GRS Retirement Consulting

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December 5, 2019

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

Subject: Certification of the June 30, 2019 Actuarial Valuation Results

Dear Trustees of the Board:

Enclosed are the June 30, 2019 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 recommend the employer contribution rates for the KERS and SPRS Systems for the fiscal years beginning July 1, 2020 and ending June 30, 2022 and the employer contribution rates for the CERS Systems for the fiscal year beginning July 1, 2020 and ending June 30, 2021. The contribution rates determined by these actuarial valuations are intended to become effective twelve months after the valuation date and, as such, are intended to be used by the Board for recommending the required contribution rates.

These contribution rates are calculated based on the membership data and plan assets as of June 30, 2019. These calculations are also based on the benefit provisions in effect as of June 30, 2019. 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 pension and health insurance funds 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 2019 actuarial valuation is 24 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, 2018 to June 30, 2019 for the retirement funds of each System. As the table shows, the funded ratio for the KERS Hazardous fund, both CERS funds, and the SPRS fund decreased since the prior year. These decreases are mainly due to the updated actuarial assumptions adopted by the Board as a result of the experience study conducted after the June 30, 2018 valuation. Additionally, the full actuarially determined contribution rates for both CERS funds were not paid in FY2018-19 (due to the contribution phase-in provisions from House Bill 362 passed during the 2018 legislative session), which further decreased the funded ratio for these funds. The improvement in the financial health of these retirement systems is very dependent on the Retirement System and the Commonwealth maintaining a sound funding policy and the participating employers paying the actuarially determined contribution rates on the payroll of their employees.

For FY 2018-19, the KERS non-hazardous retirement system distributed $1,012 million in benefit payments and administrative expenses, and received $1,129 million in employer and employee contributions (excluding contributions to the 401(h) account). As of June 30, 2019, plan assets for this system were $2,234 million (excluding assets in the 401(h) account). 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 continue to exceed the benefit payments. If the entire actuarially determined employer contribution documented in this letter is not made to this system in FY 2020-21 and FY 2021-22, the financial condition of this retirement system is expected to deteriorate and there is a significant risk of the plan assets being exhausted.

Table 1. Change in the Funded Ratio (AVA / AAL)
from June 30, 2018 to June 30, 2019 for the Retirement Funds

System	Funded Ratio – Retirement Funds	
	June 20, 2018	June 30, 2019
KERS Non-Hazardous	12.9%	13.4%
KERS Hazardous	55.5%	54.8%
CERS Non-Hazardous	52.7%	49.1%
CERS Hazardous	48.4%	45.3%
SPRS	27.1%	27.0%

Table 2 shown below provides a similar comparison of the change in funded ratio for the insurance funds. As the table shows, the funded ratio for the KERS Hazardous fund and the CERS Non-Hazardous fund experienced relatively larger decreases. The decreases for these funds are mainly due to the updated actuarial assumptions adopted by the Board as a result of the experience study conducted after the June 30, 2018 valuation. The updated actuarial assumptions decreased the funded ratio for the other funds, as well; however, other demographic experience offset this decrease so that the funded ratio stayed relatively stable for the KERS Non-Hazardous, CERS Hazardous, and SPRS funds.

Table 2. Change in the Funded Ratio (AVA / AAL)
from June 30, 2018 to June 30, 2019 for the Insurance Funds

System	Funded Ratio – Insurance Funds	
	June 30, 2018	June 30, 2019
KERS Non-Hazardous	36.4%	36.3%
KERS Hazardous	130.0%	123.1%
CERS Non-Hazardous	76.7%	70.7%
CERS Hazardous	74.6%	75.8%
SPRS	71.6%	71.3%

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, 2018 actuarial valuation, the certified contribution rates that are in effect for the fiscal year ending June 30, 2020, and the actuarially determined contribution rates determined by the June 30, 2019 actuarial valuation. The table also provides the recommended contribution rates for fiscal year ending June 30, 2021.

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

System	2018 Valuation Calculated Rates	Effective for FY2019-20	2019 Valuation Calculated Rates	Recommend for FY2020-21
KERS Non-Hazardous	85.19%	83.43%[1]	93.01%	93.01%
KERS Hazardous	34.42%	36.85%	38.71%	38.71%
CERS Non-Hazardous	27.28%	24.06%[2]	31.99%	26.95%[2]
CERS Hazardous	46.50%	39.58%[2]	56.78%	44.33%[2]
SPRS	140.04%	146.28%	156.97%	156.97%

[1] House Bill 1 passed during the 2019 special legislative session reduced the FY2019-20 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 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 contribution rates for all funds increased due to the updated actuarial assumptions adopted by the Board as a result of the experience study conducted after the June 30, 2018 valuation. In addition, the KERS Non-Hazardous pension fund contribution rate increased by 1.8% of pay due to covered payroll being 2.3% lower than the prior year (compared to the 0% payroll growth assumption in the valuation). Similarly, the KERS Hazardous pension fund contribution rate increased by 1.6% of pay due to covered payroll being 4.9% lower than the prior year (compared to the 0% payroll growth assumption in the valuation) and SPRS pension fund contribution rate increased by 2.7% of pay due to covered payroll being 2.2% lower than the prior year (compared to the 0% payroll growth assumption in the valuation).

As contribution rates increase there becomes increased incentive for participating employers to make business decisions to reduce their covered payroll to decrease their pension cost, thereby resulting in a continual pattern of additional increases in contribution rates. As a result, we recommend Kentucky Retirement Systems work with the legislators of the Commonwealth to change the method for collecting the amortization cost of the unfunded liability.

ASSUMPTIONS AND METHODS

The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. The Board adopted updated assumptions for use in this actuarial valuation. The principle updated assumptions include:

- Change in the rates of salary increases for individuals.
- New post-retirement mortality assumption based on KRS retiree experience and the inclusion of an explicit assumption for future improvement in mortality.
- Updated mortality assumptions for members during employment and for disabled retirees.
- Change in the rates of retirement.
- Change in the rates that an active member is assumed to become an inactive member in the System prior to retirement.
- Updated rates of disability incidence.

The experience study included a review of several economic assumptions which encompassed the rate of inflation, the investment return assumption, and the payroll growth assumption. However, those assumptions remain unchanged from the prior actuarial valuation.

The assumed increase in future health care costs, or trend assumption, is reviewed on an annual basis and was updated (i.e. increased) since the June 30, 2018 valuation to better reflect more current expectations relating to anticipated future increases in the medical costs for post-age 65 retirees.

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 that were in effect on June 30, 2019. House Bill 1 passed during the 2019 Special Legislative Session and allows certain employers in the KERS Non-Hazardous plan a continuation of their 49.47% contribution rate (pension and insurance) for fiscal year 2020 and an opportunity to elect to cease participating in the System as of June 30, 2020 under different provisions than were previously in statute. Since we are unable to identify which agencies will elect to cease participation, we have made no assumption regarding future employer elections and the results of this actuarial valuation reflect the membership as of June 30, 2019. There were no other benefit changes since the prior valuation.

DATA

Member data for retired, active and inactive members was supplied as of June 30, 2019, by the KRS staff. The staff also supplied asset information as of June 30, 2019. 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.

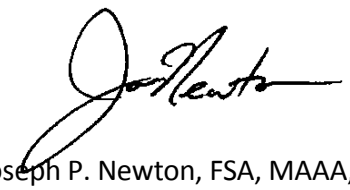
CERTIFICATION

We certify that the information presented herein is accurate and fairly portrays the actuarial position of KERS as of June 30, 2019. 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
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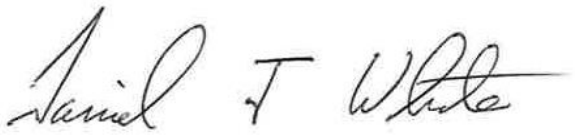
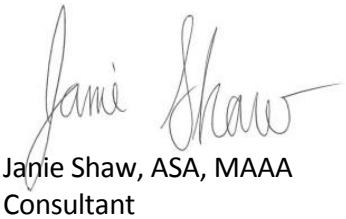


Daniel J. White, FSA, MAAA, EA
Senior Consultant



Janie Shaw, ASA, MAAA
Consultant

Summary of June 30, 2019 Actuarial Valuation Results

	KERS Non-Hazardous	KERS Hazardous	CERS Non-Hazardous	CERS Hazardous	SPRS
Actuarially Determined Contribution:					
Pension Fund Contribution	80.98%	38.71%	26.21%	46.31%	136.12%
Insurance Fund Contribution	12.03%	0.00%	5.78%	10.47%	20.85%
Total Calculated Employer Contribution	93.01%	38.71%	31.99%	56.78%	156.97%
Certified Contribution Rate for Fiscal Year Ending 2021[1]	93.01%	38.71%	26.95%	44.33%	156.97%
Assets:					
Retirement					
• Actuarial value (AVAR)	$2,206,279,835	$671,647,194	$7,049,526,916	$2,375,106,268	$282,162,043
• Market value (MVAR)	$2,233,671,656	$680,932,449	$7,159,921,492	$2,413,707,764	$286,165,095
• Ratio of actuarial to market value of assets	98.8%	98.6%	98.5%	98.4%	98.6%
Insurance					
• Actuarial value (AVAI)	$991,426,599	$525,314,509	$2,523,248,929	$1,313,658,522	$197,394,638
• Market value (MVAI)	$995,088,799	$534,052,943	$2,569,511,355	$1,340,713,985	$201,205,711
• Ratio of actuarial to market value of assets	99.6%	98.4%	98.2%	98.0%	98.1%
Funded Status:					
Retirement					
• Actuarial accrued liability	$16,466,427,022	$1,226,194,844	$14,356,113,761	$5,245,364,702	$1,045,317,668
• Unfunded accrued liability on AVAR	$14,260,147,187	$554,547,650	$7,306,586,845	$2,870,258,434	$763,155,625
• Funded ratio on AVAR	13.4%	54.8%	49.1%	45.3%	27.0%
• Unfunded accrued liability on MVAR	$14,232,755,366	$545,262,395	$7,196,192,269	$2,831,656,938	$759,152,573
• Funded ratio on MVAR	13.6%	55.5%	49.9%	46.0%	27.4%
Insurance					
• Actuarial accrued liability	$2,733,065,479	$426,704,754	$3,567,946,559	$1,732,879,194	$276,809,220
• Unfunded accrued liability on AVAI	$1,741,638,880	($98,609,755)	$1,044,697,630	$419,220,672	$79,414,582
• Funded ratio on AVAI	36.3%	123.1%	70.7%	75.8%	71.3%
• Unfunded accrued liability on MVAI	$1,737,976,680	($107,348,189)	$998,435,204	$392,165,209	$75,603,509
• Funded ratio on MVAI	36.4%	125.2%	72.0%	77.4%	72.7%
Membership:					
• Number of					
- Active Members	33,696	3,705	81,506	9,474	883
- Retirees and Beneficiaries	47,410	4,537	64,539	10,023	1,647
- Inactive Members	51,914	6,248	91,543	3,422	557
- Total	133,020	14,490	237,588	22,919	3,087
• Projected payroll of active members	$1,437,647,279	$150,445,806	$2,521,860,154	$559,352,588	$47,752,039
• Average salary of active members	$42,665	$40,606	$30,941	$59,041	$54,079

[1] The fiscal year 2021 contribution rates for the KERS and SPRS systems will require budgeting during the 2020 legislative session. Contribution rates for CERS Systems limited to a 12% increase in the certified contribution rates from the prior fiscal year in accordance with House Bill 362 (2018 legislative session).

Kentucky Employees Retirement System (KERS)

Actuarial Valuation Report
as of June 30, 2019

GRS Retirement Consulting

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December 5, 2019

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

Subject: Actuarial Valuation as of June 30, 2019

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, 2021 and June 30, 2022, 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 Systems (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 2019 actuarial valuation is 24 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, 2019 actuarial valuation will be used by the Board to recommend the participating employers' and the Commonwealth's contribution rates for the fiscal year beginning July 1, 2020 and ending June 30, 2021, as well as the subsequent fiscal year beginning July 1, 2021 and ending June 30, 2022.

ASSUMPTIONS AND METHODS

The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. An experience study was conducted after the June 30, 2018 actuarial valuation and the Board adopted updated assumptions for use in this actuarial valuation. The principle updated assumptions include:

- Change in the rates of salary increases for individuals.
- New post-retirement mortality assumption based on KRS retiree experience and the inclusion of an explicit assumption for future improvement in mortality.
- Updated mortality assumptions for members during employment and for disabled retirees.
- Change in the rates of retirement.
- Change in the rates that an active member is assumed to become an inactive member in the System prior to retirement.
- Updated rates of disability incidence.

The experience study included a review of several economic assumptions which encompassed the rate of inflation, the investment return assumption, and the payroll growth assumption. However, those assumptions remain unchanged from the prior actuarial valuation.

The assumed increase in future health care costs, or trend assumption, is reviewed on an annual basis and was updated (i.e. increased) since the June 30, 2018 valuation to better reflect more current expectations relating to anticipated future increases in the medical costs for post-age 65 retirees.

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, 2019. House Bill 1 passed during the 2019 Special Legislative Session and allows certain employers in the Non-Hazardous plan a continuation of their 49.47% contribution rate (pension and insurance) for fiscal year 2020 and an opportunity to elect to cease participating in the System as of June 30, 2020 under different provisions than were previously in statute. Since we are unable to identify at this time which agencies will elect to cease participation, we have made no assumption regarding future employer elections and the results of this actuarial valuation reflect the membership as of June 30, 2019. There were no other benefit changes since the prior valuation.

DATA

Member data for retired, active and inactive members was supplied as of June 30, 2019, by the KRS staff. The staff also supplied asset information as of June 30, 2019. 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, 2019.

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

Janie Shaw, ASA, MAAA
Consultant

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SECTION 1

EXECUTIVE SUMMARY

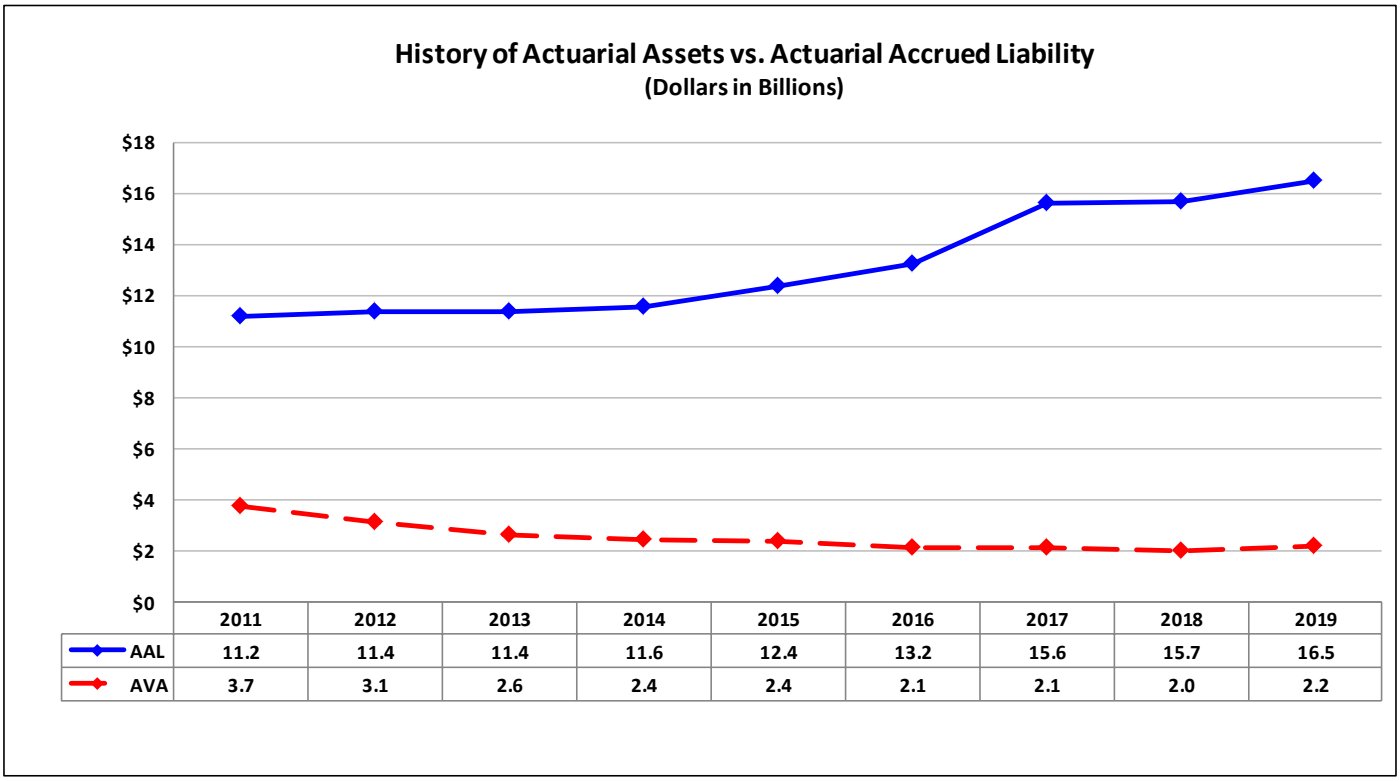
	Non-Hazardous		Hazardous		Total	
	June 30, 2019	June 30, 2018	June 30, 2019	June 30, 2018	June 30, 2019	June 30, 2018
Actuarially Determined Contribution:						
Retirement	80.98%	74.54%	38.71%	34.42%		
Insurance	12.03%	10.65%	0.00%	0.00%		
Total	93.01%	85.19%	38.71%	34.42%	N/A	N/A
Contribution Rate for Next Fiscal Year[1]	93.01%	83.43%	38.71%	36.85%		
Assets:						
Retirement						
• Actuarial value (AVAR)	$2,206,280	$2,019,278	$671,647	$639,262	$2,877,927	$2,658,540
• Market value (MVAR)	$2,233,672	$2,004,446	$680,932	$645,485	$2,914,604	$2,649,931
• Ratio of actuarial to market value of assets	98.8%	100.7%	98.6%	99.0%	98.7%	100.3%
Insurance						
• Actuarial value (AVAI)	$991,427	$887,121	$525,315	$511,441	$1,516,742	$1,398,562
• Market value (MVAI)	$995,089	$891,205	$534,053	$519,072	$1,529,142	$1,410,277
• Ratio of actuarial to market value of assets	99.6%	99.5%	98.4%	98.5%	99.2%	99.2%
Funded Status:						
Retirement						
• Actuarial accrued liability	$16,466,428	$15,675,232	$1,226,195	$1,151,923	$17,692,623	$16,827,155
• Unfunded accrued liability on AVAR	$14,260,148	$13,655,954	$554,548	$512,661	$14,814,696	$14,168,615
• Funded ratio on AVAR	13.4%	12.9%	54.8%	55.5%	16.3%	15.8%
• Unfunded accrued liability on MVAR	$14,232,756	$13,670,786	$545,263	$506,438	$14,778,019	$14,177,224
• Funded ratio on MVAR	13.6%	12.8%	55.5%	56.0%	16.5%	15.7%
Insurance						
• Actuarial accrued liability	$2,733,065	$2,435,505	$426,704	$393,481	$3,159,769	$2,828,986
• Unfunded accrued liability on AVAI	$1,741,638	$1,548,384	($98,611)	($117,960)	$1,643,027	$1,430,424
• Funded ratio on AVAI	36.3%	36.4%	123.1%	130.0%	48.0%	49.4%
• Unfunded accrued liability on MVAI	$1,737,976	$1,544,300	($107,349)	($125,591)	$1,630,627	$1,418,709
• Funded ratio on MVAI	36.4%	36.6%	125.2%	131.9%	48.4%	49.9%
Membership:						
• Number of						
- Active Members	33,696	35,139	3,705	3,929	37,401	39,068
- Retirees and Beneficiaries	47,410	46,526	4,537	4,370	51,947	50,896
- Inactive Members	51,914	50,435	6,248	5,727	58,162	56,162
- Total	133,020	132,100	14,490	14,026	147,510	146,126
• Projected payroll of active members	$1,437,647	$1,471,477	$150,446	$158,213	$1,588,093	$1,629,690
• Average salary of active members	$42,665	$41,876	$40,606	$40,268	$42,461	$41,714

[1] Contribution rates for fiscal year 2021 will require budgeting during the 2020 legislative session.

Executive Summary (Continued)

Non-Hazardous Retirement Fund

The unfunded actuarial accrued liability of the non-hazardous retirement system increased by $604 million since the prior year's valuation to $14.3 billion. The largest source of this increase is due to a $705 million increase in the liability due to the updated actuarial assumptions. 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 nine years has generally been due to a combination of: (1) contributions that were insufficient to amortize the unfunded actuarial accrued liability, (2) a decrease in the assumed rate of return in 2015, 2016 and again in 2017, and (3) the actual investment experience being less than the fund's expected investment return assumption.



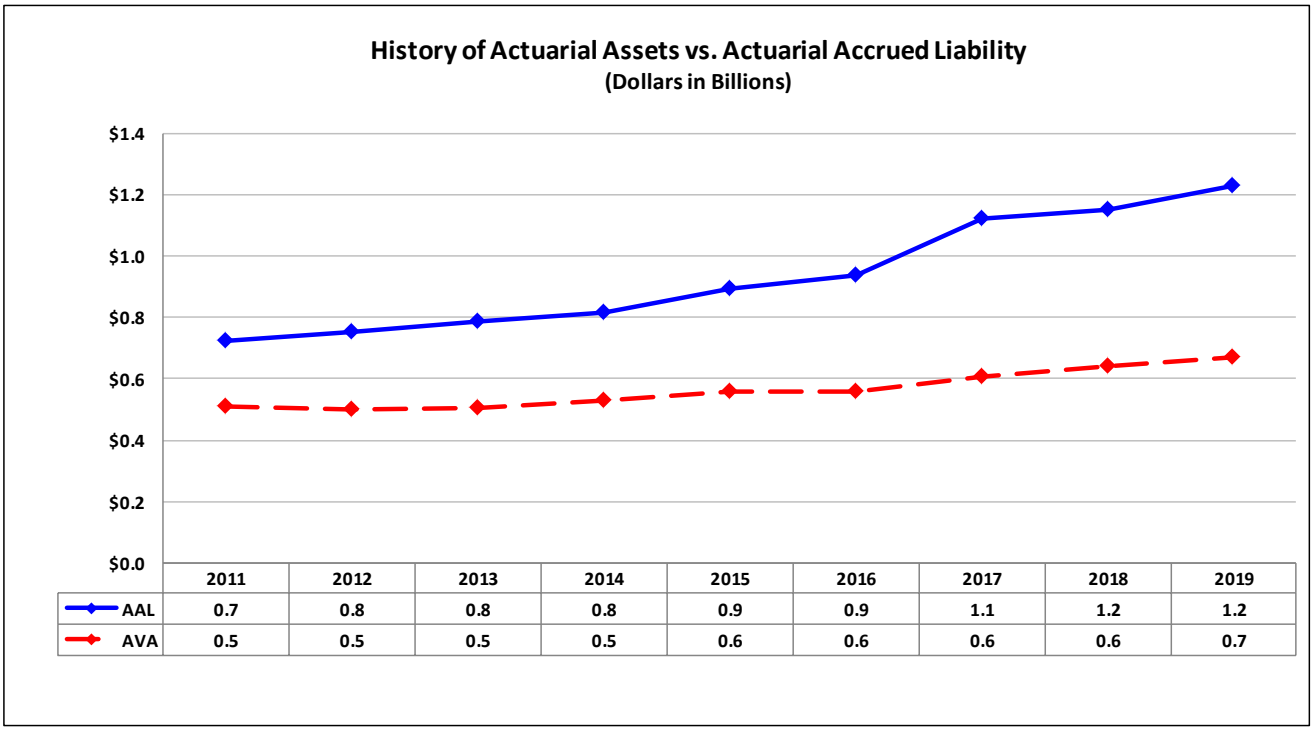
	2011	2012	2013	2014	2015	2016	2017	2018	2019
AAL	11.2	11.4	11.4	11.6	12.4	13.2	15.6	15.7	16.5
AVA	3.7	3.1	2.6	2.4	2.4	2.1	2.1	2.0	2.2

For FY2018-19, the KERS non-hazardous pension system distributed $1,012 million in benefit payments and administrative expenses, and received $1,129 million in employer and employee contributions (excluding contributions to the 401(h) account). As of June 30, 2019, plan assets for this system were $2,234 million (excluding assets in the 401(h) account). 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 continue to exceed the benefit payments. If the entire actuarially determined employer contribution documented in this letter is not made to this system in FY 2020-21 and FY 2021-22, the financial condition of this retirement system is expected to deteriorate and there is a significant risk of the plan assets being exhausted.

Executive Summary (Continued)

Hazardous Retirement Fund

The unfunded actuarial accrued liability of the hazardous retirement system increased by $42 million since the prior year's valuation to $555 million. The largest source of this increase is due to a $49 million increase in the liability due to the updated actuarial assumptions. 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 nine years has generally been due to a combination of: (1) contributions that were insufficient to amortize the unfunded actuarial accrued liability, (2) a decrease in the assumed rate of return in 2015 and again in 2017, and (3) the actual investment experience being less than the fund's expected investment return assumption.



	2011	2012	2013	2014	2015	2016	2017	2018	2019
AAL	0.7	0.8	0.8	0.8	0.9	0.9	1.1	1.2	1.2
AVA	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7

Executive Summary (Continued)

Summary of Change in Financial Condition of the Insurance Funds

The non-Medicare premiums were lower than expected and the Medicare premiums were higher than expected from calendar year 2019 to 2020. Specifically, the non-Medicare premiums were expected to increase by 7.00% from calendar year 2019 to calendar year 2020 (i.e. the medical trend assumption for non-Medicare premiums used in the actuarial valuation) and the actual average premiums were relatively level. Also, the Medicare premiums were expected to increase by 5.00% from calendar year 2019 to calendar year 2020 (i.e. the medical trend assumption used in the actuarial valuation for Medicare premium) and the actual average premiums increased by 13%. The favorable non-Medicare premium experience offset most of the actuarial loss that resulted from the new Medicare premiums. In fact, the overall premium experience resulted in a small actuarial gain for the hazardous plan which has younger retirees.

