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October 31, 2018

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

Subject: Certification of the June 30, 2018 Actuarial Valuation Results

Dear Trustees of the Board:

Enclosed are the June 30, 2018 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) and analyze fluctuations in the employer contribution rates since the prior actuarial valuation.

Under Kentucky Statute, the Board must approve the employer contribution rates for the CERS Systems for the fiscal year beginning July 1, 2018 and ending June 30, 2019. The June 30, 2018 actuarial valuations for the KERS and SPRS were used by the Board for informational purposes only as the employer contribution rates for these systems were certified in the June 30, 2017 actuarial for the fiscal years ending June 30, 2019 and June 30, 2020.

These contribution rates are calculated based on the membership data and plan assets as of June 30, 2018. These calculations are also based on the benefit provisions in effect as of June 30, 2018. If new legislation is enacted between the valuation date and the date the contribution rates become effective, the Board may adjust the calculated rates for CERS 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 2018 actuarial valuation is 25 years. The amortization period used in subsequent actuarial valuations will decrease by one each future year.

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 (absent of benefit improvements) with the goal of attaining 100%.

Table 1 shown below provides a comparison of the change in funded ratio from June 30, 2017 to June 30, 2018 for the retirement funds of each System. As the table shows, there is little change in the funded ratio for each system compared to the prior year. The improvement in the financial health of these retirement systems is very dependent on the Retirement System and Commonwealth maintaining a sound funding policy and the participating employers paying the actuarially determined contribution rates on the payroll of their employees.

In particular, during the last fiscal year KERS non-hazardous pension fund distributed $981 million in benefit payments and received $794 million in employer and employee contributions (excluding contributions to the 401(h)). As of June 30, 2018, the market value of assets for this system was $2,004 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. If employer contribution rates determined by the June 30, 2017 actuarial valuation 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.

Table 1. Change in the Funded Ratio (AVA / AAL) from 2017 to 2018 for the Retirement Funds

	Funded Ratio – Retirement Funds	
System	**June 20, 2017**	**June 30, 2018**
KERS Non-Hazardous	13.6%	12.9%
KERS Hazardous	54.1%	55.5%
CERS Non-Hazardous	52.8%	52.7%
CERS Hazardous	48.1%	48.4%
SPRS	27.0%	27.1%

Table 2 on the following page provides a similar comparison of the change in funded ratio for the insurance funds. As the table shows, there is a significant increase in the funded ratio for each system compared to the prior year. The increase in the funded ratio is the result of very favorable premium experience from calendar year 2018 to 2019. Specifically, the non-Medicare premiums were expected to increase by 7.25% from calendar year 2018 to calendar year 2019 (i.e. the medical trend assumption for non-Medicare premiums used in the actuarial valuation) and the actual average premiums remained relatively unchanged. Also, the Medicare premiums were expected to increase by 5.10% from calendar year 2018 to calendar year 2019 (i.e. the medical trend assumption used in the actuarial valuation for Medicare premium) and the actual average premiums decreased by 12%.

Table 2. Change in the Funded Ratio (AVA / AAL) from 2017 to 2018 for the Insurance Funds

System	Funded Ratio – Insurance Funds June 30, 2017	June 30, 2018
KERS Non-Hazardous	30.7%	36.4%
KERS Hazardous	117.6%	130.0%
CERS Non-Hazardous	66.4%	76.7%
CERS Hazardous	66.9%	74.6%
SPRS	65.2%	71.6%

Please note that while the insurance funds experienced favorable premium experience from calendar year 2018 to calendar year 2019, there may be years where the premium experience is less favorable than expected resulting in actuarial losses and possible decreases in the funded ratio in future years.

Summary of Change in Contribution Rates Since the Prior Valuation

The following tables provide a comparison of the actuarially determined contribution rates determined by the June 30, 2017 actuarial valuation, the certified contribution rates that are in effect for the fiscal year ending June 30, 2019, and the actuarially determined contribution rates determined by the June 30, 2018 actuarial valuation.

Table 3. Comparison of the Contribution Rates (Retirement and Insurance)

System	2017 Valuation Calculated Rates	Effective for FY 2019	2018 Valuation Calculated Rates
KERS Non-Hazardous	83.43%	83.43%[1]	85.19%
KERS Hazardous	36.85%	36.85%	34.42%
CERS Non-Hazardous	28.05%	21.48%[2]	27.28%
CERS Hazardous	47.86%	35.34%[2]	46.50%
SPRS	146.28%	146.28%	140.04%

[1] House Bill 265 passed during the 2018 legislative session which reduced the FY 2019 employer contribution rate to 49.47% for Regional Mental Health/Mental Retardation Boards, Local and District Health Departments, State Universities, Community Colleges and any other agency eligible to voluntarily cease participating in the KERS non-hazardous system.

[2] House Bill 362 passed during the 2018 legislative session which limited the CERS employer contribution rate increases to 12% per year over the prior fiscal year for the period of July 1, 2018 to June 30, 2028.

The actuarially determined contribution rate for the KERS Non-Hazardous System increase by 1.76% from the prior year primarily due to the 4.0% decrease in covered payroll. However, the expected contribution dollars on the calculated contribution rates remain relatively unchanged from the prior year (i.e. $1,277 million based on the 2017 valuation and $1,254 million based on the 2018 valuation). The actuarially determined contribution rates for the other four systems (i.e. KERS Hazardous, CERS Non-Hazardous and Hazardous, and SPRS) slightly decreased due to the favorable experience with the insurance funds.

Also note that while the actuarially determined contribution rates decreased for both CERS Systems, the actual certified contribution rate will increase from fiscal year 2019 to fiscal year 2020 as the contribution rate increases due to the assumption changes from the June 30, 2017 valuation are being phased-in in accordance with HB 362.

Assumptions and Methods

There were no changes in the actuarial assumptions or methods since the last actuarial valuation. It is our opinion that the current assumptions are internally consistent and reasonably reflect the anticipated future experience of the System.

Kentucky Statutes require 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 and the results of that analysis will be first used to prepare the actuarial valuation as of June 30, 2019.

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 these valuations are those which were in effect on June 30, 2018. During the 2018 legislative session House Bill 185 was enacted which increased the benefit provisions for active members who die in the line of duty. House Bill 265 reduced the FY 2019 employer contribution rate to 49.47% for Regional Mental Health/Mental Retardation Boards, Local and District Health Departments, State Universities, Community Colleges and any other agency eligible to voluntarily cease participating in the KERS. Also, House Bill 362 limits the increase in the CERS employer contribution rate to 12% per year over the prior fiscal year for the period of July 1, 2018 to June 30, 2028.

This actuarial valuation was determined without regard to the enactment of SB 151 in 2018, which is currently being reviewed by the State Supreme Court.

DATA

Member data for retired, active and inactive members was supplied as of June 30, 2018, by the KRS staff. The staff also supplied asset information as of June 30, 2018. 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, 2018. 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

Janie Shaw, ASA, MAAA
Consultant

Summary of June 30, 2018 Actuarial Valuation Results

	KERS Non-Hazardous	KERS Hazardous	CERS Non-Hazardous	CERS Hazardous	SPRS
Actuarially Determined Contribution:					
Pension Fund Contribution	74.54%	34.42%	22.52%	36.98%	120.54%
Insurance Fund Contribution	10.65%	0.00%	4.76%	9.52%	19.50%
Total Calculated Employer Contribution	85.19%	34.42%	27.28%	46.50%	140.04%
Certified Contribution Rate for Fiscal Year Ending 2020[1]	83.43%	36.85%	24.06%	39.58%	146.28%
Assets:					
Retirement					
• Actuarial value (AVAR)	$2,019,277,832	$639,261,848	$6,950,225,236	$2,321,720,761	$268,258,835
• Market value (MVAR)	$2,004,445,981	$645,484,989	$7,018,963,357	$2,348,336,623	$267,572,480
• Ratio of actuarial to market value of assets	100.7%	99.0%	99.0%	98.9%	100.3%
Insurance					
• Actuarial value (AVAI)	$887,121,270	$511,441,262	$2,371,430,361	$1,256,306,056	$187,535,217
• Market value (MVAI)	$891,204,988	$519,072,283	$2,414,126,203	$1,280,981,973	$190,846,553
• Ratio of actuarial to market value of assets	99.5%	98.5%	98.2%	98.1%	98.3%
Funded Status:					
Retirement					
• Actuarial accrued liability	$15,675,231,694	$1,151,922,950	$13,191,504,861	$4,792,547,709	$989,528,282
• Unfunded accrued liability on AVAR	$13,655,953,862	$512,661,102	$6,241,279,625	$2,470,826,948	$721,269,447
• Funded ratio on AVAR	12.9%	55.5%	52.7%	48.4%	27.1%
• Unfunded accrued liability on MVAR	$13,670,785,713	$506,437,961	$6,172,541,504	$2,444,211,086	$721,955,802
• Funded ratio on MVAR	12.8%	56.0%	53.2%	49.0%	27.0%
Insurance					
• Actuarial accrued liability	$2,435,505,788	$393,480,563	$3,092,623,449	$1,684,028,461	$262,088,421
• Unfunded accrued liability on AVAI	$1,548,384,518	($117,960,699)	$721,193,088	$427,722,405	$74,553,204
• Funded ratio on AVAI	36.4%	130.0%	76.7%	74.6%	71.6%
• Unfunded accrued liability on MVAI	$1,544,300,800	($125,591,720)	$678,497,246	$403,046,488	$71,241,868
• Funded ratio on MVAI	36.6%	131.9%	78.1%	76.1%	72.8%
Membership:					
• Number of					
- Active Members	35,139	3,929	81,818	9,263	886
- Retirees and Beneficiaries	46,526	4,370	61,938	9,587	1,600
- Inactive Members	50,435	5,727	87,160	3,067	499
- Total	132,100	14,026	230,916	21,917	2,985
• Projected payroll of active members	$1,471,477,482	$158,212,710	$2,466,801,417	$533,617,790	$48,808,080
• Average salary of active members	$41,876	$40,268	$30,150	$57,607	$55,088

[1] Based on contribution rates budgeted in House Bill 200 for the KERS and SPRS systems and on a 12% increase in the certified contribution rates from fiscal year ending 2019 in accordance with House Bill 362 for the CERS system

Kentucky Employees Retirement System (KERS)

Actuarial Valuation Report as of June 30, 2018

GRS Retirement Consulting
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October 31, 2018

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

Subject: Actuarial Valuation as of June 30, 2018

Dear Trustees of the Board:

This report describes the current actuarial condition of the Kentucky Employees Retirement System (KERS), provides the actuarially determined employer contribution rates for fiscal year ending June 30, 2020, and analyzes changes in the System's financial condition. In addition, the report provides various summaries of the data. The results of this actuarial valuation, including the calculated employer contribution rates will be used by the Board and stakeholders for informational purposes only as the employer contribution rate for the fiscal years ending June 30, 2019 and June 30, 2020 were certified in the June 30, 2017 actuarial valuation and adopted by the Board.

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 2018 actuarial valuation is 25 years. As noted above, the contribution rate determined by this actuarial valuation is for informational purposes and may be useful in tracking the change in the calculated contribution rate since the prior valuation performed as of June 30, 2017.

ASSUMPTIONS AND METHODS

There were no changes in actuarial assumptions since the prior actuarial valuation. It is our opinion that the current assumptions are internally consistent and reasonably reflect the anticipated future experience of the System.

Kentucky Statutes also require 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 and the Board adopted assumptions as a result of that analysis will be first used to prepare the June 30, 2019 actuarial valuation. The Board also has the authority to review the assumptions on a more frequent basis and adopt new assumptions prior to the next scheduled experience study.

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 these valuations are those which were in effect on June 30, 2018. During the 2018 legislative session House Bill 185 was enacted which increased the benefit provisions for active members who die in the line of duty. House Bill 265 maintained the FY 2019 employer contribution rate at 49.47% for Regional Mental Health/Mental Retardation Boards, Local and District Health Departments, State Universities, Community Colleges and any other agency eligible to voluntarily cease participating in the KERS non-hazardous retirement and insurance funds.

This actuarial valuation was determined without regard to the enactment of SB 151 in 2018, which is currently being reviewed by the State Supreme Court.

DATA

Member data for retired, active and inactive members was supplied as of June 30, 2018, by the KRS staff. The staff also supplied asset information as of June 30, 2018. 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, 2018.

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,

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SECTION 1

EXECUTIVE SUMMARY

Summary of Principal Results

(Dollar amounts expressed in thousands)

	Non-Hazardous		Hazardous		Total	
	June 30, 2018	June 30, 2017	June 30, 2018	June 30, 2017	June 30, 2018	June 30, 2017
Actuarially Determined Contribution:						
Retirement	74.54%	71.03%	34.42%	34.39%		
Insurance	10.65%	12.40%	0.00%	2.46%		
Total	85.19%	83.43%	34.42%	36.85%	N/A	N/A
Actual Contribution Rate for Next Fiscal Year[1]	83.43%	83.43%	36.85%	36.85%		
Assets:						
Retirement						
• Actuarial value (AVAR)	$2,019,278	$2,123,623	$639,262	$607,159	$2,658,540	$2,730,782
• Market value (MVAR)	$2,004,446	$2,056,870	$645,485	$601,529	$2,649,931	$2,658,399
• Ratio of actuarial to market value of assets	100.7%	103.2%	99.0%	100.9%	100.3%	102.7%
Insurance						
• Actuarial value (AVAI)	$887,121	$823,918	$511,441	$493,458	$1,398,562	$1,317,376
• Market value (MVAI)	$891,205	$817,370	$519,072	$488,838	$1,410,277	$1,306,208
• Ratio of actuarial to market value of assets	99.5%	100.8%	98.5%	100.9%	99.2%	100.9%
Funded Status:						
Retirement						
• Actuarial accrued liability	$15,675,232	$15,591,641	$1,151,923	$1,121,420	$16,827,155	$16,713,061
• Unfunded accrued liability on AVAR	$13,655,954	$13,468,018	$512,661	$514,261	$14,168,615	$13,982,279
• Funded ratio on AVAR	12.9%	13.6%	55.5%	54.1%	15.8%	16.3%
• Unfunded accrued liability on MVAR	$13,670,786	$13,534,771	$506,438	$519,891	$14,177,224	$14,054,662
• Funded ratio on MVAR	12.8%	13.2%	56.0%	53.6%	15.7%	15.9%
Insurance						
• Actuarial accrued liability	$2,435,505	$2,683,496	$393,481	$419,439	$2,828,986	$3,102,935
• Unfunded accrued liability on AVAI	$1,548,384	$1,859,578	($117,960)	($74,019)	$1,430,424	$1,785,559
• Funded ratio on AVAI	36.4%	30.7%	130.0%	117.6%	49.4%	42.5%
• Unfunded accrued liability on MVAI	$1,544,300	$1,866,126	($125,591)	($69,399)	$1,418,709	$1,796,727
• Funded ratio on MVAI	36.6%	30.5%	131.9%	116.5%	49.9%	42.1%
Membership:						
• Number of						
- Active Members	35,139	37,234	3,929	4,047	39,068	41,281
- Retirees and Beneficiaries	46,526	44,916	4,370	4,093	50,896	49,009
- Inactive Members	50,435	49,658	5,727	5,298	56,162	54,956
- Total	132,100	131,808	14,026	13,438	146,126	145,246
• Projected payroll of active members	$1,471,477	$1,531,535	$158,213	$162,418	$1,629,690	$1,693,953
• Average salary of active members	$41,876	$41,133	$40,268	$40,133	$41,714	$41,035

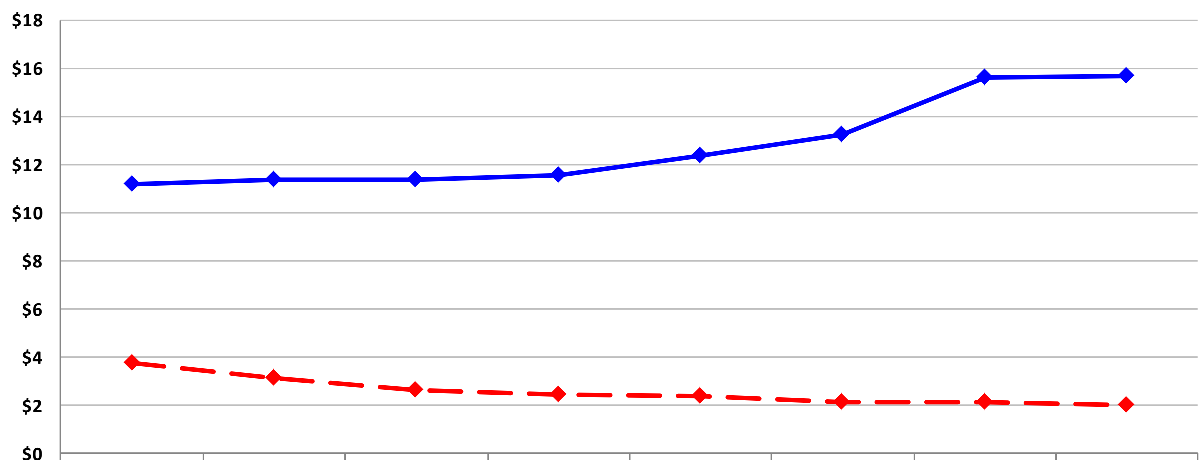
[1] Based on contribution rates budgeted in House Bill 200 during the 2018 legislative session

Executive Summary (Continued)

Non-Hazardous Retirement Fund

The unfunded actuarial accrued liability for the non-hazardous retirement fund increased by $0.188 billion since the prior year's valuation to $13.656 billion. The largest source of this increase includes the FY 2018 contribution effort being $0.099 billion less than the interest on the prior year's unfunded actuarial accrued liability (i.e. negative amortization of $0.099 billion), followed by a $0.066 increase due to a liability experience. 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 eight 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.

History of Actuarial Assets vs. Actuarial Accrued Liability
(Dollars in Billions)



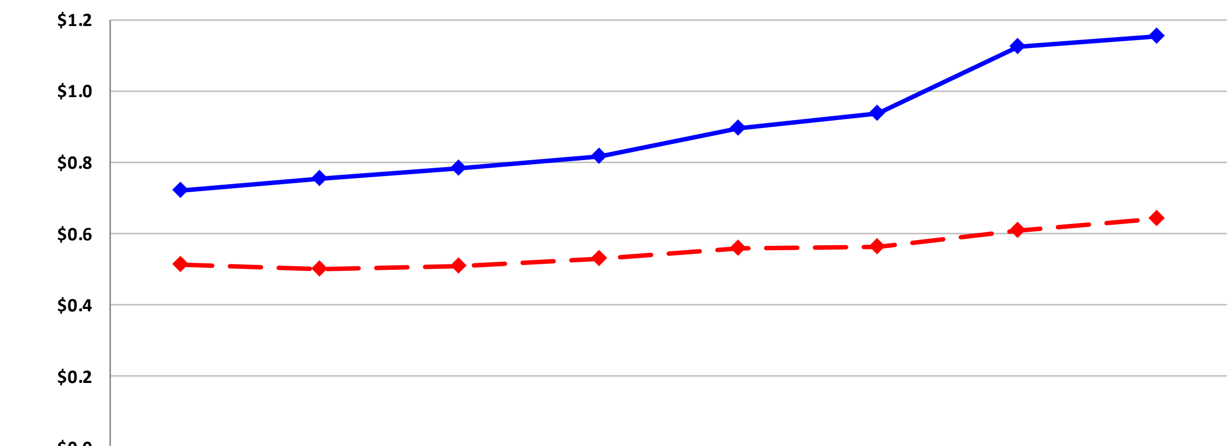
	2011	2012	2013	2014	2015	2016	2017	2018
AAL	11.2	11.4	11.4	11.6	12.4	13.2	15.6	15.7
AVA	3.7	3.1	2.6	2.4	2.4	2.1	2.1	2.0

For FY 2018, the KERS non-hazardous pension system distributed $981 million in benefit payments and received $794 million in employer and employee contributions (excluding contributions to the 401(h)). As of June 30, 2018, the market value of assets for this system was $2,004 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. 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. If employer contribution amounts determined by the June 30, 2017 actuarial valuation 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 decreased by $1.6 million since the prior year's valuation to $512.7 million. The largest source of this decrease includes a $1.9 million gain due to realized investment experience. 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 eight 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.



	2011	2012	2013	2014	2015	2016	2017	2018
AAL	0.7	0.8	0.8	0.8	0.9	0.9	1.1	1.2
AVA	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6

Executive Summary (Continued)

Summary of Change in Financial Condition of the Insurance Funds

Both the Non-Hazardous and Hazardous Insurance funds experience extremely favorable premium experience from calendar year 2018 to 2019. Specifically, the non-Medicare premiums were expected to increase by 7.25% from calendar year 2018 to calendar year 2019 (i.e. the medical trend assumption for non-Medicare premiums used in the actuarial valuation) and the actual average premiums remained relatively unchanged. Also, the Medicare premiums were expected to increase by 5.10% from calendar year 2018 to calendar year 2019 (i.e. the medical trend assumption used in the actuarial valuation for Medicare premium) and the actual average premiums decreased by 12%.

Non-Hazardous Insurance Fund

Since the prior year's valuation, the unfunded actuarial accrued liability for the nonhazardous insurance fund decreased by $0.312 billion to $1.548 billion with $0.311 billion of that decrease attributable to the favorable premium experience. The corresponding funded ratio increased from 30.7% at June 30, 2017 to 36.4% at June 30, 2018.

Hazardous Insurance Fund

Since the prior year's valuation, the actuarial value of assets in excess of the actuarial accrued liability for the hazardous insurance fund increased by $0.044 billion to $0.118 billion with $0.041 billion of that increase attributable to the favorable premium experience. The corresponding funded ratio increased from 117.6% at June 30, 2017 to 130.0% at June 30, 2018.

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, 2018 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 and analyze changes in the System's financial condition. In addition, the report provides various summaries of the data. The results of this actuarial valuation, including the calculated employer contribution rates will be used by the Board and stakeholders for informational purposes only as the employer contribution rate for the fiscal years ending June 30, 2019 and June 30, 2020 were certified in the June 30, 2017 actuarial valuation and adopted by the Board.

