                          | 12                       | 0                      | 51                 | 22.92%  | 22.92%   |
| 2023                                | 319                               | 231                             | 88   | 72%                          | 12                       | 0                      | 52                 | 22.92%  | 21.70%   |
| 2024                                | 321                               | 237                             | 84   | 74%                          | 11                       | 0                      | 53                 | 20.35%  | 20.35%   |
| 2025                                | 322                               | 241                             | 81   | 75%                          | 11                       | 0                      | 54                 | 20.35%  | 19.25%   |
| 2026                                | 322                               | 244                             | 78   | 76%                          | 10                       | 0                      | 55                 | 18.17%  | 18.17%   |
| 2027                                | 320                               | 246                             | 74   | 77%                          | 10                       | 0                      | 56                 | 18.17%  | 17.28%   |
| 2028                                | 318                               | 247                             | 71   | 78%                          | 9                        | 0                      | 57                 | 16.37%  | 16.37%   |
| 2029                                | 314                               | 247                             | 67   | 79%                          | 10                       | 1                      | 59                 | 16.37%  | 15.65%   |
| 2030                                | 310                               | 246                             | 64   | 79%                          | 9                        | 1                      | 61                 | 14.90%  | 14.90%   |
| 2031                                | 305                               | 245                             | 60   | 80%                          | 9                        | 1                      | 62                 | 14.90%  | 14.30%   |
| 2032                                | 300                               | 244                             | 56   | 81%                          | 9                        | 1                      | 64                 | 13.64%  | 13.64%   |
| 2033                                | 294                               | 242                             | 52   | 82%                          | 9                        | 1                      | 66                 | 13.64%  | 13.13%   |
| 2034                                | 288                               | 241                             | 47   | 84%                          | 9                        | 1                      | 68                 | 12.58%  | 12.58%   |
| 2035                                | 283                               | 239                             | 44   | 84%                          | 9                        | 1                      | 69                 | 12.58%  | 12.18%   |
| 2036                                | 277                               | 238                             | 39   | 86%                          | 8                        | 1                      | 71                 | 11.77%  | 11.77%   |

Notes and assumptions:

The projection is based on the results of the June 30, 2017 actuarial valuation.

The employer actuarially determined contribution rate for a particular year is determined by the prior year's actuarial valuation.