Non-Hazardous Insurance Fund

Since the prior year's valuation, the unfunded actuarial accrued liability of the non-hazardous insurance fund increased by $193 million since the prior year's valuation to $1,742 million. The largest source of this increase is due to a $116 million increase in the liability due to the updated actuarial assumptions adopted by the Board as a result of the experience study. The corresponding funded ratio slightly decreased from 36.4% at June 30, 2018 to 36.3% at June 30, 2019.

Hazardous Insurance Fund

Since the prior year's valuation, the plan assets in excess of the actuarial accrued liability of the hazardous insurance fund decreased by $19 million since the prior year's valuation to a $99 million surplus. The largest source of this decrease is due to a $16 million increase in the liability due to the updated actuarial assumptions adopted by the Board as a result of the experience study. The corresponding funded ratio decreased from 130.0% at June 30, 2018 to 123.1% at June 30, 2019.

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, 2019 actuarial funding valuation for both the Retirement Funds and Insurance Funds.

The primary purposes of the valuation report are to depict the current financial condition of the Funds and analyze changes in the Fund's financial condition. In addition, the report provides various summaries of the data.

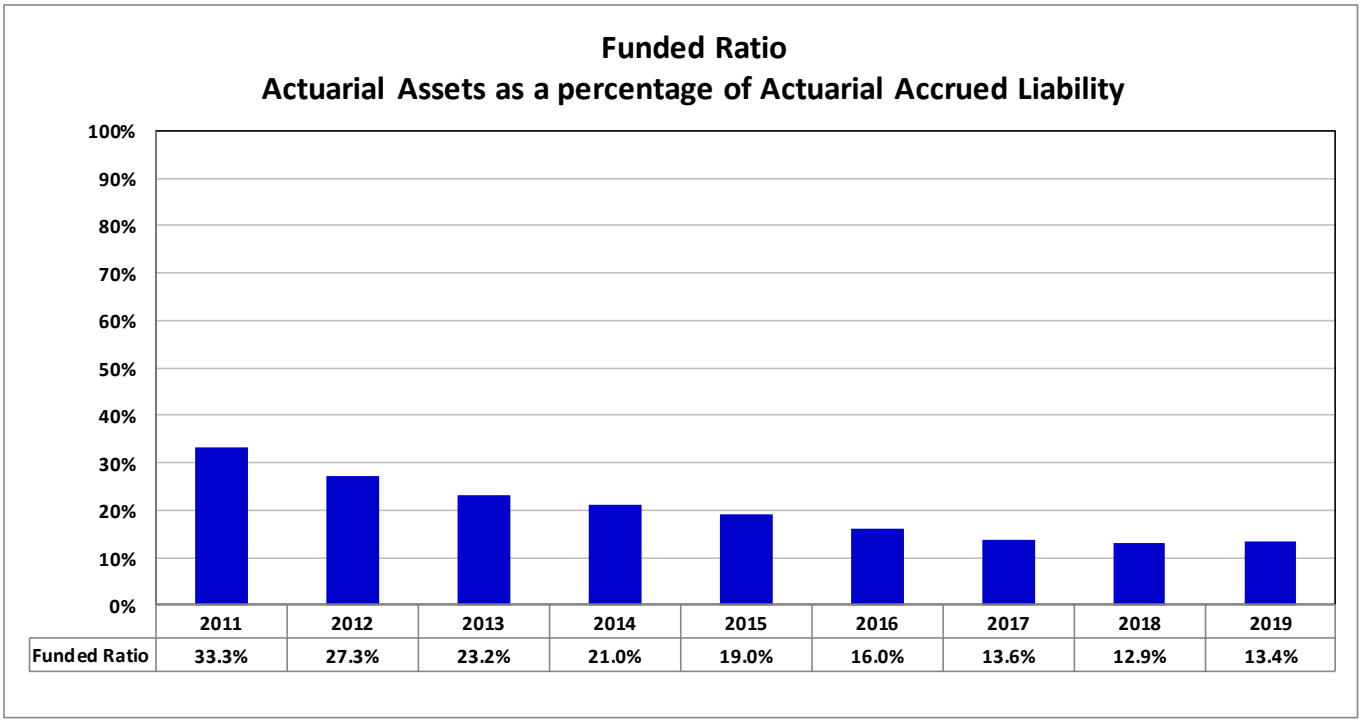
The actuarially determined contribution rates consist of two components: a normal cost rate and an amortization cost to finance the unfunded actuarial accrued liability. The normal cost rate is the theoretical amount which would be required to pay the members' benefits, based on the current plan provisions, 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 that it should cost to provide the benefits for an average 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. Section 5 provides a discussion of various risk measures, which are intended to aid stakeholders in understanding the effects of future experience differing from the assumptions used in performing an actuarial valuation. This section was added to the report this year in compliance with the newly adopted Actuarial Standards of Practice. Appendices A and B provide summaries of the principle actuarial assumptions and methods and plan provisions. Finally, Appendix C provides a glossary of technical terms that are used throughout this report.

Funding Progress

The following charts provide a nine-year history of the retirement 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 nine years has generally been due to: (1) actual contributions being insufficient to finance the unfunded actuarial accrued liability, (2) a decrease in the assumed rate of return in 2015, 2016 and again in 2017, and (3) actual investment experience being less than the investment return assumption.

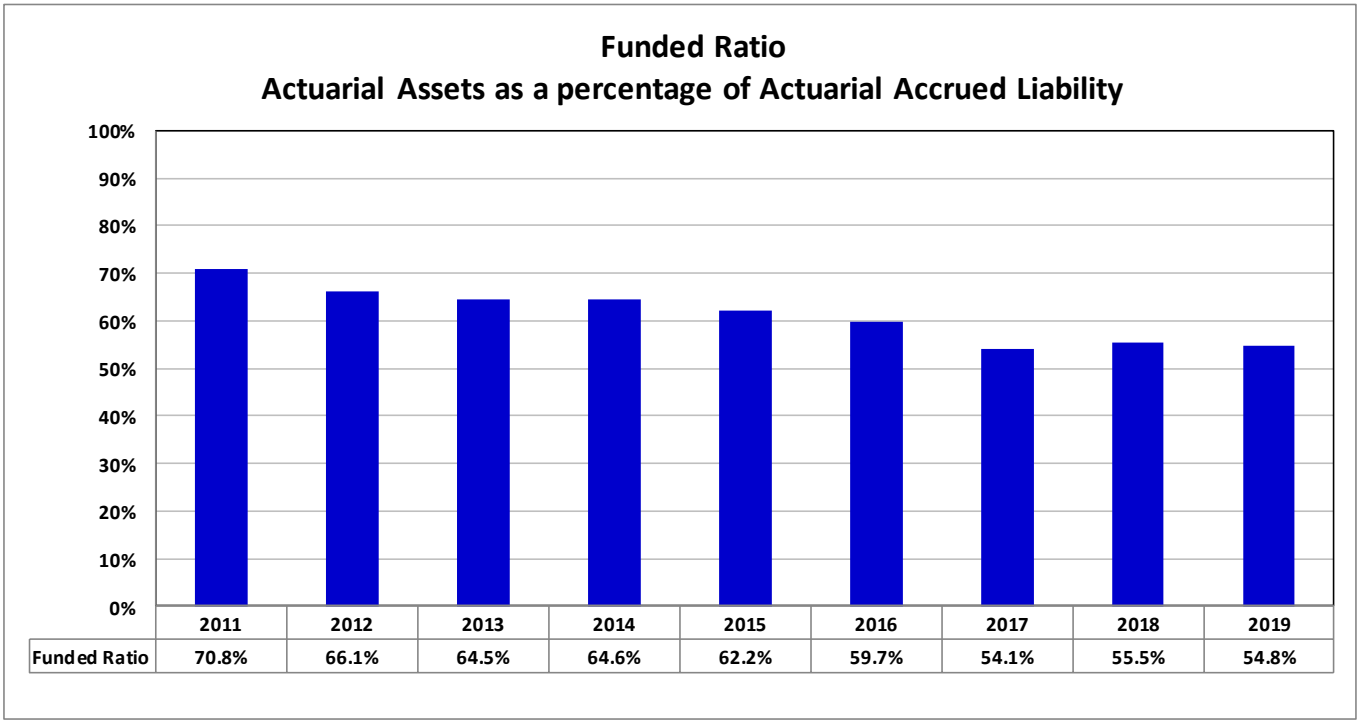
Non-Hazardous Retirement Fund



	2011	2012	2013	2014	2015	2016	2017	2018	2019
Funded Ratio	33.3%	27.3%	23.2%	21.0%	19.0%	16.0%	13.6%	12.9%	13.4%

Funding Progress (Continued)

Hazardous Retirement Fund



	2011	2012	2013	2014	2015	2016	2017	2018	2019
Funded Ratio	70.8%	66.1%	64.5%	64.6%	62.2%	59.7%	54.1%	55.5%	54.8%

Assuming the actuarial determined contributions are actually paid in future years and absent future unfavorable experience we expect the funded ratio to continue 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 now that the higher contribution rates determined by the June 30, 2017 actuarial valuation became 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 Funds.

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 $2.019 billion to $2.206 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 for the non-hazardous retirement fund on a dollar-weighted basis for fiscal year 2019 was a 5.4% which is greater than the 5.25% expected annual return. The return on an actuarial (smoothed) asset value was 3.4%, which resulted in a $39 million 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 $27 million greater than the actuarial value of assets, which signifies that the retirement fund is in a position of deferred gains to be realized in future years.

Likewise, the actuarial value of assets for the hazardous retirement fund increased from $639 million to $672 million since the prior valuation. The rate of return on the market value of assets on a dollar-weighted basis for fiscal year 2019 was a 5.6% which is less than the 6.25% expected annual return. The return on an actuarial (smoothed) asset value was 5.2%, which resulted in a $6.6 million loss for the fiscal year. The market value of assets is $9.3 million greater than the actuarial value of assets, which signifies that the retirement fund is in a position of deferred 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 Systems 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 a 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 / (losses) 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	$ 13,655,954	$ 512,661
2. Normal cost and administrative expenses	190,998	27,276
3. Less: contributions for the year	(1,129,258)	(72,381)
4. Interest accrual	692,308	30,632
5. Expected UAAL (Sum of Items 1 - 4)	$ 13,410,002	$ 498,188
6. Actual UAAL as of June 30,2019	$ 14,260,148	$ 554,548
7. Total gain (loss) for the year (Item 5 - Item 6)	$ (850,146)	$ (56,360)
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ (38,932)	$ (6,606)
9. Liability experience gain (loss) for the year	(106,272)	(504)
10. Plan Change	—	—
11. Assumption change	(704,942)	(49,250)
12. Total	$ (850,146)	$ (56,360)

Of the $850 million and $56 million in actuarial losses experienced by the non-hazardous and hazardous retirement funds, respectively, $705 million and $49 million were due to the increases in liability resulting from the assumption changes reflected as a result of the experience study as of June 30, 2018.

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	$ 1,548,384	$ (117,960)
2. Normal cost and administrative expenses	42,084	9,113
3. Less: contributions for the year	(184,930)	(5,906)
4. Interest accrual	92,310	(7,272)
5. Expected UAAL (Sum of Items 1 - 4)	$ 1,497,848	$ (122,025)
6. Actual UAAL as of June 30,2019	$ 1,741,638	$ (98,611)
7. Total gain (loss) for the year (Item 5 - Item 6)	$ (243,790)	$ (23,414)
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ (11,091)	$ (4,282)
9. Liability experience gain (loss) for the year	(66,090)	(738)
10. Plan Change	—	—
11. Assumption change	(166,609)	(18,394)
12. Total	$ (243,790)	$ (23,414)

Of the $244 million and $23 million in actuarial losses experienced by the non-hazardous and hazardous insurance funds, respectively, $167 million and $18 million were due to the increases in liability resulting from the assumption changes reflected as a result of the experience study as of June 30, 2018 and the updated trend assumption. Additionally, the non-hazardous insurance fund's liability increased by $66 million due to the premium experience ($50 million) and other demographic experience ($16 million). The hazardous insurance fund's liability decreased by a net $0.7 million due to a $2.6 million gain due to the premium experience and a $3.3 million loss attributable to other demographic experience.

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. The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. An experience study was conducted after the June 30, 2018 actuarial valuation and the Board adopted updated assumptions for use in this actuarial valuation. The principle updated assumptions include:

- Change in the rates of salary increases for individuals.
- New post-retirement mortality assumption based on KRS retiree experience and the inclusion of an explicit assumption for future improvement in mortality.
- Updated mortality assumptions for members during employment and for disabled retirees.
- Change in the rates of retirement.
- Change in the rates that an active member is assumed to become an inactive member in the System prior to retirement.
- Updated rates of disability incidence.

The experience study included a review of several economic assumptions which included the rate of inflation, the investment return assumption, and the payroll growth assumption. However, those assumptions remain unchanged from the prior actuarial valuation.

The assumed increase in future health care costs, or trend assumption, is reviewed on an annual basis and was updated (i.e. increased) since the June 30, 2018 valuation to better reflect more current expectations relating to anticipated future increases in the medical costs for post-age 65 retirees.

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.

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. House Bill 1 passed during the 2019 Special Legislative Session and allows certain employers in the Non-Hazardous plan to elect to cease participating in the System as of June 30, 2020 under different provisions than were previously in statute. Since we are unable to identify at this time which agencies will elect to cease participation, we have made no assumption regarding future employer elections and the results of this actuarial valuation reflect the membership as of June 30, 2019. There were no other benefit changes since the prior valuation.

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, 2019	
		Non-Hazardous (1)	Hazardous (2)
1.	Projected payroll of active members	$ 1,437,647	$ 150,446
2.	Present value of future pay	$ 11,307,599	$ 1,121,242
3.	Normal cost rate		
	a. Total normal cost rate	12.18%	16.48%
	b. Less: member contribution rate	-5.00%	-8.00%
	c. Employer normal cost rate	7.18%	8.48%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 5,271,991	$ 523,314
	b. Less: present value of future normal costs	(1,318,794)	(176,937)
	c. Actuarial accrued liability	$ 3,953,197	$ 346,377
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 11,897,063	$ 834,633
	b. Inactive members	616,168	45,185
	c. Active members (Item 4c)	3,953,197	346,377
	d. Total	$ 16,466,428	$ 1,226,195
6.	Actuarial value of assets	$ 2,206,280	$ 671,647
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 14,260,148	$ 554,548
8.	Funded Ratio	13.4%	54.8%

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

		June 30, 2019	
		Non-Hazardous (1)	Hazardous (2)
1.	Active members		
	a. Service retirement	$ 4,678,511	$ 467,800
	b. Deferred termination benefits and refunds	356,788	35,202
	c. Survivor benefits	73,963	4,765
	d. Disability benefits	162,729	15,547
	e. Total	$ 5,271,991	$ 523,314
2.	Retired members		
	a. Service retirement	$ 10,908,911	$ 770,537
	b. Disability retirement	286,978	18,107
	c. Beneficiaries	701,174	45,989
	d. Total	$ 11,897,063	$ 834,633
3.	Inactive members		
	a. Vested terminations	$ 579,691	$ 37,563
	b. Nonvested terminations	36,477	7,622
	c. Total	$ 616,168	$ 45,185
4.	Total actuarial present value of future benefits	$ 17,785,222	$ 1,403,132

Development of Actuarially Determined Contribution Rate
Retirement Benefits

		June 30, 2019	
		Non-Hazardous (1)	Hazardous (2)
1.	Total normal cost rate		
	a. Service retirement	8.40%	11.90%
	b. Deferred termination benefits and refunds	2.82%	3.58%
	c. Survivor benefits	0.35%	0.30%
	d. Disability benefits	0.61%	0.70%
	e. Total	12.18%	16.48%
2.	Less: member contribution rate	-5.00%	-8.00%
3.	Total employer normal cost rate	7.18%	8.48%
4.	Administrative expenses	0.81%	0.73%
5.	Net employer normal cost rate	7.99%	9.21%
6.	UAAL amortization contribution	72.99%	29.50%
7.	Total calculated employer contribution	80.98%	38.71%

Actuarial Balance Sheet

Non-Hazardous Members Retirement

(Dollar amounts expressed in thousands)

		June 30, 2019 (1)	June 30, 2018 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 2,206,280	$ 2,019,278
	b. Present value of future member contributions	$ 565,380	$ 627,853
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 753,414	$ 828,611
	ii. Unfunded accrued liability contributions	14,260,148	13,655,954
	iii. Total future employer contributions	$ 15,013,562	$ 14,484,565
	d. Total assets	$ 17,785,222	$ 17,131,696
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 1,318,794	$ 1,456,464
	ii. Accrued liability	3,953,197	3,746,213
	iii. Total present value of future benefits	$ 5,271,991	$ 5,202,677
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 11,897,063	$ 11,419,229
	c. Present value of benefits payable on account of current inactive members	$ 616,168	$ 509,790
	d. Total liabilities	$ 17,785,222	$ 17,131,696

Actuarial Balance Sheet

Hazardous Members Retirement

(Dollar amounts expressed in thousands)

		June 30, 2019 (1)	June 30, 2018 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 671,647	$ 639,262
	b. Present value of future member contributions	$ 89,699	$ 109,399
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 87,238	$ 101,503
	ii. Unfunded accrued liability contributions	554,548	512,661
	iii. Total future employer contributions	$ 641,786	$ 614,164
	d. Total assets	$ 1,403,132	$ 1,362,825
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 176,937	$ 210,902
	ii. Accrued liability	346,377	341,612
	iii. Total present value of future benefits	$ 523,314	$ 552,514
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 834,633	$ 771,706
	c. Present value of benefits payable on account of current inactive members	$ 45,185	$ 38,605
	d. Total liabilities	$ 1,403,132	$ 1,362,825

Reconciliation of Retirement Net Assets

(Dollar amounts expressed in thousands)[1]

	Year Ending June 30, 2019 (1) Non-Hazardous	Year Ending June 30, 2019 (2) Hazardous
1. Value of assets at beginning of year	$ 2,004,446	$ 645,485
2. Revenue for the year		
a. Contributions		
i. Member contributions	$ 93,759	$ 17,118
ii. Employer contributions	948,866	55,230
iii. Other contributions (less 401h)	86,632	33
iii. Total	$ 1,129,258	$ 72,381
b. Income		
i. Interest, dividends, and other income	$ 45,887	$ 16,014
ii. Investment expenses	(13,378)	(4,589)
iii. Net	$ 32,509	$ 11,426
c. Net realized and unrealized gains (losses)	79,862	24,955
d. Total revenue	$ 1,241,629	$ 108,762
3. Expenditures for the year		
a. Disbursements		
i. Refunds	$ 12,342	$ 2,684
ii. Regular annuity benefits	988,349	69,527
iii. Other benefit payments	0	0
iv. Transfers to other systems	0	0
v. Total	$ 1,000,691	$ 72,211
b. Administrative expenses and depreciation	11,712	1,103
c. Total expenditures	$ 1,012,403	$ 73,314
4. Increase in net assets (Item 2. - Item 3.)	$ 229,226	$ 35,447
5. Value of assets at end of year (Item 1. + Item 4.)	$ 2,233,672	$ 680,932
6. Net external cash flow		
a. Dollar amount	$ 116,855	$ (933)
b. Percentage of market value	5.5%	-0.1%
7. Estimated annual return on net assets	5.4%	5.6%

[1] Amounts may not add due to rounding

[1] Excludes 401h assets

Development of Actuarial Value of Assets

Non-Hazardous Members Retirement

(Dollar amounts expressed in thousands)*

	Year Ending	June 30, 2019
1.	Actuarial value of assets at beginning of year	$ 2,019,278
2.	Market value of assets at beginning of year	$ 2,004,446
3.	Net new investments	
	a. Contributions	$ 1,129,258
	b. Benefit payments	(1,000,691)
	c. Administrative expenses	(11,712)
	d. Subtotal	$ 116,855
4.	Market value of assets at end of year	$ 2,233,672
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$ 112,371
6.	Assumed investment return rate for fiscal year	5.25%
7.	Expected return for immediate recognition	$ 108,301
8.	Excess return for phased recognition	$ 4,070
9.	Phased-in recognition, 20% of excess return on assets for prior years:	

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2019	$ 4,070	$ 814
b.	2018	42,022	8,404
c.	2017	89,028	17,806
d.	2016	(183,443)	(36,689)
e.	2015	(142,444)	(28,489)
f.	Total		$ (38,153)

10.	Actuarial value of assets as of June 30, 2019 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$ 2,206,280
11.	Ratio of actuarial value to market value	98.8%
12.	Estimated annual return on actuarial value of assets	3.4%

* 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, 2019
1.	Actuarial value of assets at beginning of year	$	639,262
2.	Market value of assets at beginning of year	$	645,485
3.	Net new investments		
	a. Contributions	$	72,381
	b. Benefit payments		(72,211)
	c. Administrative expenses		(1,103)
	d. Subtotal	$	(933)
4.	Market value of assets at end of year	$	680,932
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	36,381
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	40,314
8.	Excess return for phased recognition	$	(3,933)

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

	Fiscal Year Ending June 30,		Excess Return		Recognized Amount
a.	2019	$	(3,933)	$	(787)
b.	2018		14,102		2,820
c.	2017		31,023		6,205
d.	2016		(42,195)		(8,439)
e.	2015		(33,972)		(6,794)
f.	Total			$	(6,995)

10.	Actuarial value of assets as of June 30, 2019 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	671,647
11.	Ratio of actuarial value to market value		98.6%
12.	Estimated annual return on actuarial value of assets		5.2%

* 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%
2019	2,206,280	16,466,428	14,260,148	13.4%	1,437,647	991.9%
			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%
2019	671,647	1,226,195	554,548	54.8%	150,446	368.6%
			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%
2019	2,877,927	17,692,623	14,814,696	16.3%	1,588,093	932.9%

Summary of Principal Assumptions and Methods

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

	Non-Hazardous	Hazardous
Valuation date:	June 30, 2019	June 30, 2019
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:	24-year closed period	24-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	3.30% to 15.30% (varies by service)	3.55% to 20.05% (varies by service)
Inflation	2.30%	2.30%
Post-retirement benefit adjustments	0.00%	0.00%
Retiree Mortality	System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from MP-2014 mortality improvement scale use a base year of 2019.	System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from MP-2014 mortality improvement scale use a base year of 2019.

Solvency Test
Retirement Benefits
(Dollar amounts expressed in thousands)

June 30,	Actuarial Accrued Liability: Active Member Contributions	Actuarial Accrued Liability: Retired Members & Beneficiaries	Actuarial Accrued Liability: Active Members (Employer Financed)	Valuation Assets	Portion of Aggregate Accrued Liabilities Covered by Assets: Active	Portion of Aggregate Accrued Liabilities Covered by Assets: Retired	Portion of Aggregate Accrued Liabilities Covered by Assets: 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%
2019	881,020	12,513,231	3,072,177	2,206,280	100.0%	10.6%	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%
2019	86,663	879,818	259,714	671,647	100.0%	66.5%	0.0%

INSURANCE BENEFITS

ACTUARIAL TABLES

Development of Unfunded Actuarial Accrued Liability
Insurance Benefits

(Dollar amounts expressed in thousands)

		June 30, 2019	
		Non-Hazardous (1)	Hazardous (2)
1.	Projected payroll of active members	$ 1,437,647	$ 150,446
2.	Present value of future pay	$ 10,536,505	$ 1,120,096
3.	Normal cost rate		
	a. Total normal cost rate	2.71%	4.92%
	b. Less: member contribution rate	-0.41%	-0.60%
	c. Employer normal cost rate	2.30%	4.32%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 1,306,934	$ 189,937
	b. Less: present value of future normal costs	(260,473)	(45,302)
	c. Actuarial accrued liability	$ 1,046,461	$ 144,635
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 1,546,457	$ 271,869
	b. Inactive members	140,147	10,200
	c. Active members (Item 4c)	1,046,461	144,635
	d. Total	$ 2,733,065	$ 426,704
6.	Actuarial value of assets	$ 991,427	$ 525,315
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 1,741,638	$ (98,611)
8.	Funded Ratio	36.3%	123.1%

Development of Actuarially Determined Contribution Rate
Insurance Benefits

		June 30, 2019	
		Non-Hazardous (1)	Hazardous (2)
1.	Total normal cost rate	2.71%	4.92%
2.	Less: member contribution rate	-0.41%	-0.60%
3.	Total employer normal cost rate	2.30%	4.32%
4.	Administrative expenses	0.06%	0.08%
5.	Net employer normal cost rate	2.36%	4.40%
6.	UAAL amortization contribution	9.67%	-5.47%
7.	Total calculated employer contribution Max (0%, item 5. + item6.)	12.03%	0.00%

Actuarial Balance Sheet

Non-Hazardous Members Insurance

(Dollar amounts expressed in thousands)

		June 30, 2019 (1)	June 30, 2018 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 991,427	$ 887,121
	b. Present value of future member contributions	$ 52,755	$ 58,117
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 207,718	$ 244,052
	ii. Unfunded accrued liability contributions	1,741,638	1,548,384
	iii. Total future employer contributions	$ 1,949,356	$ 1,792,436
	d. Total assets	$ 2,993,538	$ 2,737,674
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 260,473	$ 302,169
	ii. Accrued liability	1,046,461	959,552
	iii. Total present value of future benefits	$ 1,306,934	$ 1,261,721
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 1,546,457	$ 1,357,311
	c. Present value of benefits payable on account of current inactive members	$ 140,147	$ 118,642
	d. Total liabilities	$ 2,993,538	$ 2,737,674

Actuarial Balance Sheet

Hazardous Members Insurance

(Dollar amounts expressed in thousands)

		June 30, 2019 (1)	June 30, 2018 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 525,315	$ 511,441
	b. Present value of future member contributions	$ 8,240	$ 9,821
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 37,062	$ 55,395
	ii. Unfunded accrued liability contributions	(98,611)	(117,960)
	iii. Total future employer contributions	$ (61,549)	$ (62,565)
	d. Total assets	$ 472,006	$ 458,697
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 45,302	$ 65,216
	ii. Accrued liability	144,635	144,706
	iii. Total present value of future benefits	$ 189,937	$ 209,922
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 271,869	$ 238,885
	c. Present value of benefits payable on account of current inactive members	$ 10,200	$ 9,890
	d. Total liabilities	$ 472,006	$ 458,697