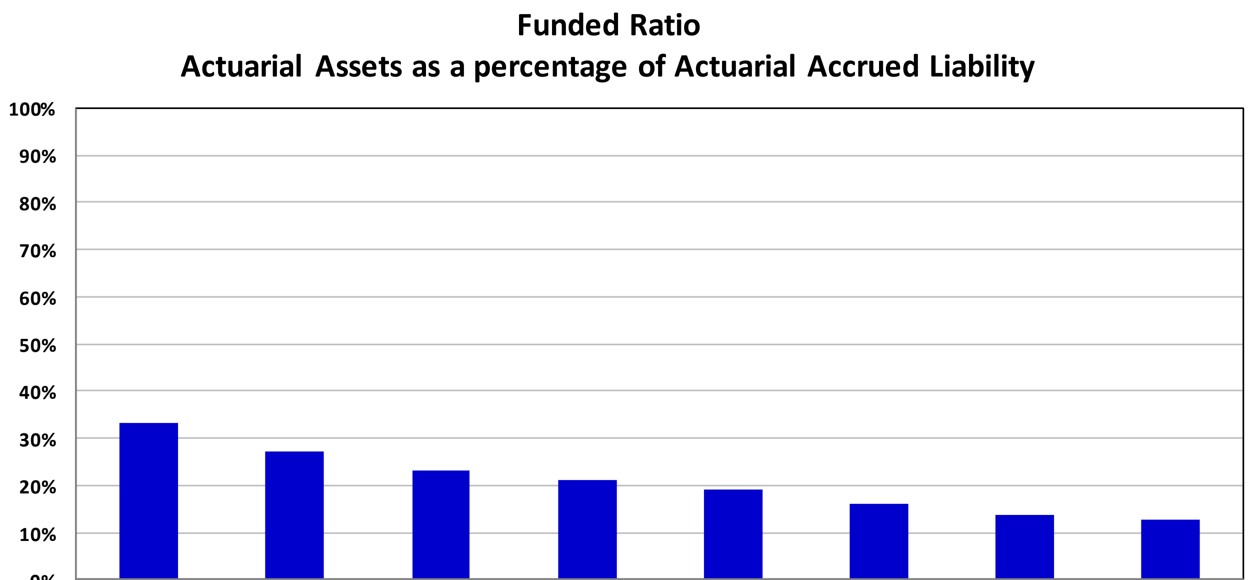
The actuarially determined contribution rates consist of two components: a normal cost rate and an amortization cost to finance the unfunded actuarial accrued liability. The normal cost rate is the theoretical amount which would be required to pay the members' benefits, based on the current plan provisions, 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 an eight-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 eight 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.

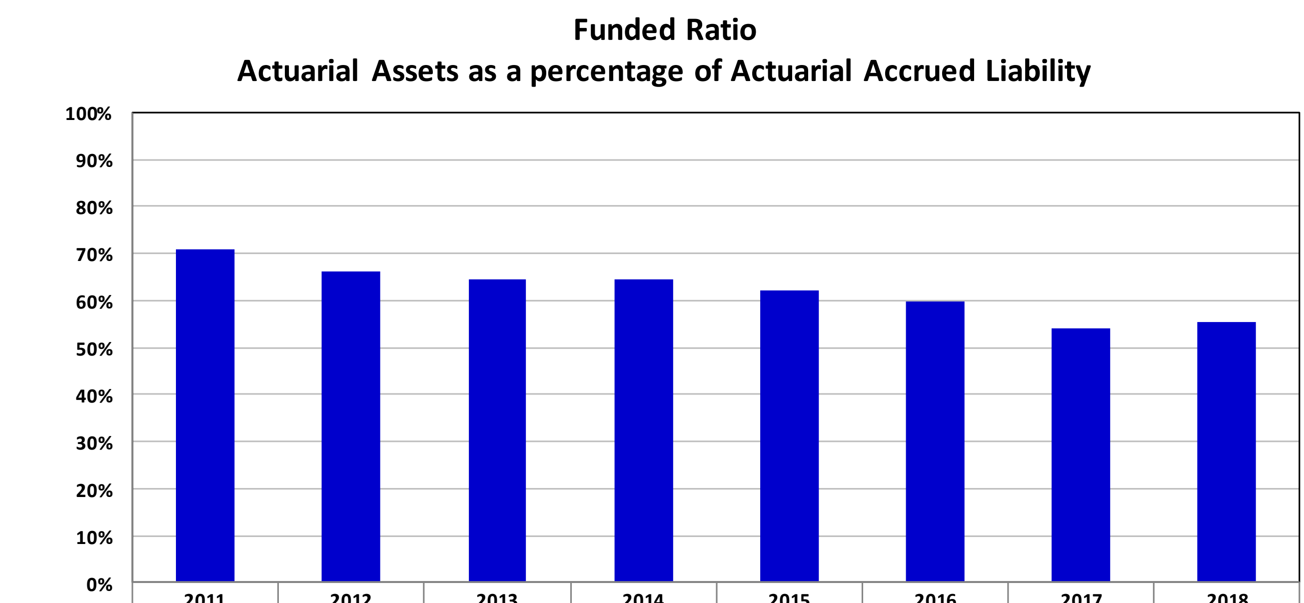
Non-Hazardous Retirement Fund



	2011	2012	2013	2014	2015	2016	2017	2018
Funded Ratio	33.3%	27.3%	23.2%	21.0%	19.0%	16.0%	13.6%	12.9%

Funding Progress (Continued)

Hazardous Retirement Fund



	2011	2012	2013	2014	2015	2016	2017	2018
Funded Ratio	70.8%	66.1%	64.5%	64.6%	62.2%	59.7%	54.1%	55.5%

Assuming the actuarial determined contributions are actually paid in future years and absent future unfavorable investment or demographic experience, we expect the funded ratio to begin improving. 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 decreased from $2.124 billion to $2.019 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 2018 was 7.4% for the non-hazardous retirement fund which is greater than the 5.25% expected annual return. The return on an actuarial (smoothed) asset value was 4.6%, which resulted in a $0.013 billion loss for the fiscal year. 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 for the non-hazardous retirement fund is $0.015 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.

The actuarial value of assets for the hazardous retirement fund increased from $607 million to $639 million since the prior valuation. The rate of return on the market value of assets on a dollar-weighted basis for fiscal year 2018 was 8.6% which is greater than the 6.25% expected annual return. The return on the actuarial (smoothed) asset value was 6.6%, which resulted in a $2 million gain for the fiscal year. The market value of assets for the hazardous fund is $6 million greater than the actuarial value of assets, which signifies that this system has some net deferred investment gains to be realized in future years.

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	$ 13,468,018	$ 514,261
2. Normal cost and administrative expenses	201,703	28,699
3. Less: contributions for the year	(794,416)	(61,585)
4. Interest accrual	691,512	31,114
5. Expected UAAL (Sum of Items 1 - 4)	$ 13,566,817	$ 512,489
6. Actual UAAL as of June 30,2018	$ 13,655,954	$ 512,661
7. Total gain (loss) for the year (Item 5 - Item 6)	$ (89,137)	$ (172)
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ (13,404)	$ 1,897
9. Liability experience gain (loss) for the year	(66,109)	(1,364)
10. Plan Change	(9,624)	(705)
11. Assumption change	0	0
12. Total	$ (89,137)	$ (172)

The UAAL for the non-hazardous retirement fund was expected to increase since the prior year as the FY 2018 contribution effort was less than the interest on the prior year's unfunded actuarial accrued liability (i.e. negative amortization). Once the higher contribution rates are effective on July 1, 2018, the UAAL for the non-hazardous fund is expecting to begin decreasing in future years (absent other gains or losses).

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	$	1,859,578	$	(74,019)
	2. Normal cost and administrative expenses		47,560		10,467
	3. Less: contributions for the year		(142,237)		(6,215)
	4. Interest accrual		113,265		(4,493)
	5. Expected UAAL (Sum of Items 1 - 4)	$	1,878,166	$	(74,260)
	6. Actual UAAL as of June 30,2018	$	1,548,384	$	(117,960)
	7. Total gain (loss) for the year (Item 5 - Item 6)	$	329,782	$	43,700
B.	Source of gains and losses				
	8. Asset gain (loss) for the year	$	1,596	$	254
	9. Liability experience gain (loss) for the year		329,415		43,612
	10. Plan Change		(1,229)		(166)
	11. Assumption change		0		0
	12. Total	$	329,782	$	43,700

The favorable premium experience from calendar year 2018 to calendar year 2019 resulted in a $311 million liability gain for the non-hazardous insurance fund and a $41 million liability 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. There were no changes to the actuarial assumptions and methods since the last actuarial valuation. It is our opinion that the assumptions are internally consistent, reasonable, and reflect anticipated future experience of the System. Appendix A includes a summary of the actuarial assumptions and methods used in this valuation.

An experience study was conducted as of June 30, 2013 and the next experience study will be conducted as of June 30, 2018, the results of which will be first used in preparing the June 30, 2019 actuarial valuation. 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.

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.

During the 2018 legislative session, House Bill 185 was enacted, which updated the benefit provisions for active members who die in the line of duty. Benefits paid to the spouses of deceased members paid from the retirement fund have been increased from 25% of the member's final rate of pay to 75% of the member's average pay. If the member does not have a surviving spouse, benefits paid to surviving dependent children have been increased from 10% of the member's final pay rate to 50% of average pay for one child, 65% of average pay for two children, or 75% of average pay for three children. The insurance fund shall also now pay 100% of the insurance premium for spouses and children of all active members who die in the line of duty.

House Bill 265 maintained the FY 2019 employer contribution rate at 49.47% for Regional Mental Health/Mental Retardation Boards, Local and District Health Departments, State Universities, Community Colleges and any other agency eligible to voluntarily cease participating in the KERS. This legislation impacts the contribution rates for approximately 114 employers participating in the KERS non-hazardous retirement and insurance funds. The covered payroll for these employers exempt from the higher contribution rate is approximately 25% of the total covered payroll for the KERS non-hazardous system.

This actuarial valuation was determined without regard to enactment of SB 151 in 2018, which is currently being reviewed by the State Supreme Court.

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

ACTUARIAL TABLES

Actuarial Tables

RETIREMENT BENEFITS

ACTUARIAL TABLES

Development of Unfunded Actuarial Accrued Liability
Retirement Benefits

(Dollar amounts expressed in thousands)

		June 30, 2018	
		Non-Hazardous (1)	Hazardous (2)
1.	Projected payroll of active members	$ 1,471,477	$ 158,213
2.	Present value of future pay	$ 12,557,065	$ 1,367,492
3.	Normal cost rate		
	a. Total normal cost rate	12.25%	16.62%
	b. Less: member contribution rate	-5.00%	-8.00%
	c. Employer normal cost rate	7.25%	8.62%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 5,202,677	$ 552,514
	b. Less: present value of future normal costs	(1,456,464)	(210,902)
	c. Actuarial accrued liability	$ 3,746,213	$ 341,612
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 11,419,229	$ 771,706
	b. Inactive members	509,790	38,605
	c. Active members (Item 4c)	3,746,213	341,612
	d. Total	$ 15,675,232	$ 1,151,923
6.	Actuarial value of assets	$ 2,019,278	$ 639,262
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 13,655,954	$ 512,661
8.	Funded Ratio	12.9%	55.5%

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

		June 30, 2018	
		Non-Hazardous (1)	Hazardous (2)
1.	Active members		
	a. Service retirement	$ 4,700,863	$ 498,190
	b. Deferred termination benefits and refunds	345,804	40,012
	c. Survivor benefits	64,161	5,220
	d. Disability benefits	91,849	9,092
	e. Total	$ 5,202,677	$ 552,514
2.	Retired members		
	a. Service retirement	$ 10,472,173	$ 711,832
	b. Disability retirement	290,266	16,817
	c. Beneficiaries	656,790	43,057
	d. Total	$ 11,419,229	$ 771,706
3.	Inactive members		
	a. Vested terminations	$ 450,060	$ 31,174
	b. Nonvested terminations	59,730	7,431
	c. Total	$ 509,790	$ 38,605
4.	Total actuarial present value of future benefits	$ 17,131,696	$ 1,362,825

Development of Actuarially Determined Contribution Rate
Retirement Benefits

		June 30, 2018	
		Non-Hazardous	Hazardous
		(1)	(2)
1.	Total normal cost rate		
	a. Service retirement	9.45%	13.46%
	b. Deferred termination benefits and refunds	2.17%	2.49%
	c. Survivor benefits	0.28%	0.28%
	d. Disability benefits	0.35%	0.39%
	e. Total	12.25%	16.62%
2.	Less: member contribution rate	-5.00%	-8.00%
3.	Total employer normal cost rate	7.25%	8.62%
4.	Administrative expenses	0.73%	0.62%
5.	Net employer normal cost rate	7.98%	9.24%
6.	UAAL amortization contribution	66.56%	25.18%
7.	Total calculated employer contribution	74.54%	34.42%

Actuarial Balance Sheet

Non-Hazardous Members Retirement

(Dollar amounts expressed in thousands)

		June 30, 2018 (1)	June 30, 2017 (2)
1.	Assets - Present and Expected Future Resources		
a.	Current assets (actuarial value)	$ 2,019,278	$ 2,123,623
b.	Present value of future member contributions	$ 627,853	$ 643,468
c.	Present value of future employer contributions		
	i. Normal cost contributions	$ 828,611	$ 887,737
	ii. Unfunded accrued liability contributions	13,655,954	13,468,018
	iii. Total future employer contributions	$ 14,484,565	$ 14,355,755
d.	Total assets	$ 17,131,696	$ 17,122,846
2.	Liabilities - Present Value of Expected Future Benefit Payments		
a.	Active members		
	i. Present value of future normal costs	$ 1,456,464	$ 1,531,205
	ii. Accrued liability	3,746,213	3,983,295
	iii. Total present value of future benefits	$ 5,202,677	$ 5,514,500
b.	Present value of benefits payable on account of current retired members and beneficiaries	$ 11,419,229	$ 11,120,669
c.	Present value of benefits payable on account of current inactive members	$ 509,790	$ 487,677
d.	Total liabilities	$ 17,131,696	$ 17,122,846

Actuarial Balance Sheet

Hazardous Members Retirement

(Dollar amounts expressed in thousands)

	June 30, 2018 (1)	June 30, 2017 (2)
1. Assets - Present and Expected Future Resources		
a. Current assets (actuarial value)	$ 639,262	$ 607,159
b. Present value of future member contributions	$ 109,399	$ 109,126
c. Present value of future employer contributions		
i. Normal cost contributions	$ 101,503	$ 108,685
ii. Unfunded accrued liability contributions	512,661	514,261
iii. Total future employer contributions	$ 614,164	$ 622,946
d. Total assets	$ 1,362,825	$ 1,339,231
2. Liabilities - Present Value of Expected Future Benefit Payments		
a. Active members		
i. Present value of future normal costs	$ 210,902	$ 217,811
ii. Accrued liability	341,612	375,070
iii. Total present value of future benefits	$ 552,514	$ 592,881
b. Present value of benefits payable on account of current retired members and beneficiaries	$ 771,706	$ 712,284
c. Present value of benefits payable on account of current inactive members	$ 38,605	$ 34,066
d. Total liabilities	$ 1,362,825	$ 1,339,231

Reconciliation of Retirement Net Assets

(Dollar amounts expressed in thousands)*

	Year Ending			
	June 30, 2018		June 30, 2018	
	(1)		(2)	
	Non-Hazardous		**Hazardous**	
1. Value of assets at beginning of year	$	2,056,870	$	601,529
2. Revenue for the year				
a. Contributions				
i. Member contributions	$	104,972	$	17,891
ii. Employer contributions		619,988		32,790
iii. Other contributions (less 401h)		69,456		10,904
iii. Total	$	794,416	$	61,585
b. Income				
i. Interest, dividends, and other income	$	47,741	$	14,013
ii. Investment expenses		(13,157)		(4,833)
iii. Net	$	34,584	$	9,180
c. Net realized and unrealized gains (losses)		110,246		42,283
d. Total revenue	$	939,245	$	113,048
3. Expenditures for the year				
a. Disbursements				
i. Refunds	$	13,603	$	2,501
ii. Regular annuity benefits		967,375		65,616
iii. Other benefit payments		0		0
iv. Transfers to other systems		0		0
v. Total	$	980,977	$	68,117
b. Administrative expenses and depreciation		10,692		975
c. Total expenditures	$	991,669	$	69,092
4. Increase in net assets (Item 2. - Item 3.)	$	(52,424)	$	43,956
5. Value of assets at end of year (Item 1. + Item 4.)	$	2,004,446	$	645,485
6. Net external cash flow				
a. Dollar amount	$	(197,253)	$	(7,507)
b. Percentage of market value		-9.7%		-1.2%
7. Estimated annual return on net assets		7.4%		8.6%

* Amounts may not add due to rounding
* Excludes 401h assets

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

	Year Ending		June 30, 2018
1.	Actuarial value of assets at beginning of year	$	2,123,623
2.	Market value of assets at beginning of year	$	2,056,870
3.	Net new investments		
	a. Contributions	$	794,416
	b. Benefit payments		(980,977)
	c. Administrative expenses		(10,692)
	d. Subtotal	$	(197,253)
4.	Market value of assets at end of year	$	2,004,446
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	144,829
6.	Assumed investment return rate for fiscal year		5.25%
7.	Expected return for immediate recognition	$	102,808
8.	Excess return for phased recognition	$	42,022

9. Phased-in recognition, 20% of excess return on assets for prior years:

	Fiscal Year Ending June 30,		Excess Return		Recognized Amount
a.	2018	$	42,022	$	8,404
b.	2017		89,028		17,806
c.	2016		(183,443)		(36,689)
d.	2015		(142,444)		(28,489)
e.	2014		145,338		29,068
f.	Total			$	(9,900)

10.	Actuarial value of assets as of June 30, 2018 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	2,019,278
11.	Ratio of actuarial value to market value		100.7%
12.	Estimated annual return on actuarial value of assets		4.6%

* 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, 2018
1.	Actuarial value of assets at beginning of year	$	607,159
2.	Market value of assets at beginning of year	$	601,529
3.	Net new investments		
	a. Contributions	$	61,585
	b. Benefit payments		(68,117)
	c. Administrative expenses		(975)
	d. Subtotal	$	(7,507)
4.	Market value of assets at end of year	$	645,485
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	51,463
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	37,361
8.	Excess return for phased recognition	$	14,102

9. Phased-in recognition, 20% of excess return on assets for prior years:

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2018	$ 14,102	$ 2,820
b.	2017	31,023	6,205
c.	2016	(42,195)	(8,439)
d.	2015	(33,972)	(6,794)
e.	2014	42,286	8,457
f.	Total		$ 2,249

10.	Actuarial value of assets as of June 30, 2018 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	639,262
11.	Ratio of actuarial value to market value		99.0%
12.	Estimated annual return on actuarial value of assets		6.6%

* Amounts may not add due to rounding

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

June 30, (1)	Actuarial Value of Assets (AVA) (2)	Actuarial Accrued Liability (AAL) (3)	Unfunded Actuarial Accrued Liability (UAAL) (3) - (2) (4)	Funded Ratio (2)/(3) (5)	Annual Covered Payroll (6)	UAAL as % of Payroll (4)/(6) (7)
Non-Hazardous Members						
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%
2018	2,019,278	15,675,232	13,655,954	12.9%	1,471,477	928.0%
Hazardous Members						
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%
2018	639,262	1,151,923	512,661	55.5%	158,213	324.0%
Total KERS Members						
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%
2018	2,658,540	16,827,155	14,168,615	15.8%	1,629,690	869.4%

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:

	Non-Hazardous	Hazardous
Valuation date:	June 30, 2018	June 30, 2018
Actuarial cost method:	Entry Age Normal	Entry Age Normal
Amortization method:	Level percentage of payroll (0% payroll growth assumed)	Level percentage of payroll (0% payroll growth assumed)
Amortization period for contribution rate:	25-year closed period	25-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% (varies by service)	3.55% to 19.55% (varies by service)
Inflation	2.30%	2.30%
Post-retirement benefit adjustments	0.00%	0.00%
Retiree Mortality	RP-2000 Combined Mortality Table for Males and Females, projected using scale BB to 2013 (set back one year for females).	RP-2000 Combined Mortality Table for Males and Females, projected using scale BB to 2013 (set back one year for females).

Solvency Test
Retirement Benefits
(Dollar amounts expressed in thousands)

	Actuarial Accrued Liability				Portion of Aggregate Accrued Liabilities Covered by Assets		
June 30,	Active Member Contributions	Retired Members & Beneficiaries	Active Members (Employer Financed)	Valuation Assets	Active	Retired	ER Financed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Hazardous Members							
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%
2018	892,033	11,929,019	2,854,180	2,019,278	100.0%	9.4%	0.0%
Hazardous Members							
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%
2018	89,106	810,311	252,506	639,262	100.0%	67.9%	0.0%

INSURANCE BENEFITS

ACTUARIAL TABLES

Development of Unfunded Actuarial Accrued Liability
Insurance Benefits

(Dollar amounts expressed in thousands)

		June 30, 2018	
		Non-Hazardous (1)	Hazardous (2)
1.	Projected payroll of active members	$ 1,471,477	$ 158,213
2.	Present value of future pay	$ 11,638,890	$ 1,357,261
3.	Normal cost rate		
	a. Total normal cost rate	2.83%	5.73%
	b. Less: member contribution rate	-0.40%	-0.58%
	c. Employer normal cost rate	2.43%	5.15%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 1,261,721	$ 209,922
	b. Less: present value of future normal costs	(302,169)	(65,216)
	c. Actuarial accrued liability	$ 959,552	$ 144,706
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 1,357,311	$ 238,885
	b. Inactive members	118,642	9,890
	c. Active members (Item 4c)	959,552	144,706
	d. Total	$ 2,435,505	$ 393,481
6.	Actuarial value of assets	$ 887,121	$ 511,441
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 1,548,384	$ (117,960)
8.	Funded Ratio	36.4%	130.0%

Development of Actuarially Determined Contribution Rate
Insurance Benefits

		June 30, 2018	
		Non-Hazardous	Hazardous
		(1)	(2)
1.	Total normal cost rate	2.83%	5.73%
2.	Less: member contribution rate	-0.40%	-0.58%
3.	Total employer normal cost rate	2.43%	5.15%
4.	Administrative expenses	0.05%	0.07%
5.	Net employer normal cost rate	2.48%	5.22%
6.	UAAL amortization contribution	8.17%	-6.09%
7.	Total calculated employer contribution Max (0%, item 5. + item6.)	10.65%	0.00%

Actuarial Balance Sheet

Non-Hazardous Members Insurance

(Dollar amounts expressed in thousands)

			June 30, 2018 (1)		June 30, 2017 (2)
1.	Assets - Present and Expected Future Resources				
	a. Current assets (actuarial value)	$	887,121	$	823,918
	b. Present value of future member contributions	$	58,117	$	53,847
	c. Present value of future employer contributions				
	i. Normal cost contributions	$	244,052	$	282,814
	ii. Unfunded accrued liability contributions		1,548,384		1,859,578
	iii. Total future employer contributions	$	1,792,436	$	2,142,392
	d. Total assets	$	2,737,674	$	3,020,157
2.	Liabilities - Present Value of Expected Future Benefit Payments				
	a. Active members				
	i. Present value of future normal costs	$	302,169	$	336,661
	ii. Accrued liability		959,552		1,108,202
	iii. Total present value of future benefits	$	1,261,721	$	1,444,863
	b. Present value of benefits payable on account of current retired members and beneficiaries	$	1,357,311	$	1,452,876
	c. Present value of benefits payable on account of current inactive members	$	118,642	$	122,418
	d. Total liabilities	$	2,737,674	$	3,020,157

Actuarial Balance Sheet

Hazardous Members Insurance

(Dollar amounts expressed in thousands)

		June 30, 2018 (1)		June 30, 2017 (2)
1. Assets - Present and Expected Future Resources				
a. Current assets (actuarial value)	$	511,441	$	493,458
b. Present value of future member contributions	$	9,821	$	9,088
c. Present value of future employer contributions				
i. Normal cost contributions	$	55,395	$	61,771
ii. Unfunded accrued liability contributions		(117,960)		(74,019)
iii. Total future employer contributions	$	(62,565)	$	(12,248)
d. Total assets	$	458,697	$	490,298
2. Liabilities - Present Value of Expected Future Benefit Payments				
a. Active members				
i. Present value of future normal costs	$	65,216	$	70,859
ii. Accrued liability		144,706		175,623
iii. Total present value of future benefits	$	209,922	$	246,482
b. Present value of benefits payable on account of current retired members and beneficiaries	$	238,885	$	233,808
c. Present value of benefits payable on account of current inactive members	$	9,890	$	10,008
d. Total liabilities	$	458,697	$	490,298

Reconciliation of Insurance Net Assets

(Dollar amounts expressed in thousands)*

	Year Ending June 30, 2018 (1) Non-Hazardous	June 30, 2018 (2) Hazardous
1. Value of assets at beginning of year	$ 817,370	$ 488,838
2. Revenue for the year		
a. Contributions		
i. Member contributions	$ 5,786	$ 909
ii. Employer contributions	132,365	4,301
iii. Other contributions (less 401h)	4,086	1,005
iii. Total	$ 142,237	$ 6,215
b. Income		
i. Interest, dividends, and other income	$ 16,929	$ 10,562
ii. Investment expenses	(5,501)	(4,479)
iii. Net	$ 11,428	$ 6,082
c. Net realized and unrealized gains (losses)	52,600	36,866
d. Total revenue	$ 206,266	$ 49,164
3. Expenditures for the year		
a. Disbursements		
i. Refunds	$ 0	$ 0
ii. Healthcare premium subsidies	130,069	18,697
iii. Other benefit payments	1,601	129
iv. Transfers to other systems	0	0
v. Total	$ 131,670	$ 18,826
b. Administrative expenses and depreciation	760	104
c. Total expenditures	$ 132,430	$ 18,930
4. Increase in net assets (Item 2. - Item 3.)	$ 73,835	$ 30,234
5. Value of assets at end of year (Item 1. + Item 4.)	$ 891,205	$ 519,072
6. Net external cash flow		
a. Dollar amount	$ 9,807	$ (12,715)
b. Percentage of market value	1.1%	-2.5%
7. Estimated annual return on net assets	7.8%	8.9%

* Amounts may not add due to rounding
* Includes 401h assets

Development of Actuarial Value of Assets

Non-Hazardous Members Insurance

(Dollar amounts expressed in thousands)*

	Year Ending		June 30, 2018
1.	Actuarial value of assets at beginning of year	$	823,918
2.	Market value of assets at beginning of year	$	817,370
3.	Net new investments		
	a. Contributions	$	142,237
	b. Benefit payments		(131,670)
	c. Administrative expenses		(760)
	d. Subtotal	$	9,807
4.	Market value of assets at end of year	$	891,205
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	64,028
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	51,392
8.	Excess return for phased recognition	$	12,636

9. Phased-in recognition, 20% of excess return on assets for prior years:

	Fiscal Year Ending June 30,		Excess Return		Recognized Amount
a.	2018	$	12,636	$	2,527
b.	2017		41,687		8,337
c.	2016		(55,901)		(11,180)
d.	2015		(43,387)		(8,677)
e.	2014		54,989		10,998
f.	Total			$	2,005

10.	Actuarial value of assets as of June 30, 2018 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	887,121
11.	Ratio of actuarial value to market value		99.5%
12.	Estimated annual return on actuarial value of assets		6.4%

* Amounts may not add due to rounding

Development of Actuarial Value of Assets

Hazardous Members Insurance

(Dollar amounts expressed in thousands)*

	Year Ending		June 30, 2018
1.	Actuarial value of assets at beginning of year	$	493,458
2.	Market value of assets at beginning of year	$	488,838
3.	Net new investments		
	a. Contributions	$	6,215
	b. Benefit payments		(18,826)
	c. Administrative expenses		(104)
	d. Subtotal	$	(12,715)
4.	Market value of assets at end of year	$	519,072
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	42,949
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	30,155
8.	Excess return for phased recognition	$	12,794

9. Phased-in recognition, 20% of excess return on assets for prior years:

	Fiscal Year Ending June 30,		Excess Return		Recognized Amount
a.	2018	$	12,794	$	2,559
b.	2017		26,956		5,391
c.	2016		(33,995)		(6,799)
d.	2015		(25,896)		(5,179)
e.	2014		22,857		4,571
f.	Total			$	543

10.	Actuarial value of assets as of June 30, 2018 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	511,441
11.	Ratio of actuarial value to market value		98.5%
12.	Estimated annual return on actuarial value of assets		6.3%

* Amounts may not add due to rounding

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

June 30, (1)	Actuarial Value of Assets (AVA) (2)	Actuarial Accrued Liability (AAL) (3)	Unfunded Actuarial Accrued Liability (UAAL) (3) - (2) (4)	Funded Ratio (2)/(3) (5)	Annual Covered Payroll (6)	UAAL as % of Payroll (4)/(6) (7)
			Non-Hazardous Members			
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%
2018	887,121	2,435,505	1,548,384	36.4%	1,471,477	105.2%
			Hazardous Members			
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%
2018	511,441	393,481	(117,960)	130.0%	158,213	-74.6%
			Total KERS Members			
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%
2018	1,398,562	2,828,986	1,430,424	49.4%	1,629,690	87.8%

Solvency Test
Insurance Benefits
(Dollar amounts expressed in thousands)

	Actuarial Accrued Liability				Portion of Aggregate Accrued Liabilities Covered by Assets		
June 30,	Active Member Contributions	Retired Members & Beneficiaries	Active Members (Employer Financed)	Valuation Assets	Active	Retired	ER Financed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Hazardous Members							
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%
2018	-	1,475,953	959,552	887,121	100.0%	60.1%	0.0%
Hazardous Members							
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%
2018	-	248,775	144,706	511,441	100.0%	100.0%	100.0%

SECTION 4

MEMBERSHIP INFORMATION

Membership Tables

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

		Non-Hazardous June 30, 2018 (1)	Hazardous June 30, 2018 (2)	Total June 30, 2018 (3)	Total June 30, 2017 (4)
1.	Active members				
a.	Males	13,374	2,706	16,080	16,991
b.	Females	21,765	1,223	22,988	24,290
c.	Total members	35,139	3,929	39,068	41,281
d.	Total annualized prior year salaries	$ 1,471,477	$ 158,213	$ 1,629,690	$ 1,693,953
e.	Average salary	$ 41,876	$ 40,268	$ 41,714	$ 41,035
f.	Average age	45.2	39.8	44.7	44.9
g.	Average service	10.8	7.3	10.4	10.6
h.	Member contributions with interest	$ 892,033	$ 89,106	$ 981,139	$ 1,027,910
i.	Average contributions with interest	$ 25,386	$ 22,679	$ 25,114	$ 24,900
2.	Vested inactive members				
a.	Number	13,230	886	14,116	11,299
b.	Total annual deferred benefits	$ 73,955	$ 4,084	$ 78,039	$ 73,067
c.	Average annual deferred benefit	$ 5,590	$ 4,610	$ 5,528	$ 6,467
d.	Average age at the valuation date	48.8	44.0	48.5	48.6
3.	Nonvested inactive members				
a.	Number	37,205	4,841	42,046	43,657
b.	Total member contributions with interest	$ 59,730	$ 7,431	$ 67,161	$ 72,457
c.	Average contributions with interest	$ 1,605	$ 1,535	$ 1,597	$ 1,660
4.	Service retirees				
a.	Number	39,702	3,760	43,462	41,675
b.	Total annual benefits	$ 857,037	$ 58,157	$ 915,193	$ 881,896
c.	Average annual benefit	$ 21,587	$ 15,467	$ 21,057	$ 21,161
d.	Average age at the valuation date	69.0	64.5	68.6	68.5
5.	Disabled retirees				
a.	Number	1,969	160	2,129	2,137
b.	Total annual benefits	$ 25,766	$ 1,463	$ 27,229	$ 27,183
c.	Average annual benefit	$ 13,086	$ 9,146	$ 12,790	$ 12,720
d.	Average age at the valuation date	65.5	60.2	65.1	64.8
6.	Beneficiaries				
a.	Number	4,855	450	5,305	5,197
b.	Total annual benefits	$ 70,148	$ 4,430	$ 74,578	$ 71,385
c.	Average annual benefit	$ 14,449	$ 9,844	$ 14,058	$ 13,736
d.	Average age at the valuation date	70.5	66.0	70.2	70.6

Summary of Historical Active Membership

June 30,	Active Members: Number	Active Members: Percent Increase /(Decrease)	Covered Payroll[1]: Amount in Thousands	Covered Payroll[1]: Percent Increase /(Decrease)	Average Annual Pay: Amount	Average Annual Pay: Percent Increase /(Decrease)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-Hazardous Members						
2011	46,617		1,731,633		$ 37,146	
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%
2018	35,139	-5.6%	1,471,477	-3.9%	41,876	1.8%
Hazardous Members						
2011	4,291		$ 133,054		$ 31,008	
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%
2018	3,929	-2.9%	158,213	-2.6%	40,268	0.3%

Distribution of Active Members by Age and by Years of Service

Non-Hazardous Members

	Years of Credited Service												
Attained Age	0 Count & Avg. Comp.	1 Count & Avg. Comp.	2 Count & Avg. Comp.	3 Count & Avg. Comp.	4 Count & Avg. Comp.	5-9 Count & Avg. Comp.	10-14 Count & Avg. Comp.	15-19 Count & Avg. Comp.	20-24 Count & Avg. Comp.	25-29 Count & Avg. Comp.	30-34 Count & Avg. Comp.	35 & Over Count & Avg. Comp.	Total Count & Avg. Comp.
Under 20	14	2	0	0	0	0	0	0	0	0	0	0	16
	$22,301	$24,102	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$22,526
20-24	437	243	84	48	17	2	1	0	0	0	0	0	832
	$23,505	$30,683	$33,249	$32,676	$34,649	$34,709	$36,667	$0	$0	$0	$0	$0	$27,385
25-29	612	606	510	413	279	347	1	0	0	0	0	0	2,768
	$26,304	$32,155	$34,692	$34,985	$35,379	$35,953	$33,855	$0	$0	$0	$0	$0	$32,553
30-34	386	392	402	394	323	1,312	312	7	0	0	0	0	3,528
	$27,664	$33,818	$37,118	$37,597	$35,776	$39,665	$40,117	$45,686	$0	$0	$0	$0	$36,877
35-39	316	347	302	305	245	1,200	1,354	472	32	0	0	0	4,573
	$28,032	$35,721	$40,884	$37,025	$38,474	$40,407	$43,711	$44,465	$50,070	$0	$0	$0	$40,363
40-44	271	265	274	221	217	864	1,129	1,310	427	18	2	0	4,998
	$27,943	$35,234	$40,702	$37,298	$36,520	$42,223	$45,125	$47,886	$49,329	$56,396	$71,845	$0	$43,339
45-49	239	277	225	210	164	855	944	1,161	943	303	27	2	5,350
	$27,724	$34,386	$38,218	$36,694	$36,005	$40,316	$45,231	$47,986	$51,897	$54,340	$65,033	$95,033	$44,596
50-54	178	189	204	162	203	701	864	863	787	435	115	8	4,709
	$28,508	$36,896	$38,530	$37,014	$36,605	$40,577	$43,294	$45,779	$51,587	$56,031	$61,386	$62,035	$44,855
55-59	131	150	130	117	119	661	826	855	637	321	126	22	4,095
	$29,429	$35,971	$39,296	$37,564	$38,001	$39,189	$42,922	$44,738	$48,846	$54,722	$62,378	$68,557	$44,184
60-64	86	99	89	70	71	475	628	632	433	197	71	38	2,889
	$29,217	$36,759	$53,219	$40,946	$36,321	$42,722	$42,264	$45,496	$47,996	$54,312	$60,358	$73,616	$45,167
65 & Over	45	39	37	43	34	246	304	319	154	85	42	33	1,381
	$34,944	$44,391	$69,895	$40,441	$49,018	$38,870	$46,090	$45,982	$54,432	$52,951	$67,485	$74,156	$47,576
Total	2,715	2,609	2,257	1,983	1,672	6,663	6,363	5,619	3,413	1,359	383	103	35,139
	$27,047	$34,206	$38,900	$36,847	$36,764	$40,256	$43,820	$46,437	$50,537	$54,908	$62,502	$72,225	$41,876

Distribution of Active Members by Age and by Years of Service

Hazardous Members

	Years of Credited Service												
Attained Age	0 Count & Avg. Comp.	1 Count & Avg. Comp.	2 Count & Avg. Comp.	3 Count & Avg. Comp.	4 Count & Avg. Comp.	5-9 Count & Avg. Comp.	10-14 Count & Avg. Comp.	15-19 Count & Avg. Comp.	20-24 Count & Avg. Comp.	25-29 Count & Avg. Comp.	30-34 Count & Avg. Comp.	35 & Over Count & Avg. Comp.	Total Count & Avg. Comp.
Under 20	1	0	0	0	0	0	0	0	0	0	0	0	1
	$15,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,000
20-24	144	73	27	4	0	0	0	0	0	0	0	0	248
	$23,029	$39,018	$42,451	$36,095	$0	$0	$0	$0	$0	$0	$0	$0	$30,060
25-29	171	136	105	103	73	70	0	0	0	0	0	0	658
	$26,954	$38,250	$39,560	$40,761	$40,872	$42,776	$0	$0	$0	$0	$0	$0	$36,689
30-34	102	67	63	66	57	181	49	0	0	0	0	0	585
	$26,447	$36,257	$40,527	$40,249	$40,211	$40,932	$44,935	$0	$0	$0	$0	$0	$38,015
35-39	55	40	41	28	24	144	187	36	1	0	0	0	556
	$25,686	$36,978	$42,024	$38,792	$40,065	$42,127	$43,375	$46,140	$42,450	$0	$0	$0	$40,546
40-44	45	18	33	28	21	97	131	131	16	0	0	0	520
	$26,160	$37,285	$37,737	$38,225	$41,973	$41,453	$46,046	$48,854	$53,564	$0	$0	$0	$42,991
45-49	35	34	33	26	16	90	121	107	42	8	0	0	512
	$26,257	$36,846	$37,987	$39,821	$35,673	$41,764	$48,025	$49,540	$53,554	$53,760	$0	$0	$44,104
50-54	21	29	23	24	20	75	85	65	20	13	1	0	376
	$28,037	$38,885	$38,299	$42,265	$37,794	$43,078	$44,259	$45,946	$50,783	$62,048	$54,115	$0	$43,147
55-59	19	11	18	9	13	50	55	51	13	6	1	0	246
	$30,533	$38,743	$39,170	$44,932	$34,547	$40,331	$46,495	$47,910	$54,150	$72,784	$112,168	$0	$44,044
60-64	4	5	3	10	12	43	43	39	7	3	0	0	169
	$25,997	$42,677	$43,512	$39,580	$41,194	$39,712	$41,949	$46,637	$46,435	$75,608	$0	$0	$42,723
65 & Over	2	0	3	2	3	13	20	9	2	1	3	0	58
	$16,276	$0	$67,671	$35,239	$45,911	$35,270	$42,385	$47,090	$69,085	$96,877	$65,095	$0	$44,899
Total	599	413	349	300	239	763	691	438	101	31	5	0	3,929
	$25,797	$37,893	$40,099	$40,253	$39,860	$41,497	$45,046	$48,023	$52,788	$64,423	$72,314	$0	$40,268

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

	Retirement		Disability		Survivors & Beneficiaries		Total	
Current Age	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Under 50	525	$ 12,861	110	$ 1,547	498	$ 5,730	1,133	$ 20,138
50 - 54	1,753	47,528	187	2,819	181	2,183	2,121	52,530
55 - 59	3,913	101,415	268	3,566	314	4,245	4,495	109,226
60 - 64	6,946	165,460	405	5,475	511	7,569	7,862	178,504
65 - 69	9,685	212,463	384	4,994	629	10,798	10,698	228,255
70 - 74	7,534	156,803	261	3,236	659	11,130	8,454	171,169
75 - 79	4,501	85,661	188	2,339	652	10,290	5,341	98,290
80 - 84	2,593	43,131	112	1,272	576	8,723	3,281	53,126
85 - 89	1,466	22,115	42	444	471	6,073	1,979	28,632
90 And Over	786	9,600	12	75	364	3,408	1,162	13,083
Total	**39,702**	**$ 857,037**	**1,969**	**$ 25,766**	**4,855**	**$ 70,148**	**46,526**	**$ 952,951**

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

	Retirement		Disability		Survivors & Beneficiaries		Total	
Current Age	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Under 50	252	$ 4,813	27	$ 368	55	$ 536	334	$ 5,717
50 - 54	384	7,313	25	220	19	191	428	7,724
55 - 59	516	9,503	26	266	51	586	593	10,355
60 - 64	701	11,827	28	237	52	541	781	12,605
65 - 69	864	12,273	30	248	76	920	970	13,441
70 - 74	615	8,227	12	82	73	632	700	8,941
75 - 79	262	2,784	6	17	62	573	330	3,374
80 - 84	120	1,054	5	22	37	293	162	1,369
85 - 89	38	248	1	3	19	92	58	343
90 And Over	8	116	0	-	6	67	14	183
Total	**3,760**	**$ 58,157**	**160**	**$ 1,463**	**450**	**$ 4,430**	**4,370**	**$ 64,050**

Non-Hazardous Retired Lives Summary

	Male Lives			Female Lives			Total		
Form of Payment	Number		Monthly Benefit Amount	Number		Monthly Benefit Amount	Number		Monthly Benefit Amount
(1)	(2)		(3)	(4)		(5)	(6)		(7)
Basic	4,229	$	7,630,679	12,128	$	17,755,442	16,357	$	25,386,120
Joint & Survivor:									
100% to Beneficiary	2,373		4,357,201	1,115		1,395,025	3,488		5,752,226
66 2/3% to Beneficiary	822		2,305,032	568		1,097,309	1,390		3,402,341
50% to Beneficiary	1,142		2,877,506	1,521		3,026,442	2,663		5,903,948
Pop-up Option	4,053		9,847,283	3,778		7,325,753	7,831		17,173,036
Social Security Option:									
Age 62 Basic	404		848,056	964		1,564,679	1,368		2,412,736
Age 62 Survivorship	800		1,607,679	610		974,202	1,410		2,581,881
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	0		0	0		0	0		0
10 Years Certain & Life	984		1,727,000	2,256		3,416,680	3,240		5,143,680
15 Years Certain & Life	437		707,245	620		924,751	1,057		1,631,996
20 Years Certain & Life	439		956,756	634		1,005,404	1,073		1,962,160
Refund	0		0	0		0	0		0
Partial Lump Sum Option (PLSO):									
12 Month Basic	81		133,879	287		440,254	368		574,133
24 Month Basic	32		38,929	151		197,445	183		236,374
36 Month Basic	134		121,009	392		298,631	526		419,640
12 Month Survivor	101		210,677	101		172,917	202		383,595
24 Month Survivor	78		124,189	73		107,349	151		231,537
36 Month Survivor	213		243,916	151		127,573	364		371,488
Total:	16,322	$	33,737,035	25,349	$	39,829,857	41,671	$	73,566,892

Hazardous Retired Lives Summary

Form of Payment	Male Lives: Number		Male Lives: Monthly Benefit Amount	Female Lives: Number		Female Lives: Monthly Benefit Amount	Total: Number		Total: Monthly Benefit Amount
(1)	(2)		(3)	(4)		(5)	(6)		(7)
Basic	647	$	735,853	509	$	553,691	1,156	$	1,289,544
Joint & Survivor:									
100% to Beneficiary	345		409,449	44		49,058	389		458,507
66 2/3% to Beneficiary	113		140,881	30		34,303	143		175,184
50% to Beneficiary	173		270,893	71		107,998	244		378,891
Pop-up Option	905		1,384,064	191		254,396	1,096		1,638,461
Social Security Option:									
Age 62 Basic	58		69,929	32		29,856	90		99,786
Age 62 Survivorship	139		176,034	18		14,464	157		190,498
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		67,579	13		17,031	60		84,610
10 Years Certain & Life	116		139,766	78		69,006	194		208,771
15 Years Certain & Life	49		61,660	25		25,079	74		86,739
20 Years Certain & Life	62		84,327	32		42,001	94		126,328
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	14		14,040	9		7,948	23		21,987
36 Month Basic	43		37,150	23		20,016	66		57,166
12 Month Survivor	20		26,786	6		5,151	26		31,937
24 Month Survivor	18		25,731	9		11,029	27		36,760
36 Month Survivor	43		42,999	15		18,695	58		61,695
Total:	2,802	$	3,697,742	1,118	$	1,270,600	3,920	$	4,968,342