Reconciliation of Insurance Net Assets

(Dollar amounts expressed in thousands)[1]

	Year Ending June 30, 2019 (1) Non-Hazardous	Year Ending June 30, 2019 (2) Hazardous
1. Value of assets at beginning of year	$ 891,205	$ 519,072
2. Revenue for the year		
a. Contributions		
i. Member contributions	$ 5,963	$ 934
ii. Employer contributions	173,577	3,726
iii. Other contributions (less 401h)	5,391	1,247
iii. Total	$ 184,930	$ 5,906
b. Income		
i. Interest, dividends, and other income	$ 22,091	$ 12,876
ii. Investment expenses	(5,431)	(3,981)
iii. Net	$ 16,660	$ 8,895
c. Net realized and unrealized gains (losses)	29,089	19,477
d. Total revenue	$ 230,679	$ 34,278
3. Expenditures for the year		
a. Disbursements		
i. Refunds	$ 0	$ 0
ii. Healthcare premium subsidies	127,221	19,281
iii. Other benefit payments[2]	(1,300)	(100)
iv. Transfers to other systems	0	0
v. Total	$ 125,921	$ 19,180
b. Administrative expenses and depreciation	875	117
c. Total expenditures	$ 126,796	$ 19,298
4. Increase in net assets (Item 2. - Item 3.)	$ 103,884	$ 14,981
5. Value of assets at end of year (Item 1. + Item 4.)	$ 995,089	$ 534,053
6. Net external cash flow		
a. Dollar amount	$ 58,135	$ (13,392)
b. Percentage of market value	6.2%	-2.5%
7. Estimated annual return on net assets	5.0%	5.5%

[1] Amounts may not add due to rounding

[1] Includes 401h assets

[2] Benefit payments have been offset by Medicare Drug Reimbursements, Insurance Premiums, and Humana Gain Share Payments

Development of Actuarial Value of Assets

Non-Hazardous Members Insurance

(Dollar amounts expressed in thousands)*

	Year Ending	June 30, 2019
1.	Actuarial value of assets at beginning of year	$ 887,121
2.	Market value of assets at beginning of year	$ 891,205
3.	Net new investments	
	a. Contributions	$ 184,930
	b. Benefit payments	(125,921)
	c. Administrative expenses	(875)
	d. Subtotal	$ 58,135
4.	Market value of assets at end of year	$ 995,089
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$ 45,749
6.	Assumed investment return rate for fiscal year	6.25%
7.	Expected return for immediate recognition	$ 57,517
8.	Excess return for phased recognition	$ (11,768)
9.	Phased-in recognition, 20% of excess return on assets for prior years:	

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2019	$ (11,768)	$ (2,354)
b.	2018	12,636	2,527
c.	2017	41,687	8,337
d.	2016	(55,901)	(11,180)
e.	2015	(43,387)	(8,677)
f.	Total		$ (11,346)

10.	Actuarial value of assets as of June 30, 2019 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$ 991,427
11.	Ratio of actuarial value to market value	99.6%
12.	Estimated annual return on actuarial value of assets	5.0%

* 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, 2019
1.	Actuarial value of assets at beginning of year	$	511,441
2.	Market value of assets at beginning of year	$	519,072
3.	Net new investments		
	a. Contributions	$	5,906
	b. Benefit payments		(19,180)
	c. Administrative expenses		(117)
	d. Subtotal	$	(13,392)
4.	Market value of assets at end of year	$	534,053
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	28,372
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	32,024
8.	Excess return for phased recognition	$	(3,651)

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

	Fiscal Year Ending June 30,		Excess Return		Recognized Amount
a.	2019	$	(3,651)	$	(730)
b.	2018		12,794		2,559
c.	2017		26,956		5,391
d.	2016		(33,995)		(6,799)
e.	2015		(25,896)		(5,179)
f.	Total			$	(4,759)

10.	Actuarial value of assets as of June 30, 2019 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	525,315
11.	Ratio of actuarial value to market value		98.4%
12.	Estimated annual return on actuarial value of assets		5.4%

* 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%
2019	991,427	2,733,065	1,741,638	36.3%	1,437,647	121.1%
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%
2019	525,315	426,704	(98,611)	123.1%	150,446	-65.5%
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%
2019	1,516,742	3,159,769	1,643,027	48.0%	1,588,093	103.5%

Solvency Test
Insurance Benefits
(Dollar amounts expressed in thousands)

June 30,	Actuarial Accrued Liability: Active Member Contributions	Actuarial Accrued Liability: Retired Members & Beneficiaries	Actuarial Accrued Liability: Active Members (Employer Financed)	Valuation Assets	Portion of Aggregate Accrued Liabilities Covered by Assets: Active	Portion of Aggregate Accrued Liabilities Covered by Assets: Retired	Portion of Aggregate Accrued Liabilities Covered by Assets: 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%
2019	-	1,686,604	1,046,461	991,427	100.0%	58.8%	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%
2019	-	282,069	144,635	525,315	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, 2019 (1)	Hazardous June 30, 2019 (2)	Total June 30, 2019 (3)	Total June 30, 2018 (4)
1.	Active members				
a.	Males	12,936	2,484	15,420	16,080
b.	Females	20,760	1,221	21,981	22,988
c.	Total members	33,696	3,705	37,401	39,068
d.	Total annualized prior year salaries	$ 1,437,647	$ 150,446	$ 1,588,093	$ 1,629,690
e.	Average salary[2]	$ 42,665	$ 40,606	$ 42,461	$ 41,714
f.	Average age	45.4	39.8	44.9	44.7
g.	Average service	11.0	7.3	10.6	10.4
h.	Member contributions with interest	$ 881,020	$ 86,663	$ 967,683	$ 981,139
i.	Average contributions with interest[2]	$ 26,146	$ 23,391	$ 25,873	$ 25,114
2.	Vested inactive members[1]				
a.	Number	31,544	2,178	33,722	14,116
b.	Total annual deferred benefits	$ 82,692	$ 4,407	$ 87,099	$ 78,039
c.	Average annual deferred benefit[2]	$ 2,621	$ 2,023	$ 2,583	$ 5,528
d.	Average age at the valuation date	51.3	46.5	51.0	48.5
3.	Nonvested inactive members[1]				
a.	Number	20,370	4,070	24,440	42,046
b.	Total member contributions with interest	$ 35,078	$ 7,132	$ 42,210	$ 67,161
c.	Average contributions with interest[2]	$ 1,722	$ 1,752	$ 1,727	$ 1,597
4.	Service retirees				
a.	Number	40,519	3,913	44,432	43,462
b.	Total annual benefits	$ 870,243	$ 61,454	$ 931,697	$ 915,193
c.	Average annual benefit[2]	$ 21,477	$ 15,705	$ 20,969	$ 21,057
d.	Average age at the valuation date	69.4	64.8	69.0	68.6
5.	Disabled retirees				
a.	Number	1,949	162	2,111	2,129
b.	Total annual benefits	$ 25,745	$ 1,541	$ 27,286	$ 27,229
c.	Average annual benefit[2]	$ 13,209	$ 9,510	$ 12,925	$ 12,790
d.	Average age at the valuation date	65.8	60.3	65.3	65.1
6.	Beneficiaries				
a.	Number	4,942	462	5,404	5,305
b.	Total annual benefits	$ 72,718	$ 4,528	$ 77,246	$ 74,578
c.	Average annual benefit[2]	$ 14,714	$ 9,801	$ 14,294	$ 14,058
d.	Average age at the valuation date	70.6	66.0	70.2	70.2

[1] Vested inactive member section includes Tier 1 members eligible for a benefit equal to the actuarially equivalent of two times the member's contribution balance. These members were included in the nonvested inactive member section in 2018.

[2] Average dollar amounts shown are expresed to the dollar.

Summary of Historical Active Membership

	Active Members		Covered Payroll[1]		Average Annual Pay	
June 30,	Number	Percent Increase /(Decrease)	Amount in Thousands	Percent Increase /(Decrease)	Amount	Percent Increase /(Decrease)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-Hazardous Members						
2010	47,090		$ 1,815,146		$ 38,546	
2011	46,617	-1.0%	1,731,633	-4.6%	37,146	-3.6%
2012	42,196	-9.5%	1,644,897	-5.0%	38,982	4.9%
2013	42,226	0.1%	1,644,409	0.0%	38,943	-0.1%
2014	40,365	-4.4%	1,577,496	-4.1%	39,081	0.4%
2015	39,056	-3.2%	1,544,234	-2.1%	39,539	1.2%
2016	37,779	-3.3%	1,529,249	-1.0%	40,479	2.4%
2017	37,234	-1.4%	1,531,535	0.1%	41,133	1.6%
2018	35,139	-5.6%	1,471,477	-3.9%	41,876	1.8%
2019	33,696	-4.1%	1,437,647	-2.3%	42,665	1.9%
Hazardous Members						
2010	4,291		$ 143,558		$ 33,456	
2011	4,291	0.0%	133,054	-7.3%	31,008	-7.3%
2012	4,086	-4.8%	131,977	-0.8%	32,300	4.2%
2013	4,127	1.0%	132,015	0.0%	31,988	-1.0%
2014	4,024	-2.5%	129,076	-2.2%	32,077	0.3%
2015	3,886	-3.4%	128,680	-0.3%	33,114	3.2%
2016	3,959	1.9%	147,563	14.7%	37,273	12.6%
2017	4,047	2.2%	162,418	10.1%	40,133	7.7%
2018	3,929	-2.9%	158,213	-2.6%	40,268	0.3%
2019	3,705	-5.7%	150,446	-4.9%	40,606	0.8%

[1] Covered payroll is the annualized, projected compensation for the following year and does not include payroll attributable to working retirees.

Distribution of Active Members by Age and by Years of Service

Non-Hazardous Members

Attained Age	Years of Credited Service												
	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	20	1	1	0	0	0	0	0	0	0	0	0	22
	$18,784	$24,759	$16,623	$0	$0	$0	$0	$0	$0	$0	$0	$0	$18,958
20-24	423	258	108	35	17	5	1	0	0	0	0	0	847
	$23,540	$31,767	$32,136	$32,416	$33,258	$39,887	$38,840	$0	$0	$0	$0	$0	$27,819
25-29	536	529	468	372	280	330	4	0	0	0	0	0	2,519
	$26,221	$32,599	$35,103	$36,657	$36,318	$37,425	$40,699	$0	$0	$0	$0	$0	$33,365
30-34	384	375	348	337	337	1,203	282	3	0	0	0	0	3,269
	$27,055	$35,108	$35,461	$37,295	$40,029	$40,004	$41,508	$36,460	$0	$0	$0	$0	$37,287
35-39	318	276	291	279	265	1,171	1,269	387	32	0	0	0	4,288
	$28,299	$35,047	$38,252	$42,955	$39,281	$41,910	$45,177	$45,773	$46,655	$0	$0	$0	$41,467
40-44	249	245	229	245	199	865	1,108	1,193	467	15	0	0	4,815
	$30,926	$36,510	$39,514	$43,742	$38,154	$41,856	$45,533	$48,950	$50,919	$59,751	$0	$0	$44,389
45-49	252	204	240	203	196	784	900	1,119	954	282	17	2	5,153
	$29,670	$35,596	$35,774	$38,451	$38,967	$41,171	$45,476	$49,313	$51,939	$54,405	$57,977	$133,510	$45,274
50-54	196	176	150	177	139	663	853	817	802	448	102	11	4,534
	$29,962	$38,043	$40,329	$40,880	$38,385	$40,191	$44,432	$47,137	$51,635	$56,646	$61,120	$59,567	$45,859
55-59	143	123	140	116	123	637	828	763	641	310	129	24	3,977
	$27,748	$35,626	$37,692	$43,818	$40,144	$39,823	$43,650	$44,267	$50,171	$54,396	$62,038	$74,018	$44,690
60-64	69	89	100	95	64	446	644	610	445	224	69	25	2,880
	$38,092	$39,019	$35,603	$48,667	$39,003	$39,443	$44,231	$44,818	$47,699	$53,228	$63,463	$64,340	$44,907
65 & Over	25	38	37	39	46	241	321	320	171	78	39	37	1,392
	$31,715	$46,341	$47,430	$71,180	$42,354	$42,441	$46,552	$46,930	$53,925	$53,450	$63,742	$75,562	$48,775
Total	2,615	2,314	2,112	1,898	1,666	6,345	6,210	5,212	3,512	1,357	356	99	33,696
	$27,616	$34,927	$36,772	$40,866	$38,764	$40,673	$44,780	$47,207	$50,922	$54,953	$62,044	$71,748	$42,665

Distribution of Active Members by Age and by Years of Service

Hazardous Members

Attained Age	Years of Credited Service												
	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	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	141	61	29	3	1	0	0	0	0	0	0	0	235
	$26,182	$37,383	$40,726	$36,740	$33,814	$0	$0	$0	$0	$0	$0	$0	$31,052
25-29	169	132	97	88	70	81	0	0	0	0	0	0	637
	$25,107	$36,663	$39,978	$41,427	$42,344	$43,798	$0	$0	$0	$0	$0	$0	$36,292
30-34	94	67	50	60	52	192	34	0	0	0	0	0	549
	$24,387	$36,617	$39,382	$42,064	$39,846	$42,280	$45,625	$0	$0	$0	$0	$0	$38,214
35-39	37	35	31	28	30	142	183	39	1	0	0	0	526
	$24,752	$37,999	$38,943	$43,842	$40,348	$43,991	$44,318	$50,541	$45,503	$0	$0	$0	$42,328
40-44	35	33	21	23	18	92	118	113	16	0	0	0	469
	$25,606	$37,329	$38,744	$41,720	$40,269	$44,823	$46,080	$49,293	$51,343	$0	$0	$0	$43,878
45-49	32	28	25	31	24	74	115	100	34	5	0	0	468
	$26,967	$36,630	$38,901	$38,572	$39,436	$40,622	$47,949	$49,724	$53,672	$59,273	$0	$0	$44,054
50-54	22	15	20	22	19	75	92	70	16	7	1	0	359
	$21,738	$36,185	$41,367	$43,745	$39,865	$42,573	$43,117	$45,911	$54,713	$62,962	$54,115	$0	$42,652
55-59	17	15	9	15	13	62	58	48	12	3	1	1	254
	$24,727	$40,325	$36,893	$35,801	$51,025	$39,952	$47,673	$48,721	$54,158	$50,756	$53,876	$112,168	$43,726
60-64	4	2	6	6	10	39	40	38	6	2	0	0	153
	$29,609	$28,534	$44,501	$45,226	$39,398	$39,477	$42,373	$49,547	$48,062	$77,564	$0	$0	$43,586
65 & Over	0	3	1	3	1	18	18	9	0	1	1	0	55
	$0	$37,045	$32,637	$71,849	$37,988	$40,715	$43,134	$45,236	$0	$96,877	$93,179	$0	$45,523
Total	551	391	289	279	238	775	658	417	85	18	3	1	3,705
	$25,262	$37,024	$39,725	$41,752	$41,194	$42,560	$45,313	$48,815	$53,006	$63,409	$67,057	$112,168	$40,606

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	506	$ 12,354	100	$ 1,423	497	$ 5,816	1,103	$ 19,593
50 - 54	1,627	43,279	179	2,717	175	2,231	1,981	48,227
55 - 59	3,771	95,985	268	3,709	317	4,265	4,356	103,959
60 - 64	6,760	160,871	382	5,292	503	7,211	7,645	173,374
65 - 69	9,692	208,022	385	5,049	660	11,317	10,737	224,388
70 - 74	8,242	174,563	289	3,500	688	11,713	9,219	189,776
75 - 79	4,838	94,180	183	2,291	696	11,169	5,717	107,640
80 - 84	2,758	48,308	108	1,198	591	9,160	3,457	58,666
85 - 89	1,478	21,750	43	482	467	6,369	1,988	28,601
90 And Over	847	10,931	12	86	348	3,467	1,207	14,484
Total	**40,519**	**$ 870,243**	**1,949**	**$ 25,745**	**4,942**	**$ 72,718**	**47,410**	**$ 968,706**

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	282	$ 5,558	25	$ 365	60	$ 576	367	$ 6,499
50 - 54	381	7,493	24	209	21	252	426	7,954
55 - 59	527	9,727	31	345	53	561	611	10,633
60 - 64	699	12,008	31	252	44	452	774	12,712
65 - 69	830	11,977	27	231	81	984	938	13,192
70 - 74	716	9,816	13	96	70	592	799	10,504
75 - 79	290	3,262	3	11	68	632	361	3,905
80 - 84	137	1,218	7	29	34	301	178	1,548
85 - 89	39	237	1	3	25	104	65	344
90 And Over	12	159	0	0	6	75	18	234
Total	**3,913**	**$ 61,454**	**162**	**$ 1,541**	**462**	**$ 4,528**	**4,537**	**$ 67,523**

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	4,319	$ 7,740,649	12,465	$ 18,184,939	16,784	$ 25,925,588
Joint & Survivor:						
100% to Beneficiary	2,460	4,511,306	1,183	1,495,741	3,643	6,007,047
66 2/3% to Beneficiary	827	2,315,732	594	1,146,183	1,421	3,461,915
50% to Beneficiary	1,149	2,887,093	1,539	3,051,864	2,688	5,938,957
Pop-up Option	4,131	9,948,117	3,882	7,494,847	8,013	17,442,964
Social Security Option:						
Age 62 Basic	398	817,385	947	1,550,362	1,345	2,367,747
Age 62 Survivorship	776	1,549,879	607	974,546	1,383	2,524,425
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	1,710,181	2,285	3,467,023	3,269	5,177,204
15 Years Certain & Life	448	716,349	646	963,846	1,094	1,680,194
20 Years Certain & Life	440	968,550	643	1,011,012	1,083	1,979,562
Refund	0	0	0	0	0	0
Partial Lump Sum Option (PLSO):						
12 Month Basic	81	133,879	276	421,659	357	555,538
24 Month Basic	31	37,757	150	197,234	181	234,991
36 Month Basic	128	117,986	378	288,711	506	406,697
12 Month Survivor	97	204,353	101	172,917	198	377,270
24 Month Survivor	75	117,772	71	105,263	146	223,035
36 Month Survivor	209	236,029	148	126,525	357	362,554
Total:	16,553	$ 34,013,015	25,915	$ 40,652,673	42,468	$ 74,665,689

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	670	$ 761,411	532	$ 585,831	1,202	$ 1,347,242
Joint & Survivor:						
100% to Beneficiary	373	449,276	48	53,254	421	502,530
66 2/3% to Beneficiary	123	158,590	32	38,946	155	197,536
50% to Beneficiary	180	288,551	73	113,086	253	401,637
Pop-up Option	955	1,485,282	200	275,201	1,155	1,760,483
Social Security Option:						
Age 62 Basic	56	65,007	33	29,797	89	94,804
Age 62 Survivorship	137	170,568	19	16,475	156	187,043
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	51	78,847	14	17,451	65	96,298
10 Years Certain & Life	116	143,299	76	69,243	192	212,541
15 Years Certain & Life	50	65,260	25	25,079	75	90,339
20 Years Certain & Life	64	89,501	35	47,625	99	137,126
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	13	12,467	9	7,948	22	20,415
36 Month Basic	39	33,910	23	20,016	62	53,925
12 Month Survivor	20	26,786	5	4,810	25	31,596
24 Month Survivor	18	25,731	9	11,029	27	36,760
36 Month Survivor	39	39,135	15	18,695	54	57,830
Total:	2,914	$ 3,904,221	1,161	$ 1,345,364	4,075	$ 5,249,584

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	17	$ 9,432	35	$ 37,877	52	$ 47,309
Joint & Survivor:						
100% to Beneficiary	360	309,552	1,452	1,627,370	1,812	1,936,922
66 2/3% to Beneficiary	85	88,330	298	377,056	383	465,386
50% to Beneficiary	173	135,088	443	366,334	616	501,422
Pop-up Option	223	343,824	774	1,358,451	997	1,702,275
Social Security Option:						
Age 62 Basic	1	1,293	11	10,670	12	11,964
Age 62 Survivorship	74	102,249	331	575,164	405	677,413
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	2	611	2	611
5 Years Certain	32	43,527	52	46,955	84	90,483
10 Years Certain	84	75,334	98	60,753	182	136,086
10 Years Certain & Life	33	32,221	44	40,611	77	72,832
15 Years Certain & Life	16	21,553	43	44,652	59	66,205
20 Years Certain & Life	23	47,100	63	107,041	86	154,141
Refund	0	0	0	0	0	0
Partial Lump Sum Option (PLSO):						
12 Month Basic	0	0	1	1,792	1	1,792
24 Month Basic	0	0	0	0	0	0
36 Month Basic	0	0	2	3,357	2	3,357
12 Month Survivor	7	11,919	28	48,594	35	60,513
24 Month Survivor	12	17,120	28	25,361	40	42,481
36 Month Survivor	21	16,087	76	72,561	97	88,648
Total:	1,161	$ 1,254,628	3,781	$ 4,805,211	4,942	$ 6,059,839

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	15	8,098	146	106,656	161	114,754
66 2/3% to Beneficiary	0	0	20	10,715	20	10,715
50% to Beneficiary	4	2,769	33	11,654	37	14,423
Pop-up Option	15	15,130	109	113,267	124	128,397
Social Security Option:						
Age 62 Basic	0	0	1	18	1	18
Age 62 Survivorship	0	0	41	42,985	41	42,985
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	0	0	0	0
5 Years Certain	0	0	5	4,499	5	4,499
10 Years Certain	1	1,150	16	14,845	17	15,994
10 Years Certain & Life	3	967	5	3,181	8	4,148
15 Years Certain & Life	2	819	4	2,627	6	3,445
20 Years Certain & Life	1	2,658	7	6,382	8	9,040
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	3	2,912	3	2,912
24 Month Survivor	1	995	3	2,022	4	3,017
36 Month Survivor	3	1,165	14	16,150	17	17,315
Total:	47	$ 34,803	415	$ 342,521	462	$ 377,324

Schedule of Retirants Added to And Removed from Rolls

(Dollar amounts except average allowance expressed in thousands)

Year Ended	Added to Rolls	Removed from Rolls	Rolls End of the Year		% Increase in Annual Benefit	Average Annual Benefit
	Number	Number	Number	Annual Benefits		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Non-Hazardous			
2010	1,162	1,100	37,945	$ 801,882		$ 21,133
2011	1,592	940	38,597	821,197	2.4%	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
2019	2,226	1,342	47,410	968,706	1.7%	20,433
			Hazardous			
2010	282	95	2,835	$ 41,115		14,503
2011	288	59	3,064	45,609	10.9%	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
2019	227	60	4,537	67,523	5.4%	14,883

SECTION 5

ASSESSMENT AND DISCLOSURE OF RISK

Risks Associated with Measuring the Accrued Liability And Actuarially Determined Contribution

(As Required by ASOP No. 51)

The determination of KERS's accrued liability and actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. The risk measures illustrated in this section are intended to aid stakeholders in understanding the effects of future experience differing from the assumptions used in performing an actuarial valuation. These risk measures may also help with illustrating the potential volatility in the funded status and actuarially determined contributions that result from differences between actual experience and the expected experience based on the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience (economic and demographic) differing from the assumptions, changes in assumptions due to changing conditions, changes in contribution requirements due to modifications to the funding policy, and changes in the liability and cost due to changes in plan provisions or applicable law. The scope of this actuarial valuation does not include any analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the System's future financial condition include:

- Investment risk – actual investment returns may differ from expected returns;
- Longevity risk – members may live longer or shorter than expected and receive pensions for a time period different than assumed;
- Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future contributions differing from expected;
- Salary and payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liabilities or contributions differing from expected;
- Asset/Liability mismatch – changes in assets may be inconsistent with changes in liabilities, thereby altering the relative difference between the assets and liabilities which may alter the funded status and contribution requirements;
- Contribution risk – actual contributions may differ from expected future contributions (for example, actual contributions not being paid in accordance with the System's funding policy, withdrawal liability assessments or other anticipated payments to the plan are not being paid, or material changes occurring in the anticipated number of covered employees, covered payroll, or another relevant contribution base).

Effects of certain experience can generally be anticipated. For example, if investment returns since the most recent actuarial valuation is less (or more) than the assumed rate of return, then the funded status of the plan can be expected to decrease (or increase) more than anticipated.

The contribution rate in this report was established in accordance with applicable Statutes and assumptions adopted by the Board. However, stakeholders should be aware that the scheduled contribution rates specified in State Code do not necessarily guarantee that the contribution requirements will not increase in a future year.

Employer Risk with Contribution Rates

Currently KRS collects contributions from participating employers based on the employer's total payroll of employees who are earning benefits in KERS (i.e. covered payroll). The actuarially determined contribution rate is comprised of two components - the normal cost rate (to pay for the benefits accruing in the next year) and the unfunded amortization (to pay for the benefits accrued by members in previous years). The unfunded amortization is calculated by first determining the dollar amount necessary to pay for the unfunded liability based on KRS's funding policy, and then by dividing that dollar amount by expected covered payroll to convert that contribution requirement to a percentage of payroll (i.e. a contribution rate).

As the contribution requirement, as a percentage of payroll, increases then there is increased incentive for participating employers to make deliberate business action to reduce their payroll reported to the System in order to reduce their pension cost.

Plan Specific Risk Measures

Risks faced by a pension plan evolve over time. A relatively new plan with virtually no assets and paying few benefits will experience lower investment risk than a mature plan with a significant amount of assets and large number of members receiving benefits. There are a few measures that can assist stakeholders in understanding and comparing the maturity of a plan to other systems, which include:

- Ratio of market value of assets to payroll: The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. If assets are approximately the same as covered payroll, an investment return that is 5% different than assumed would equal 5% of payroll. In another example, if the assets are approximately twice as large as covered payroll, an investment return that is 5% different than assumed would equal 10% of payroll. A ratio that increases over time generally indicates the potential of an increasing volatility in employer contribution rates as a percentage of payroll.
- Ratio of actuarial accrued liability to payroll: The ratio of actuarial accrued liability to payroll can be used as a measure to indicate the potential volatility of contributions due to volatility in the liability experience. For instance, if the actuarial accrued liability is 5 times the size of the covered payroll, then a change in the liability that is 2% different than expected would be a change in magnitude that is 10% of payroll. A ratio that increases over time generally indicates the potential of an increasing volatility in employer contribution rates as a percentage of payroll.
- Percentage of Expected Contributions Actually Received: This measure identifies the percentage difference between the contributions the fund expects to receive during the fiscal year to and actual contributions received by the fund during the fiscal year. A percentage that is less than 100% means that actual contributions the fund received were less than the expected contributions determined by a prior actuarial valuation. On the other hand, a percentage that is greater than 100% means that actual contributions the fund received were more than the expected contributions.