Non-Hazardous Beneficiary Lives Summary

	Male Lives		Female Lives		Total	
Form of Payment	Number	Monthly Benefit Amount	Number	Monthly Benefit Amount	Number	Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	16	$ 8,783	33	$ 35,052	49	$ 43,835
Joint & Survivor:						
100% to Beneficiary	372	317,653	1,444	1,600,258	1,816	1,917,911
66 2/3% to Beneficiary	82	87,250	308	380,611	390	467,861
50% to Beneficiary	175	136,519	429	346,393	604	482,912
Pop-up Option	225	333,328	709	1,239,721	934	1,573,049
Social Security Option:						
Age 62 Basic	1	1,293	10	9,527	11	10,820
Age 62 Survivorship	71	97,069	313	541,231	384	638,299
Partial Deferred (Old Plan)	0	0	0	0		
Widows Age 60	0	0	3	1,475	3	1,475
5 Years Certain	28	43,626	64	54,336	92	97,962
10 Years Certain	81	64,364	103	70,223	184	134,587
10 Years Certain & Life	34	31,325	43	41,756	77	73,081
15 Years Certain & Life	18	23,921	41	39,145	59	63,066
20 Years Certain & Life	24	42,985	62	115,242	86	158,227
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	6	10,098	26	43,945	32	54,044
24 Month Survivor	12	15,777	28	27,132	40	42,909
36 Month Survivor	20	16,520	71	63,986	91	80,506
Total:	1,165	$ 1,230,513	3,690	$ 4,615,180	4,855	$ 5,845,692

Hazardous Beneficiary Lives Summary

Form of Payment	Male Lives Number		Male Lives Monthly Benefit Amount	Female Lives Number		Female Lives Monthly Benefit Amount	Total Number		Total Monthly Benefit Amount
(1)	(2)		(3)	(4)		(5)	(6)		(7)
Basic	2	$	1,052	7	$	4,483	9	$	5,535
Joint & Survivor:									
100% to Beneficiary	12		4,283	148		107,980	160		112,263
66 2/3% to Beneficiary	0		0	21		11,377	21		11,377
50% to Beneficiary	3		1,862	33		12,194	36		14,057
Pop-up Option	13		13,893	102		107,548	115		121,441
Social Security Option:									
Age 62 Basic	0		0	0		0	0		0
Age 62 Survivorship	1		483	36		40,982	37		41,465
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	3		3,405	16		16,102	19		19,507
10 Years Certain & Life	5		3,601	4		2,824	9		6,425
15 Years Certain & Life	2		819	4		2,627	6		3,445
20 Years Certain & Life	0		0	7		5,926	7		5,926
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	2		706	13		13,996	15		14,702
Total:	45	$	31,733	405	$	337,420	450	$	369,153

Schedule of Retirants Added to And Removed from Rolls

(Dollar amounts except average allowance expressed in thousands)

Year Ended	Added to Rolls Number	Removed from Rolls Number	Rolls End of the Year Number	Rolls End of the Year Annual Benefits	% Increase in Annual Benefit	Average Annual Benefit
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Non-Hazardous			
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
2018	2,853	1,243	46,526	952,951	3.4%	20,482
			Hazardous			
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
2018	321	44	4,370	64,050	8.3%	14,657

APPENDIX A

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.

	Non-Hazardous			Hazardous	
Age	Members participating before 9/1/2008[1]	Members participating on or after 9/1/2008[2]	Service	Members participating before 9/1/2008[3]	Members participating on or after 9/1/2008[4]
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%

[1] If service is at least 27 years, the rate is 35%.
[2] If age plus service is at least 87, the rate is 35%.
[3] The annual rate of service retirement is 100% at age 65.
[4] 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[1]:

January 1	Non-Medicare Plans	Medicare Plans	Dollar Contribution[2]
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%

[1]All increases are assumed to occur on January 1. The 2019 premiums were known at the time of the valuation and were incorporated into the liability measurement.

[2]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	Participation Percentage
Medical Only	7%
Essential	8%
Premium	86%

Non-Medicare Plan	Participation Percentage
LivingWell Limited	2%
LivingWell Basic	13%
LivingWell CDHP	27%
LivingWell PPO	58%

- 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, 2021, 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:

None.

Development of Baseline Claims Cost

For non-Medicare retirees, the initial per capita costs were based on the plan premiums effective January 1, 2019, 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 $865.74 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.

For those not eligible for Medicare		
Age	Member	Spouse/Dependents
<65	$717.39	$865.74

For Medicare retirees, the initial per capita costs were estimated based on the plan premiums effective January 1, 2019, 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.

For those eligible for Medicare		
Age	Male	Female
65	$183.50	$173.08
75	214.69	209.49
85	227.02	229.07

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.

Mehdi Riazi

Mehdi Riazi, FSA, EA, MAAA

APPENDIX B

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 Any age with at least 27 years of service
Benefit Amount	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. 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. Final average compensation is based on the member's highest 5 years of compensation.
Early Retirement Eligibility	Any age (prior to age 65) with at least 25 years of service; or 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 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.

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 Under age 55 with at least 60 months of service and actively working at the time of death; or 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 75% of the deceased member's final monthly average pay. Each dependent child will receive 10% of average pay (not to exceed a total child benefit of 25% while the spouse is alive). A spouse may also elect the non-line of duty death benefit.
Child Benefit	In the event there is no surviving spouse, the benefit is 50% of final monthly average pay for one child, 65% of final average pay for two children, or 75% of final average pay for three or more eligible children.

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

During the 2018 legislative session, House Bill 185 was enacted, which updated the benefit provisions for active members who die in the line of duty. Benefits paid to the spouses of deceased members paid from the retirement fund have been increased from 25% of the member's final rate of pay to 75% of the member's average pay. If the member does not have a surviving spouse, benefits paid to surviving dependent children have been increased from 10% of the member's final pay rate to 50% of average pay for one child, 65% of average pay for two children, or 75% of average pay for three children.

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 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. 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. 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 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 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. 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 55th 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 Under age 55 with at least 60 months of service and actively working at the time of death; or 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 75% of the deceased member's final average pay. Each dependent child will receive 10% of average pay (not to exceed a total child benefit of 25% while the spouse is alive). 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	In the event there is no surviving spouse, the benefit is 50% of final monthly average pay for one child, 65% of final average pay for two children, or 75% of final average pay for three or more eligible children.

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

During the 2018 legislative session, House Bill 185 was enacted, which updated the benefit provisions for active members who die in the line of duty. Benefits paid to the spouses of deceased members paid from the retirement fund have been increased from 25% of the member's final rate of pay to 75% of the member's average pay. If the member does not have a surviving spouse, benefits paid to surviving dependent children have been increased from 10% of the member's final pay rate to 50% of average pay for one child, 65% of average pay for two children, or 75% of average pay for three children.

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 a fully subsidized health insurance benefit. 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

Benefit Eligibility	Recipient of a retirement allowance with at least 120 months of service at retirement
Non-Hazardous Subsidy	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.
Hazardous Subsidy	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.
Duty Disability Retirement	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.
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 a fully subsidized health insurance benefit. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.
Non-Duty Death in Service	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, 2019

Non-Medicare Plan Options					
Plan Option	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	1,333.64	1,479.76	818.96
LivingWell Basic	682.80	940.64	1,450.02	1,615.30	800.94
Living Well Limited	607.54	865.08	1,327.16	1,477.04	730.90

Medicare Plan Options	
Kentucky Retirement Systems - Medical Only Plan	$175.22
Kentucky Retirement Systems – Medicare Advantage/Essential Plan	53.73
Kentucky Retirement Systems – Medicare Advantage/Premium Plan*	220.11

*For 2019, 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, 2018.

Non-Hazardous Service	Hazardous Service
$13.38	$20.07

Changes since the Prior Valuation

During the 2018 legislative session, House Bill 185 was enacted, which updated the benefit provisions for active members who die in the line of duty. The insurance fund shall now pay 100% of the insurance premium for spouses and children of all active members who die in the line of duty.

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, 2018

P: 469.524.0000 | F: 469.524.0003 | www.grsconsulting.com

October 31, 2018

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

Subject: Actuarial Valuation as of June 30, 2018

Dear Trustees of the Board:

This report describes the current actuarial condition of the County Employees Retirement System (CERS), provides the actuarially determined employer contribution rates for fiscal year ending June 30, 2020, 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 2018 actuarial valuation is 25 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, 2018 actuarial valuation will be used by the Board to certify the participating employer's contribution rates for the fiscal year July 1, 2019 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

There were no changes in actuarial assumptions since the prior actuarial valuation. It is our opinion that the current assumptions are internally consistent and reasonably reflect the anticipated future experience of the System.

Kentucky Statutes also require 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 and the Board adopted assumptions as a result of that analysis will be first used to prepare the June 30, 2019 actuarial valuation. The Board also has the authority to review the assumptions on a more frequent basis and adopt new assumptions prior to the next scheduled experience study.

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 these valuations are those which were in effect on June 30, 2018. During the 2018 legislative session House Bill 185 was enacted which provided increased retirement and health insurance benefits for active members who die in the line of duty. House Bill 362 limits the increase in the CERS employer contribution rate over the prior fiscal year to 12% per year for the period of July 1, 2018 to June 30, 2028.

This actuarial valuation was determined without regard to the enactment of SB 151 in 2018, which is currently being reviewed by the State Supreme Court.

DATA

Member data for retired, active and inactive members was supplied as of June 30, 2018, by the KRS staff. The staff also supplied asset information as of June 30, 2018. 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, 2018.

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

Janie Shaw, ASA, MAAA
Consultant

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SECTION 1

EXECUTIVE SUMMARY

Summary of Principal Results

(Dollar amounts expressed in thousands)

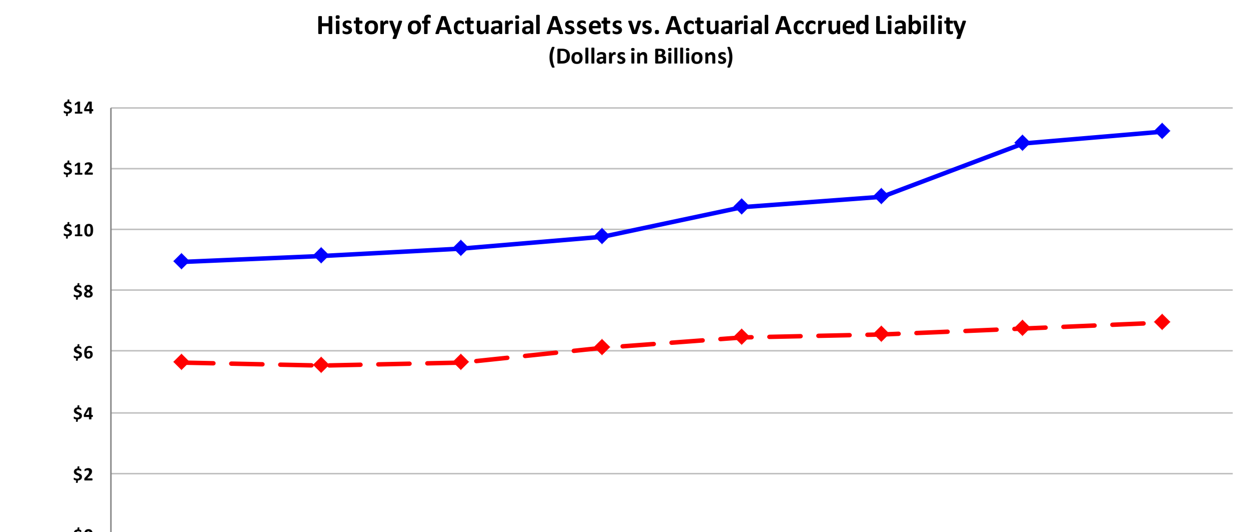
	Non-Hazardous		Hazardous		Total	
	June 30, 2018	June 30, 2017	June 30, 2018	June 30, 2017	June 30, 2018	June 30, 2017
Actuarially Determined Contribution:						
Retirement	22.52%	21.84%	36.98%	35.69%		
Insurance	4.76%	6.21%	9.52%	12.17%		
Total	27.28%	28.05%	46.50%	47.86%	N/A	N/A
Actual Contribution Rate for Next Fiscal Year[1]	24.06%	21.48%	39.58%	35.34%		
Assets:						
Retirement						
• Actuarial value (AVAR)	$6,950,225	$6,764,873	$2,321,721	$2,238,320	$9,271,946	$9,003,193
• Market value (MVAR)	$7,018,963	$6,687,237	$2,348,337	$2,217,996	$9,367,300	$8,905,233
• Ratio of actuarial to market value of assets	99.0%	101.2%	98.9%	100.9%	99.0%	101.1%
Insurance						
• Actuarial value (AVAI)	$2,371,430	$2,227,401	$1,256,306	$1,196,780	$3,627,736	$3,424,181
• Market value (MVAI)	$2,414,126	$2,212,536	$1,280,982	$1,189,001	$3,695,108	$3,401,537
• Ratio of actuarial to market value of assets	98.2%	100.7%	98.1%	100.7%	98.2%	100.7%
Funded Status:						
Retirement						
• Actuarial accrued liability	$13,191,505	$12,803,510	$4,792,548	$4,649,047	$17,984,053	$17,452,557
• Unfunded accrued liability on AVAR	$6,241,280	$6,038,637	$2,470,827	$2,410,727	$8,712,107	$8,449,364
• Funded ratio on AVAR	52.7%	52.8%	48.4%	48.1%	51.6%	51.6%
• Unfunded accrued liability on MVAR	$6,172,542	$6,116,273	$2,444,211	$2,431,051	$8,616,753	$8,547,324
• Funded ratio on MVAR	53.2%	52.2%	49.0%	47.7%	52.1%	51.0%
Insurance						
• Actuarial accrued liability	$3,092,624	$3,355,151	$1,684,028	$1,788,433	$4,776,652	$5,143,584
• Unfunded accrued liability on AVAI	$721,194	$1,127,750	$427,722	$591,653	$1,148,916	$1,719,403
• Funded ratio on AVAI	76.7%	66.4%	74.6%	66.9%	75.9%	66.6%
• Unfunded accrued liability on MVAI	$678,498	$1,142,615	$403,046	$599,432	$1,081,544	$1,742,047
• Funded ratio on MVAI	78.1%	65.9%	76.1%	66.5%	77.4%	66.1%
Membership:						
• Number of						
- Active Members	81,818	82,198	9,263	9,495	91,081	91,693
- Retirees and Beneficiaries	61,938	59,013	9,587	8,998	71,525	68,011
- Inactive Members	87,160	85,031	3,067	3,198	90,227	88,229
- Total	230,916	226,242	21,917	21,691	252,833	247,933
• Projected payroll of active members	$2,466,801	$2,452,407	$533,618	$541,633	$3,000,419	$2,994,040
• Average salary of active members	$30,150	$29,835	$57,607	$57,044	$32,942	$32,653

[1] Based on a 12% increase in the certified contribution rates from fiscal year ending 2018 in accordance with House Bill 362

Executive Summary (Continued)

Non-Hazardous Retirement Fund

The unfunded actuarial accrued liability for the non-hazardous retirement fund increased by $0.202 billion since the prior year's valuation to $6.241 billion. The largest source of this increase includes the FY 2018 contribution effort to finance the unfunded liability being $0.117 billion less than the interest on the prior year's unfunded actuarial accrued liability (i.e. negative amortization of $0.117 billion) and a $0.082 billion increase due to liability experience. 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 eight 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.

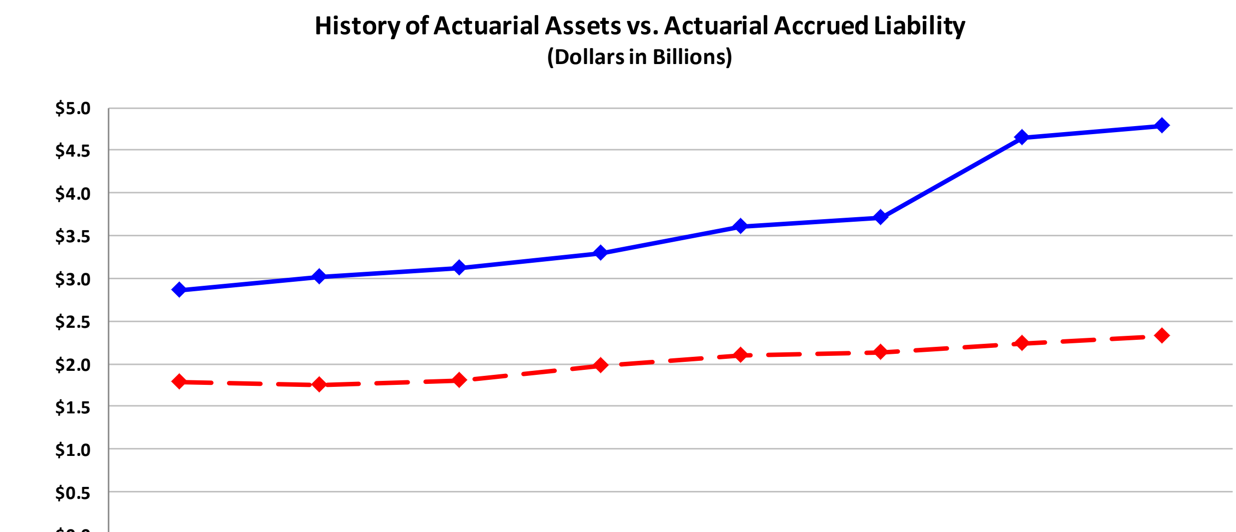


	2011	2012	2013	2014	2015	2016	2017	2018
AAL	8.9	9.1	9.4	9.8	10.7	11.1	12.8	13.2
AVA	5.6	5.5	5.6	6.1	6.5	6.5	6.8	7.0

Executive Summary (Continued)

Hazardous Retirement Fund

The unfunded actuarial accrued liability for the hazardous retirement fund increased by $0.060 billion since the prior year's valuation to $2.471 billion. The largest source of this increase includes the FY 2018 contribution effort to finance the unfunded liability being $0.039 billion less than the interest on the prior year's unfunded actuarial accrued liability (i.e. negative amortization of $0.039 billion) and $0.026 billion increase due to liability experience. 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 eight 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.



	2011	2012	2013	2014	2015	2016	2017	2018
AAL	2.9	3.0	3.1	3.3	3.6	3.7	4.6	4.8
AVA	1.8	1.7	1.8	2.0	2.1	2.1	2.2	2.3

Executive Summary (Continued)

Summary of Change in Financial Condition of the Insurance Funds

Both the Non-Hazardous and Hazardous Insurance funds experience extremely favorable premium experience from calendar year 2018 to 2019. Specifically, the non-Medicare premiums were expected to increase by 7.25% from calendar year 2018 to calendar year 2019 (i.e. the medical trend assumption for non-Medicare premiums used in the actuarial valuation) and the actual average premiums remained relatively unchanged. Also, the Medicare premiums were expected to increase by 5.10% from calendar year 2018 to calendar year 2019 (i.e. the medical trend assumption used in the actuarial valuation for Medicare premium) and the actual average premiums decreased by 12%.

Non-Hazardous Insurance Fund

Since the prior year's valuation the unfunded actuarial accrued liability for the nonhazardous insurance fund decreased by $0.407 billion to $0.721 billion with $0.389 billion of that decrease attributable to the favorable premium experience. The corresponding funded ratio increased from 66.4% at June 30, 2017 to 76.7% at June 30, 2018.

Hazardous Insurance Fund

Since the prior year's valuation the unfunded actuarial accrued liability for the hazardous insurance fund decreased by $0.164 billion to $0.428 billion with $0.172 billion of that decrease attributable to the favorable premium experience. The corresponding funded ratio increased from 66.9% at June 30, 2017 to 74.6% at June 30, 2018.

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, 2018 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.

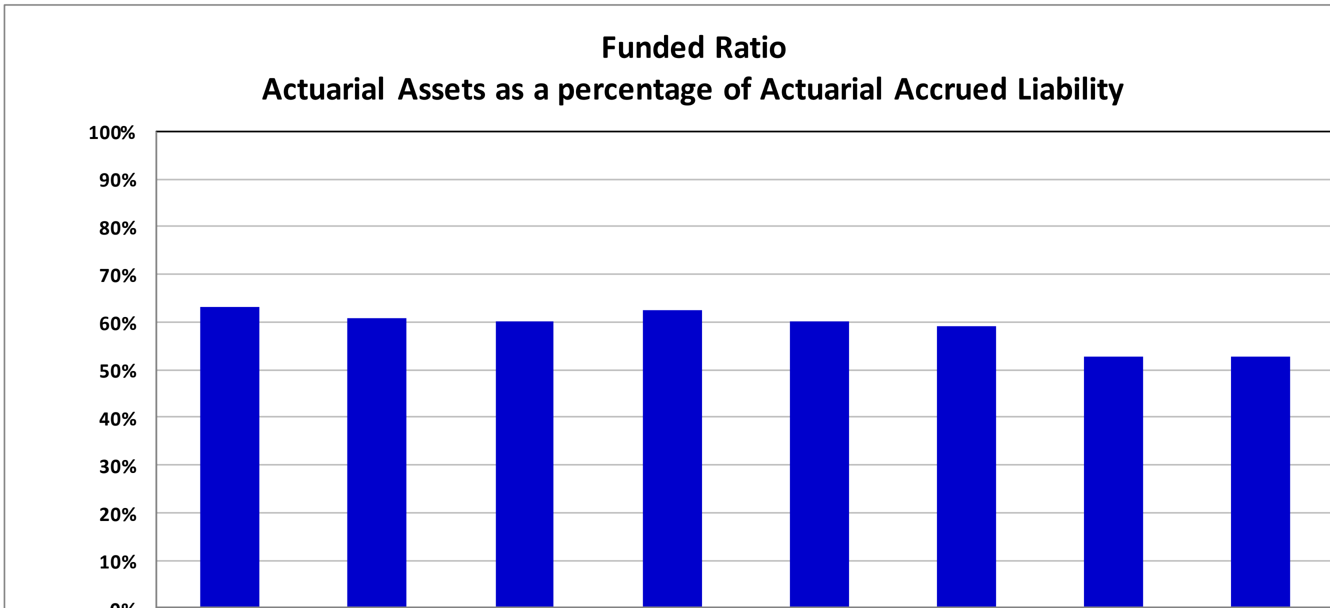
The actuarially determined contribution rates consist of two components: a normal cost rate and an amortization cost to finance the unfunded actuarial accrued liability. The normal cost rate is the theoretical amount which would be required to pay the members' benefits, based on the current plan provisions, 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 an eight-year history of the funded ratio (i.e. the Actuarial Value of Assets divided by the Actuarial Accrued Liability) for the retirement funds. The decline in the funded ratio over the last eight 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.