- Ratio of active to retired members: A relatively mature open plan is likely to have close to the same number of actives to retirees resulting in a ratio that is around 1.0. On the other hand, a super-mature plan, or a plan that is closed to new entrants will have more retirees than active members resulting in a ratio below 1.0. As this ratio declines, a larger portion of the total actuarial accrued liability in the System is attributable to retirees. This metric also typically moves in tandem with the liability to payroll metric, which provides an indication of potential contribution volatility.

The following tables provide a summary of these measures for KERS Non-Hazardous and Hazardous Funds for the current year and the prior four years so stakeholders can identify how these measures are trending. While ASOP No. 51 requires this disclosure with respect to only the retirement funds, we have included this information for the insurance funds for completeness.

KERS Non-Hazardous

	Retirement Fund					Insurance Fund				
	June 30,					June 30,				
	2019	2018	2017	2016	2015	2019	2018	2017	2016	2015
Ratio of the market value of assets to total payroll	1.55	1.36	1.34	1.28	1.49	0.69	0.61	0.53	0.45	0.45
Ratio of actuarial accrued liability to payroll	11.45	10.65	10.18	8.65	8.00	1.90	1.66	1.75	1.61	1.56
Ratio of net cash flow to market value of assets	5.2%	-9.8%	-5.5%	-17.0%	-12.9%	5.8%	1.1%	3.3%	1.6%	2.1%
Percentage of Expected Contribution Actually Received	91% [1]	93%	104%	95%	102%	95% [1]	99%	100%	106%	101%
Ratio of actives to retirees and beneficiaries	0.71	0.76	0.83	0.86	0.92					

[1] Expected contribution for FYE2019 based on the actuarially determined contribution rate of 83.43% from the June 30, 2017 valuation and expected compensation based on census data from the June 30, 2018 valuation

KERS Hazardous

	Retirement Fund					Insurance Fund				
	June 30,					June 30,				
	2019	2018	2017	2016	2015	2019	2018	2017	2016	2015
Ratio of the market value of assets to total payroll	4.53	4.08	3.70	3.56	4.28	3.55	3.28	3.01	2.99	3.43
Ratio of actuarial accrued liability to payroll	8.15	7.28	6.90	6.35	6.96	2.84	2.49	2.58	2.56	2.91
Ratio of net cash flow to market value of assets	-0.1%	-1.2%	1.0%	-4.5%	-3.3%	-2.5%	-2.4%	-2.3%	0.0%	-0.4%
Percentage of Expected Contribution Actually Received	102% [1]	95%	116%	103%	129%	96% [1]	190%	111%	166%	105%
Ratio of actives to retirees and beneficiaries	0.82	0.90	0.99	1.00	1.03					

[1] Expected contribution for FYE2019 based on the actuarially determined contribution rate of 36.85% from the June 30, 2017 valuation and expected compensation based on census data from the June 30, 2018 valuation

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, 2018 and adopted by the Board in April 2019.

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%

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

Assumed annual rate of 0.00%

Rates of Annual Salary Increase:

Assumed rates of annual salary increases are shown below.

Service Years	Annual Rates of Salary					
	Merit & Seniority		Price Inflation & Productivity		Total Increase	
	Non-Hazardous	Hazardous	Non-Hazardous	Hazardous	Non-Hazardous	Hazardous
0	12.00%	16.50%	3.30%	3.55%	15.30%	20.05%
1	3.50%	4.00%	3.30%	3.55%	6.80%	7.55%
2	2.75%	3.00%	3.30%	3.55%	6.05%	6.55%
3	2.50%	3.00%	3.30%	3.55%	5.80%	6.55%
4	2.00%	2.00%	3.30%	3.55%	5.30%	5.55%
5	1.50%	1.50%	3.30%	3.55%	4.80%	5.05%
6	1.25%	1.00%	3.30%	3.55%	4.55%	4.55%
7	1.00%	0.50%	3.30%	3.55%	4.30%	4.05%
8	0.75%	0.50%	3.30%	3.55%	4.05%	4.05%
9	0.50%	0.00%	3.30%	3.55%	3.80%	3.55%
10	0.50%	0.00%	3.30%	3.55%	3.80%	3.55%
11 & Over	0.00%	0.00%	3.30%	3.55%	3.30%	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			
	Normal Retirement		Early Retirement[1]			Members participating before 9/1/2008[2]		Members participating between 9/1/2008 and 1/1/2014[3]	Members participating after 1/1/2014[3]
Age	Male	Female	Male	Female	Service	Age 55-61	Age 62+		
Under 45	20.0%	33.0%			5	10.0%	35.0%		
45	21.0%	33.0%			6	10.0%	35.0%		
46	22.0%	33.0%			7	10.0%	35.0%		
47	23.0%	33.0%			8	10.0%	35.0%		
48	24.0%	33.0%			9	10.0%	35.0%		
49	25.0%	33.0%			10	10.0%	35.0%		
50	26.0%	33.0%			11	10.0%	35.0%		
51	27.0%	33.0%			12	10.0%	35.0%		
52	28.0%	33.0%			13	10.0%	35.0%		
53	29.0%	33.0%			14	10.0%	35.0%		
54	30.0%	33.0%			15	10.0%	35.0%		
55	30.0%	33.0%	5.0%	5.0%	16	10.0%	35.0%		
56	30.0%	33.0%	5.0%	5.0%	17	10.0%	35.0%		
57	30.0%	33.0%	5.0%	5.0%	18	10.0%	35.0%		
58	30.0%	33.0%	5.0%	5.0%	19	10.0%	35.0%		
59	30.0%	33.0%	5.0%	5.0%	20	50.0%	50.0%		
60	30.0%	33.0%	5.0%	8.0%	21	32.0%	32.0%		
61	30.0%	33.0%	8.0%	9.0%	22	32.0%	32.0%		
62	35.0%	35.0%	15.0%	20.0%	23	32.0%	32.0%		
63	30.0%	33.0%	15.0%	18.0%	24	32.0%	32.0%		
64	30.0%	33.0%	15.0%	16.0%	25	32.0%	32.0%	25.6%	16.0%
65	30.0%	33.0%			26	32.0%	32.0%	25.6%	16.0%
66	30.0%	33.0%			27	32.0%	32.0%	25.6%	16.0%
67	30.0%	33.0%			28	32.0%	32.0%	25.6%	16.0%
68	30.0%	33.0%			29	32.0%	32.0%	25.6%	16.0%
69	30.0%	33.0%			30+	32.0%	32.0%	25.6%	100.0%
70	30.0%	33.0%							
71	30.0%	33.0%							
72	30.0%	33.0%							
73	30.0%	33.0%							
74	30.0%	33.0%							
75	100.0%	100.0%							

[1] *The annual rate of retirement is 12% for male members and 14% for female members with 25-26 years of service.*

[2] *The annual rate of retirement is 100% at age 65.*

[3] *The annual rate of retirement is 100% at age 60.*

Non-Hazardous System: For members hired after 7/1/2003, the rates shown above are multiplied by 80% if the member is under age 65 to reflect the different retiree health insurance benefit.

Hazardous System: For members hired after 7/1/2003 and prior to 9/1/2008, the rates shown above are multiplied by 80% if the member is under age 65 to reflect the different retiree health insurance benefit.

Disability rates:

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

Age	Non-Hazardous		Hazardous	
	Male	Female	Male	Female
20	0.03%	0.03%	0.05%	0.05%
30	0.06%	0.06%	0.08%	0.08%
40	0.12%	0.12%	0.18%	0.18%
50	0.34%	0.34%	0.50%	0.50%
60	0.88%	0.88%	1.32%	1.32%

Withdrawal rates (for causes other than disability and retirement):

Assumed annual rates of withdrawal are shown below and include pre-retirement mortality rates as described on the next page.

Service Years	Annual Rates of Withdrawal	
	Non-Hazardous	Hazardous
1	20.00%	25.00%
2	16.45%	19.68%
3	13.39%	15.12%
4	11.61%	12.45%
5	10.34%	10.56%
6	9.35%	9.09%
7	8.55%	7.89%
8	7.87%	6.87%
9	7.28%	5.99%
10	6.76%	5.22%
11	6.30%	4.53%
12	5.88%	3.90%
13	5.49%	3.33%
14	5.14%	2.80%
15	4.81%	2.31%
16	4.51%	1.86%
17	4.22%	1.43%
18	3.96%	1.03%
19	3.70%	0.66%
20	3.47%	0.30%
21	3.24%	0.00%
22	3.02%	0.00%
23	2.82%	0.00%
24	2.62%	0.00%
25	2.43%	0.00%
26 & Over	0.00%	0.00%

Mortality Assumption:

Pre-retirement mortality: PUB-2010 General Mortality table, for the Non-Hazardous System, and the PUB-2010 Public Safety Mortality table for the Hazardous System, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2010.

Post-retirement mortality (non-disabled): System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from MP-2014 mortality improvement scale using a base year of 2019.

The following table provides the life expectancy for a non-disabled retiree in future years based on the assumption with full generational projection:

Life Expectancy for an Age 65 Retiree in Years					
Gender	**Year of Retirement**				
	2020	**2025**	**2030**	**2035**	**2040**
Male	21.0	21.4	21.8	22.2	22.6
Female	24.0	24.4	24.8	25.2	25.6

Post-retirement mortality (disabled): PUB-2010 Disabled Mortality table, with a 4-year set-forward for both male and female rates, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2010.

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

Non-Hazardous: 2% of disabilities are assumed to occur in the line of duty

Hazardous: 10% 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 or disability 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]
2021	6.25%	5.50%	1.50%
2022	6.25%	5.40%	1.50%
2023	6.25%	5.30%	1.50%
2024	6.00%	5.20%	1.50%
2025	5.80%	5.10%	1.50%
2026	5.60%	5.00%	1.50%
2027	5.40%	4.90%	1.50%
2028	5.20%	4.80%	1.50%
2029	5.00%	4.70%	1.50%
2030	4.80%	4.60%	1.50%
2031	4.60%	4.50%	1.50%
2032	4.40%	4.40%	1.50%
2033	4.20%	4.30%	1.50%
2034	4.05%	4.20%	1.50%
2035 & Beyond	4.05%	4.05%	1.50%

[1]All increases are assumed to occur on January 1. The 2020 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 – 2035

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:

- Active 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 after 7/1/2003
Under 10	50%	100%
10-14	75%	100%
15-19	90%	100%
Over 20	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	85%

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

Health Care Participation Assumptions (continued):

- 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 receiving insurance benefits from the non-hazardous fund are assumed to begin health coverage at age 55 for members participating before September 1, 2008, at age 60 for members participating on or after September 1, 2008 but before January 1, 2014, and at age 65 for members participating on or after January 1, 2014.

- Deferred vested members receiving insurance benefits from the hazardous fund are assumed to begin health coverage at age 50 for members participating before January 1, 2014 and at age 60 for members participating on or after January 1, 2014.

- 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 0.9%. 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.

Other Assumptions

1. Valuation payroll (used for determining the amortization contribution rate): Current fiscal year payroll.

2. Individual salaries used to project benefits: For salary amounts prior to the valuation date, the salary from the last fiscal year is projected backward with the valuation salary scale assumption. For future salaries, the salary from the last fiscal year is projected forward with one year's salary scale.

3. Pay increase timing: Beginning of (fiscal) year. This is equivalent to assuming that reported salaries represent amounts paid to members during the year ending on the valuation date.

4. Current active members that terminated employment (for reasons other than retirement, disability, or death) are assumed to commence their retirement benefits at first unreduced retirement eligibility. Members are assumed to elect a refund of member contributions if the value of their account balance exceeds the present value of the deferred benefit. Members participating in the Cash Balance plan are assumed to elect to receive a lump sum of their cash balance account if their account balance exceeds the present value of the deferred benefit and the member is not eligible for insurance benefits at termination.

5. The beneficiaries of current active members that die while active are assumed to commence their survivor benefits at the member's first unreduced retirement eligibility. Beneficiaries are assumed to elect a refund of member contributions if the value of the member's account balance exceeds the present value of the survivor benefit. Beneficiaries of active members that die while in the line of duty are assumed to commence their survivor benefits immediately at the death of the member.

6. There will be no recoveries once disabled.

7. Cash Balance Provisions: The cash balance interest crediting rate while a member is an active employee is assumed to equal 4.9375% (based upon the 5.25% assumed investment return) for the Non-Hazardous Fund and 5.6875% (based upon the 6.25% assumed investment return) for the Hazardous Fund. The interest crediting rate after a member terminates employment is 4% for all plans.

8. Decrement timing: Decrements of all types are assumed to occur mid-year. Decrement rates are used as described in this report, without adjustment for multiple decrement table effects.

9. Service: All members are assumed to accrue 1 year of benefit and eligibility service each year.

10. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.

11. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.

12. Current Inactive Population (Retirement Funds): All non-vested members are assumed to take an immediate refund of member contributions. Vested members are assumed to elect an immediate refund of member contributions at the valuation date if the value of their account balance exceeds the present value of their deferred benefit. Non-hazardous members are assumed to retire at age 65. Hazardous members hired prior to September 1, 2008 are assumed to retire at age 55 and hazardous members hired on or after September 1, 2008 are assumed to retire at age 60.

Participant Data

Participant data was supplied in electronic text files. There were separate files for (i) active and inactive members, and (ii) members and beneficiaries receiving benefits.

The data for active and terminated members included date of birth, gender, date of participation, benefit tier indicator, service with the current system, total vesting service, salary, employee contribution account balances, and employer pay credits for members participating in the cash balance plan. For retired members and beneficiaries, the data included date of birth, gender, spouse's date of birth (where applicable), amount of monthly benefit, date of retirement, and form of payment code.

Assumptions were made to correct for missing, bad, or inconsistent data. These had no material impact on the results presented.

Changes in assumptions since the prior valuation:

- Annual salary increases were updated based on the 2018 Experience Study
- Annual rates of retirement, disability, withdrawal, and mortality were updated based on the 2018 Experience Study
- The percent of disabilities assumed to occur in the line of duty was updated from 0% to 2% for non-hazardous members and 10% for hazardous members
- The assumed increase in future health care costs, or trend assumption, is reviewed on an annual basis and was updated (i.e. increased) to better reflect more current expectations relating to anticipated future increases in the medical costs for post-age 65 retirees.
- The assumed impact of the Cadillac Tax was changed from a 3.6% to a 0.9% load on employer paid premiums for Non-Medicare retirees who became participants prior to July 1, 2003.

Development of Baseline Claims Cost

For non-Medicare retirees, the initial per capita costs were based on the plan premiums effective January 1, 2020, 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 $870.41 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.

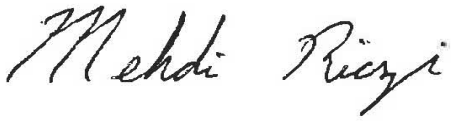
For those not eligible for Medicare		
Age	Member	Spouse/Dependents
<65	$728.75	$870.41

For Medicare retirees, the initial per capita costs were estimated based on the plan premiums effective January 1, 2020, 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	$207.21	$195.44
75	242.43	236.56
85	256.36	259.38

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, 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 65 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 the final monthly 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 monthly average pay for two children, or 75% of final monthly 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

- House Bill 1 passed during the 2019 Special Legislative Session and allows certain employers in the Non-Hazardous plan to elect to cease participating in the System as of June 30, 2020 under different provisions than were previously in statute.

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 monthly average pay. Each dependent child will receive 10% of the final monthly 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

There have been no changes to benefit provisions since the prior valuation.

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, 2019, the Non-Hazardous monthly contribution was $13.58/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, 2019, the Hazardous monthly contribution was $20.37/year of service. Upon the retiree's death, the surviving spouse of a hazardous duty member will receive a monthly contribution of $10 ($13.58 as of July 1, 2019) 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, 2020

Non-Medicare Plan Options					
Plan Option	Single	Parent Plus	Couple	Family	Family X-Ref
LivingWell PPO*	$731.82	$1,044.12	$1,604.96	$1,787.46	$881.40
LivingWell CDHP	710.94	982.30	1,342.78	1,500.50	821.36
LivingWell Basic	683.58	942.52	1,457.82	1,624.66	801.82
Living Well Limited	608.24	866.76	1,334.18	1,485.46	731.68

Medicare Plan Options	
Kentucky Retirement Systems - Medical Only Plan	$176.26
Kentucky Retirement Systems – Medicare Advantage/Essential Plan	63.15
Kentucky Retirement Systems – Medicare Advantage/Premium Plan*	250.75

*For 2020, 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, 2019.

Non-Hazardous Service	Hazardous Service
$13.58	$20.37

Changes since the Prior Valuation

There have been no changes to benefit provisions since the prior valuation.

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, 2019

GRS Retirement Consulting

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

December 5, 2019

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

Subject: Actuarial Valuation as of June 30, 2019

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, 2021, 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 Systems (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 2019 actuarial valuation is 24 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, 2019 actuarial valuation will be used by the Board to certify the participating employers' contribution rates for the fiscal year beginning July 1, 2020 and ending June 30, 2021.

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

The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. An experience study was conducted after the June 30, 2018 actuarial valuation and the Board adopted updated assumptions for use in this actuarial valuation. The principle updated assumptions include:

- Change in the rates of salary increases for individuals.
- New post-retirement mortality assumption based on KRS retiree experience and the inclusion of an explicit assumption for future improvement in mortality.
- Updated mortality assumptions for members during employment and for disabled retirees.
- Change in the rates of retirements.
- Change in the rates that an active member is assumed to become an inactive member in the System prior to retirement.
- Updated rates of disability incidence.

The experience study included a review of several economic assumptions which encompassed the rate of inflation, the investment return assumption, and the payroll growth assumption. However, those assumptions remain unchanged from the prior actuarial valuation.

The assumed increase in future health care costs, or trend assumption, is reviewed on an annual basis and was updated (i.e. increased) since the June 30, 2018 valuation to better reflect more current expectations relating to anticipated future increases in the medical costs for post-age 65 retirees.

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, 2019. There were no benefit changes since the prior valuation.

DATA

Member data for retired, active and inactive members was supplied as of June 30, 2019, by the KRS staff. The staff also supplied asset information as of June 30, 2019. 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

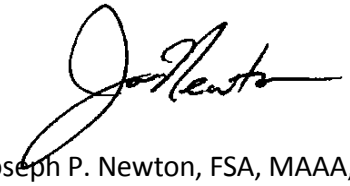
We certify that the information presented herein is accurate and fairly portrays the actuarial position of CERS as of June 30, 2019.

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.

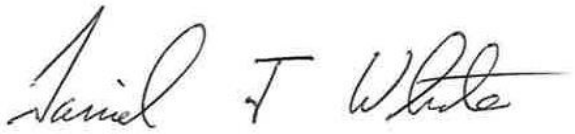
The undersigned are independent actuaries and consultants. Mr. Newton and Mr. White are Enrolled Actuaries. All three of the undersigned are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries. All of the undersigned are experienced in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

Sincerely,

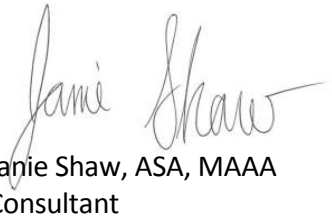
Gabriel, Roeder, Smith & Co.



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



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



Janie Shaw, ASA, MAAA
Consultant

Table of Contents

SECTION 1

EXECUTIVE SUMMARY

Summary of Principal Results

(Dollar amounts expressed in thousands)

	Non-Hazardous		Hazardous		Total	
	June 30, 2019	June 30, 2018	June 30, 2019	June 30, 2018	June 30, 2019	June 30, 2018
Actuarially Determined Contribution:						
Retirement	26.21%	22.52%	46.31%	36.98%		
Insurance	5.78%	4.76%	10.47%	9.52%		
Total	31.99%	27.28%	56.78%	46.50%	N/A	N/A
Contribution Rate for Next Fiscal Year[1]	26.95%	24.06%	44.33%	39.58%		
Assets:						
Retirement						
• Actuarial value (AVAR)	$7,049,527	$6,950,225	$2,375,106	$2,321,721	$9,424,633	$9,271,946
• Market value (MVAR)	$7,159,921	$7,018,963	$2,413,708	$2,348,337	$9,573,629	$9,367,300
• Ratio of actuarial to market value of assets	98.5%	99.0%	98.4%	98.9%	98.4%	99.0%
Insurance						
• Actuarial value (AVAI)	$2,523,249	$2,371,430	$1,313,659	$1,256,306	$3,836,908	$3,627,736
• Market value (MVAI)	$2,569,511	$2,414,126	$1,340,714	$1,280,982	$3,910,225	$3,695,108
• Ratio of actuarial to market value of assets	98.2%	98.2%	98.0%	98.1%	98.1%	98.2%
Funded Status:						
Retirement						
• Actuarial accrued liability	$14,356,113	$13,191,505	$5,245,365	$4,792,548	$19,601,478	$17,984,053
• Unfunded accrued liability on AVAR	$7,306,586	$6,241,280	$2,870,259	$2,470,827	$10,176,845	$8,712,107
• Funded ratio on AVAR	49.1%	52.7%	45.3%	48.4%	48.1%	51.6%
• Unfunded accrued liability on MVAR	$7,196,192	$6,172,542	$2,831,657	$2,444,211	$10,027,849	$8,616,753
• Funded ratio on MVAR	49.9%	53.2%	46.0%	49.0%	48.8%	52.1%
Insurance						
• Actuarial accrued liability	$3,567,947	$3,092,624	$1,732,879	$1,684,028	$5,300,826	$4,776,652
• Unfunded accrued liability on AVAI	$1,044,698	$721,194	$419,220	$427,722	$1,463,918	$1,148,916
• Funded ratio on AVAI	70.7%	76.7%	75.8%	74.6%	72.4%	75.9%
• Unfunded accrued liability on MVAI	$998,436	$678,498	$392,165	$403,046	$1,390,601	$1,081,544
• Funded ratio on MVAI	72.0%	78.1%	77.4%	76.1%	73.8%	77.4%
Membership:						
• Number of						
- Active Members	81,506	81,818	9,474	9,263	90,980	91,081
- Retirees and Beneficiaries	64,539	61,938	10,023	9,587	74,562	71,525
- Inactive Members	91,543	87,160	3,422	3,067	94,965	90,227
- Total	237,588	230,916	22,919	21,917	260,507	252,833
• Projected payroll of active members	$2,521,860	$2,466,801	$559,353	$533,618	$3,081,213	$3,000,419
• Average salary of active members	$30,941	$30,150	$59,041	$57,607	$33,867	$32,942

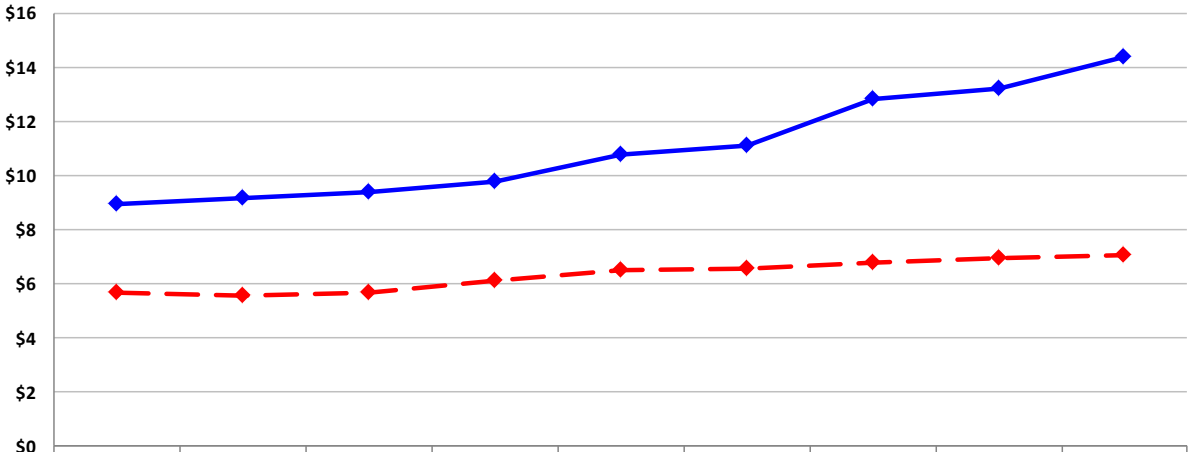
[1] Contribution rates limited to a 12% increase in the certified contribution rates from the prior fiscal year in accordance with House Bill 362 (2018 legislative session).

Executive Summary (Continued)

Non-Hazardous Retirement Fund

The unfunded actuarial accrued liability of the non-hazardous retirement system increased by $1,065 million since the prior year's valuation to $7.3 billion. The largest source of this increase is due to a $729 million increase in the liability due to the updated assumptions. 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 nine years has generally been due to a combination of: (1) contributions that were insufficient to amortize the unfunded actuarial accrued liability, (2) a decrease in the assumed rate of return in 2015 and again in 2017, and (3) the actual investment experience being less than the fund's expected investment return assumption.

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



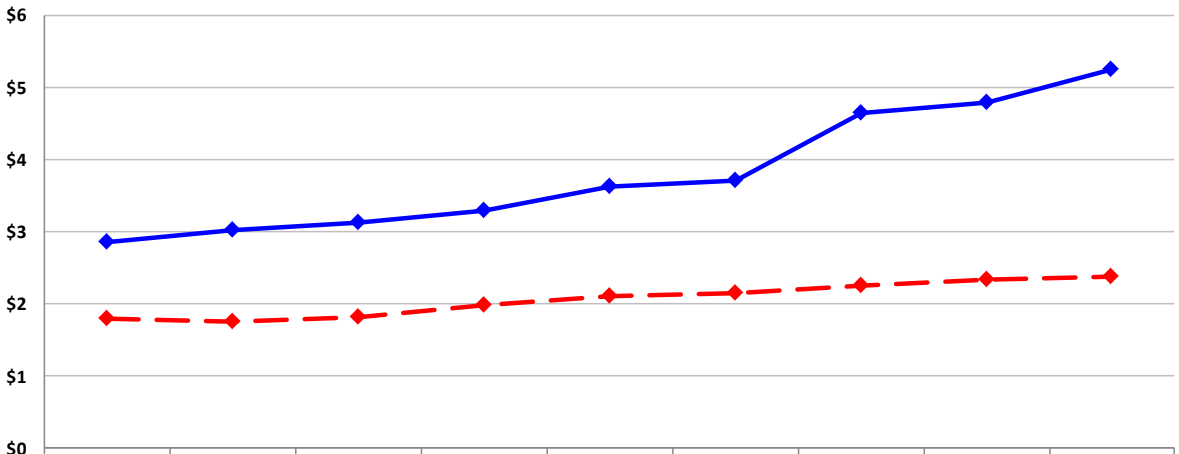
	2011	2012	2013	2014	2015	2016	2017	2018	2019
AAL	8.9	9.1	9.4	9.8	10.7	11.1	12.8	13.2	14.4
AVA	5.6	5.5	5.6	6.1	6.5	6.5	6.8	7.0	7.0

Executive Summary (Continued)

Hazardous Retirement Fund

The unfunded actuarial accrued liability of the hazardous retirement system increased by $399 million since the prior year's valuation to $2.9 billion. The largest source of this increase is due to a $273 million increase in the liability due to the updated assumptions. 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 nine years has generally been due to a combination of (1) contributions that were insufficient to amortize the unfunded actuarial accrued liability, (2) a decrease in the assumed rate of return in 2015 and again in 2017, and (3) the actual investment experience being less than the fund's expected investment return assumption.

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



	2011	2012	2013	2014	2015	2016	2017	2018	2019
AAL	2.9	3.0	3.1	3.3	3.6	3.7	4.6	4.8	5.2
AVA	1.8	1.7	1.8	2.0	2.1	2.1	2.2	2.3	2.4

Executive Summary (Continued)

Summary of Change in Financial Condition of the Insurance Funds

The non-Medicare premiums were lower than expected and the Medicare premiums were higher than expected from calendar year 2019 to 2020. Specifically, the non-Medicare premiums were expected to increase by 7.00% from calendar year 2019 to calendar year 2020 (i.e. the medical trend assumption for non-Medicare premiums used in the actuarial valuation) and the actual average premiums were relatively level. Also, the Medicare premiums were expected to increase by 5.00% from calendar year 2019 to calendar year 2020 (i.e. the medical trend assumption used in the actuarial valuation for Medicare premium) and the actual average premiums increased by 13%. The favorable non-Medicare premium experience offset most of the actuarial loss that resulted from the new Medicare premiums. In fact, the overall premium experience resulted in a small actuarial gain for the hazardous plan which has younger retirees.

Non-Hazardous Insurance Fund

Since the prior year's valuation, the unfunded actuarial accrued liability of the non-hazardous insurance fund increased by $324 million since the prior year's valuation to $1,045 million. The largest source of this increase is due to a $174 million increase in the liability due to the updated actuarial assumptions adopted by the Board as a result of the experience study. The corresponding funded ratio decreased from 76.7% at June 30, 2018 to 70.7% at June 30, 2019.

Hazardous Insurance Fund

Since the prior year's valuation, the unfunded actuarial accrued liability of the hazardous insurance fund decreased by $9 million since the prior year's valuation to $419 million. The largest source of this decrease is due to a $45 million increase in the liability due to the updated actuarial assumptions adopted by the Board as a result of the experience study, which was offset by a $50 million decrease due to the premium experience described above plus other favorable demographic experience. The corresponding funded ratio increased from 74.6% at June 30, 2018 to 75.8% at June 30, 2019.

SECTION 2

DISCUSSION

Discussion

The County Employees Retirement System (CERS) is a cost-sharing, multiple-employer defined benefit pension fund that provides pensions and health care coverage for regular full-time members employed by positions of each participating county, city, and school board, and any additional eligible local agencies electing to participate in CERS. CERS includes both non-hazardous and hazardous duty benefits. This report presents the result of the June 30, 2019 actuarial funding valuation for both the Retirement Funds and Insurance Funds.

The primary purposes of the valuation report are to depict the current financial condition of the Funds and analyze changes in the Fund's financial condition. In addition, the report provides various summaries of the data.

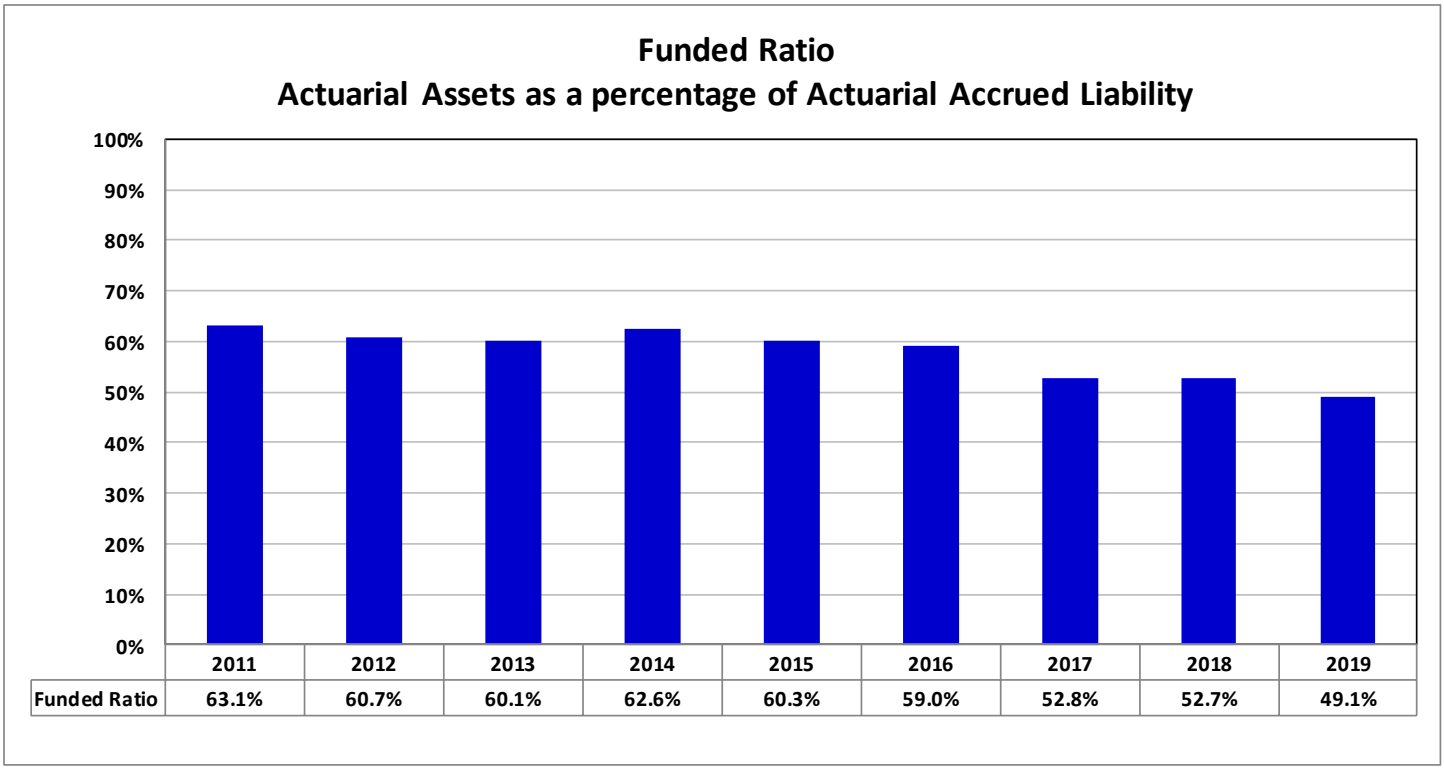
The actuarially determined contribution rates consist of two components: a normal cost rate and an amortization cost to finance the unfunded actuarial accrued liability. The normal cost rate is the theoretical amount which would be required to pay the members' benefits, based on the current plan provisions, 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 that it should cost to provide the benefits for an average 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. Section 5 provides a discussion of various risk measures, which are intended to aid stakeholders in understanding the effects of future experience differing from the assumptions used in performing an actuarial valuation. This section was added to the report this year in compliance with the newly adopted Actuarial Standards of Practice. Appendices A and B provide summaries of the principle actuarial assumptions and methods and plan provisions. Finally, Appendix C provides a glossary of technical terms that are used throughout this report.

Funding Progress

The following charts provide a nine-year history of the retirement 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 nine years has generally been due to (1) actual contributions being insufficient to finance the unfunded actuarial accrued liability, (2) a decrease in the assumed rate of return in 2015 and again in 2017, and (3) actual investment experience being less than the investment return assumption.

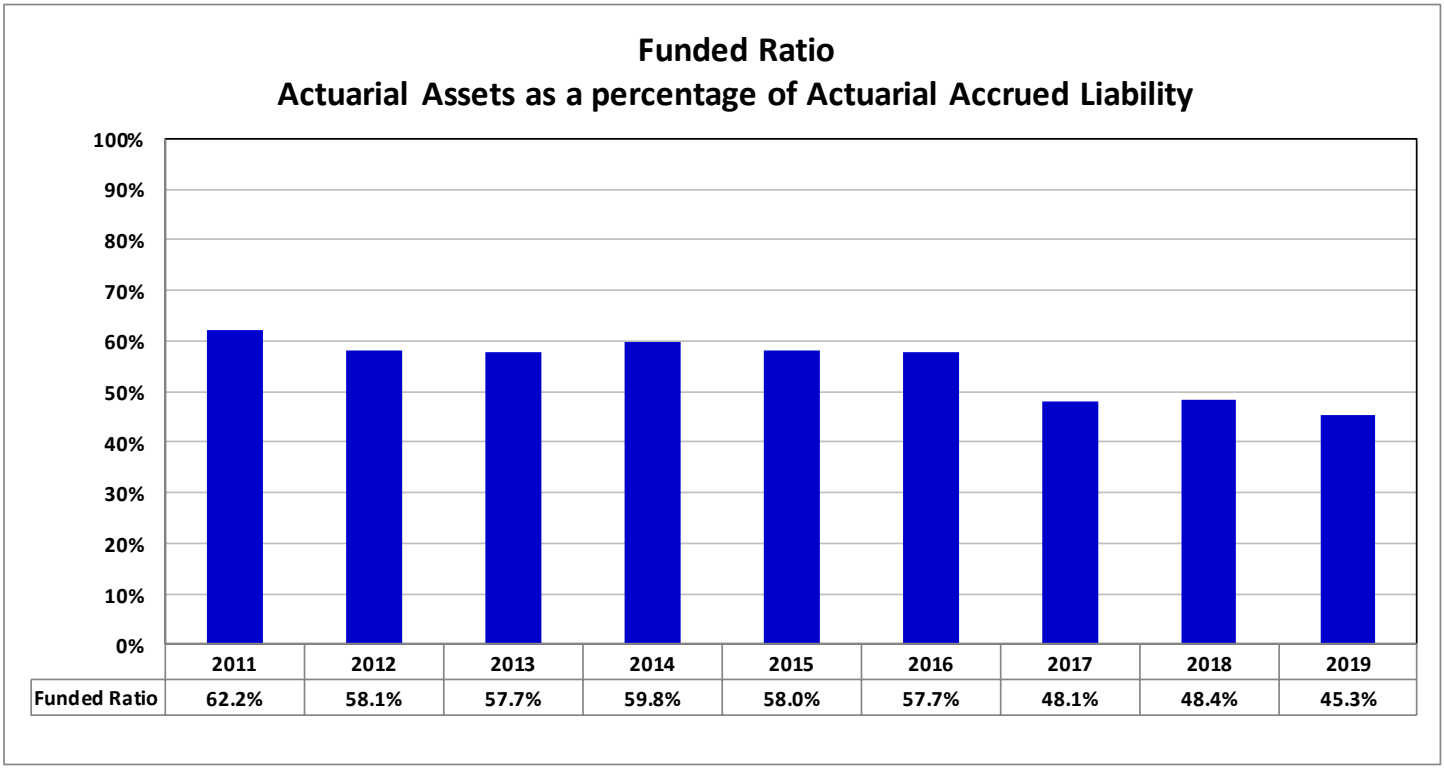
Non-Hazardous Retirement Fund



	2011	2012	2013	2014	2015	2016	2017	2018	2019
Funded Ratio	63.1%	60.7%	60.1%	62.6%	60.3%	59.0%	52.8%	52.7%	49.1%

Funding Progress (Continued)

Hazardous Retirement Fund



	2011	2012	2013	2014	2015	2016	2017	2018	2019
Funded Ratio	62.2%	58.1%	57.7%	59.8%	58.0%	57.7%	48.1%	48.4%	45.3%

Assuming the actuarial determined contributions are actually paid in future years and absent future unfavorable experience we expect the funded ratio to begin improving once the full actuarially determined contribution rates have been completely phased-in. Also, once the phase-in is complete, 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 begin decreasing. Table 9, Schedule of Funding Progress, in the following section of the report provides additional detail regarding the funding progress of the Retirement Funds.

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 $6.950 billion to $7.050 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 for the non-hazardous retirement fund on a dollar-weighted basis for fiscal year 2019 was a 5.7% which is less than the 6.25% expected annual return. The return on an actuarial (smoothed) asset value was 5.1%, which resulted in a $78 million 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 $110 million greater than the actuarial value of assets, which signifies that the retirement fund is in a position of deferred gains to be realized in future years.

Likewise, the actuarial value of assets for the hazardous retirement fund increased from $2.322 billion to $2.375 billion since the prior valuation. The rate of return on the market value of assets on a dollar-weighted basis for fiscal year 2019 was a 5.7% which is less than the 6.25% expected annual return. The return on an actuarial (smoothed) asset value was 5.3%, which resulted in a $23 million loss for the fiscal year. The market value of assets is $39 million greater than the actuarial value of assets, which signifies that the retirement fund is in a position of deferred 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 Systems 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 a 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 / (losses) 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	$ 6,241,280	$ 2,470,827
2. Normal cost and administrative expenses	266,415	76,574
3. Less: contributions for the year	(552,561)	(196,727)
4. Interest accrual	381,138	150,672
5. Expected UAAL (Sum of Items 1 - 4)	$ 6,336,272	$ 2,501,346
6. Actual UAAL as of June 30,2019	$ 7,306,586	$ 2,870,259
7. Total gain (loss) for the year (Item 5 - Item 6)	$ (970,314)	$ (368,913)
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ (77,578)	$ (22,771)
9. Liability experience gain (loss) for the year	(163,429)	(72,909)
10. Plan Change	—	—
11. Assumption change	(729,307)	(273,233)
12. Total	$ (970,314)	$ (368,913)

Of the $970 million and $369 million in actuarial losses experienced by the non-hazardous and hazardous retirement funds, respectively, $729 million and $273 million were due to the increases in liability resulting from the assumption changes reflected as a result of the experience study as of June 30, 2018.

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	$ 721,194	$ 427,722
2. Normal cost and administrative expenses	81,842	25,619
3. Less: contributions for the year	(151,466)	(64,735)
4. Interest accrual	42,899	25,510
5. Expected UAAL (Sum of Items 1 - 4)	$ 694,469	$ 414,116
6. Actual UAAL as of June 30,2019	$ 1,044,698	$ 419,220
7. Total gain (loss) for the year (Item 5 - Item 6)	$ (350,229)	$ (5,104)
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ (14,747)	$ (7,157)
9. Liability experience gain (loss) for the year	(86,733)	49,543
10. Plan Change	—	—
11. Assumption change	(248,749)	(47,490)
12. Total	$ (350,229)	$ (5,104)

Of the $350 million and $5.1 million in actuarial losses experienced by the non-hazardous and hazardous insurance funds, respectively, $249 million and $47 million were due to the increases in liability resulting from the assumption changes reflected as a result of the experience study as of June 30, 2018 and the updated trend assumption. Additionally, the non-hazardous insurance fund's liability increased by $87 million due to the premium experience ($79 million) and other demographic experience ($8 million). The hazardous insurance fund's liability decreased by $50 million due to the premium experience ($27 million) and other demographic experience ($23 million).

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. The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. An experience study was conducted after the June 30, 2018 actuarial valuation and the Board adopted updated assumptions for use in this actuarial valuation. The principle updated assumptions include:

- Change in the rates of salary increases for individuals.
- New post-retirement mortality assumption based on KRS retiree experience and the inclusion of an explicit assumption for future improvement in mortality.
- Updated mortality assumptions for members during employment and for disabled retirees.
- Change in the rates of retirements.
- Change in the rates that an active member is assumed to become an inactive member in the System prior to retirement.
- Updated rates of disability incidence.

The experience study included a review of several economic assumptions which included the rate of inflation, the investment return assumption, and the payroll growth assumption. However, those assumptions remain unchanged from the prior actuarial valuation.

The assumed increase in future health care costs, or trend assumption, is reviewed on an annual basis and was updated (i.e. increased) since the June 30, 2018 valuation to better reflect more current expectations relating to anticipated future increases in the medical costs for post-age 65 retirees.

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.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. This report does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

Benefit Provisions

Appendix B of this report includes a summary of the benefit provisions for CERS. There were not any changes in benefits since the prior valuation.

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, 2019	
		Non-Hazardous (1)	Hazardous (2)
1.	Projected payroll of active members	$ 2,521,860	$ 559,353
2.	Present value of future pay	$ 19,454,837	$ 4,712,053
3.	Normal cost rate		
	a. Total normal cost rate	10.77%	19.05%
	b. Less: member contribution rate	-5.00%	-8.00%
	c. Employer normal cost rate	5.77%	11.05%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 7,429,476	$ 2,685,330
	b. Less: present value of future normal costs	(1,978,907)	(839,919)
	c. Actuarial accrued liability	$ 5,450,569	$ 1,845,411
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 8,350,811	$ 3,334,535
	b. Inactive members	554,733	65,419
	c. Active members (Item 4c)	5,450,569	1,845,411
	d. Total	$ 14,356,113	$ 5,245,365
6.	Actuarial value of assets	$ 7,049,527	$ 2,375,106
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 7,306,586	$ 2,870,259
8.	Funded Ratio	49.1%	45.3%

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

		June 30, 2019	
		Non-Hazardous (1)	Hazardous (2)
1.	Active members		
	a. Service retirement	$ 6,573,827	$ 2,455,820
	b. Deferred termination benefits and refunds	419,710	96,762
	c. Survivor benefits	127,137	21,715
	d. Disability benefits	308,802	111,033
	e. Total	$ 7,429,476	$ 2,685,330
2.	Retired members		
	a. Service retirement	$ 7,369,020	$ 3,031,901
	b. Disability retirement	497,810	116,272
	c. Beneficiaries	483,981	186,362
	d. Total	$ 8,350,811	$ 3,334,535
3.	Inactive members		
	a. Vested terminations	$ 504,951	$ 59,235
	b. Nonvested terminations	49,782	6,184
	c. Total	$ 554,733	$ 65,419
4.	Total actuarial present value of future benefits	$ 16,335,020	$ 6,085,284

Development of Actuarially Determined Contribution Rate
Retirement Benefits

		June 30, 2019	
		Non-Hazardous (1)	Hazardous (2)
1.	Total normal cost rate		
	a. Service retirement	7.51%	15.26%
	b. Deferred termination benefits and refunds	2.17%	2.20%
	c. Survivor benefits	0.38%	0.29%
	d. Disability benefits	0.71%	1.30%
	e. Total	10.77%	19.05%
2.	Less: member contribution rate	-5.00%	-8.00%
3.	Total employer normal cost rate	5.77%	11.05%
4.	Administrative expenses	0.86%	0.31%
5.	Net employer normal cost rate	6.63%	11.36%
6.	UAAL amortization contribution	19.58%	34.95%
7.	Total calculated employer contribution	26.21%	46.31%

Actuarial Balance Sheet

Non-Hazardous Members Retirement

(Dollar amounts expressed in thousands)

		June 30, 2019 (1)	June 30, 2018 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 7,049,527	$ 6,950,225
	b. Present value of future member contributions	$ 972,742	$ 976,392
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 1,006,165	$ 850,617
	ii. Unfunded accrued liability contributions	7,306,586	6,241,280
	iii. Total future employer contributions	$ 8,312,751	$ 7,091,897
	d. Total assets	$ 16,335,020	$ 15,018,514
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 1,978,907	$ 1,827,009
	ii. Accrued liability	5,450,569	4,994,786
	iii. Total present value of future benefits	$ 7,429,476	$ 6,821,795
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 8,350,811	$ 7,754,521
	c. Present value of benefits payable on account of current inactive members	$ 554,733	$ 442,198
	d. Total liabilities	$ 16,335,020	$ 15,018,514

Actuarial Balance Sheet

Hazardous Members Retirement

(Dollar amounts expressed in thousands)

		June 30, 2019 (1)	June 30, 2018 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 2,375,106	$ 2,321,721
	b. Present value of future member contributions	$ 376,964	$ 276,852
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 462,955	$ 180,354
	ii. Unfunded accrued liability contributions	2,870,259	2,470,827
	iii. Total future employer contributions	$ 3,333,214	$ 2,651,181
	d. Total assets	$ 6,085,284	$ 5,249,754
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 839,919	$ 457,206
	ii. Accrued liability	1,845,411	1,641,490
	iii. Total present value of future benefits	$ 2,685,330	$ 2,098,696
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 3,334,535	$ 3,094,100
	c. Present value of benefits payable on account of current inactive members	$ 65,419	$ 56,958
	d. Total liabilities	$ 6,085,284	$ 5,249,754

Reconciliation of Retirement Net Assets

(Dollar amounts expressed in thousands)[1]

	Year Ending June 30, 2019 (1) Non-Hazardous	Year Ending June 30, 2019 (2) Hazardous
1. Value of assets at beginning of year	$ 7,018,963	$ 2,348,337
2. Revenue for the year		
a. Contributions		
i. Member contributions	$ 159,064	$ 58,661
ii. Employer contributions	393,302	137,666
iii. Other contributions (less 401h)	195	400
iii. Total	$ 552,561	$ 196,727
b. Income		
i. Interest, dividends, and other income	$ 169,822	$ 57,285
ii. Investment expenses	(50,068)	(16,559)
iii. Net	$ 119,754	$ 40,726
c. Net realized and unrealized gains (losses)	270,910	91,507
d. Total revenue	$ 943,225	$ 328,960
3. Expenditures for the year		
a. Disbursements		
i. Refunds	$ 14,387	$ 2,854
ii. Regular annuity benefits	766,221	259,009
iii. Other benefit payments	0	0
iv. Transfers to other systems	0	0
v. Total	$ 780,608	$ 261,863
b. Administrative expenses and depreciation	21,659	1,726
c. Total expenditures	$ 802,267	$ 263,588
4. Increase in net assets (Item 2. - Item 3.)	$ 140,958	$ 65,371
5. Value of assets at end of year (Item 1. + Item 4.)	$ 7,159,921	$ 2,413,708
6. Net external cash flow		
a. Dollar amount	$ (249,706)	$ (66,862)
b. Percentage of market value	-3.5%	-2.8%
7. Estimated annual return on net assets	5.7%	5.7%

[1] Amounts may not add due to rounding

[1] Excludes 401h assets

Development of Actuarial Value of Assets

Non-Hazardous Members Retirement

(Dollar amounts expressed in thousands)*

	Year Ending	June 30, 2019
1.	Actuarial value of assets at beginning of year	$ 6,950,225
2.	Market value of assets at beginning of year	$ 7,018,963
3.	Net new investments	
	a. Contributions	$ 552,561
	b. Benefit payments	(780,608)
	c. Administrative expenses	(21,659)
	d. Subtotal	$ (249,706)
4.	Market value of assets at end of year	$ 7,159,921
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$ 390,664
6.	Assumed investment return rate for fiscal year	6.25%
7.	Expected return for immediate recognition	$ 430,882
8.	Excess return for phased recognition	$ (40,218)
9.	Phased-in recognition, 20% of excess return on assets for prior years:	

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2019	$ (40,218)	$ (8,044)
b.	2018	163,357	32,671
c.	2017	369,213	73,843
d.	2016	(515,652)	(103,130)
e.	2015	(386,073)	(77,215)
f.	Total		$ (81,875)

10.	Actuarial value of assets as of June 30, 2019 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$ 7,049,527
11.	Ratio of actuarial value to market value	98.5%
12.	Estimated annual return on actuarial value of assets	5.1%

* Amounts may not add due to rounding

Development of Actuarial Value of Assets

Hazardous Members Retirement

(Dollar amounts expressed in thousands)*

	Year Ending		June 30, 2019
1.	Actuarial value of assets at beginning of year	$	2,321,721
2.	Market value of assets at beginning of year	$	2,348,337
3.	Net new investments		
	a. Contributions	$	196,727
	b. Benefit payments		(261,863)
	c. Administrative expenses		(1,726)
	d. Subtotal	$	(66,862)
4.	Market value of assets at end of year	$	2,413,708
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	132,233
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	144,682
8.	Excess return for phased recognition	$	(12,449)

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

	Fiscal Year Ending June 30,		Excess Return		Recognized Amount
a.	2019	$	(12,449)	$	(2,490)
b.	2018		54,598		10,920
c.	2017		120,774		24,155
d.	2016		(162,540)		(32,508)
e.	2015		(122,554)		(24,511)
f.	Total			$	(24,434)

10.	Actuarial value of assets as of June 30, 2019 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	2,375,106
11.	Ratio of actuarial value to market value		98.4%
12.	Estimated annual return on actuarial value of assets		5.3%

* 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%
2019	7,049,527	14,356,113	7,306,586	49.1%	2,521,860	289.7%
			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%
2019	2,375,106	5,245,365	2,870,259	45.3%	559,353	513.1%
			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%
2019	9,424,633	19,601,478	10,176,845	48.1%	3,081,213	330.3%

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, 2019	June 30, 2019
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:	24-year closed period	24-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 10.30% (varies by service)	3.55% to 19.05% (varies by service)
Inflation	2.30%	2.30%
Post-retirement benefit adjustments	0.00%	0.00%
Retiree Mortality	System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from MP-2014 mortality improvement scale use a base year of 2019.	System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from MP-2014 mortality improvement scale use a base year of 2019.