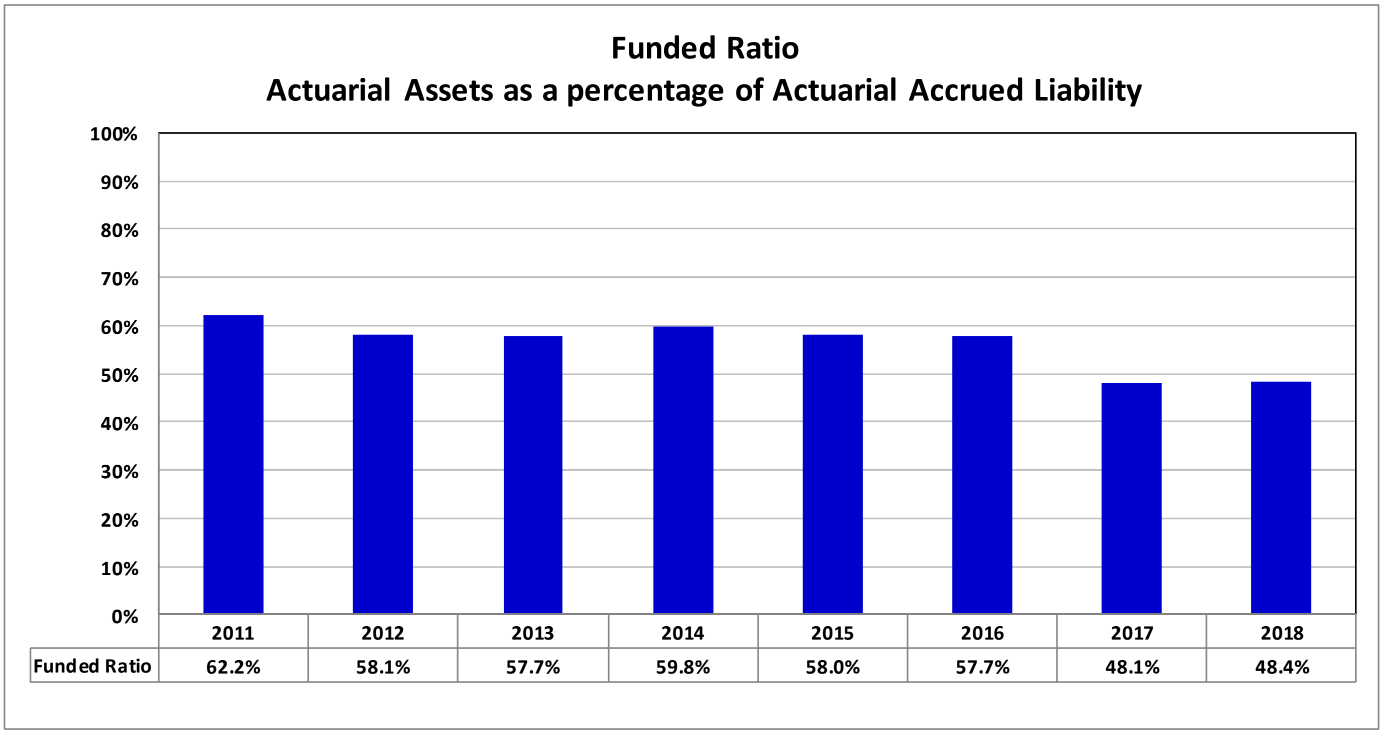
Non-Hazardous Retirement Fund



	2011	2012	2013	2014	2015	2016	2017	2018
Funded Ratio	63.1%	60.7%	60.1%	62.6%	60.3%	59.0%	52.8%	52.7%

Funding Progress (Continued)

Hazardous Retirement Fund



	2011	2012	2013	2014	2015	2016	2017	2018
Funded Ratio	62.2%	58.1%	57.7%	59.8%	58.0%	57.7%	48.1%	48.4%

Assuming the actuarial determined contributions are actually paid in future years and absent future unfavorable investment or demographic experience, we expect the funded ratio to slowly improve for both the nonhazardous and hazardous systems. 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 $6.765 billion to $6.950 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 2018 was 8.7% for the non-hazardous retirement fund which is greater than the 6.25% expected rate of return. The return on an actuarial (smoothed) asset value was 6.4%, which resulted in a $0.012 billion gain for the fiscal year. 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 $0.069 billion more than the actuarial value of assets, which signifies that this system has some net deferred investment gains to be realized in future years.

Likewise, the actuarial value of assets for the hazardous retirement fund increased from $2.238 billion to $2.322 billion since the prior valuation. The rate of return on the market value of assets on a dollar-weighted basis for fiscal year 2018 was 8.7% which is greater than the 6.25% expected return. The return on the actuarial (smoothed) asset value was 6.5%, which resulted in a $6 million gain for the fiscal year. The market value of assets is $0.027 billion greater than the actuarial value of assets, which signifies that this system has some net deferred investment gains to be realized in future years.

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
A. Calculation of total actuarial gain or loss		
1. Unfunded actuarial accrued liability (UAAL), previous year	$ 6,038,636	$ 2,410,727
2. Normal cost and administrative expenses	266,086	80,053
3. Less: contributions for the year	(518,748)	(188,860)
4. Interest accrual	369,519	147,270
5. Expected UAAL (Sum of Items 1 - 4)	$ 6,155,493	$ 2,449,190
6. Actual UAAL as of June 30,2018	$ 6,241,280	$ 2,470,827
7. Total gain (loss) for the year (Item 5 - Item 6)	$ (85,787)	$ (21,637)
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ 12,130	$ 6,388
9. Liability experience gain (loss) for the year	(82,209)	(25,853)
10. Plan Change	(15,708)	(2,172)
11. Assumption change	0	0
12. Total	$ (85,787)	$ (21,637)

The UAAL for both retirement funds was expected to increase since the prior year as the FY 2018 contribution effort was less than the interest on the prior year's unfunded actuarial accrued liability (i.e. negative amortization). The UAAL is expected to remain relatively unchanged for the next few years until it begins to decrease after the phase-in to the higher contribution rates become effective.

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	$ 1,127,750	$ 591,653
2. Normal cost and administrative expenses	87,442	29,502
3. Less: contributions for the year	(135,519)	(58,215)
4. Interest accrual	68,982	36,081
5. Expected UAAL (Sum of Items 1 - 4)	$ 1,148,655	$ 599,021
6. Actual UAAL as of June 30,2018	$ 721,194	$ 427,722
7. Total gain (loss) for the year (Item 5 - Item 6)	$ 427,461	$ 171,299
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ 5,309	$ 3,159
9. Liability experience gain (loss) for the year	424,524	168,622
10. Plan Change	(2,372)	(482)
11. Assumption change	0	0
12. Total	$ 427,461	$ 171,299

The favorable premium experience from calendar year 2018 to calendar year 2019 resulted in a $389 million liability gain for the non-hazardous insurance fund and a $172 million liability 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. There were no changes to the actuarial assumptions and methods since the last actuarial valuation. It is our opinion that the assumptions are internally consistent, reasonable, and reflect anticipated future experience of the System. Appendix A includes a summary of the actuarial assumptions and methods used in this valuation.

An experience study was conducted as of June 30, 2013 and the next experience study will be conducted as of June 30, 2018, the results of which will be first used in preparing the June 30, 2019 actuarial valuation. 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.

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.

During the 2018 legislative session, House Bill 185 was enacted, which updated the benefit provisions for active members who die in the line of duty. Benefits paid to the spouses of deceased members paid from the retirement fund have been increased from 25% of the member's final rate of pay to 75% of the member's average pay. If the member does not have a surviving spouse, benefits paid to surviving dependent children have been increased from 10% of the member's final pay rate to 50% of average pay for one child, 65% of average pay for two children, or 75% of average pay for three children. The insurance fund shall also now pay 100% of the insurance premium for spouses and children of all active members who die in the line of duty.

Also, House Bill 362 was enacted during the 2018 legislative session that limits the increase in the CERS employer contribution rate over the prior fiscal year to 12% per year for the period of July 1, 2018 to June 30, 2028.

Please note that this actuarial valuation was determined without regard to enactment of SB 151 in 2018, which is currently being reviewed by the State Supreme Court.

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

ACTUARIAL TABLES

Actuarial Tables

RETIREMENT BENEFITS

ACTUARIAL TABLES

Development of Unfunded Actuarial Accrued Liability
Retirement Benefits

(Dollar amounts expressed in thousands)

		June 30, 2018	
		Non-Hazardous (1)	Hazardous (2)
1.	Projected payroll of active members	$ 2,466,801	$ 533,618
2.	Present value of future pay	$ 19,527,842	$ 3,460,652
3.	Normal cost rate		
	a. Total normal cost rate	10.01%	14.07%
	b. Less: member contribution rate	-5.00%	-8.00%
	c. Employer normal cost rate	5.01%	6.07%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 6,821,795	$ 2,098,696
	b. Less: present value of future normal costs	(1,827,009)	(457,206)
	c. Actuarial accrued liability	$ 4,994,786	$ 1,641,490
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 7,754,521	$ 3,094,100
	b. Inactive members	442,198	56,958
	c. Active members (Item 4c)	4,994,786	1,641,490
	d. Total	$ 13,191,505	$ 4,792,548
6.	Actuarial value of assets	$ 6,950,225	$ 2,321,721
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 6,241,280	$ 2,470,827
8.	Funded Ratio	52.7%	48.4%

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

		June 30, 2018	
		Non-Hazardous (1)	Hazardous (2)
1.	Active members		
	a. Service retirement	$ 6,194,197	$ 1,782,058
	b. Deferred termination benefits and refunds	374,526	253,193
	c. Survivor benefits	114,364	14,203
	d. Disability benefits	138,708	49,242
	e. Total	$ 6,821,795	$ 2,098,696
2.	Retired members		
	a. Service retirement	$ 6,818,513	$ 2,814,815
	b. Disability retirement	492,386	110,115
	c. Beneficiaries	443,622	169,170
	d. Total	$ 7,754,521	$ 3,094,100
3.	Inactive members		
	a. Vested terminations	$ 366,025	$ 51,047
	b. Nonvested terminations	76,173	5,911
	c. Total	$ 442,198	$ 56,958
4.	Total actuarial present value of future benefits	$ 15,018,514	$ 5,249,754

Development of Actuarially Determined Contribution Rate
Retirement Benefits

		June 30, 2018	
		Non-Hazardous	Hazardous
		(1)	(2)
1.	Total normal cost rate		
	a. Service retirement	7.59%	8.57%
	b. Deferred termination benefits and refunds	1.76%	4.76%
	c. Survivor benefits	0.32%	0.20%
	d. Disability benefits	0.34%	0.54%
	e. Total	10.01%	14.07%
2.	Less: member contribution rate	-5.00%	-8.00%
3.	Total employer normal cost rate	5.01%	6.07%
4.	Administrative expenses	0.79%	0.28%
5.	Net employer normal cost rate	5.80%	6.35%
6.	UAAL amortization contribution	16.72%	30.63%
7.	Total calculated employer contribution	22.52%	36.98%

Actuarial Balance Sheet

Non-Hazardous Members Retirement

(Dollar amounts expressed in thousands)

			June 30, 2018 (1)		June 30, 2017 (2)
1.	Assets - Present and Expected Future Resources				
	a. Current assets (actuarial value)	$	6,950,225	$	6,764,873
	b. Present value of future member contributions	$	976,392	$	961,800
	c. Present value of future employer contributions				
	i. Normal cost contributions	$	850,617	$	870,845
	ii. Unfunded accrued liability contributions		6,241,280		6,038,637
	iii. Total future employer contributions	$	7,091,897	$	6,909,482
	d. Total assets	$	15,018,514	$	14,636,155
2.	Liabilities - Present Value of Expected Future Benefit Payments				
	a. Active members				
	i. Present value of future normal costs	$	1,827,009	$	1,832,645
	ii. Accrued liability		4,994,786		5,071,828
	iii. Total present value of future benefits	$	6,821,795	$	6,904,473
	b. Present value of benefits payable on account of current retired members and beneficiaries	$	7,754,521	$	7,313,076
	c. Present value of benefits payable on account of current inactive members	$	442,198	$	418,606
	d. Total liabilities	$	15,018,514	$	14,636,155

Actuarial Balance Sheet

Hazardous Members Retirement

(Dollar amounts expressed in thousands)

			June 30, 2018 (1)		June 30, 2017 (2)
1.	Assets - Present and Expected Future Resources				
	a. Current assets (actuarial value)	$	2,321,721	$	2,238,320
	b. Present value of future member contributions	$	276,852	$	272,353
	c. Present value of future employer contributions				
	i. Normal cost contributions	$	180,354	$	194,134
	ii. Unfunded accrued liability contributions		2,470,827		2,410,727
	iii. Total future employer contributions	$	2,651,181	$	2,604,861
	d. Total assets	$	5,249,754	$	5,115,534
2.	Liabilities - Present Value of Expected Future Benefit Payments				
	a. Active members				
	i. Present value of future normal costs	$	457,206	$	466,487
	ii. Accrued liability		1,641,490		1,738,446
	iii. Total present value of future benefits	$	2,098,696	$	2,204,933
	b. Present value of benefits payable on account of current retired members and beneficiaries	$	3,094,100	$	2,851,704
	c. Present value of benefits payable on account of current inactive members	$	56,958	$	58,897
	d. Total liabilities	$	5,249,754	$	5,115,534

Reconciliation of Retirement Net Assets

(Dollar amounts expressed in thousands)*

	Year Ending			
	June 30, 2018		June 30, 2018	
	(1)		(2)	
	Non-Hazardous		**Hazardous**	
1. Value of assets at beginning of year	$	6,687,237	$	2,217,996
2. Revenue for the year				
a. Contributions				
i. Member contributions	$	160,370	$	61,089
ii. Employer contributions		355,473		124,953
iii. Other contributions (less 401h)		2,905		2,818
iii. Total	$	518,748	$	188,860
b. Income				
i. Interest, dividends, and other income	$	155,876	$	51,582
ii. Investment expenses		(54,718)		(18,196)
iii. Net	$	101,158	$	33,386
c. Net realized and unrealized gains (losses)		472,587		157,932
d. Total revenue	$	1,092,494	$	380,178
3. Expenditures for the year				
a. Disbursements				
i. Refunds	$	14,608	$	4,214
ii. Regular annuity benefits		726,569		244,118
iii. Other benefit payments		0		0
iv. Transfers to other systems		0		0
v. Total	$	741,176	$	248,333
b. Administrative expenses and depreciation		19,592		1,504
c. Total expenditures	$	760,768	$	249,837
4. Increase in net assets (Item 2. - Item 3.)	$	331,726	$	130,340
5. Value of assets at end of year (Item 1. + Item 4.)	$	7,018,963	$	2,348,337
6. Net external cash flow				
a. Dollar amount	$	(242,020)	$	(60,977)
b. Percentage of market value		-3.5%		-2.7%
7. Estimated annual return on net assets		8.7%		8.7%

* Amounts may not add due to rounding
* Excludes 401h assets

Development of Actuarial Value of Assets

Non-Hazardous Members Retirement

(Dollar amounts expressed in thousands)*

	Year Ending		June 30, 2018
1.	Actuarial value of assets at beginning of year	$	6,764,873
2.	Market value of assets at beginning of year	$	6,687,237
3.	Net new investments		
	a. Contributions	$	518,748
	b. Benefit payments		(741,176)
	c. Administrative expenses		(19,592)
	d. Subtotal	$	(242,020)
4.	Market value of assets at end of year	$	7,018,963
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	573,746
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	410,389
8.	Excess return for phased recognition	$	163,357

9. Phased-in recognition, 20% of excess return on assets for prior years:

	Fiscal Year Ending June 30,		Excess Return		Recognized Amount
a.	2018	$	163,357	$	32,671
b.	2017		369,213		73,843
c.	2016		(515,652)		(103,130)
d.	2015		(386,073)		(77,215)
e.	2014		454,067		90,813
f.	Total			$	16,983

10.	Actuarial value of assets as of June 30, 2018 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	6,950,225
11.	Ratio of actuarial value to market value		99.0%
12.	Estimated annual return on actuarial value of assets		6.4%

* 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, 2018
1.	Actuarial value of assets at beginning of year	$	2,238,320
2.	Market value of assets at beginning of year	$	2,217,996
3.	Net new investments		
	a. Contributions	$	188,860
	b. Benefit payments		(248,333)
	c. Administrative expenses		(1,504)
	d. Subtotal	$	(60,977)
4.	Market value of assets at end of year	$	2,348,337
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	191,318
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	136,719
8.	Excess return for phased recognition	$	54,598

9. Phased-in recognition, 20% of excess return on assets for prior years:

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2018	$ 54,598	$ 10,920
b.	2017	120,774	24,155
c.	2016	(162,540)	(32,508)
d.	2015	(122,554)	(24,511)
e.	2014	148,014	29,603
f.	Total		$ 7,658

10.	Actuarial value of assets as of June 30, 2018 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	2,321,721
11.	Ratio of actuarial value to market value		98.9%
12.	Estimated annual return on actuarial value of assets		6.5%

* Amounts may not add due to rounding

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

June 30, (1)	Actuarial Value of Assets (AVA) (2)	Actuarial Accrued Liability (AAL) (3)	Unfunded Actuarial Accrued Liability (UAAL) (3) - (2) (4)	Funded Ratio (2)/(3) (5)	Annual Covered Payroll (6)	UAAL as % of Payroll (4)/(6) (7)
			Non-Hazardous Members			
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%
2018	6,950,225	13,191,505	6,241,280	52.7%	2,466,801	253.0%
			Hazardous Members			
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%
2018	2,321,721	4,792,548	2,470,827	48.4%	533,618	463.0%
			Total CERS Members			
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%
2018	9,271,946	17,984,053	8,712,107	51.6%	3,000,419	290.4%

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:

	Non-Hazardous	Hazardous
Valuation date:	June 30, 2018	June 30, 2018
Actuarial cost method:	Entry Age Normal	Entry Age Normal
Amortization method:	Level percentage of payroll (2% payroll growth assumed)	Level percentage of payroll (2% payroll growth assumed)
Amortization period for contribution rate:	25-year closed period	25-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% (varies by service)	3.05% to 18.55% (varies by service)
Inflation	2.30%	2.30%
Post-retirement benefit adjustments	0.00%	0.00%
Retiree Mortality	RP-2000 Combined Mortality Table for Males and Females, projected using scale BB to 2013 (set back one year for females).	RP-2000 Combined Mortality Table for Males and Females, projected using scale BB to 2013 (set back one year for females).

Solvency Test
Retirement Benefits
(Dollar amounts expressed in thousands)

	Actuarial Accrued Liability				Portion of Aggregate Accrued Liabilities Covered by Assets		
June 30,	Active Member Contributions	Retired Members & Beneficiaries	Active Members (Employer Financed)	Valuation Assets	Active	Retired	ER Financed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Non-Hazardous Members				
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%
2018	1,269,287	8,196,719	3,725,499	6,950,225	100.0%	69.3%	0.0%
			Hazardous Members				
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%
2018	442,637	3,151,058	1,198,853	2,321,721	100.0%	59.6%	0.0%

Insurance Benefits

Actuarial Tables

Development of Unfunded Actuarial Accrued Liability
Insurance Benefits

(Dollar amounts expressed in thousands)

		June 30, 2018	
		Non-Hazardous (1)	Hazardous (2)
1.	Projected payroll of active members	$ 2,466,801	$ 533,618
2.	Present value of future pay	$ 19,346,340	$ 3,452,875
3.	Normal cost rate		
	a. Total normal cost rate	3.32%	4.74%
	b. Less: member contribution rate	-0.46%	-0.41%
	c. Employer normal cost rate	2.86%	4.33%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 2,172,566	$ 816,206
	b. Less: present value of future normal costs	(605,265)	(133,895)
	c. Actuarial accrued liability	$ 1,567,301	$ 682,311
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 1,374,325	$ 983,359
	b. Inactive members	150,998	18,358
	c. Active members (Item 4c)	1,567,301	682,311
	d. Total	$ 3,092,624	$ 1,684,028
6.	Actuarial value of assets	$ 2,371,430	$ 1,256,306
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 721,194	$ 427,722
8.	Funded Ratio	76.7%	74.6%

Development of Actuarially Determined Contribution Rate
Insurance Benefits

		June 30, 2018	
		Non-Hazardous (1)	Hazardous (2)
1.	Total normal cost rate	3.32%	4.74%
2.	Less: member contribution rate	-0.46%	-0.41%
3.	Total employer normal cost rate	2.86%	4.33%
4.	Administrative expenses	0.03%	0.07%
5.	Net employer normal cost rate	2.89%	4.40%
6.	UAAL amortization contribution	1.87%	5.12%
7.	Total calculated employer contribution Max (0%, item 5. + item6.)	4.76%	9.52%

Actuarial Balance Sheet

Non-Hazardous Members Insurance

(Dollar amounts expressed in thousands)

		June 30, 2018 (1)	June 30, 2017 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 2,371,430	$ 2,227,401
	b. Present value of future member contributions	$ 106,356	$ 94,725
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 498,909	$ 544,406
	ii. Unfunded accrued liability contributions	721,194	1,127,750
	iii. Total future employer contributions	$ 1,220,103	$ 1,672,156
	d. Total assets	$ 3,697,889	$ 3,994,282
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 605,265	$ 639,131
	ii. Accrued liability	1,567,301	1,751,713
	iii. Total present value of future benefits	$ 2,172,566	$ 2,390,844
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 1,374,325	$ 1,445,497
	c. Present value of benefits payable on account of current inactive members	$ 150,998	$ 157,941
	d. Total liabilities	$ 3,697,889	$ 3,994,282

Actuarial Balance Sheet

Hazardous Members Insurance

(Dollar amounts expressed in thousands)

		June 30, 2018 (1)	June 30, 2017 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 1,256,306	$ 1,196,780
	b. Present value of future member contributions	$ 19,064	$ 16,300
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 114,831	$ 134,540
	ii. Unfunded accrued liability contributions	427,722	591,653
	iii. Total future employer contributions	$ 542,553	$ 726,193
	d. Total assets	$ 1,817,923	$ 1,939,273
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 133,895	$ 150,840
	ii. Accrued liability	682,311	793,669
	iii. Total present value of future benefits	$ 816,206	$ 944,509
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 983,359	$ 973,103
	c. Present value of benefits payable on account of current inactive members	$ 18,358	$ 21,661
	d. Total liabilities	$ 1,817,923	$ 1,939,273

Reconciliation of Insurance Net Assets

(Dollar amounts expressed in thousands)*

	Year Ending	
	June 30, 2018	June 30, 2018
	(1)	(2)
	Non-Hazardous	**Hazardous**
1. Value of assets at beginning of year	$ 2,212,536	$ 1,189,001
2. Revenue for the year		
a. Contributions		
i. Member contributions	$ 10,826	$ 2,173
ii. Employer contributions	120,797	55,027
iii. Other contributions (less 401h)	3,896	1,015
iii. Total	$ 135,519	$ 58,215
b. Income		
i. Interest, dividends, and other income	$ 48,736	$ 26,405
ii. Investment expenses	(21,923)	(12,173)
iii. Net	$ 26,813	$ 14,233
c. Net realized and unrealized gains (losses)	175,256	95,620
d. Total revenue	$ 337,588	$ 168,069
3. Expenditures for the year		
a. Disbursements		
i. Refunds	$ 0	$ 0
ii. Healthcare premium subsidies	131,630	74,844
iii. Other benefit payments	3,606	868
iv. Transfers to other systems	0	0
v. Total	$ 135,236	$ 75,712
b. Administrative expenses and depreciation	761	376
c. Total expenditures	$ 135,997	$ 76,088
4. Increase in net assets (Item 2. - Item 3.)	$ 201,591	$ 91,981
5. Value of assets at end of year (Item 1. + Item 4.)	$ 2,414,126	$ 1,280,982
6. Net external cash flow		
a. Dollar amount	$ (478)	$ (17,873)
b. Percentage of market value	0.0%	-1.4%
7. Estimated annual return on net assets	9.1%	9.3%

* Amounts may not add due to rounding
* Includes 401h assets

Development of Actuarial Value of Assets

Non-Hazardous Members Insurance

(Dollar amounts expressed in thousands)*

	Year Ending		June 30, 2018
1.	Actuarial value of assets at beginning of year	$	2,227,401
2.	Market value of assets at beginning of year	$	2,212,536
3.	Net new investments		
	a. Contributions	$	135,519
	b. Benefit payments		(135,236)
	c. Administrative expenses		(761)
	d. Subtotal	$	(478)
4.	Market value of assets at end of year	$	2,414,126
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	202,069
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	138,269
8.	Excess return for phased recognition	$	63,800

9. Phased-in recognition, 20% of excess return on assets for prior years:

	Fiscal Year Ending June 30,		Excess Return		Recognized Amount
a.	2018	$	63,800	$	12,760
b.	2017		121,364		24,273
c.	2016		(147,421)		(29,484)
d.	2015		(110,970)		(22,194)
e.	2014		104,420		20,884
f.	Total			$	6,239

10.	Actuarial value of assets as of June 30, 2018 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	2,371,430
11.	Ratio of actuarial value to market value		98.2%
12.	Estimated annual return on actuarial value of assets		6.5%

* Amounts may not add due to rounding

Development of Actuarial Value of Assets

Hazardous Members Insurance

(Dollar amounts expressed in thousands)*

Year Ending			June 30, 2018
1.	Actuarial value of assets at beginning of year	$	1,196,780
2.	Market value of assets at beginning of year	$	1,189,001
3.	Net new investments		
	a. Contributions	$	58,215
	b. Benefit payments		(75,712)
	c. Administrative expenses		(376)
	d. Subtotal	$	(17,873)
4.	Market value of assets at end of year	$	1,280,982
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	109,853
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	73,754
8.	Excess return for phased recognition	$	36,099

9. Phased-in recognition, 20% of excess return on assets for prior years:

	Fiscal Year Ending June 30,		Excess Return		Recognized Amount
a.	2018	$	36,099	$	7,220
b.	2017		65,383		13,077
c.	2016		(78,507)		(15,701)
d.	2015		(60,152)		(12,030)
e.	2014		55,401		11,080
f.	Total			$	3,645

10.	Actuarial value of assets as of June 30, 2018 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	1,256,306
11.	Ratio of actuarial value to market value		98.1%
12.	Estimated annual return on actuarial value of assets		6.5%

* Amounts may not add due to rounding

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

June 30, (1)	Actuarial Value of Assets (AVA) (2)	Actuarial Accrued Liability (AAL) (3)	Unfunded Actuarial Accrued Liability (UAAL) (3) - (2) (4)	Funded Ratio (2)/(3) (5)	Annual Covered Payroll (6)	UAAL as % of Payroll (4)/(6) (7)
			Non-Hazardous Members			
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%
2018	2,371,430	3,092,624	721,194	76.7%	2,466,801	29.2%
			Hazardous Members			
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%
2018	1,256,306	1,684,028	427,722	74.6%	533,618	80.2%
			Total CERS Members			
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%
2018	3,627,736	4,776,652	1,148,916	75.9%	3,000,419	38.3%

Solvency Test
Insurance Benefits
(Dollar amounts expressed in thousands)

June 30, (1)	Actuarial Accrued Liability: Active Member Contributions (2)	Actuarial Accrued Liability: Retired Members & Beneficiaries (3)	Actuarial Accrued Liability: Active Members (Employer Financed) (4)	Valuation Assets (5)	Portion of Aggregate Accrued Liabilities Covered by Assets: Active (6)	Retired (7)	ER Financed (8)
Non-Hazardous Members							
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%
2018	-	1,525,323	1,567,301	2,371,430	100.0%	100.0%	54.0%
Hazardous Members							
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%
2018	-	1,001,717	682,311	1,256,306	100.0%	100.0%	37.3%

SECTION 4

MEMBERSHIP INFORMATION

Membership Tables

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

		Non-Hazardous June 30, 2018 (1)	Hazardous June 30, 2018 (2)	Total June 30, 2018 (3)	Total June 30, 2017 (4)
1.	Active members				
	a. Males	29,252	8,137	37,389	37,655
	b. Females	52,566	1,126	53,692	54,038
	c. Total members	81,818	9,263	91,081	91,693
	d. Total annualized prior year salaries	$ 2,466,801	$ 533,618	$ 3,000,419	$ 2,994,040
	e. Average salary	$ 30,150	$ 57,607	$ 32,942	$ 32,653
	f. Average age	47.7	38.5	46.8	47.0
	g. Average service	9.2	10.2	9.3	9.5
	h. Member contributions with interest	$ 1,269,287	$ 442,637	$ 1,711,924	$ 1,736,240
	i. Average contributions with interest	$ 15,514	$ 47,786	$ 18,796	$ 18,935
2.	Vested inactive members				
	a. Number	17,621	954	18,575	15,358
	b. Total annual deferred benefits	$ 66,670	$ 7,194	$ 73,864	$ 69,010
	c. Average annual deferred benefit	$ 3,784	$ 7,540	$ 3,977	$ 4,493
	d. Average age at the valuation date	50.6	43.4	50.3	50.6
3.	Nonvested inactive members				
	a. Number	69,539	2,113	71,652	72,871
	b. Total member contributions with interest	$ 76,173	$ 5,911	$ 82,084	$ 86,252
	c. Average contributions with interest	$ 1,095	$ 2,797	$ 1,146	$ 1,184
4.	Service retirees				
	a. Number	52,123	7,916	60,039	56,977
	b. Total annual benefits	$ 611,865	$ 219,838	$ 831,703	$ 776,476
	c. Average annual benefit	$ 11,739	$ 27,771	$ 13,853	$ 13,628
	d. Average age at the valuation date	70.3	61.8	69.2	69.1
5.	Disabled retirees				
	a. Number	4,165	564	4,729	4,640
	b. Total annual benefits	$ 47,368	$ 9,328	$ 56,695	$ 55,008
	c. Average annual benefit	$ 11,373	$ 16,539	$ 11,989	$ 11,855
	d. Average age at the valuation date	65.2	56.6	64.1	63.8
6.	Beneficiaries				
	a. Number	5,650	1,107	6,757	6,394
	b. Total annual benefits	$ 51,141	$ 16,509	$ 67,650	$ 62,664
	c. Average annual benefit	$ 9,052	$ 14,913	$ 10,012	$ 9,800
	d. Average age at the valuation date	68.1	57.7	66.4	66.9

Summary of Historical Active Membership

June 30,	Active Members: Number	Active Members: Percent Increase /(Decrease)	Covered Payroll[1]: Amount in Thousands	Covered Payroll[1]: Percent Increase /(Decrease)	Average Annual Pay: Amount	Average Annual Pay: Percent Increase /(Decrease)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-Hazardous Members						
2011	85,285		2,276,596		$ 26,694	
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%
2018	81,818	-0.5%	2,466,801	0.6%	30,150	1.1%
Hazardous Members						
2011	9,407		$ 466,964		$ 49,640	
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%
2018	9,263	-2.4%	533,618	-1.5%	57,607	1.0%

Distribution of Active Members by Age and by Years of Service

Non-Hazardous Members

	Years of Credited Service												
Attained Age	0 Count & Avg. Comp.	1 Count & Avg. Comp.	2 Count & Avg. Comp.	3 Count & Avg. Comp.	4 Count & Avg. Comp.	5-9 Count & Avg. Comp.	10-14 Count & Avg. Comp.	15-19 Count & Avg. Comp.	20-24 Count & Avg. Comp.	25-29 Count & Avg. Comp.	30-34 Count & Avg. Comp.	35 & Over Count & Avg. Comp.	Total Count & Avg. Comp.
Under 20	125	9	0	0	1	0	1	0	0	0	0	0	136
	$13,084	$15,227	$0	$0	$15,544	$0	$13,319	$0	$0	$0	$0	$0	$13,245
20-24	1,422	652	276	124	46	21	2	0	0	0	0	0	2,543
	$17,513	$23,339	$26,154	$25,222	$30,370	$29,907	$14,475	$0	$0	$0	$0	$0	$20,653
25-29	1,554	1,156	813	586	374	580	13	0	1	1	0	0	5,078
	$19,952	$24,791	$26,249	$29,167	$31,193	$34,050	$41,333	$0	$1,508	$79,781	$0	$0	$25,626
30-34	1,411	1,021	801	650	470	1,434	532	13	1	0	0	0	6,333
	$19,571	$24,118	$26,024	$29,085	$32,022	$35,706	$39,938	$39,466	$57,456	$0	$0	$0	$28,432
35-39	1,308	1,063	826	743	528	1,757	1,310	530	20	1	0	0	8,086
	$19,590	$24,341	$25,348	$25,478	$27,983	$32,872	$40,828	$43,959	$59,147	$89,817	$0	$0	$29,922
40-44	1,139	973	798	720	562	2,026	1,585	1,203	417	13	0	0	9,436
	$20,756	$23,342	$24,929	$26,327	$27,139	$31,370	$36,888	$44,154	$48,782	$59,770	$0	$0	$31,445
45-49	936	882	731	688	577	2,316	2,198	1,720	1,006	214	9	0	11,277
	$20,415	$24,525	$25,765	$27,342	$28,905	$29,682	$34,032	$40,110	$49,254	$55,423	$90,203	$0	$32,794
50-54	830	718	594	570	475	2,048	2,250	2,396	1,379	411	82	11	11,764
	$20,040	$23,321	$25,834	$26,860	$27,267	$29,559	$31,969	$34,222	$40,821	$49,621	$61,156	$76,222	$31,791
55-59	698	610	518	558	440	1,895	2,225	2,608	1,800	642	120	41	12,155
	$18,616	$25,026	$24,928	$27,025	$27,386	$30,060	$31,483	$32,373	$36,283	$44,360	$55,998	$62,973	$31,496
60-64	512	441	368	399	326	1,587	1,615	1,724	1,289	595	109	54	9,019
	$17,828	$21,130	$24,516	$25,827	$26,135	$28,076	$31,599	$33,870	$34,872	$40,514	$47,746	$62,859	$30,816
65 & Over	411	345	266	323	241	1,249	1,169	965	530	326	98	68	5,991
	$13,194	$18,037	$19,335	$22,333	$20,380	$24,064	$27,610	$31,433	$34,276	$36,031	$39,891	$53,730	$26,549
Total	10,346	7,870	5,991	5,361	4,040	14,913	12,900	11,159	6,443	2,203	418	174	81,818
	$19,110	$23,686	$25,287	$26,810	$28,036	$30,426	$33,633	$35,941	$39,710	$44,273	$51,818	$60,163	$30,150

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

	Years of Credited Service												
Attained Age	0 Count & Avg. Comp.	1 Count & Avg. Comp.	2 Count & Avg. Comp.	3 Count & Avg. Comp.	4 Count & Avg. Comp.	5-9 Count & Avg. Comp.	10-14 Count & Avg. Comp.	15-19 Count & Avg. Comp.	20-24 Count & Avg. Comp.	25-29 Count & Avg. Comp.	30-34 Count & Avg. Comp.	35 & Over Count & Avg. Comp.	Total Count & Avg. Comp.
Under 20	3	1	0	0	0	0	0	0	0	0	0	0	4
	$27,500	$24,839	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$26,835
20-24	208	128	66	14	8	6	0	0	0	0	0	0	430
	$32,837	$43,725	$43,019	$50,558	$42,294	$40,110	$0	$0	$0	$0	$0	$0	$38,495
25-29	216	274	244	199	191	236	1	0	0	0	0	0	1,361
	$34,908	$44,642	$47,898	$50,820	$50,737	$52,714	$48,992	$0	$0	$0	$0	$0	$46,842
30-34	113	154	120	149	133	765	252	1	0	0	0	0	1,687
	$34,909	$44,540	$48,276	$52,159	$52,702	$57,267	$61,643	$46,208	$0	$0	$0	$0	$53,804
35-39	50	62	55	62	68	425	711	220	13	0	0	0	1,666
	$36,373	$45,227	$47,569	$51,950	$50,786	$57,788	$62,280	$65,830	$80,391	$0	$0	$0	$58,993
40-44	23	27	27	26	29	223	448	581	197	16	0	0	1,597
	$29,630	$45,790	$51,249	$49,746	$53,251	$55,585	$62,007	$67,981	$78,511	$84,626	$0	$0	$64,265
45-49	21	24	23	20	19	126	267	492	320	51	5	0	1,368
	$35,587	$39,617	$48,544	$44,839	$48,577	$56,201	$59,941	$65,806	$77,431	$86,080	$96,227	$0	$65,604
50-54	10	14	9	7	12	70	141	215	105	65	11	0	659
	$28,753	$42,939	$37,105	$57,315	$45,121	$56,091	$57,113	$64,279	$72,814	$87,685	$83,445	$0	$64,078
55-59	9	1	7	6	5	33	70	83	55	27	12	1	309
	$39,932	$69,292	$47,400	$48,773	$52,971	$50,822	$53,798	$63,068	$63,261	$77,362	$94,694	$123,210	$60,917
60-64	4	3	0	3	1	15	31	28	16	10	5	2	118
	$31,110	$59,168	$0	$54,765	$34,127	$44,701	$53,033	$59,578	$62,051	$69,201	$92,672	$118,612	$58,208
65 & Over	1	1	3	1	1	8	16	20	5	2	2	4	64
	$29,880	$28,673	$66,092	$21,011	$44,502	$38,312	$48,834	$70,117	$73,697	$58,985	$72,703	$103,827	$60,308
Total	658	689	554	487	467	1,907	1,937	1,640	711	171	35	7	9,263
	$34,113	$44,384	$47,473	$51,094	$51,058	$56,165	$60,863	$66,175	$75,634	$83,873	$89,832	$110,820	$57,607

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

	Retirement		Disability		Survivors & Beneficiaries		Total	
Current Age	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Under 50	306	$ 6,911	206	$ 2,574	694	$ 5,482	1,206	$ 14,967
50 - 54	1,241	29,780	293	3,758	270	2,509	1,804	36,047
55 - 59	4,147	72,485	694	8,847	441	4,444	5,282	85,776
60 - 64	8,594	121,258	937	11,205	626	6,396	10,157	138,859
65 - 69	12,599	148,601	827	9,338	795	8,171	14,221	166,110
70 - 74	10,505	108,480	577	5,932	773	7,714	11,855	122,126
75 - 79	7,332	67,318	386	3,743	791	7,338	8,509	78,399
80 - 84	4,308	35,457	182	1,540	587	4,666	5,077	41,663
85 - 89	2,101	15,581	54	384	430	3,110	2,585	19,075
90 And Over	990	5,994	9	47	243	1,310	1,242	7,351
Total	**52,123**	**$ 611,865**	**4,165**	**$ 47,368**	**5,650**	**$ 51,141**	**61,938**	**$ 710,374**

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

	Retirement		Disability		Survivors & Beneficiaries		Total	
Current Age	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Under 50	954	$ 31,680	157	$ 2,757	279	$ 2,323	1,390	$ 36,760
50 - 54	1,253	41,021	97	1,720	77	1,120	1,427	43,861
55 - 59	1,265	37,939	105	1,788	93	1,665	1,463	41,392
60 - 64	1,410	37,533	96	1,396	152	2,469	1,658	41,398
65 - 69	1,420	36,526	65	977	150	2,890	1,635	40,393
70 - 74	896	19,959	29	491	143	2,477	1,068	22,927
75 - 79	478	10,123	7	83	99	1,875	584	12,081
80 - 84	180	3,665	7	96	73	1,014	260	4,775
85 - 89	50	1,195	0	-	33	516	83	1,711
90 And Over	10	196	1	20	8	160	19	376
Total	**7,916**	**$ 219,838**	**564**	**$ 9,328**	**1,107**	**$ 16,509**	**9,587**	**$ 245,675**

Non-Hazardous Retired Lives Summary

Form of Payment	Male Lives Number	Male Lives Monthly Benefit Amount	Female Lives Number	Female Lives Monthly Benefit Amount	Total Number	Total Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	5,709	$ 6,016,003	20,431	$ 15,327,748	26,140	$ 21,343,751
Joint & Survivor:						
100% to Beneficiary	3,264	3,795,295	1,888	1,239,053	5,152	5,034,348
66 2/3% to Beneficiary	863	1,590,528	668	717,280	1,531	2,307,808
50% to Beneficiary	1,183	1,936,508	1,735	2,007,149	2,918	3,943,658
Pop-up Option	4,237	6,797,888	3,945	4,213,658	8,182	11,011,547
Social Security Option:						
Age 62 Basic	249	429,948	543	570,090	792	1,000,038
Age 62 Survivorship	599	1,066,262	367	375,074	966	1,441,336
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	0	0	1	236	1	236
10 Years Certain & Life	1,461	1,549,983	3,582	2,781,656	5,043	4,331,639
15 Years Certain & Life	661	685,408	925	717,857	1,586	1,403,265
20 Years Certain & Life	496	686,107	789	595,322	1,285	1,281,429
Refund	0	0	0	0	0	0
Partial Lump Sum Option (PLSO):						
12 Month Basic	91	108,237	360	308,541	451	416,779
24 Month Basic	56	38,167	238	192,634	294	230,801
36 Month Basic	241	119,288	691	316,436	932	435,724
12 Month Survivor	137	170,256	88	88,115	225	258,371
24 Month Survivor	85	87,067	59	37,965	144	125,032
36 Month Survivor	372	244,946	274	125,381	646	370,327
Total:	19,704	$ 25,321,895	36,584	$ 29,614,195	56,288	$ 54,936,090

Hazardous Retired Lives Summary

Form of Payment	Male Lives			Female Lives			Total		
	Number		Monthly Benefit Amount	Number		Monthly Benefit Amount	Number		Monthly Benefit Amount
(1)	(2)		(3)	(4)		(5)	(6)		(7)
Basic	1,163	$	2,421,416	343	$	543,755	1,506	$	2,965,171
Joint & Survivor:									
100% to Beneficiary	999		2,165,629	43		56,826	1,042		2,222,455
66 2/3% to Beneficiary	336		856,258	21		52,813	357		909,072
50% to Beneficiary	485		1,185,427	51		113,274	536		1,298,700
Pop-up Option	3,334		8,575,121	158		318,383	3,492		8,893,504
Social Security Option:									
Age 62 Basic	109		169,548	13		12,930	122		182,477
Age 62 Survivorship	296		487,661	19		32,950	315		520,610
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	94		175,991	4		4,175	98		180,166
10 Years Certain & Life	241		507,015	68		121,260	309		628,275
15 Years Certain & Life	97		188,809	18		30,961	115		219,770
20 Years Certain & Life	168		352,277	29		45,859	197		398,136
Refund	0		0	0		0	0		0
Partial Lump Sum Option (PLSO):									
12 Month Basic	22		35,421	9		12,127	31		47,548
24 Month Basic	20		42,817	6		6,336	26		49,154
36 Month Basic	49		82,198	19		22,651	68		104,849
12 Month Survivor	57		146,341	4		8,080	61		154,422
24 Month Survivor	66		108,868	2		2,248	68		111,117
36 Month Survivor	131		205,458	6		6,249	137		211,707
Total:	7,667	$	17,706,255	813	$	1,390,877	8,480	$	19,097,132