Solvency Test
Retirement Benefits
(Dollar amounts expressed in thousands)

June 30,	Actuarial Accrued Liability: Active Member Contributions	Actuarial Accrued Liability: Retired Members & Beneficiaries	Actuarial Accrued Liability: Active Members (Employer Financed)	Valuation Assets	Portion of Aggregate Accrued Liabilities Covered by Assets: Active	Portion of Aggregate Accrued Liabilities Covered by Assets: Retired	Portion of Aggregate Accrued Liabilities Covered by Assets: 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%
2019	1,280,679	8,905,544	4,169,890	7,049,527	100.0%	64.8%	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%
2019	458,559	3,399,954	1,386,852	2,375,106	100.0%	56.4%	0.0%

INSURANCE BENEFITS

ACTUARIAL TABLES

Development of Unfunded Actuarial Accrued Liability
Insurance Benefits

(Dollar amounts expressed in thousands)

		June 30, 2019	
		Non-Hazardous (1)	Hazardous (2)
1.	Projected payroll of active members	$ 2,521,860	$ 559,353
2.	Present value of future pay	$ 18,726,729	$ 4,746,141
3.	Normal cost rate		
	a. Total normal cost rate	3.40%	5.84%
	b. Less: member contribution rate	-0.49%	-0.46%
	c. Employer normal cost rate	2.91%	5.38%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 2,337,913	$ 863,948
	b. Less: present value of future normal costs	(600,658)	(203,930)
	c. Actuarial accrued liability	$ 1,737,255	$ 660,018
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 1,643,126	$ 1,053,842
	b. Inactive members	187,566	19,019
	c. Active members (Item 4c)	1,737,255	660,018
	d. Total	$ 3,567,947	$ 1,732,879
6.	Actuarial value of assets	$ 2,523,249	$ 1,313,659
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 1,044,698	$ 419,220
8.	Funded Ratio	70.7%	75.8%

Development of Actuarially Determined Contribution Rate
Insurance Benefits

		June 30, 2019	
		Non-Hazardous (1)	Hazardous (2)
1.	Total normal cost rate	3.40%	5.84%
2.	Less: member contribution rate	-0.49%	-0.46%
3.	Total employer normal cost rate	2.91%	5.38%
4.	Administrative expenses	0.04%	0.08%
5.	Net employer normal cost rate	2.95%	5.46%
6.	UAAL amortization contribution	2.83%	5.01%
7.	Total calculated employer contribution Max (0%, item 5. + item6.)	5.78%	10.47%

Actuarial Balance Sheet

Non-Hazardous Members Insurance

(Dollar amounts expressed in thousands)

		June 30, 2019 (1)	June 30, 2018 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 2,523,249	$ 2,371,430
	b. Present value of future member contributions	$ 106,109	$ 106,356
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 494,549	$ 498,909
	ii. Unfunded accrued liability contributions	1,044,698	721,194
	iii. Total future employer contributions	$ 1,539,247	$ 1,220,103
	d. Total assets	$ 4,168,605	$ 3,697,889
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 600,658	$ 605,265
	ii. Accrued liability	1,737,255	1,567,301
	iii. Total present value of future benefits	$ 2,337,913	$ 2,172,566
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 1,643,126	$ 1,374,325
	c. Present value of benefits payable on account of current inactive members	$ 187,566	$ 150,998
	d. Total liabilities	$ 4,168,605	$ 3,697,889

Actuarial Balance Sheet

Hazardous Members Insurance

(Dollar amounts expressed in thousands)

		June 30, 2019 (1)	June 30, 2018 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 1,313,659	$ 1,256,306
	b. Present value of future member contributions	$ 31,194	$ 19,064
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 172,736	$ 114,831
	ii. Unfunded accrued liability contributions	419,220	427,722
	iii. Total future employer contributions	$ 591,956	$ 542,553
	d. Total assets	$ 1,936,809	$ 1,817,923
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 203,930	$ 133,895
	ii. Accrued liability	660,018	682,311
	iii. Total present value of future benefits	$ 863,948	$ 816,206
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 1,053,842	$ 983,359
	c. Present value of benefits payable on account of current inactive members	$ 19,019	$ 18,358
	d. Total liabilities	$ 1,936,809	$ 1,817,923

Reconciliation of Insurance Net Assets

(Dollar amounts expressed in thousands)[1]

	Year Ending June 30, 2019 (1) Non-Hazardous	Year Ending June 30, 2019 (2) Hazardous
1. Value of assets at beginning of year	$ 2,414,126	$ 1,280,982
2. Revenue for the year		
a. Contributions		
i. Member contributions	$ 11,801	$ 2,458
ii. Employer contributions	135,570	61,106
iii. Other contributions (less 401h)	4,095	1,171
iii. Total	$ 151,466	$ 64,735
b. Income		
i. Interest, dividends, and other income	$ 60,556	$ 32,356
ii. Investment expenses	(18,887)	(10,468)
iii. Net	$ 41,670	$ 21,888
c. Net realized and unrealized gains (losses)	95,921	51,429
d. Total revenue	$ 289,057	$ 138,052
3. Expenditures for the year		
a. Disbursements		
i. Refunds	$ 0	$ 0
ii. Healthcare premium subsidies	133,004	78,190
iii. Other benefit payments[2]	(210)	(303)
iv. Transfers to other systems	0	0
v. Total	$ 132,794	$ 77,886
b. Administrative expenses and depreciation	877	434
c. Total expenditures	$ 133,672	$ 78,320
4. Increase in net assets (Item 2. - Item 3.)	$ 155,385	$ 59,732
5. Value of assets at end of year (Item 1. + Item 4.)	$ 2,569,511	$ 1,340,714
6. Net external cash flow		
a. Dollar amount	$ 17,795	$ (13,585)
b. Percentage of market value	0.7%	-1.0%
7. Estimated annual return on net assets	5.7%	5.8%

[1] Amounts may not add due to rounding

[1] Includes 401h assets

[2] Benefit payments have been offset by Medicare Drug Reimbursements, Insurance Premiums, and Humana Gain Share Payments

Development of Actuarial Value of Assets

Non-Hazardous Members Insurance

(Dollar amounts expressed in thousands)*

	Year Ending	June 30, 2019
1.	Actuarial value of assets at beginning of year	$ 2,371,430
2.	Market value of assets at beginning of year	$ 2,414,126
3.	Net new investments	
	a. Contributions	$ 151,466
	b. Benefit payments	(132,794)
	c. Administrative expenses	(877)
	d. Subtotal	$ 17,795
4.	Market value of assets at end of year	$ 2,569,511
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$ 137,590
6.	Assumed investment return rate for fiscal year	6.25%
7.	Expected return for immediate recognition	$ 151,439
8.	Excess return for phased recognition	$ (13,849)
9.	Phased-in recognition, 20% of excess return on assets for prior years:	

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2019	$ (13,849)	$ (2,770)
b.	2018	63,800	12,760
c.	2017	121,364	24,273
d.	2016	(147,421)	(29,484)
e.	2015	(110,970)	(22,194)
f.	Total		$ (17,415)

10.	Actuarial value of assets as of June 30, 2019 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$ 2,523,249
11.	Ratio of actuarial value to market value	98.2%
12.	Estimated annual return on actuarial value of assets	5.6%

* 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, 2019
1.	Actuarial value of assets at beginning of year	$	1,256,306
2.	Market value of assets at beginning of year	$	1,280,982
3.	Net new investments		
	a. Contributions	$	64,735
	b. Benefit payments		(77,886)
	c. Administrative expenses		(434)
	d. Subtotal	$	(13,585)
4.	Market value of assets at end of year	$	1,340,714
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	73,317
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	79,637
8.	Excess return for phased recognition	$	(6,320)

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

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2019	$ (6,320)	$ (1,264)
b.	2018	36,099	7,220
c.	2017	65,383	13,077
d.	2016	(78,507)	(15,701)
e.	2015	(60,152)	(12,030)
f.	Total		$ (8,699)

10.	Actuarial value of assets as of June 30, 2019 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	1,313,659
11.	Ratio of actuarial value to market value		98.0%
12.	Estimated annual return on actuarial value of assets		5.7%

* 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%
2019	2,523,249	3,567,947	1,044,698	70.7%	2,521,860	41.4%
			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%
2019	1,313,659	1,732,879	419,220	75.8%	559,353	74.9%
			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%
2019	3,836,908	5,300,826	1,463,918	72.4%	3,081,213	47.5%

Solvency Test
Insurance Benefits
(Dollar amounts expressed in thousands)

June 30,	Actuarial Accrued Liability: Active Member Contributions	Actuarial Accrued Liability: Retired Members & Beneficiaries	Actuarial Accrued Liability: Active Members (Employer Financed)	Valuation Assets	Portion of Aggregate Accrued Liabilities Covered by Assets: Active	Portion of Aggregate Accrued Liabilities Covered by Assets: Retired	Portion of Aggregate Accrued Liabilities Covered by Assets: ER Financed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(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%
2019	-	1,830,692	1,737,255	2,523,249	100.0%	100.0%	39.9%
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%
2019	-	1,072,861	660,018	1,313,659	100.0%	100.0%	36.5%

SECTION 4

MEMBERSHIP INFORMATION

Membership Tables

Summary of Membership Data

(Total dollar amounts expressed in thousands)

		Non-Hazardous June 30, 2019 (1)	Hazardous June 30, 2019 (2)	Total June 30, 2019 (3)	Total June 30, 2018 (4)
1.	Active members				
a.	Males	29,297	8,313	37,610	37,389
b.	Females	52,209	1,161	53,370	53,692
c.	Total members	81,506	9,474	90,980	91,081
d.	Total annualized prior year salaries	$ 2,521,860	$ 559,353	$ 3,081,213	$ 3,000,419
e.	Average salary[2]	$ 30,941	$ 59,041	$ 33,867	$ 32,942
f.	Average age	47.7	38.6	46.7	46.8
g.	Average service	9.1	10.1	9.2	9.3
h.	Member contributions with interest	$ 1,280,679	$ 458,559	$ 1,739,238	$ 1,711,924
i.	Average contributions with interest[2]	$ 15,713	$ 48,402	$ 19,117	$ 18,796
2.	Vested inactive members[1]				
a.	Number	50,768	1,782	52,550	18,575
b.	Total annual deferred benefits	$ 77,396	$ 7,387	$ 84,783	$ 73,864
c.	Average annual deferred benefit[2]	$ 1,525	$ 4,145	$ 1,613	$ 3,977
d.	Average age at the valuation date	52.3	45.3	52.1	50.3
3.	Nonvested inactive members[1]				
a.	Number	40,775	1,640	42,415	71,652
b.	Total member contributions with interest	$ 48,090	$ 5,484	$ 53,574	$ 82,084
c.	Average contributions with interest[2]	$ 1,179	$ 3,344	$ 1,263	$ 1,146
4.	Service retirees				
a.	Number	54,493	8,275	62,768	60,039
b.	Total annual benefits	$ 644,546	$ 231,301	$ 875,847	$ 831,703
c.	Average annual benefit[2]	$ 11,828	$ 27,952	$ 13,954	$ 13,853
d.	Average age at the valuation date	70.6	62.0	69.4	69.2
5.	Disabled retirees				
a.	Number	4,198	576	4,774	4,729
b.	Total annual benefits	$ 48,289	$ 9,697	$ 57,986	$ 56,695
c.	Average annual benefit[2]	$ 11,503	$ 16,835	$ 12,146	$ 11,989
d.	Average age at the valuation date	65.5	57.1	64.5	64.1
6.	Beneficiaries				
a.	Number	5,848	1,172	7,020	6,757
b.	Total annual benefits	$ 54,282	$ 17,815	$ 72,097	$ 67,650
c.	Average annual benefit[2]	$ 9,282	$ 15,200	$ 10,270	$ 10,012
d.	Average age at the valuation date	68.2	58.6	66.6	66.4

[1] Vested inactive member section includes Tier 1 members eligible for a benefit equal to the actuarially equivalent of two times the member's contribution balance. These members were included in the nonvested inactive member section in 2018.

[2] Average dollar amounts shown are expresed to the dollar.

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						
2010	84,681		$ 2,236,855		$ 26,415	
2011	85,285	0.7%	2,276,596	1.8%	26,694	1.1%
2012	83,052	-2.6%	2,236,546	-1.8%	26,929	0.9%
2013	81,815	-1.5%	2,236,277	0.0%	27,333	1.5%
2014	81,115	-0.9%	2,272,270	1.6%	28,013	2.5%
2015	80,852	-0.3%	2,296,716	1.1%	28,406	1.4%
2016	80,664	-0.2%	2,352,762	2.4%	29,167	2.7%
2017	82,198	1.9%	2,452,407	4.2%	29,835	2.3%
2018	81,818	-0.5%	2,466,801	0.6%	30,150	1.1%
2019	81,506	-0.4%	2,521,860	2.2%	30,941	2.6%
Hazardous Members						
2010	9,562		$ 466,549		$ 48,792	
2011	9,407	-1.6%	466,964	0.1%	49,640	1.7%
2012	9,130	-2.9%	464,229	-0.6%	50,847	2.4%
2013	9,123	-0.1%	461,673	-0.6%	50,605	-0.5%
2014	9,194	0.8%	479,164	3.8%	52,117	3.0%
2015	9,172	-0.2%	483,641	0.9%	52,730	1.2%
2016	9,084	-1.0%	492,851	1.9%	54,255	2.9%
2017	9,495	4.5%	541,633	9.9%	57,044	5.1%
2018	9,263	-2.4%	533,618	-1.5%	57,607	1.0%
2019	9,474	2.3%	559,353	4.8%	59,041	2.5%

[1] Covered payroll is the annualized, projected compensation for the following year and does not include payroll attributable to working retirees.

Distribution of Active Members by Age and by Years of Service

Non-Hazardous Members

Attained Age	Years of Credited Service												
	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	164	4	2	1	0	0	1	0	0	0	0	0	172
	$12,640	$22,490	$21,294	$13,027	$0	$0	$16,865	$0	$0	$0	$0	$0	$12,996
20-24	1,438	707	308	133	49	15	2	0	0	0	0	0	2,652
	$17,918	$24,347	$27,040	$29,492	$28,212	$34,176	$30,324	$0	$0	$0	$0	$0	$21,563
25-29	1,620	1,119	812	571	397	609	13	0	1	1	0	0	5,143
	$20,588	$25,555	$28,540	$28,790	$31,430	$35,167	$35,407	$0	$16,174	$80,496	$0	$0	$26,446
30-34	1,373	1,076	803	652	542	1,406	511	9	0	0	0	0	6,372
	$20,346	$25,499	$26,883	$28,981	$32,769	$37,041	$41,255	$51,163	$0	$0	$0	$0	$29,384
35-39	1,339	1,075	848	719	600	1,721	1,200	495	26	0	0	0	8,023
	$20,276	$24,362	$26,442	$27,468	$28,381	$34,188	$42,715	$44,742	$58,026	$0	$0	$0	$30,698
40-44	1,173	959	803	691	631	1,980	1,514	1,166	438	24	0	0	9,379
	$21,234	$24,066	$27,333	$28,326	$28,622	$31,656	$39,288	$45,754	$49,726	$56,754	$0	$0	$32,650
45-49	975	789	747	657	600	2,185	2,007	1,634	1,032	241	7	0	10,874
	$21,686	$24,917	$27,097	$26,518	$29,043	$31,111	$35,016	$40,957	$50,519	$56,130	$79,771	$0	$33,777
50-54	903	703	612	559	551	1,973	2,134	2,101	1,433	435	66	14	11,484
	$22,370	$24,947	$26,906	$28,881	$28,410	$30,379	$32,944	$35,407	$41,433	$53,273	$59,916	$83,009	$32,941
55-59	802	607	536	483	520	1,933	2,162	2,510	1,885	642	116	42	12,238
	$19,631	$23,815	$26,768	$27,456	$28,184	$30,791	$33,118	$33,433	$37,038	$46,450	$53,804	$64,199	$32,365
60-64	554	427	443	366	370	1,498	1,569	1,733	1,312	607	111	45	9,035
	$17,090	$23,085	$23,729	$26,094	$28,171	$28,544	$32,517	$34,100	$35,900	$41,481	$48,224	$60,375	$31,326
65 & Over	518	352	306	250	280	1,322	1,192	898	555	316	89	56	6,134
	$14,910	$15,695	$19,862	$20,270	$21,802	$24,291	$28,013	$32,023	$33,981	$37,088	$37,827	$58,375	$26,406
Total	10,859	7,818	6,220	5,082	4,540	14,642	12,305	10,546	6,682	2,266	389	157	81,506
	$19,842	$24,257	$26,551	$27,556	$28,849	$31,269	$34,860	$36,890	$40,496	$46,277	$50,061	$62,703	$30,941

Distribution of Active Members by Age and by Years of Service

Hazardous Members

Attained Age	Years of Credited Service												
	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	2	0	0	0	0	0	0	0	0	0	0	0	2
	$29,994	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$29,994
20-24	222	148	68	27	7	4	0	1	0	0	0	0	477
	$36,019	$44,524	$46,717	$42,514	$52,742	$41,717	$0	$79,118	$0	$0	$0	$0	$40,934
25-29	228	264	278	217	165	248	2	0	0	0	0	0	1,402
	$37,611	$45,794	$49,230	$49,511	$53,850	$54,907	$59,656	$0	$0	$0	$0	$0	$48,300
30-34	121	149	145	143	156	785	227	2	0	0	0	0	1,728
	$36,040	$46,293	$50,186	$50,328	$54,761	$57,247	$62,834	$68,850	$0	$0	$0	$0	$54,176
35-39	46	48	64	57	77	442	718	200	9	0	0	0	1,661
	$38,312	$45,695	$47,395	$51,250	$55,491	$58,690	$65,151	$67,057	$82,788	$0	$0	$0	$60,842
40-44	28	34	31	33	23	204	454	559	200	16	0	0	1,582
	$37,317	$41,859	$46,748	$50,861	$54,611	$56,555	$64,803	$68,763	$78,981	$88,943	$0	$0	$65,403
45-49	15	20	25	30	22	123	257	463	348	57	2	0	1,362
	$29,766	$46,750	$41,170	$48,328	$51,098	$55,384	$62,575	$68,616	$79,594	$91,967	$95,321	$0	$68,120
50-54	10	10	15	7	10	60	155	205	116	54	9	0	651
	$44,202	$40,265	$45,518	$40,882	$53,508	$53,530	$59,401	$66,370	$74,542	$88,359	$100,411	$0	$65,584
55-59	6	8	5	9	5	33	114	88	60	32	11	3	374
	$42,646	$42,907	$48,674	$51,387	$47,396	$52,881	$66,588	$64,692	$69,437	$72,996	$88,421	$118,771	$65,246
60-64	4	3	2	0	3	19	46	33	16	15	2	3	146
	$45,714	$34,632	$40,387	$0	$58,295	$47,047	$60,350	$65,733	$66,952	$61,703	$82,594	$103,688	$60,648
65 & Over	1	1	1	4	1	7	26	35	7	2	0	4	89
	$29,208	$39,704	$33,042	$63,924	$20,441	$43,259	$48,640	$61,337	$87,866	$53,553	$0	$90,834	$58,178
Total	683	685	634	527	469	1,925	1,999	1,586	756	176	24	10	9,474
	$36,831	$45,282	$48,409	$49,606	$54,195	$56,710	$63,783	$67,749	$77,698	$84,120	$93,007	$103,071	$59,041

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

Current Age	Retirement		Disability		Survivors & Beneficiaries		Total	
	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	291	$ 6,782	174	$ 2,120	693	$ 5,604	1,158	$ 14,506
50 - 54	1,166	27,146	315	4,003	284	2,526	1,765	33,675
55 - 59	4,148	72,265	639	8,584	455	4,874	5,242	85,723
60 - 64	8,749	125,782	956	11,436	645	6,839	10,350	144,057
65 - 69	12,993	155,857	832	9,466	821	8,814	14,646	174,137
70 - 74	11,484	121,483	626	6,681	845	8,137	12,955	136,301
75 - 79	7,738	72,105	392	3,827	810	7,599	8,940	83,531
80 - 84	4,638	39,238	192	1,645	630	5,233	5,460	46,116
85 - 89	2,268	17,569	60	460	401	3,020	2,729	21,049
90 And Over	1,018	6,318	12	68	264	1,636	1,294	8,022
Total	**54,493**	**$ 644,546**	**4,198**	**$ 48,289**	**5,848**	**$ 54,282**	**64,539**	**$ 747,117**

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	962	$ 31,981	154	$ 2,738	277	$ 2,447	1,393	$ 37,166
50 - 54	1,258	41,379	98	1,840	79	1,142	1,435	44,361
55 - 59	1,414	43,117	111	1,890	107	1,857	1,632	46,864
60 - 64	1,390	36,870	85	1,330	149	2,395	1,624	40,595
65 - 69	1,466	38,916	73	1,069	166	3,117	1,705	43,102
70 - 74	992	22,480	39	629	156	2,841	1,187	25,950
75 - 79	513	10,526	9	103	116	2,101	638	12,730
80 - 84	206	4,391	4	63	74	1,168	284	5,622
85 - 89	60	1,312	2	16	41	637	103	1,965
90 And Over	14	330	1	20	7	110	22	460
Total	**8,275**	**$ 231,301**	**576**	**$ 9,697**	**1,172**	**$ 17,815**	**10,023**	**$ 258,813**

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	5,941	$ 6,332,648	21,393	$ 16,226,558	27,334	$ 22,559,206
Joint & Survivor:						
100% to Beneficiary	3,497	4,151,226	2,061	1,397,234	5,558	5,548,460
66 2/3% to Beneficiary	885	1,634,848	732	780,592	1,617	2,415,440
50% to Beneficiary	1,230	2,014,604	1,836	2,130,969	3,066	4,145,572
Pop-up Option	4,385	7,055,704	4,174	4,473,551	8,559	11,529,254
Social Security Option:						
Age 62 Basic	249	426,139	548	565,449	797	991,588
Age 62 Survivorship	592	1,055,268	372	376,001	964	1,431,269
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	1,491	1,617,087	3,715	2,916,610	5,206	4,533,697
15 Years Certain & Life	670	709,957	978	754,757	1,648	1,464,714
20 Years Certain & Life	501	711,798	833	619,967	1,334	1,331,765
Refund	0	0	0	0	0	0
Partial Lump Sum Option (PLSO):						
12 Month Basic	87	103,518	353	304,897	440	408,415
24 Month Basic	52	33,276	234	185,902	286	219,178
36 Month Basic	222	111,067	677	311,612	899	422,679
12 Month Survivor	134	166,924	88	88,115	222	255,039
24 Month Survivor	81	83,303	58	36,432	139	119,735
36 Month Survivor	354	235,814	268	124,447	622	360,261
Total:	20,371	$ 26,443,180	38,320	$ 31,293,092	58,691	$ 57,736,272

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	1,198	$ 2,487,926	368	$ 589,402	1,566	$ 3,077,328
Joint & Survivor:						
100% to Beneficiary	1,059	2,305,421	49	65,219	1,108	2,370,640
66 2/3% to Beneficiary	351	891,004	22	54,272	373	945,276
50% to Beneficiary	494	1,214,102	57	124,636	551	1,338,738
Pop-up Option	3,508	9,122,656	163	336,767	3,671	9,459,423
Social Security Option:						
Age 62 Basic	108	165,074	12	10,106	120	175,181
Age 62 Survivorship	296	490,578	20	35,162	316	525,740
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	103	197,116	3	2,749	106	199,865
10 Years Certain & Life	253	543,960	72	128,682	325	672,642
15 Years Certain & Life	103	200,529	19	34,501	122	235,030
20 Years Certain & Life	176	365,308	30	48,248	206	413,556
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	19	41,153	6	6,336	25	47,489
36 Month Basic	48	81,699	19	22,651	67	104,350
12 Month Survivor	56	139,805	3	7,738	59	147,544
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:	7,991	$ 18,596,079	860	$ 1,487,091	8,851	$ 20,083,170

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	20	$ 4,892	45	$ 30,193	65	$ 35,085
Joint & Survivor:						
100% to Beneficiary	514	302,115	1,749	1,258,947	2,263	1,561,062
66 2/3% to Beneficiary	85	51,291	263	214,498	348	265,789
50% to Beneficiary	178	71,708	404	238,917	582	310,624
Pop-up Option	262	230,361	859	914,376	1,121	1,144,737
Social Security Option:						
Age 62 Basic	1	1,291	5	4,806	6	6,097
Age 62 Survivorship	38	26,814	164	202,895	202	229,709
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	0	0	0	0
5 Years Certain	88	70,479	109	74,742	197	145,221
10 Years Certain	125	85,774	208	159,909	333	245,683
10 Years Certain & Life	65	50,605	110	97,689	175	148,294
15 Years Certain & Life	42	37,421	84	73,135	126	110,555
20 Years Certain & Life	51	34,523	81	85,618	132	120,141
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	1	149	1	152	2	302
12 Month Survivor	11	9,727	48	49,913	59	59,639
24 Month Survivor	14	16,931	36	32,066	50	48,997
36 Month Survivor	39	20,948	148	70,617	187	91,565
Total:	1,534	$ 1,015,027	4,314	$ 3,508,472	5,848	$ 4,523,499

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	8	$ 4,541	53	$ 41,155	61	$ 45,696
Joint & Survivor:						
100% to Beneficiary	32	22,162	273	353,267	305	375,430
66 2/3% to Beneficiary	3	3,103	57	82,108	60	85,211
50% to Beneficiary	13	9,422	96	92,196	109	101,619
Pop-up Option	40	29,967	329	553,649	369	583,617
Social Security Option:						
Age 62 Basic	0	0	0	0	0	0
Age 62 Survivorship	4	2,058	105	147,779	109	149,837
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	3	2,669	3	2,669
5 Years Certain	3	7,523	3	1,341	6	8,864
10 Years Certain	25	23,221	16	14,500	41	37,721
10 Years Certain & Life	4	2,656	10	7,854	14	10,511
15 Years Certain & Life	4	1,224	5	6,879	9	8,103
20 Years Certain & Life	2	1,080	16	13,638	18	14,718
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	11,652	8	11,652
24 Month Survivor	1	1,295	11	7,457	12	8,752
36 Month Survivor	5	3,219	36	30,995	41	34,213
Total:	146	$ 112,033	1,026	$ 1,372,545	1,172	$ 1,484,578

Schedule of Retirants Added to And Removed from Rolls

(Dollar amounts except average allowance expressed in thousands)

Year Ended	Added to Rolls	Removed from Rolls	Rolls End of the Year		% Increase in Annual Benefit	Average Annual Benefit
	Number	Number	Number	Annual Benefits		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-Hazardous						
2010	2,565	1,283	41,038	$ 452,614		$ 11,029
2011	3,250	1,077	43,211	483,594	6.8%	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
2019	4,472	1,871	64,539	747,117	5.2%	11,576
Hazardous						
2010	423	163	6,068	$ 146,917		$ 24,212
2011	502	102	6,468	160,259	9.1%	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
2019	608	172	10,023	258,813	5.3%	25,822

SECTION 5

ASSESSMENT AND DISCLOSURE OF RISK

Risks Associated with Measuring the Accrued Liability And Actuarially Determined Contribution

(As Required by ASOP No. 51)

The determination of CERS's accrued liability and actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. The risk measures illustrated in this section are intended to aid stakeholders in understanding the effects of future experience differing from the assumptions used in performing an actuarial valuation. These risk measures may also help with illustrating the potential volatility in the funded status and actuarially determined contributions that result from differences between actual experience and the expected experience based on the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience (economic and demographic) differing from the assumptions, changes in assumptions due to changing conditions, changes in contribution requirements due to modifications to the funding policy, and changes in the liability and cost due to changes in plan provisions or applicable law. The scope of this actuarial valuation does not include any analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the System's future financial condition include:

- Investment risk – actual investment returns may differ from expected returns;
- Longevity risk – members may live longer or shorter than expected and receive pensions for a time period different than assumed;
- Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future contributions differing from expected;
- Salary and payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liabilities or contributions differing from expected;
- Asset/Liability mismatch – changes in assets may be inconsistent with changes in liabilities, thereby altering the relative difference between the assets and liabilities which may alter the funded status and contribution requirements;
- Contribution risk – actual contributions may differ from expected future contributions (for example, actual contributions not being paid in accordance with the System's funding policy, withdrawal liability assessments or other anticipated payments to the plan are not being paid, or material changes occurring in the anticipated number of covered employees, covered payroll, or another relevant contribution base).