Non-Hazardous Beneficiary Lives Summary

Form of Payment	Male Lives Number	Male Lives Monthly Benefit Amount	Female Lives Number	Female Lives Monthly Benefit Amount	Total Number	Total Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	19	$ 5,002	42	$ 25,426	61	$ 30,428
Joint & Survivor:						
100% to Beneficiary	514	287,009	1,689	1,207,016	2,203	1,494,025
66 2/3% to Beneficiary	79	45,565	253	202,470	332	248,034
50% to Beneficiary	179	77,477	398	232,681	577	310,158
Pop-up Option	252	207,439	789	827,040	1,041	1,034,479
Social Security Option:						
Age 62 Basic	1	1,291	5	4,806	6	6,097
Age 62 Survivorship	30	18,654	161	201,012	191	219,666
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	0	0	0	0
5 Years Certain	97	81,180	122	79,702	219	160,883
10 Years Certain	134	87,260	194	152,461	328	239,721
10 Years Certain & Life	63	44,477	88	71,590	151	116,067
15 Years Certain & Life	43	37,300	74	58,371	117	95,670
20 Years Certain & Life	57	37,896	75	72,665	132	110,561
Refund	0	0	0	0	0	0
Partial Lump Sum Option (PLSO):						
12 Month Basic	0	0	1	396	1	396
24 Month Basic	0	0	0	0	0	0
36 Month Basic	1	149	1	152	2	302
12 Month Survivor	12	9,860	46	48,539	58	58,399
24 Month Survivor	14	17,937	34	30,138	48	48,075
36 Month Survivor	43	21,140	140	67,669	183	88,809
Total:	1,538	$ 979,633	4,112	$ 3,282,134	5,650	$ 4,261,766

Hazardous Beneficiary Lives Summary

Form of Payment	Male Lives Number		Male Lives Monthly Benefit Amount	Female Lives Number		Female Lives Monthly Benefit Amount	Total Number		Total Monthly Benefit Amount
(1)	(2)		(3)	(4)		(5)	(6)		(7)
Basic	11	$	5,268	47	$	38,598	58	$	43,866
Joint & Survivor:									
100% to Beneficiary	36		28,175	258		320,020	294		348,195
66 2/3% to Beneficiary	4		4,477	55		75,909	59		80,387
50% to Beneficiary	14		10,925	83		77,328	97		88,254
Pop-up Option	49		39,605	290		495,927	339		535,532
Social Security Option:									
Age 62 Basic	0		0	0		0	0		0
Age 62 Survivorship	3		3,234	106		145,847	109		149,081
Partial Deferred (Old Plan)	0		0	0		0	0		0
Widows Age 60	0		0	3		2,669	3		2,669
5 Years Certain	1		1,784	2		1,333	3		3,116
10 Years Certain	28		23,769	12		10,875	40		34,644
10 Years Certain & Life	5		3,607	7		4,285	12		7,893
15 Years Certain & Life	3		686	4		6,218	7		6,905
20 Years Certain & Life	3		1,403	14		12,772	17		14,174
Refund	0		0	0		0	0		0
Partial Lump Sum Option (PLSO):									
12 Month Basic	0		0	2		2,641	2		2,641
24 Month Basic	0		0	1		1,467	1		1,467
36 Month Basic	2		562	2		1,296	4		1,858
12 Month Survivor	0		0	8		11,725	8		11,725
24 Month Survivor	1		1,295	12		7,949	13		9,244
36 Month Survivor	5		3,219	36		30,898	41		34,117
Total:	165	$	128,008	942	$	1,247,758	1,107	$	1,375,767

Schedule of Retirants Added to And Removed from Rolls

(Dollar amounts except average allowance expressed in thousands)

Year Ended	Added to Rolls Number	Removed from Rolls Number	Rolls End of the Year Number	Rolls End of the Year Annual Benefits	% Increase in Annual Benefit	Average Annual Benefit
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-Hazardous						
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
2018	4,650	1,725	61,938	710,374	6.4%	11,469
Hazardous						
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
2018	779	190	9,587	245,675	8.4%	25,626

APPENDIX A

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: Members participating before 9/1/2008[1]	Non-Hazardous: Members participating on or after 9/1/2008[2]	Service	Hazardous: Members participating before 9/1/2008[3]	Hazardous: Members participating on or after 9/1/2008[4]
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%

[1] If service is at least 27 years, the rate is 30%.
[2] If age plus service is at least 87, the rate is 30%.
[3] The annual rate of service retirement is 100% at age 62.
[4] 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[1]:

January 1	Non-Medicare Plans	Medicare Plans	Dollar Contribution[2]
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%

[1]All increases are assumed to occur on January 1. The 2019 premiums were known at the time of the valuation and were incorporated into the liability measurement.

[2]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	Participation Percentage
Medical Only	7%
Essential	8%
Premium	86%

Non-Medicare Plan	Participation Percentage
LivingWell Limited	2%
LivingWell Basic	13%
LivingWell CDHP	27%
LivingWell PPO	58%

- 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.

- 75% 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, 2021, 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:

None.

Development of Baseline Claims Cost

For non-Medicare retirees, the initial per capita costs were based on the plan premiums effective January 1, 2019, 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 $865.74 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.

For those not eligible for Medicare		
Age	Member	Spouse/Dependents
<65	$717.39	$865.74

For Medicare retirees, the initial per capita costs were estimated based on the plan premiums effective January 1, 2019, 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.

For those eligible for Medicare		
Age	Male	Female
65	$183.50	$173.08
75	214.69	209.49
85	227.02	229.07

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.

Mehdi Riazi

Mehdi Riazi, FSA, EA, MAAA

Appendix B

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 Any age with at least 27 years of service
Benefit Amount	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. 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. Final average compensation is based on the member's highest 5 years of compensation.
Early Retirement Eligibility	Any age (prior to age 65) with at least 25 years of service; or 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. 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 Under age 55 with at least 60 months of service and actively working at the time of death; or 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 75% of the deceased member's final monthly average pay. Each dependent child will receive 10% of average pay (not to exceed a total child benefit of 25% while the spouse is alive). A spouse may also elect the non-line of duty death benefit.
Child Benefit	In the event there is no surviving spouse, the benefit is 50% of final monthly average pay for one child, 65% of final average pay for two children, or 75% of final average pay for three or more eligible children.

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

During the 2018 legislative session, House Bill 185 was enacted, which updated the benefit provisions for active members who die in the line of duty. Benefits paid to the spouses of deceased members paid from the retirement fund have been increased from 25% of the member's final rate of pay to 75% of the member's average pay. If the member does not have a surviving spouse, benefits paid to surviving dependent children have been increased from 10% of the member's final pay rate to 50% of average pay for one child, 65% of average pay for two children, or 75% of average pay for three children.

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 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. 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. 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 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 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. 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 55th 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 Under age 55 with at least 60 months of service and actively working at the time of death; or 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 75% of the deceased member's final average pay. Each dependent child will receive 10% of average pay (not to exceed a total child benefit of 25% while the spouse is alive). 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	In the event there is no surviving spouse, the benefit is 50% of final monthly average pay for one child, 65% of final average pay for two children, or 75% of final average pay for three or more eligible children.

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

During the 2018 legislative session, House Bill 185 was enacted, which updated the benefit provisions for active members who die in the line of duty. Benefits paid to the spouses of deceased members paid from the retirement fund have been increased from 25% of the member's final rate of pay to 75% of the member's average pay. If the member does not have a surviving spouse, benefits paid to surviving dependent children have been increased from 10% of the member's final pay rate to 50% of average pay for one child, 65% of average pay for two children, or 75% of average pay for three children.

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 a fully subsidized health insurance benefit. 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

Benefit Eligibility	Recipient of a retirement allowance with at least 120 months of service at retirement
Non-Hazardous Subsidy	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.
Hazardous Subsidy	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.
Duty Disability Retirement	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.
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 a fully subsidized health insurance benefit. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.
Non-Duty Death in Service	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, 2019

	Non-Medicare Plan Options				
Plan Option	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	1,333.64	1,479.76	818.96
LivingWell Basic	682.80	940.64	1,450.02	1,615.30	800.94
Living Well Limited	607.54	865.08	1,327.16	1,477.04	730.90

Medicare Plan Options	
Kentucky Retirement Systems - Medical Only Plan	$175.22
Kentucky Retirement Systems – Medicare Advantage/Essential Plan	53.73
Kentucky Retirement Systems – Medicare Advantage/Premium Plan*	220.11

*For 2019, 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, 2018.

Non-Hazardous Service	Hazardous Service
$13.38	$20.07

Changes since the Prior Valuation

During the 2018 legislative session, House Bill 185 was enacted, which updated the benefit provisions for active members who die in the line of duty. The insurance fund shall now pay 100% of the insurance premium for spouses and children of all active members who die in the line of duty.

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, 2018

GRS Retirement Consulting

P: 469.524.0000 | F: 469.524.0003 | www.grsconsulting.com

October 31, 2018

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

Subject: **Actuarial Valuation as of June 30, 2018**

Dear Trustees of the Board:

This report describes the current actuarial condition of the State Police Retirement System (SPRS), provides the actuarially determined employer contribution rates for fiscal year ending June 30, 2020, and analyzes changes in the System's financial condition. In addition, the report provides various summaries of the data. The results of this actuarial valuation, including the calculated employer contribution rates will be used by the Board and stakeholders for informational purposes only as the employer contribution rate for the fiscal years ending June 30, 2019 and June 30, 2020 were certified in the June 30, 2017 actuarial valuation and adopted by the Board.

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 2018 actuarial valuation is 25 years. As noted above, the contribution rate determined by this actuarial valuation is for informational purposes and may be useful in tracking the change in in the calculated contribution rate since the prior valuation performed as of June 30, 2017.

ASSUMPTIONS AND METHODS

There were no changes in actuarial assumptions since the prior actuarial valuation. It is our opinion that the current assumptions are internally consistent and reasonably reflect the anticipated future experience of the System.

Kentucky Statutes also require 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 and the Board adopted assumptions as a result of that analysis will be first used to prepare the June 30, 2019 actuarial valuation. The Board also has the authority to review the assumptions on a more frequent basis and adopt new assumptions prior to the next scheduled experience study.

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 these valuations are those which were in effect on June 30, 2018. During the 2018 legislative session House Bill 185 was enacted which provides increased the retirement and health insurance benefits for active members who die in the line of duty.

This actuarial valuation was determined without regard to the enactment of SB 151 in 2018, which is currently being reviewed by the State Supreme Court.

DATA

Member data for retired, active and inactive members was supplied as of June 30, 2018, by the KRS staff. The staff also supplied asset information as of June 30, 2018. 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, 2018.

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
Pension Market Leader and Actuary

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

Janie Shaw, ASA, MAAA
Consultant and Actuary

Table of Contents

SECTION 1

EXECUTIVE SUMMARY

Summary of Principal Results

(Dollar amounts expressed in thousands)

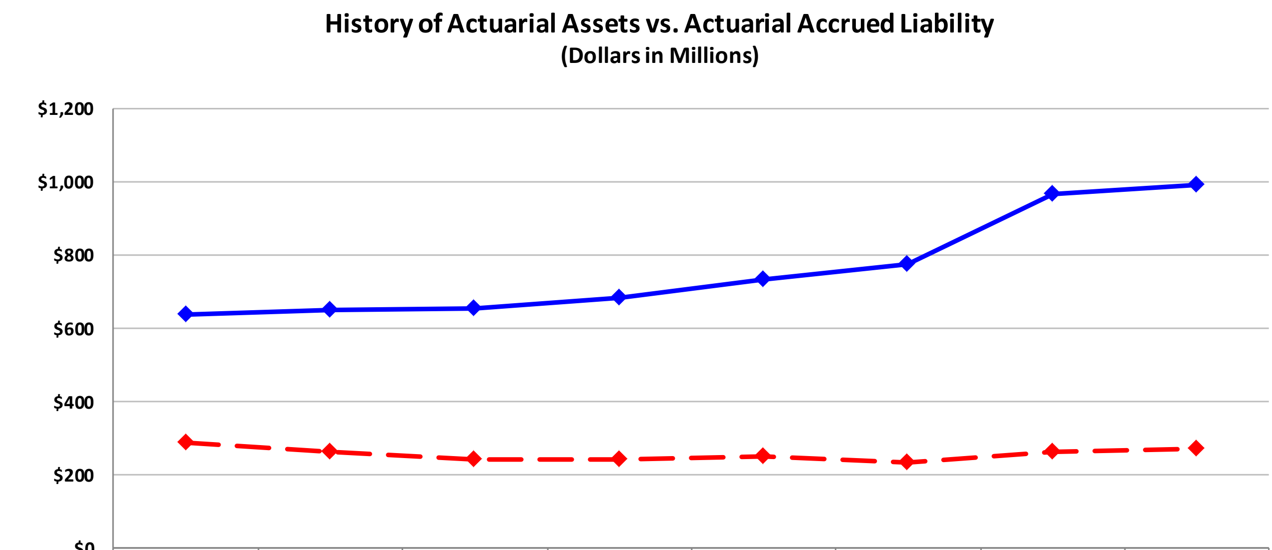
	SPRS	
	June 30, 2018	June 30, 2017
Actuarially Determined Contribution:		
Retirement	120.54%	119.05%
Insurance	19.50%	27.23%
Total	140.04%	146.28%
Actual Contribution Rate for Next Fiscal Year[1]	146.28%	146.28%
Assets:		
Retirement		
• Actuarial value (AVAR)	$268,259	$261,320
• Market value (MVAR)	$267,572	$255,737
• Ratio of actuarial to market value of assets	100.3%	102.2%
Insurance		
• Actuarial value (AVAI)	$187,535	$180,464
• Market value (MVAI)	$190,847	$178,838
• Ratio of actuarial to market value of assets	98.3%	100.9%
Funded Status:		
Retirement		
• Actuarial accrued liability	$989,528	$967,145
• Unfunded accrued liability on AVAR	$721,269	$705,825
• Funded ratio on AVAR	27.1%	27.0%
• Unfunded accrued liability on MVAR	$721,956	$711,408
• Funded ratio on MVAR	27.0%	26.4%
Insurance		
• Actuarial accrued liability	$262,088	$276,641
• Unfunded accrued liability on AVAI	$74,553	$96,177
• Funded ratio on AVAI	71.6%	65.2%
• Unfunded accrued liability on MVAI	$71,241	$97,803
• Funded ratio on MVAI	72.8%	64.6%
Membership:		
• Number of		
- Active Members	886	903
- Retirees and Beneficiaries	1,600	1,536
- Inactive Members	499	480
- Total	2,985	2,919
• Projected payroll of active members	$48,808	$48,598
• Average salary of active members	$55,088	$53,818

[1] Based on contribution rates budgeted in House Bill 200 during the 2018 legislative session

Executive Summary (Continued)

Retirement Fund

The unfunded actuarial accrued liability of the retirement system increased by $15 million since the prior year's valuation to $721 million. The largest source of this increase due to a $20 million loss due to liability experience. 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 eight 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.



	2011	2012	2013	2014	2015	2016	2017	2018
AAL	634.4	647.7	651.6	681.1	734.2	775.2	967.1	989.5
AVA	285.6	259.8	241.8	242.7	248.4	234.6	261.3	268.3

Executive Summary (Continued)

Insurance Fund

The Insurance fund experience extremely favorable premium experience from calendar year 2018 to 2019. Specifically, the non-Medicare premiums were expected to increase by 7.25% from calendar year 2018 to calendar year 2019 (i.e. the medical trend assumption for non-Medicare premiums used in the actuarial valuation) and the actual average premiums remained relatively unchanged. Also, the Medicare premiums were expected to increase by 5.10% from calendar year 2018 to calendar year 2019 (i.e. the medical trend assumption used in the actuarial valuation for Medicare premium) and the actual average premiums decreased by 12%.

Since the prior year's valuation, the unfunded actuarial accrued liability for the insurance fund decreased by $22 million to $75 million with $27 million of that decrease attributable to the favorable premium experience. The corresponding funded ratio increased from 65.2% at June 30, 2017 to 71.6% at June 30, 2018.

SECTION 2

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, 2018 actuarial funding valuation for both the Retirement Plan and Insurance Funds.

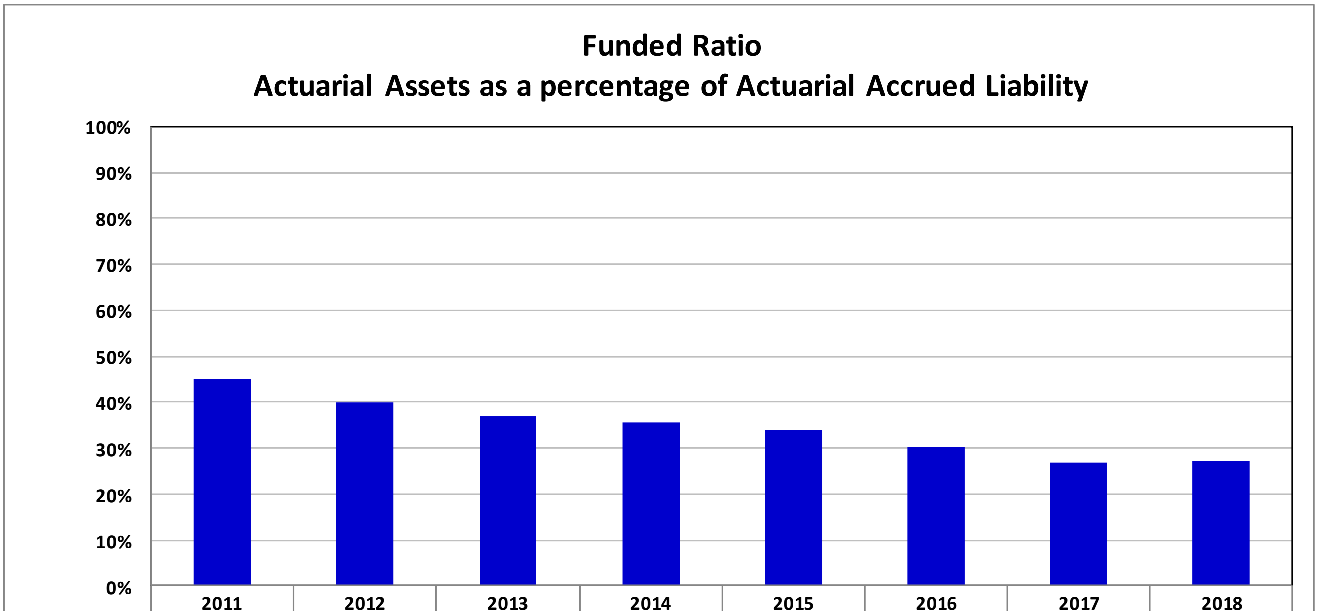
The primary purposes of the valuation report are to depict the current financial condition of the System and analyze changes in the System's financial condition. In addition, the report provides various summaries of the data. The results of this actuarial valuation, including the calculated employer contribution rates will be used by the Board and stakeholders for informational purposes only as the employer contribution rate for the fiscal years ending June 30, 2019 and June 30, 2020 were certified in the June 30, 2017 actuarial valuation and adopted by the Board.

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 an eight-year history of the retirement system's funded ratio (i.e. the Actuarial Value of Assets divided by the Actuarial Accrued Liability). The decline in the funded ratio over the last eight years 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.



	2011	2012	2013	2014	2015	2016	2017	2018
Funded Ratio	45.0%	40.1%	37.1%	35.6%	33.8%	30.3%	27.0%	27.1%

Assuming the actuarial determined contributions are actually paid in future years and 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 June 30, 2017 actuarial valuation become effective July 1, 2018. 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 $261.3 million to $268.3 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 2018 was a 7.3% which is greater than the 5.25% expected annual return. The return on an actuarial (smoothed) asset value was 5.2%, which resulted in a $7 thousand loss for the fiscal year. 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 $0.7 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	$ 705,825	$ 96,177
2. Normal cost and administrative expenses	11,766	5,597
3. Less: contributions for the year	(52,421)	(9,560)
4. Interest accrual	35,989	5,887
5. Expected UAAL (Sum of Items 1 - 4)	$ 701,159	$ 98,101
6. Actual UAAL as of June 30,2018	$ 721,269	$ 74,553
7. Total gain (loss) for the year (Item 5 - Item 6)	$ (20,110)	$ 23,548
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ (7)	$ 393
9. Liability experience gain (loss) for the year	(19,919)	23,190
10. Plan Change	(184)	(35)
11. Assumption change	0	0
12. Total	$ (20,110)	$ 23,548

The favorable premium experience from calendar year 2018 to calendar year 2019 resulted in a $27 million liability 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. There were no changes to the actuarial assumptions and methods since the last actuarial valuation. It is our opinion that the assumptions are internally consistent, reasonable, and reflect anticipated future experience of the System. Appendix A includes a summary of the actuarial assumptions and methods used in this valuation.

An experience study was conducted as of June 30, 2013 and the next experience study will be conducted as of June 30, 2018, the results of which will be first used in preparing the June 30, 2019 actuarial valuation. 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.

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.

During the 2018 legislative session, House Bill 185 was enacted, which updated the benefit provisions for active members who die in the line of duty. Benefits paid to the spouses of deceased members paid from the retirement fund have been increased from 25% of the member's final rate of pay to 75% of the member's average pay. If the member does not have a surviving spouse, benefits paid to surviving dependent children have been increased from 10% of the member's final pay rate to 50% of average pay for one child, 65% of average pay for two children, or 75% of average pay for three children. The insurance fund shall also now pay 100% of the insurance premium for spouses and children of all active members who die in the line of duty.

This actuarial valuation was determined without regard to enactment of SB 151 in 2018, which is currently being reviewed by the State Supreme Court.