Effects of certain experience can generally be anticipated. For example, if investment returns since the most recent actuarial valuation is less (or more) than the assumed rate of return, then the funded status of the plan can be expected to decrease (or increase) more than anticipated.

The contribution rate in this report was established in accordance with applicable Statutes and assumptions adopted by the Board. However, stakeholders should be aware that the scheduled contribution rates specified in State Code do not necessarily guarantee that the contribution requirements will not increase in a future year.

Employer Risk with Contribution Rates

Currently KRS collects contributions from participating employers based on the employer's total payroll of employees who are earning benefits in CERS (i.e. covered payroll). The actuarially determined contribution rate is comprised of two components - the normal cost rate (to pay for the benefits accruing in the next year) and the unfunded amortization (to pay for the benefits accrued by members in previous years). The unfunded amortization is calculated by first determining the dollar amount necessary to pay for the unfunded liability based on KRS's funding policy, and then by dividing that dollar amount by expected covered payroll to convert that contribution requirement to a percentage of payroll (i.e. a contribution rate).

As the contribution requirement, as a percentage of payroll, increases then there is increased incentive for participating employers to make deliberate business action to reduce their payroll reported to the System in order to reduce their pension cost.

Plan Specific Risk Measures

Risks faced by a pension plan evolve over time. A relatively new plan with virtually no assets and paying few benefits will experience lower investment risk than a mature plan with a significant amount of assets and large number of members receiving benefits. There are a few measures that can assist stakeholders in understanding and comparing the maturity of a plan to other systems, which include:

- Ratio of market value of assets to payroll: The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. If assets are approximately the same as covered payroll, an investment return that is 5% different than assumed would equal 5% of payroll. In another example, if the assets are approximately twice as large as covered payroll, an investment return that is 5% different than assumed would equal 10% of payroll. A ratio that increases over time generally indicates the potential of an increasing volatility in employer contribution rates as a percentage of payroll.
- Ratio of actuarial accrued liability to payroll: The ratio of actuarial accrued liability to payroll can be used as a measure to indicate the potential volatility of contributions due to volatility in the liability experience. For instance, if the actuarial accrued liability is 5 times the size of the covered payroll, then a change in the liability that is 2% different than expected would be a change in magnitude that is 10% of payroll. A ratio that increases over time generally indicates the potential of an increasing volatility in employer contribution rates as a percentage of payroll.
- Percentage of Expected Contributions Actually Received: This measure identifies the percentage difference between the contributions the fund expects to receive during the fiscal year to and actual contributions received by the fund during the fiscal year. A percentage that is less than 100% means that actual contributions the fund received were less than the expected contributions determined by a prior actuarial valuation. On the other hand, a percentage that is greater than 100% means that actual contributions the fund received were more than the expected contributions.

- Ratio of active to retired members: A relatively mature open plan is likely to have close to the same number of actives to retirees resulting in a ratio that is around 1.0. On the other hand, a super-mature plan, or a plan that is closed to new entrants will have more retirees than active members resulting in a ratio below 1.0. As this ratio declines, a larger portion of the total actuarial accrued liability in the System is attributable to retirees. This metric also typically moves in tandem with the liability to payroll metric, which provides an indication of potential contribution volatility.

The following tables provide a summary of these measures for CERS Non-Hazardous and Hazardous Funds for the current year and the prior four years so stakeholders can identify how these measures are trending. While ASOP No. 51 requires this disclosure with respect to only the retirement funds, we have included this information for the insurance funds for completeness.

CERS Non-Hazardous

	Retirement Fund					Insurance Fund				
	June 30,					June 30,				
	2019	2018	2017	2016	2015	2019	2018	2017	2016	2015
Ratio of the market value of assets to total payroll	2.84	2.85	2.73	2.60	2.79	1.02	0.98	0.90	0.83	0.85
Ratio of actuarial accrued liability to payroll	5.69	5.35	5.22	4.71	4.68	1.41	1.25	1.37	1.27	1.27
Ratio of net cash flow to market value of assets	-3.5%	-3.4%	-3.5%	-4.4%	-3.1%	0.7%	0.0%	0.1%	-0.2%	0.6%
Percentage of Expected Contribution Actually Received	72% [1]	96%	97%	95%	98%	87% [1]	101%	97%	92%	91%
Ratio of actives to retirees and beneficiaries	1.26	1.32	1.39	1.43	1.54					

[1] Expected contribution for FYE2019 based on the actuarially determined contribution rate of 28.05% from the June 30, 2017 valuation and expected compensation based on census data from the June 30, 2018 valuation

CERS Hazardous

	Retirement Fund					Insurance Fund				
	June 30,					June 30,				
	2019	2018	2017	2016	2015	2019	2018	2017	2016	2015
Ratio of the market value of assets to total payroll	4.32	4.40	4.10	4.07	4.29	2.40	2.40	2.20	2.16	2.19
Ratio of actuarial accrued liability to payroll	9.38	8.98	8.58	7.52	7.47	3.10	3.16	3.30	3.16	3.11
Ratio of net cash flow to market value of assets	-2.8%	-2.6%	-2.5%	-3.0%	-2.3%	-1.0%	-1.4%	-1.5%	0.0%	0.7%
Percentage of Expected Contribution Actually Received	71% [1]	100%	103%	102%	104%	92% [1]	104%	101%	98%	95%
Ratio of actives to retirees and beneficiaries	0.95	0.97	1.06	1.06	1.14					

[1] Expected contribution for FYE2019 based on the actuarially determined contribution rate of 47.86% from the June 30, 2017 valuation and expected compensation based on census data from the June 30, 2018 valuation

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, 2018 and adopted by the Board in April 2019.

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 Increase					
	Merit & seniority		Price Inflation & Productivity		Total Increase	
	Non-Hazardous	Hazardous	Non-Hazardous	Hazardous	Non-Hazardous	Hazardous
0	7.00%	15.50%	3.30%	3.55%	10.30%	19.05%
1	4.00%	4.00%	3.30%	3.55%	7.30%	7.55%
2	3.00%	2.00%	3.30%	3.55%	6.30%	5.55%
3	1.50%	1.25%	3.30%	3.55%	4.80%	4.80%
4	1.25%	1.00%	3.30%	3.55%	4.55%	4.55%
5	1.25%	1.00%	3.30%	3.55%	4.55%	4.55%
6	1.00%	1.00%	3.30%	3.55%	4.30%	4.55%
7	1.00%	0.50%	3.30%	3.55%	4.30%	4.05%
8	0.75%	0.50%	3.30%	3.55%	4.05%	4.05%
9	0.75%	0.00%	3.30%	3.55%	4.05%	3.55%
10	0.50%	0.00%	3.30%	3.55%	3.80%	3.55%
11	0.50%	0.00%	3.30%	3.55%	3.80%	3.55%
12	0.25%	0.00%	3.30%	3.55%	3.55%	3.55%
13	0.25%	0.00%	3.30%	3.55%	3.55%	3.55%
14	0.25%	0.00%	3.30%	3.55%	3.55%	3.55%
15 & Over	0.00%	0.00%	3.30%	3.55%	3.30%	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		
	Normal Retirement		Early Retirement[1]			Members participating before 9/1/2008[2]	Members participating between 9/1/2008 and 1/1/2014[3]	Members participating after 1/1/2014[3]
Age	Male	Female	Male	Female	Service			
Under 45	35.0%	27.0%			5	17.0%		
45	35.0%	27.0%			6	17.0%		
46	35.0%	27.0%			7	17.0%		
47	35.0%	27.0%			8	17.0%		
48	35.0%	27.0%			9	17.0%		
49	35.0%	27.0%			10	17.0%		
50	30.0%	27.0%			11	17.0%		
51	30.0%	27.0%			12	17.0%		
52	30.0%	27.0%			13	17.0%		
53	30.0%	27.0%			14	17.0%		
54	30.0%	27.0%			15	17.0%		
55	30.0%	27.0%	4.0%	5.0%	16	17.0%		
56	30.0%	27.0%	4.0%	5.0%	17	17.0%		
57	30.0%	27.0%	4.0%	5.0%	18	17.0%		
58	30.0%	27.0%	4.0%	5.0%	19	17.0%		
59	30.0%	27.0%	4.0%	5.0%	20	30.0%		
60	30.0%	27.0%	4.0%	8.0%	21	22.5%		
61	30.0%	27.0%	4.0%	9.0%	22	18.0%		
62	30.0%	40.0%	15.0%	20.0%	23	21.0%		
63	30.0%	35.0%	15.0%	18.0%	24	24.0%		
64	30.0%	30.0%	15.0%	16.0%	25	27.0%	21.6%	16.0%
65	30.0%	30.0%			26	30.0%	24.0%	16.0%
66	30.0%	27.0%			27	33.0%	26.4%	16.0%
67	30.0%	27.0%			28	36.0%	28.8%	16.0%
68	30.0%	27.0%			29	39.0%	31.2%	16.0%
69	30.0%	27.0%			30+	39.0%	31.2%	100.0%
70	30.0%	27.0%						
71	30.0%	27.0%						
72	30.0%	27.0%						
73	30.0%	27.0%						
74	30.0%	27.0%						
75	100.0%	100.0%						

[1] *The annual rate of retirement is 11% for male members and 12% for female members with 25-26 years of service.*
[2] *The annual rate of retirement is 100% at age 62.*
[3] *The annual rate of retirement is 100% at age 60.*

Non-Hazardous System: For members hired after 7/1/2003, the rates shown above are multiplied by 80% if he member is under age 65 to reflect the different retiree health insurance benefit.

Hazardous System: For members hired after 7/1/2003 and prior to 9/1/2008, the rates shown above are multiplied by 80% if the member is under age 62 to reflect the different retiree health insurance benefit.

Disability rates:

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

Age	Non-Hazardous		Hazardous	
	Male	Female	Male	Female
20	0.04%	0.04%	0.07%	0.07%
30	0.06%	0.06%	0.12%	0.12%
40	0.14%	0.14%	0.26%	0.26%
50	0.39%	0.39%	0.73%	0.73%
60	1.02%	1.02%	1.90%	1.90%

Withdrawal rates (for causes other than disability and retirement):

Assumed annual rates of withdrawal are shown below and include pre-retirement mortality rates as described on the next page.

Service Years	Annual Rates of Withdrawal	
	Non-Hazardous	Hazardous
1	20.00%	20.00%
2	15.58%	9.11%
3	12.48%	7.24%
4	10.66%	6.14%
5	9.37%	5.37%
6	8.37%	4.76%
7	7.56%	4.27%
8	6.87%	3.85%
9	6.27%	3.49%
10	5.74%	3.18%
11	5.27%	2.89%
12	4.84%	2.63%
13	4.45%	2.40%
14	4.09%	2.18%
15	3.76%	1.98%
16	3.45%	1.80%
17	3.16%	1.62%
18	2.89%	1.46%
19	2.64%	1.30%
20	2.39%	1.16%
21	2.16%	0.00%
22	1.94%	0.00%
23	1.74%	0.00%
24	1.54%	0.00%
25	1.35%	0.00%
26 & Over	0.00%	0.00%

Mortality Assumption:

Pre-retirement mortality: PUB-2010 General Mortality table, for the Non-Hazardous System, and the PUB-2010 Public Safety Mortality table for the Hazardous System, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2010.

Post-retirement mortality (non-disabled): System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2019.

The following table provides the life expectancy for a non-disabled retiree in future years based on the assumption with full generational projection:

Life Expectancy for an Age 65 Retiree in Years					
Gender	**Year of Retirement**				
	2020	**2025**	**2030**	**2035**	**2040**
Male	21.0	21.4	21.8	22.2	22.6
Female	24.0	24.4	24.8	25.2	25.6

Post-retirement mortality (disabled): PUB-2010 Disabled Mortality table, with a 4-year set-forward for both male and female rates, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2010.

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

Non-Hazardous: 2% of disabilities are assumed to occur in the line of duty

Hazardous: 50% 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 or disability 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]
2021	6.25%	5.50%	1.50%
2022	6.25%	5.40%	1.50%
2023	6.25%	5.30%	1.50%
2024	6.00%	5.20%	1.50%
2025	5.80%	5.10%	1.50%
2026	5.60%	5.00%	1.50%
2027	5.40%	4.90%	1.50%
2028	5.20%	4.80%	1.50%
2029	5.00%	4.70%	1.50%
2030	4.80%	4.60%	1.50%
2031	4.60%	4.50%	1.50%
2032	4.40%	4.40%	1.50%
2033	4.20%	4.30%	1.50%
2034	4.05%	4.20%	1.50%
2035 & Beyond	4.05%	4.05%	1.50%

[1]All increases are assumed to occur on January 1. The 2020 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 – 2035

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:

- Active 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 after 7/1/2003
Under 10	50%	100%
10-14	75%	100%
15-19	90%	100%
Over 20	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	85%

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

Health Care Participation Assumptions (continued):

- 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 receiving insurance benefits from the non-hazardous fund are assumed to begin health coverage at age 55 for members participating before September 1, 2008, at age 60 for members participating on or after September 1, 2008 but before January 1, 2014, and at age 65 for members participating on or after January 1, 2014.

- Deferred vested members receiving insurance benefits from the hazardous fund are assumed to begin health coverage at age 50 for members participating before January 1, 2014 and at age 60 for members participating on or after January 1, 2014.

- 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 0.9%. 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.

Other Assumptions

1. Valuation payroll (used for determining the amortization contribution rate): Current fiscal year payroll.

2. Individual salaries used to project benefits: For salary amounts prior to the valuation date, the salary from the last fiscal year is projected backward with the valuation salary scale assumption. For future salaries, the salary from the last fiscal year is projected forward with one year's salary scale.

3. Pay increase timing: Beginning of (fiscal) year. This is equivalent to assuming that reported salaries represent amounts paid to members during the year ending on the valuation date.

4. Current active members that terminate employment (for reasons other than retirement, disability, or death) are assumed to commence their retirement benefits at first unreduced retirement eligibility. Members are assumed to elect a refund of member contributions if the value of their account balance exceeds the present value of the deferred benefit. Members participating in the Cash Balance plan are assumed to elect to receive a lump sum of their cash balance account if their account balance exceeds the present value of the deferred benefit and the member is not eligible for insurance benefits at termination.

5. The beneficiaries of current active members that die while active are assumed to commence their survivor benefits at the member's first unreduced retirement eligibility. Beneficiaries are assumed to elect a refund of member contributions if the value of the member's account balance exceeds the present value of the survivor benefit. Beneficiaries of active members that die while in the line of duty are assumed to commence their survivor benefits immediately at the death of the member.

6. There will be no recoveries once disabled.

7. Cash Balance Provisions: The cash balance interest crediting rate while a member is an active employee is assumed to equal 5.6875% (based upon the 6.25% assumed investment return). The interest crediting rate after a member terminates employment is 4%.

8. Decrement timing: Decrements of all types are assumed to occur mid-year. Decrement rates are used as described in this report, without adjustment for multiple decrement table effects.

9. Service: All members are assumed to accrue 1 year of benefit and eligibility service each year.

10. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.

11. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.

12. Current Inactive Population (Retirement Fund): All non-vested members are assumed to take an immediate refund of member contributions. Vested members are assumed to elect an immediate refund of member contributions at the valuation date if the value of their account balance exceeds the present value of their deferred benefit. Non-hazardous members are assumed to retire at age 65. Hazardous members hired prior to September 1, 2008 are assumed to retire at age 55 and hazardous members hired on or after September 1, 2008 are assumed to retire at age 60.

Participant Data

Participant data was supplied in electronic text files. There were separate files for (i) active and inactive members, and (ii) members and beneficiaries receiving benefits.

The data for active and terminated members included date of birth, gender, date of participation, benefit tier indicator, service with the current system, total vesting service, salary, employee contribution account balances, and employer pay credits for members participating in the cash balance plan. For retired members and beneficiaries, the data included date of birth, gender, spouse's date of birth (where applicable), amount of monthly benefit, date of retirement, and form of payment code.

Assumptions were made to correct for missing, bad, or inconsistent data. These had no material impact on the results presented.

Changes in assumptions since the prior valuation:

- Annual salary increases were updated based on the 2018 Experience Study
- Annual rates of retirement, disability, withdrawal, and mortality were updated based on the 2018 Experience Study
- The percent of disabilities assumed to occur in the line of duty was updated from 0% to 2% for non-hazardous members and 50% for hazardous members
- The assumed increase in future health care costs, or trend assumption, is reviewed on an annual basis and was updated (i.e. increased) to better reflect more current expectations relating to anticipated future increases in the medical costs for post-age 65 retirees.
- The assumed impact of the Cadillac Tax was changed from a 3.6% to a 0.9% load on employer paid premiums for Non-Medicare retirees who became participants prior to July 1, 2003.

Development of Baseline Claims Cost

For non-Medicare retirees, the initial per capita costs were based on the plan premiums effective January 1, 2020, 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 $870.41 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	$728.75	$870.41

For Medicare retirees, the initial per capita costs were estimated based on the plan premiums effective January 1, 2020, 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	$207.21	$195.44
75	242.43	236.56
85	256.36	259.38

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, 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 65 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 the final monthly 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 monthly average pay for two children, or 75% of final monthly 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

There have been no changes to benefit provisions since the prior valuation.

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 monthly average pay. Each dependent child will receive 10% of the final monthly 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

There have been no changes in benefit provisions since the prior actuarial valuation.

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, 2019, the Non-Hazardous monthly contribution was $13.58/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, 2019, the Hazardous monthly contribution was $20.37/year of service. Upon the retiree's death, the surviving spouse of a hazardous duty member will receive a monthly contribution of $10 ($13.58 as of July 1, 2019) 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, 2020

Non-Medicare Plan Options					
Plan Option	Single	Parent Plus	Couple	Family	Family X-Ref
LivingWell PPO*	$731.82	$1,044.12	$1,604.96	$1,787.46	$881.40
LivingWell CDHP	710.94	982.30	1,342.78	1,500.50	821.36
LivingWell Basic	683.58	942.52	1,457.82	1,624.66	801.82
Living Well Limited	608.24	866.76	1,334.18	1,485.46	731.68

Medicare Plan Options	
Kentucky Retirement Systems - Medical Only Plan	$176.26
Kentucky Retirement Systems – Medicare Advantage/Essential Plan	63.15
Kentucky Retirement Systems – Medicare Advantage/Premium Plan*	250.75

*For 2020, 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, 2019.

Non-Hazardous Service	Hazardous Service
$13.58	$20.37

Changes since the Prior Valuation

There have been no changes in benefit provisions since the prior actuarial valuation.

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, 2019

GRS Retirement Consulting

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

December 5, 2019

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

Subject: Actuarial Valuation as of June 30, 2019

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 years ending June 30, 2021 and June 30, 2022, 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 Systems (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 2019 actuarial valuation is 24 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, 2019 actuarial valuation will be used by the Board to recommend the Commonwealth's contribution rate for the fiscal year beginning July 1, 2020 and ending June 30, 2021, as well as the subsequent fiscal year beginning July 1, 2021 and ending June 30, 2022.

ASSUMPTIONS AND METHODS

The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. An experience study was conducted after the June 30, 2018 actuarial valuation and the Board adopted updated assumptions for use in this actuarial valuation. The principle updated assumptions include:

- Change in the rates of salary increases for individuals.
- New post-retirement mortality assumption based on KRS retiree experience and the inclusion of an explicit assumption for future improvement in mortality.
- Updated mortality assumptions for members during employment and for disabled retirees.
- Change in the rates of retirement.
- Change in the rates that an active member is assumed to become an inactive member in the System prior to retirement.
- Updated rates of disability incidence.

The experience study included a review of several economic assumptions which encompassed the rate of inflation, the investment return assumption, and the payroll growth assumption. However, those assumptions remain unchanged from the prior actuarial valuation.

The assumed increase in future health care costs, or trend assumption, is reviewed on an annual basis and was updated (i.e. increased) since the June 30, 2018 valuation to better reflect more current expectations relating to anticipated future increases in the medical costs for post-age 65 retirees.

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, 2019. There were no benefit changes since the prior valuation.

DATA

Member data for retired, active and inactive members was supplied as of June 30, 2019, by the KRS staff. The staff also supplied asset information as of June 30, 2019. 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

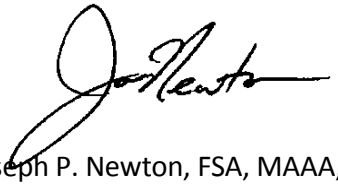
We certify that the information presented herein is accurate and fairly portrays the actuarial position of SPRS as of June 30, 2019.

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.

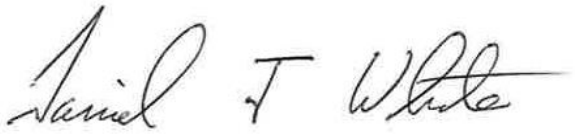
The undersigned are independent actuaries and consultants. Mr. Newton and Mr. White are Enrolled Actuaries. All three of the undersigned are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries. All of the undersigned are experienced in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

Sincerely,

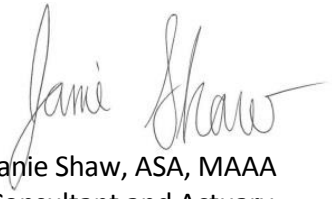
Gabriel, Roeder, Smith & Co.



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)

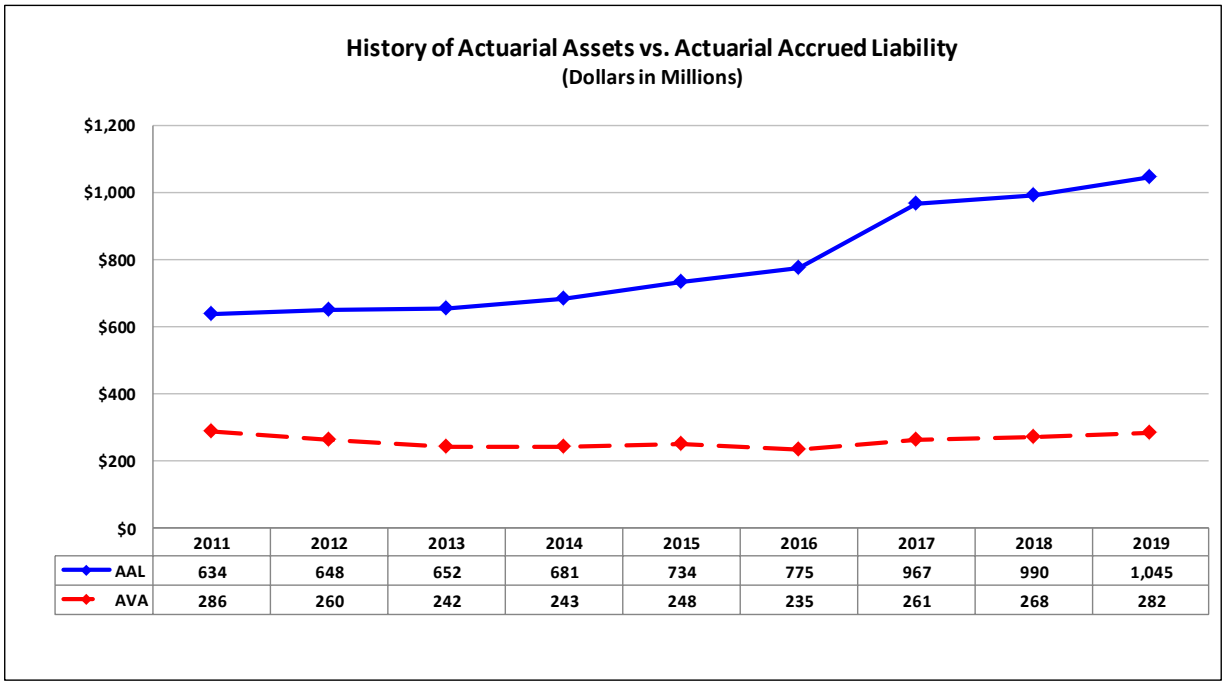
	SPRS	
	June 30, 2019	June 30, 2018
Actuarially Determined Contribution:		
Retirement	136.12%	120.54%
Insurance	20.85%	19.50%
Total	156.97%	140.04%
Contribution Rate for Next Fiscal Year[1]	156.97%	146.28%
Assets:		
Retirement		
• Actuarial value (AVAR)	$282,162	$268,259
• Market value (MVAR)	$286,165	$267,572
• Ratio of actuarial to market value of assets	98.6%	100.3%
Insurance		
• Actuarial value (AVAI)	$197,395	$187,535
• Market value (MVAI)	$201,206	$190,847
• Ratio of actuarial to market value of assets	98.1%	98.3%
Funded Status:		
Retirement		
• Actuarial accrued liability	$1,045,318	$989,528
• Unfunded accrued liability on AVAR	$763,156	$721,269
• Funded ratio on AVAR	27.0%	27.1%
• Unfunded accrued liability on MVAR	$759,153	$721,956
• Funded ratio on MVAR	27.4%	27.0%
Insurance		
• Actuarial accrued liability	$276,809	$262,088
• Unfunded accrued liability on AVAI	$79,414	$74,553
• Funded ratio on AVAI	71.3%	71.6%
• Unfunded accrued liability on MVAI	$75,603	$71,241
• Funded ratio on MVAI	72.7%	72.8%
Membership:		
• Number of		
- Active Members	883	886
- Retirees and Beneficiaries	1,647	1,600
- Inactive Members	557	499
- Total	3,087	2,985
• Projected payroll of active members	$47,752	$48,808
• Average salary of active members	$54,079	$55,088

[1] Contribution rate for fiscal year 2021 will require budgeting during the 2020 legislative session.