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

ACTUARIAL TABLES

Actuarial Tables

Development of Unfunded Actuarial Accrued Liability

(Dollar amounts expressed in thousands)

		June 30, 2018	
		Retirement (1)	Insurance (2)
1.	Projected payroll of active members	$ 48,808	$ 48,808
2.	Present value of future pay	$ 436,669	$ 398,014
3.	Normal cost rate		
	a. Total normal cost rate	23.41%	8.29%
	b. Less: member contribution rate	-8.00%	-0.35%
	c. Employer normal cost rate	15.41%	7.94%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 282,511	$ 103,561
	b. Less: present value of future normal costs	(93,771)	(24,624)
	c. Actuarial accrued liability	$ 188,740	$ 78,937
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 793,303	$ 179,760
	b. Inactive members	7,485	3,391
	c. Active members (Item 4c)	188,740	78,937
	d. Total	$ 989,528	$ 262,088
6.	Actuarial value of assets	$ 268,259	$ 187,535
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 721,269	$ 74,553
8.	Funded Ratio	27.1%	71.6%

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

		June 30, 2018	
		Retirement (1)	Insurance (2)
1.	Active members		
	a. Service retirement	$ 259,601	
	b. Deferred termination benefits and refunds	14,945	
	c. Survivor benefits	1,931	
	d. Disability benefits	6,034	
	e. Total	$ 282,511	$ 103,561
2.	Retired members		
	a. Service retirement	$ 723,302	
	b. Disability retirement	11,337	
	c. Beneficiaries	58,664	
	d. Total	$ 793,303	$ 179,760
3.	Inactive members		
	a. Vested terminations	$ 7,158	$ 3,391
	b. Nonvested terminations	327	N/A
	c. Total	$ 7,485	$ 3,391
4.	Total actuarial present value of future benefits	$ 1,083,299	$ 286,712

Development of Actuarially Determined Contribution Rate

		June 30, 2018	
		Retirement	Insurance
		(1)	(2)
1.	Total normal cost rate		
	a. Service retirement	19.57%	
	b. Deferred termination benefits and refunds	2.79%	
	c. Survivor benefits	0.27%	
	d. Disability benefits	0.78%	
	e. Total	23.41%	8.29%
2.	Less: member contribution rate	-8.00%	-0.35%
3.	Total employer normal cost rate	15.41%	7.94%
4.	Administrative expenses	0.40%	0.13%
5.	Net employer normal cost rate	15.81%	8.07%
6.	UAAL amortization contribution	104.73%	11.43%
7.	Total calculated employer contribution	120.54%	19.50%

Actuarial Balance Sheet

Retirement Benefits

(Dollar amounts expressed in thousands)

			June 30, 2018 (1)		June 30, 2017 (2)
1.	Assets - Present and Expected Future Resources				
	a. Current assets (actuarial value)	$	268,259	$	261,320
	b. Present value of future member contributions	$	34,933	$	33,935
	c. Present value of future employer contributions				
	i. Normal cost contributions	$	58,838	$	59,745
	ii. Unfunded accrued liability contributions		721,269		705,825
	iii. Total future employer contributions	$	780,107	$	765,570
	d. Total assets	$	1,083,299	$	1,060,825
2.	Liabilities - Present Value of Expected Future Benefit Payments				
	a. Active members				
	i. Present value of future normal costs	$	93,771	$	93,680
	ii. Accrued liability		188,740		193,163
	iii. Total present value of future benefits	$	282,511	$	286,843
	b. Present value of benefits payable on account of current retired members and beneficiaries	$	793,303	$	766,899
	c. Present value of benefits payable on account of current inactive members	$	7,485	$	7,083
	d. Total liabilities	$	1,083,299	$	1,060,825

Actuarial Balance Sheet

Insurance Benefits

(Dollar amounts expressed in thousands)

		June 30, 2018 (1)		June 30, 2017 (2)
1. Assets - Present and Expected Future Resources				
a. Current assets (actuarial value)	$	187,535	$	180,464
b. Present value of future member contributions	$	2,186	$	1,905
c. Present value of future employer contributions				
i. Normal cost contributions	$	22,438	$	30,836
ii. Unfunded accrued liability contributions		74,553		96,177
iii. Total future employer contributions	$	96,991	$	127,013
d. Total assets	$	286,712	$	309,382
2. Liabilities - Present Value of Expected Future Benefit Payments				
a. Active members				
i. Present value of future normal costs	$	24,624	$	32,741
ii. Accrued liability		78,937		90,251
iii. Total present value of future benefits	$	103,561	$	122,992
b. Present value of benefits payable on account of current retired members and beneficiaries	$	179,760	$	183,156
c. Present value of benefits payable on account of current inactive members	$	3,391	$	3,234
d. Total liabilities	$	286,712	$	309,382

Reconciliation of Retirement Net Assets

(Dollar amounts expressed in thousands)*

	Year Ending			
	June 30, 2018		June 30, 2018	
	(1)		(2)	
	Retirement		**Insurance**	
1. Value of assets at beginning of year	$	255,737	$	178,838
2. Revenue for the year				
a. Contributions				
i. Member contributions	$	5,522	$	155
ii. Employer contributions		36,486		9,397
iii. Other contributions (less 401h)		10,413		8
iii. Total	$	52,421	$	9,560
b. Income				
i. Interest, dividends, and other income	$	5,683	$	3,972
ii. Investment expenses		(1,692)		(1,841)
iii. Net	$	3,991	$	2,131
c. Net realized and unrealized gains (losses)		14,446		14,338
d. Total revenue	$	70,857	$	26,030
3. Expenditures for the year				
a. Disbursements				
i. Refunds	$	22	$	0
ii. Regular annuity benefits / Healthcare premiums		58,805		13,880
iii. Other benefit payments		0		79
iv. Transfers to other systems		0		0
v. Total	$	58,827	$	13,959
b. Administrative expenses and depreciation		194		62
c. Total expenditures	$	59,021	$	14,021
4. Increase in net assets (Item 2. - Item 3.)	$	11,836	$	12,008
5. Value of assets at end of year (Item 1. + Item 4.)	$	267,572	$	190,847
6. Net external cash flow				
a. Dollar amount	$	(6,600)	$	(4,461)
b. Percentage of market value		-2.5%		-2.4%
7. Estimated annual return on net assets		7.3%		9.3%

* Amounts may not add due to rounding
* Retirement assets exclude 401h assets and insurance assets include 401h assets

Development of Actuarial Value of Assets

Retirement Benefits

(Dollar amounts expressed in thousands)*

	Year Ending		June 30, 2018
1.	Actuarial value of assets at beginning of year	$	261,320
2.	Market value of assets at beginning of year	$	255,737
3.	Net new investments		
	a. Contributions	$	52,421
	b. Benefit payments		(58,827)
	c. Administrative expenses		(194)
	d. Subtotal	$	(6,600)
4.	Market value of assets at end of year	$	267,572
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	18,436
6.	Assumed investment return rate for fiscal year		5.25%
7.	Expected return for immediate recognition	$	13,253
8.	Excess return for phased recognition	$	5,183

9. Phased-in recognition, 20% of excess return on assets for prior years:

	Fiscal Year Ending June 30,		Excess Return		Recognized Amount
a.	2018	$	5,183	$	1,037
b.	2017		11,623		2,325
c.	2016		(21,455)		(4,291)
d.	2015		(16,122)		(3,224)
e.	2014		22,202		4,440
f.	Total			$	286

10.	Actuarial value of assets as of June 30, 2018 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	268,259
11.	Ratio of actuarial value to market value		100.3%
12.	Estimated annual return on actuarial value of assets		5.2%

* Amounts may not add due to rounding

Development of Actuarial Value of Assets

Insurance Benefits

(Dollar amounts expressed in thousands)*

	Year Ending		June 30, 2018
1.	Actuarial value of assets at beginning of year	$	180,464
2.	Market value of assets at beginning of year	$	178,838
3.	Net new investments		
	a. Contributions	$	9,560
	b. Benefit payments		(13,959)
	c. Administrative expenses		(62)
	d. Subtotal	$	(4,461)
4.	Market value of assets at end of year	$	190,847
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	16,469
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	11,038
8.	Excess return for phased recognition	$	5,431

9. Phased-in recognition, 20% of excess return on assets for prior years:

	Fiscal Year Ending June 30,		Excess Return		Recognized Amount
a.	2018	$	5,431	$	1,086
b.	2017		9,723		1,945
c.	2016		(12,288)		(2,458)
d.	2015		(9,762)		(1,952)
e.	2014		9,368		1,874
f.	Total			$	494

10.	Actuarial value of assets as of June 30, 2018 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	187,535
11.	Ratio of actuarial value to market value		98.3%
12.	Estimated annual return on actuarial value of assets		6.5%

* Amounts may not add due to rounding

Schedule of Funding Progress
(Dollar amounts expressed in thousands)

June 30,	Actuarial Value of Assets (AVA)	Actuarial Accrued Liability (AAL)	Unfunded Actuarial Accrued Liability (UAAL) (3) - (2)	Funded Ratio (2)/(3)	Annual Covered Payroll	UAAL as % of Payroll (4)/(6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Retirement			
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%
2018	268,259	989,528	721,269	27.1%	48,808	1477.8%
			Insurance			
2011	$ 123,687	$ 438,428	$ 314,740	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	84,494	67.1%	45,551	185.5%
2017	180,464	276,641	96,177	65.2%	48,598	197.9%
2018	187,535	262,088	74,553	71.6%	48,808	152.7%

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, 2018
Actuarial cost method:	Entry Age Normal
Amortization method:	Level percentage of payroll (0% payroll growth assumed)
Amortization period for contribution rate:	25-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% (varies by service)
Inflation	2.30%
Post-retirement benefit adjustments	0.00%
Retiree Mortality	RP-2000 Combined Mortality Table for Males and Females, projected using scale BB to 2013 (set back one year for females).

Solvency Test

(Dollar amounts expressed in thousands)

	Actuarial Accrued Liability				Portion of Aggregate Accrued Liabilities Covered by Assets		
June 30,	Active Member Contributions	Retired Members & Beneficiaries	Active Members (Employer Financed)	Valuation Assets	Active	Retired	ER Financed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Retirement				
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%
2018	43,835	800,788	144,905	268,259	100.0%	28.0%	0.0%
			Insurance				
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%
2018	-	183,151	78,937	187,535	100.0%	100.0%	5.6%

SECTION 4

MEMBERSHIP INFORMATION

Membership Tables

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

			June 30, 2018 (1)	June 30, 2017 (4)
1.	Active members			
	a.	Males	857	873
	b.	Females	29	30
	c.	Total members	886	903
	d.	Total annualized prior year salaries	$ 48,808	$ 48,598
	e.	Average salary	$ 55,088	$ 53,819
	f.	Average age	37.3	37.5
	g.	Average service	10.5	10.6
	h.	Member contributions with interest	$ 43,835	$ 44,798
	i.	Average contributions with interest	$ 49,476	$ 49,610
2.	Vested inactive members			
	a.	Number	176	86
	b.	Total annual deferred benefits	$ 815	$ 762
	c.	Average annual deferred benefit	$ 4,632	$ 8,860
	d.	Average age at the valuation date	41.0	42.5
3.	Nonvested inactive members			
	a.	Number	323	394
	b.	Total member contributions with interest	$ 327	$ 520
	c.	Average contributions with interest	$ 1,012	$ 1,320
4.	Service retirees			
	a.	Number	1,331	1,279
	b.	Total annual benefits	$ 52,821	$ 50,871
	c.	Average annual benefit	$ 39,686	$ 39,774
	d.	Average age at the valuation date	62.8	62.7
5.	Disabled retirees			
	a.	Number	52	53
	b.	Total annual benefits	$ 909	$ 968
	c.	Average annual benefit	$ 17,473	$ 18,264
	d.	Average age at the valuation date	59.3	59.2
6.	Beneficiaries			
	a.	Number	217	204
	b.	Total annual benefits	$ 5,896	$ 5,414
	c.	Average annual benefit	$ 27,168	$ 26,539
	d.	Average age at the valuation date	65.9	65.6

Summary of Historical Active Membership

June 30,	Active Members: Number	Active Members: Percent Increase /(Decrease)	Covered Payroll[1]: Amount in Thousands	Covered Payroll[1]: Percent Increase /(Decrease)	Average Annual Pay: Amount	Average Annual Pay: Percent Increase /(Decrease)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2011	965		48,693		$ 50,459	
2012	907	-6.0%	48,373	-0.7%	53,332	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%	50,167	2.7%
2017	903	-0.6%	48,598	6.7%	53,818	7.3%
2018	886	-1.9%	48,808	0.4%	55,088	2.4%

Distribution of Active Members by Age and by Years of Service

SPRS Members

Attained Age	0 Count & Avg. Comp.	1 Count & Avg. Comp.	2 Count & Avg. Comp.	3 Count & Avg. Comp.	4 Count & Avg. Comp.	5-9 Count & Avg. Comp.	10-14 Count & Avg. Comp.	15-19 Count & Avg. Comp.	20-24 Count & Avg. Comp.	25-29 Count & Avg. Comp.	30-34 Count & Avg. Comp.	35 & Over Count & Avg. Comp.	Total Count & Avg. Comp.
	Years of Credited Service												
Under 20	0	0	0	0	0	0	0	0	0	0	0	0	0
	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
20-24	24	0	7	2	0	0	0	0	0	0	0	0	33
	$26,135	$0	$45,956	$44,734	$0	$0	$0	$0	$0	$0	$0	$0	$31,467
25-29	25	15	19	51	0	22	0	0	0	0	0	0	132
	$33,400	$42,072	$45,125	$45,838	$0	$50,807	$0	$0	$0	$0	$0	$0	$43,780
30-34	9	16	9	30	3	100	14	0	0	0	0	0	181
	$36,488	$42,754	$42,602	$46,500	$43,508	$51,404	$52,670	$0	$0	$0	$0	$0	$48,614
35-39	3	7	1	8	0	56	78	25	1	0	0	0	179
	$39,111	$43,372	$44,771	$49,097	$0	$51,611	$57,427	$61,890	$72,510	$0	$0	$0	$55,015
40-44	1	3	0	6	1	24	44	89	21	1	0	0	190
	$32,329	$44,641	$0	$45,184	$46,310	$52,538	$57,395	$65,128	$74,627	$73,812	$0	$0	$61,618
45-49	0	2	0	3	0	7	18	37	43	7	0	0	117
	$0	$42,277	$0	$52,589	$0	$50,844	$55,449	$64,645	$77,191	$83,394	$0	$0	$67,446
50-54	0	0	0	0	0	1	9	10	13	6	0	0	39
	$0	$0	$0	$0	$0	$50,095	$57,021	$65,904	$75,960	$83,303	$0	$0	$69,478
55-59	0	0	0	0	0	0	4	4	2	1	0	0	11
	$0	$0	$0	$0	$0	$0	$51,375	$58,642	$74,011	$95,206	$0	$0	$62,118
60-64	0	0	0	0	0	0	0	0	1	0	1	2	4
	$0	$0	$0	$0	$0	$0	$0	$0	$79,745	$0	$95,902	$88,371	$88,097
65 & Over	0	0	0	0	0	0	0	0	0	0	0	0	0
	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	62	43	36	100	4	210	167	165	81	15	1	2	886
	$31,295	$42,726	$44,646	$46,438	$44,209	$51,501	$56,640	$64,419	$76,224	$83,506	$95,902	$88,371	$55,088

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

	Retirement		Disability		Survivors & Beneficiaries		Total	
Current Age	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Under 50	202	$ 7,596	16	$ 313	34	$ 486	252	$ 8,395
50 - 54	170	6,529	4	52	7	133	181	6,714
55 - 59	168	6,950	7	126	14	300	189	7,376
60 - 64	167	6,966	8	113	21	523	196	7,602
65 - 69	276	11,372	6	91	31	880	313	12,343
70 - 74	179	7,165	6	135	43	1,320	228	8,620
75 - 79	95	3,239	2	25	21	706	118	3,970
80 - 84	44	1,647	2	49	20	678	66	2,374
85 - 89	24	1,047	1	6	20	714	45	1,767
90 And Over	6	311	0	-	6	155	12	466
Total	**1,331**	**$ 52,821**	**52**	**$ 909**	**217**	**$ 5,896**	**1,600**	**$ 59,626**

Retired Lives Summary

Form of Payment	Male Lives Number		Male Lives Monthly Benefit Amount	Female Lives Number		Female Lives Monthly Benefit Amount	Total Number		Total Monthly Benefit Amount
(1)	(2)		(3)	(4)		(5)	(6)		(7)
Basic	149	$	438,125	17	$	50,826	166	$	488,952
Joint & Survivor:									
100% to Beneficiary	146		465,865	1		4,814	147		470,678
66 2/3% to Beneficiary	89		339,906	2		7,542	91		347,448
50% to Beneficiary	82		298,968	1		2,605	83		301,573
Pop-up Option	614		2,169,493	5		10,874	619		2,180,368
Social Security Option:									
Age 62 Basic	31		78,625	0		0	31		78,625
Age 62 Survivorship	120		230,066	1		4,416	121		234,482
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	6		28,112	0		0	6		28,112
10 Years Certain & Life	37		124,726	3		6,759	40		131,485
15 Years Certain & Life	16		45,041	1		3,919	17		48,960
20 Years Certain & Life	39		118,730	2		3,979	41		122,709
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
Total:	1,348	$	4,381,307	35	$	96,200	1,383	$	4,477,507

Beneficiary Lives Summary

Form of Payment	Male Lives Number	Male Lives Monthly Benefit Amount	Female Lives Number	Female Lives Monthly Benefit Amount	Total Number	Total Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	2	$ 821	8	$ 7,052	10	$ 7,872
Joint & Survivor:						
100% to Beneficiary	8	11,031	61	167,263	69	178,294
66 2/3% to Beneficiary	2	1,206	13	27,456	15	28,662
50% to Beneficiary	1	3,110	19	27,538	20	30,649
Pop-up Option	2	1,154	44	125,259	46	126,413
Social Security Option:						
Age 62 Basic	0	0	2	2,281	2	2,281
Age 62 Survivorship	1	2,199	43	88,984	44	91,183
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	2	4,076	0	0	2	4,076
10 Years Certain & Life	0	0	1	390	1	390
15 Years Certain & Life	0	0	1	721	1	721
20 Years Certain & Life	1	6,686	5	6,716	6	13,402
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
Total:	19	$ 30,282	198	$ 461,011	217	$ 491,293

Schedule of Retirants Added to And Removed from Rolls

(Dollar amounts except average allowance expressed in thousands)

Year Ended	Added to Rolls Number	Removed from Rolls Number	Rolls End of the Year Number	Rolls End of the Year Annual Benefits	% Increase in Annual Benefit	Average Annual Benefit
(1)	(2)	(3)	(4)	(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
2018	81	17	1,600	59,626	4.1%	37,266

APPENDIX A

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.

	Annual Rates of Salary Increases		
Service Years	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[1]	Members participating on or after 9/1/2008[2]
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%

[1] The annual rate of service retirement is 100% at age 55.

[2] 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[1]:

Year	Non-Medicare Plans	Medicare Plans	Dollar Contribution[2]
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%

[1]All increases are assumed to occur on January 1. The 2019 premiums were known at the time of the valuation and were incorporated into the liability measurement.

[2]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	100%	100%	100%
10-14	100%	100%	100%
15-19	100%	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	Participation
Medical Only	7%
Essential	8%
Premium	86%

Non-Medicare Plan	Participation
LivingWell Limited	2%
LivingWell Basic	13%
LivingWell CDHP	27%
LivingWell PPO	58%

- 100% of deferred vested members participating are assumed to elect health coverage at retirement. Deferred vested members are assumed to begin health coverage at age 50.

- 75% 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, 2021, 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:

None.

Development of Baseline Claims Cost

For non-Medicare retirees, the initial per capita costs were based on the plan premiums effective January 1, 2019, 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 $865.74 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.

For those not eligible for Medicare		
Age	Member	Spouse/Dependents
<65	$717.39	$865.74

For Medicare retirees, the initial per capita costs were estimated based on the plan premiums effective January 1, 2019, 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.

For those eligible for Medicare		
Age	Male	Female
65	$183.50	$173.08
75	214.69	209.49
85	227.02	229.07

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.

Mehdi Riazi

Mehdi Riazi, FSA, EA, MAAA

Appendix B

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 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. 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. 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 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
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
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.

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 55th 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 Under age 55 with at least 60 months of service and actively working at the time of death; or 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 75% of the deceased member's final monthly average pay. Each dependent child will receive 10% of average pay (not to exceed a total child benefit of 25% while the spouse is alive). 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	In the event there is no surviving spouse, the benefit is 50% of final monthly average pay for one child, 65% of final average pay for two children, or 75% of final average pay for three or more eligible children.

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

During the 2018 legislative session, House Bill 185 was enacted, which updated the benefit provisions for active members who die in the line of duty. Benefits paid to the spouses of deceased members paid from the retirement fund have been increased from 25% of the member's final rate of pay to 75% of the member's average pay. If the member does not have a surviving spouse, benefits paid to surviving dependent children have been increased from 10% of the member's final pay rate to 50% of average pay for one child, 65% of average pay for two children, or 75% of average pay for three children.

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 a fully subsidized health insurance benefit.

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

Benefit Eligibility	Recipient of a retirement allowance with at least 120 months of service at retirement
Non-Hazardous Subsidy	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.
Hazardous Subsidy	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.
Duty Disability Retirement	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.
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 a fully subsidized health insurance benefit.
Non-Duty Death in Service	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, 2019

	Non-Medicare Plan Options				
Plan Option	**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	1,333.64	1,479.76	818.96
LivingWell Basic	682.80	940.64	1,450.02	1,615.30	800.94
Living Well Limited	607.54	865.08	1,327.16	1,477.04	730.90

Medicare Plan Options	
Kentucky Retirement Systems - Medical Only Plan	$175.22
Kentucky Retirement Systems – Medicare Advantage/Essential Plan	53.73
Kentucky Retirement Systems – Medicare Advantage/Premium Plan*	220.11

*For 2019, 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, 2018.

Non-Hazardous Service	Hazardous Service
$13.38	$20.07

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

Changes since the Prior Valuation

During the 2018 legislative session, House Bill 185 was enacted, which updated the benefit provisions for active members who die in the line of duty. The insurance fund shall now pay 100% of the insurance premium for spouses and children of all active members who die in the line of duty.

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.