Executive Summary (Continued)

Retirement Fund

The unfunded actuarial accrued liability of the retirement system increased by $42 million since the prior year's valuation to $763 million. The largest source of this increase is due to a $44 million increase in the liability due to the updated assumptions. 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 nine years has generally been due to a combination of: (1) contributions that were insufficient to amortize the unfunded actuarial accrued liability, (2) a decrease in the assumed rate of return in 2015, 2016 and again in 2017, and (3) the actual investment experience being less than the fund's expected investment return assumption.



	2011	2012	2013	2014	2015	2016	2017	2018	2019
AAL	634	648	652	681	734	775	967	990	1,045
AVA	286	260	242	243	248	235	261	268	282

Executive Summary (Continued)

Summary of Change in Financial Condition of the Insurance Fund

The non-Medicare premiums were lower than expected and the Medicare premiums were higher than expected from calendar year 2019 to 2020. Specifically, the non-Medicare premiums were expected to increase by 7.00% from calendar year 2019 to calendar year 2020 (i.e. the medical trend assumption for non-Medicare premiums used in the actuarial valuation) and the actual average premiums were relatively level. Also, the Medicare premiums were expected to increase by 5.00% from calendar year 2019 to calendar year 2020 (i.e. the medical trend assumption used in the actuarial valuation for Medicare premium) and the actual average premiums increased by 13%. The favorable non-Medicare premium experience offset most of the actuarial loss that resulted from the new Medicare premiums. In fact, the overall premium experience resulted in a small actuarial gain for the hazardous plan which has younger retirees.

Since the prior year's valuation, the unfunded actuarial accrued liability of the insurance fund increased by $5 million since the prior year's valuation to $79 million. The largest source of this increase is due to a $7 million increase in the liability due to the updated actuarial assumptions adopted by the Board as a result of the experience study. The corresponding funded ratio slightly decreased from 71.6% at June 30, 2018 to 71.3% at June 30, 2019.

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 hazardous duty benefits only. This report presents the result of the June 30, 2019 actuarial funding valuation for both the Retirement Fund and Insurance Fund.

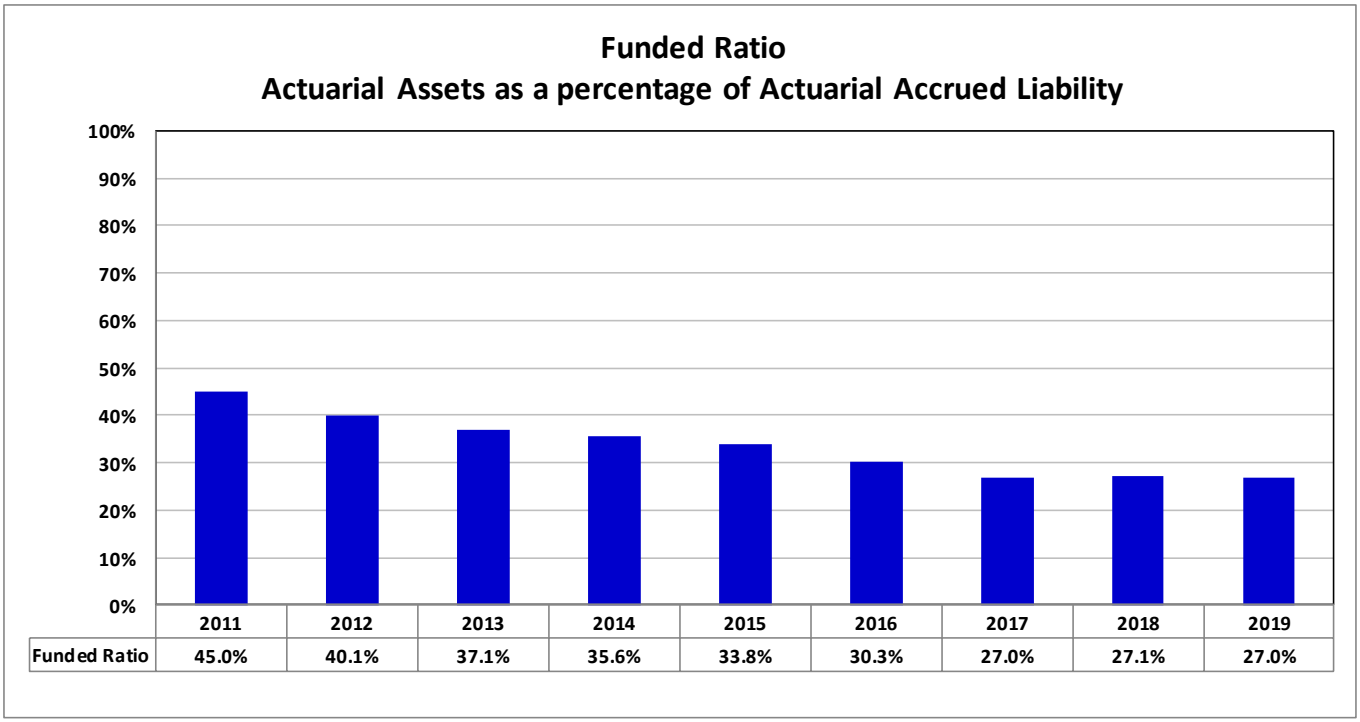
The primary purposes of the valuation report are to depict the current financial condition of the Funds and analyze changes in the Fund's financial condition. In addition, the report provides various summaries of the data.

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 that it should cost to provide the benefits for an average 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. Section 5 provides a discussion of various risk measures, which are intended to aid stakeholders in understanding the effects of future experience differing from the assumptions used in performing an actuarial valuation. This section was added to the report this year in compliance with the newly adopted Actuarial Standards of Practice. Appendices A and B provide summaries of the principle actuarial assumptions and methods and plan provisions. Finally, Appendix C provides a glossary of technical terms that are used throughout this report.

Funding Progress

The following charts provide a nine-year history of the retirement fund'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 nine years has generally been due to: (1) actual contributions being insufficient to finance the unfunded actuarial accrued liability, (2) a decrease in the assumed rate of return in 2015, 2016 and again in 2017, and (3) actual investment experience being less than the investment return assumption.



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 now that the higher contribution rates determined by the June 30, 2017 actuarial valuation became 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 Fund.

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 $268 million to $282 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 for the retirement fund on a dollar-weighted basis for fiscal year 2019 was a 5.5% which is greater than the 5.25% expected annual return. The return on an actuarial (smoothed) asset value was 3.7%, which resulted in a $4 million 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 $4 million greater than the actuarial value of assets, which signifies that the retirement fund is in a position of deferred 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 a 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 / (losses) 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	$ 721,269	$ 74,553
2. Normal cost and administrative expenses	11,621	4,054
3. Less: contributions for the year	(65,113)	(13,466)
4. Interest accrual	36,462	4,365
5. Expected UAAL (Sum of Items 1 - 4)	$ 704,239	$ 69,506
6. Actual UAAL as of June 30,2019	$ 763,156	$ 79,414
7. Total gain (loss) for the year (Item 5 - Item 6)	$ (58,917)	$ (9,908)
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ (4,057)	$ (1,392)
9. Liability experience gain (loss) for the year	(10,831)	(863)
10. Plan Change	—	—
11. Assumption change	(44,029)	(7,653)
12. Total	$ (58,917)	$ (9,908)

Of the $59 million and $10 million in actuarial losses experienced by the retirement and insurance funds, respectively, $44 million and $7.7 million were due to the increases in liability resulting from the assumption changes reflected as a result of the experience study as of June 30, 2018 and the updated trend assumption for the insurance fund. Additionally, the insurance fund's liability decreased by a net $0.9 million due to a $3.9 million gain due to the premium experience and a $4.8 million loss attributable to other demographic experience.

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. The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. An experience study was conducted after the June 30, 2018 actuarial valuation and the Board adopted updated assumptions for use in this actuarial valuation. The principle updated assumptions include:

- Change in the rates of salary increases for individuals.
- New post-retirement mortality assumption based on KRS retiree experience and the inclusion of an explicit assumption for future improvement in mortality.
- Updated mortality assumptions for members during employment and for disabled retirees.
- Change in the rates of retirements.
- Change in the rates that an active member is assumed to become an inactive member in the System prior to retirement.
- Updated rates of disability incidence.

The experience study included a review of several economic assumptions which included the rate of inflation, the investment return assumption, and the payroll growth assumption. However, those assumptions remain unchanged from the prior actuarial valuation.

The assumed increase in future health care costs, or trend assumption, is reviewed on an annual basis and was updated (i.e. increased) since the June 30, 2018 valuation to better reflect more current expectations relating to anticipated future increases in the medical costs for post-age 65 retirees.

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.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. This report does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

Benefit Provisions

Appendix B of this report includes a summary of the benefit provisions for SPRS. There were not any changes in benefits since the prior valuation.

SECTION 3

ACTUARIAL TABLES

Actuarial Tables

Development of Unfunded Actuarial Accrued Liability

(Dollar amounts expressed in thousands)

		June 30, 2019	
		Retirement (1)	Insurance (2)
1.	Projected payroll of active members	$ 47,752	$ 47,752
2.	Present value of future pay	$ 468,442	$ 431,213
3.	Normal cost rate		
	a. Total normal cost rate	26.92%	8.41%
	b. Less: member contribution rate	-8.00%	-0.40%
	c. Employer normal cost rate	18.92%	8.01%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 310,664	$ 101,969
	b. Less: present value of future normal costs	(113,743)	(25,119)
	c. Actuarial accrued liability	$ 196,921	$ 76,850
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 840,795	$ 196,513
	b. Inactive members	7,602	3,446
	c. Active members (Item 4c)	196,921	76,850
	d. Total	$ 1,045,318	$ 276,809
6.	Actuarial value of assets	$ 282,162	$ 197,395
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 763,156	$ 79,414
8.	Funded Ratio	27.0%	71.3%

Actuarial Present Value of Future Benefits

(Dollar amounts expressed in thousands)

		June 30, 2019	
		Retirement (1)	Insurance (2)
1.	Active members		
	a. Service retirement	$ 296,329	
	b. Deferred termination benefits and refunds	3,537	
	c. Survivor benefits	2,231	
	d. Disability benefits	8,567	
	e. Total	$ 310,664	$ 101,969
2.	Retired members		
	a. Service retirement	$ 765,150	
	b. Disability retirement	12,356	
	c. Beneficiaries	63,289	
	d. Total	$ 840,795	$ 196,513
3.	Inactive members		
	a. Vested terminations	$ 7,261	$ 3,446
	b. Nonvested terminations	341	N/A
	c. Total	$ 7,602	$ 3,446
4.	Total actuarial present value of future benefits	$ 1,159,061	$ 301,928

Development of Actuarially Determined Contribution Rate

		June 30, 2019	
		Retirement (1)	Insurance (2)
1.	Total normal cost rate		
	a. Service retirement	24.38%	
	b. Deferred termination benefits and refunds	1.05%	
	c. Survivor benefits	0.33%	
	d. Disability benefits	1.16%	
	e. Total	26.92%	8.41%
2.	Less: member contribution rate	-8.00%	-0.40%
3.	Total employer normal cost rate	18.92%	8.01%
4.	Administrative expenses	0.47%	0.14%
5.	Net employer normal cost rate	19.39%	8.15%
6.	UAAL amortization contribution	116.73%	12.70%
7.	Total calculated employer contribution	136.12%	20.85%

Actuarial Balance Sheet

Retirement Benefits

(Dollar amounts expressed in thousands)

		June 30, 2019 (1)	June 30, 2018 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 282,162	$ 268,259
	b. Present value of future member contributions	$ 37,475	$ 34,933
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 76,268	$ 58,838
	ii. Unfunded accrued liability contributions	763,156	721,269
	iii. Total future employer contributions	$ 839,424	$ 780,107
	d. Total assets	$ 1,159,061	$ 1,083,299
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 113,743	$ 93,771
	ii. Accrued liability	196,921	188,740
	iii. Total present value of future benefits	$ 310,664	$ 282,511
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 840,795	$ 793,303
	c. Present value of benefits payable on account of current inactive members	$ 7,602	$ 7,485
	d. Total liabilities	$ 1,159,061	$ 1,083,299

Actuarial Balance Sheet

Insurance Benefits

(Dollar amounts expressed in thousands)

		June 30, 2019 (1)	June 30, 2018 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 197,395	$ 187,535
	b. Present value of future member contributions	$ 2,782	$ 2,186
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 22,337	$ 22,438
	ii. Unfunded accrued liability contributions	79,414	74,553
	iii. Total future employer contributions	$ 101,751	$ 96,991
	d. Total assets	$ 301,928	$ 286,712
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 25,119	$ 24,624
	ii. Accrued liability	76,850	78,937
	iii. Total present value of future benefits	$ 101,969	$ 103,561
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 196,513	$ 179,760
	c. Present value of benefits payable on account of current inactive members	$ 3,446	$ 3,391
	d. Total liabilities	$ 301,928	$ 286,712

Reconciliation of Net Assets

(Dollar amounts expressed in thousands)[1]

	Year Ending June 30, 2019 (1) Retirement	Year Ending June 30, 2019 (2) Insurance
1. Value of assets at beginning of year	$ 267,572	$ 190,847
2. Revenue for the year		
a. Contributions		
i. Member contributions	$ 5,062	$ 176
ii. Employer contributions	58,948	13,283
iii. Other contributions (less 401h)	1,103	7
iii. Total	$ 65,113	$ 13,466
b. Income		
i. Interest, dividends, and other income	$ 6,567	$ 4,821
ii. Investment expenses	(1,685)	(1,597)
iii. Net	$ 4,881	$ 3,224
c. Net realized and unrealized gains (losses)	9,934	7,591
d. Total revenue	$ 79,928	$ 24,280
3. Expenditures for the year		
a. Disbursements		
i. Refunds	$ 162	$ 0
ii. Regular annuity benefits / Healthcare premiums	60,949	13,942
iii. Other benefit payments[2]	0	(90)
iv. Transfers to other systems	0	0
v. Total	$ 61,111	$ 13,852
b. Administrative expenses and depreciation	225	69
c. Total expenditures	$ 61,335	$ 13,921
4. Increase in net assets (Item 2. - Item 3.)	$ 18,593	$ 10,359
5. Value of assets at end of year (Item 1. + Item 4.)	$ 286,165	$ 201,206
6. Net external cash flow		
a. Dollar amount	$ 3,777	$ (455)
b. Percentage of market value	1.4%	-0.2%
7. Estimated annual return on net assets	5.5%	5.7%

[1] Amounts may not add due to rounding

[1] Retirement assets exclude 401h assets and insurance assets include 401h assets

[2] Insurance benefit payments have been offset by Medicare Drug Reimbursements, Insurance Premiums, and Humana Gain Share Payments

Development of Actuarial Value of Assets

Retirement Benefits

(Dollar amounts expressed in thousands)*

	Year Ending	June 30, 2019
1.	Actuarial value of assets at beginning of year	$ 268,259
2.	Market value of assets at beginning of year	$ 267,572
3.	Net new investments	
	a. Contributions	$ 65,113
	b. Benefit payments	(61,111)
	c. Administrative expenses	(225)
	d. Subtotal	$ 3,777
4.	Market value of assets at end of year	$ 286,165
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$ 14,815
6.	Assumed investment return rate for fiscal year	5.25%
7.	Expected return for immediate recognition	$ 14,147
8.	Excess return for phased recognition	$ 669
9.	Phased-in recognition, 20% of excess return on assets for prior years:	

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2019	$ 669	$ 134
b.	2018	5,183	1,037
c.	2017	11,623	2,325
d.	2016	(21,455)	(4,291)
e.	2015	(16,122)	(3,224)
f.	Total		$ (4,021)

10.	Actuarial value of assets as of June 30, 2019 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$ 282,162
11.	Ratio of actuarial value to market value	98.6%
12.	Estimated annual return on actuarial value of assets	3.7%

* Amounts may not add due to rounding

Development of Actuarial Value of Assets

Insurance Benefits

(Dollar amounts expressed in thousands)*

	Year Ending		June 30, 2019
1.	Actuarial value of assets at beginning of year	$	187,535
2.	Market value of assets at beginning of year	$	190,847
3.	Net new investments		
	a. Contributions	$	13,466
	b. Benefit payments		(13,852)
	c. Administrative expenses		(69)
	d. Subtotal	$	(455)
4.	Market value of assets at end of year	$	201,206
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	10,815
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	11,914
8.	Excess return for phased recognition	$	(1,099)

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

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2019	$ (1,099)	$ (220)
b.	2018	5,431	1,086
c.	2017	9,723	1,945
d.	2016	(12,288)	(2,458)
e.	2015	(9,762)	(1,952)
f.	Total		$ (1,599)

10.	Actuarial value of assets as of June 30, 2019 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	197,395
11.	Ratio of actuarial value to market value		98.1%
12.	Estimated annual return on actuarial value of assets		5.5%

* Amounts may not add due to rounding

Schedule of Funding Progress

(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)
			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%
2019	282,162	1,045,318	763,156	27.0%	47,752	1598.2%
			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%
2019	197,395	276,809	79,414	71.3%	47,752	166.3%

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, 2019
Actuarial cost method:	Entry Age Normal
Amortization method:	Level percentage of payroll (0% payroll growth assumed)
Amortization period for contribution rate:	24-year closed period
Asset valuation method:	5-Year Smoothed Market
Actuarial assumptions:	
Investment rate of return, retirement	5.25%
Investment rate of return, insurance	6.25%
Projected salary increases	3.55% to 16.05% (varies by service)
Inflation	2.30%
Post-retirement benefit adjustments	0.00%
Retiree Mortality	System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from MP-2014 mortality improvement scale use a base year of 2019.

Solvency Test

(Dollar amounts expressed in thousands)

June 30,	Actuarial Accrued Liability: Active Member Contributions	Actuarial Accrued Liability: Retired Members & Beneficiaries	Actuarial Accrued Liability: Active Members (Employer Financed)	Valuation Assets	Portion of Aggregate Accrued Liabilities Covered by Assets: Active	Portion of Aggregate Accrued Liabilities Covered by Assets: Retired	Portion of Aggregate Accrued Liabilities Covered by Assets: 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%
2019	41,948	848,397	154,973	282,162	100.0%	28.3%	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%
2019	-	199,959	76,850	197,395	100.0%	98.7%	0.0%

SECTION 4

MEMBERSHIP INFORMATION

Membership Tables

Summary of Membership Data

(Total dollar amounts expressed in thousands)

		June 30, 2019 (1)	June 30, 2018 (4)
1.	Active members		
a.	Males	855	857
b.	Females	28	29
c.	Total members	883	886
d.	Total annualized prior year salaries	$ 47,752	$ 48,808
e.	Average salary[2]	$ 54,079	$ 55,088
f.	Average age	36.7	37.3
g.	Average service	10.0	10.5
h.	Member contributions with interest	$ 41,948	$ 43,835
i.	Average contributions with interest[2]	$ 47,506	$ 49,476
2.	Vested inactive members[1]		
a.	Number	289	176
b.	Total annual deferred benefits	$ 811	$ 815
c.	Average annual deferred benefit[2]	$ 2,806	$ 4,632
d.	Average age at the valuation date	43.5	41.0
3.	Nonvested inactive members[1]		
a.	Number	268	323
b.	Total member contributions with interest	$ 339	$ 327
c.	Average contributions with interest[2]	$ 1,264	$ 1,012
4.	Service retirees		
a.	Number	1,363	1,331
b.	Total annual benefits	$ 54,142	$ 52,821
c.	Average annual benefit[2]	$ 39,723	$ 39,686
d.	Average age at the valuation date	63.0	62.8
5.	Disabled retirees		
a.	Number	54	52
b.	Total annual benefits	$ 959	$ 909
c.	Average annual benefit[2]	$ 17,757	$ 17,473
d.	Average age at the valuation date	58.0	59.3
6.	Beneficiaries		
a.	Number	230	217
b.	Total annual benefits	$ 6,303	$ 5,896
c.	Average annual benefit[2]	$ 27,404	$ 27,168
d.	Average age at the valuation date	67.1	65.9

[1] Vested inactive member section includes Tier 1 members eligible for a benefit equal to the actuarially equivalent of two times the member's contribution balance. These members were included in the nonvested inactive member section in 2018.

[2] Average dollar amounts shown are expresed to the dollar.

Summary of Historical Active Membership

	Active Members		Covered Payroll[1]		Average Annual Pay	
June 30,	Number	Percent Increase /(Decrease)	Amount in Thousands	Percent Increase /(Decrease)	Amount	Percent Increase /(Decrease)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2010	961		$ 51,507		$ 53,597	
2011	965	0.4%	48,693	-5.5%	50,459	-5.9%
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%
2019	883	-0.3%	47,752	-2.2%	54,079	-1.8%

Distribution of Active Members by Age and by Years of Service

SPRS Members

Attained Age	Years of Credited Service												
	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	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	50	12	0	2	0	0	0	0	0	0	0	0	64
	$21,511	$43,726	$0	$50,639	$0	$0	$0	$0	$0	$0	$0	$0	$26,587
25-29	28	25	11	18	44	7	0	0	0	0	0	0	133
	$24,764	$43,537	$45,825	$45,004	$49,941	$51,581	$0	$0	$0	$0	$0	$0	$42,515
30-34	13	1	19	9	33	90	13	0	0	0	0	0	178
	$25,460	$42,435	$45,306	$46,237	$48,908	$52,434	$56,866	$0	$0	$0	$0	$0	$49,003
35-39	6	1	5	1	9	49	70	22	1	0	0	0	164
	$21,890	$44,374	$45,534	$44,188	$50,442	$52,198	$58,526	$62,834	$89,827	$0	$0	$0	$55,050
40-44	1	1	4	0	7	22	39	90	16	0	0	0	180
	$2,382	$45,882	$43,646	$0	$48,382	$52,806	$59,532	$67,525	$75,822	$0	$0	$0	$62,975
45-49	1	0	2	0	2	8	15	40	34	7	0	0	109
	$20,250	$0	$43,818	$0	$65,906	$52,434	$55,601	$66,047	$79,382	$88,750	$0	$0	$68,397
50-54	0	0	0	0	0	2	7	12	12	6	0	0	39
	$0	$0	$0	$0	$0	$51,961	$55,807	$66,726	$80,434	$77,584	$0	$0	$69,897
55-59	0	0	0	0	0	0	4	4	3	1	1	0	13
	$0	$0	$0	$0	$0	$0	$54,737	$65,180	$78,576	$95,028	$99,380	$0	$69,985
60-64	0	0	0	0	0	0	1	1	0	0	0	1	3
	$0	$0	$0	$0	$0	$0	$52,578	$66,370	$0	$0	$0	$99,737	$72,895
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	99	40	41	30	95	178	149	169	66	14	1	1	883
	$22,767	$43,646	$45,239	$45,722	$49,851	$52,376	$58,081	$66,445	$78,832	$84,413	$99,380	$99,737	$54,079

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	198	$ 7,568	18	$ 330	30	$ 431	246	$ 8,329
50 - 54	190	7,339	7	139	11	224	208	7,702
55 - 59	179	7,316	5	79	12	202	196	7,597
60 - 64	146	6,086	8	117	18	419	172	6,622
65 - 69	267	11,189	5	73	37	1,009	309	12,271
70 - 74	211	8,304	8	168	45	1,458	264	9,930
75 - 79	95	3,308	1	1	27	912	123	4,221
80 - 84	45	1,634	2	52	17	546	64	2,232
85 - 89	26	1,112	0	0	23	828	49	1,940
90 And Over	6	286	0	0	10	274	16	560
Total	**1,363**	**$ 54,142**	**54**	**$ 959**	**230**	**$ 6,303**	**1,647**	**$ 61,404**

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	155	$ 461,690	16	$ 48,537	171	$ 510,228
Joint & Survivor:						
100% to Beneficiary	153	488,188	1	4,814	154	493,002
66 2/3% to Beneficiary	91	346,052	2	7,542	93	353,594
50% to Beneficiary	79	287,299	1	2,605	80	289,904
Pop-up Option	639	2,255,465	5	10,874	644	2,266,339
Social Security Option:						
Age 62 Basic	30	75,689	0	0	30	75,689
Age 62 Survivorship	118	222,382	1	4,416	119	226,798
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	7	30,568	0	0	7	30,568
10 Years Certain & Life	37	126,008	3	6,759	40	132,767
15 Years Certain & Life	17	45,227	1	3,919	18	49,145
20 Years Certain & Life	38	115,598	2	3,979	40	119,577
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:	1,383	$ 4,497,814	34	$ 93,910	1,417	$ 4,591,725

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	12,792	63	171,187	71	183,979
66 2/3% to Beneficiary	2	1,206	13	29,580	15	30,786
50% to Beneficiary	1	1,873	20	30,085	21	31,958
Pop-up Option	2	1,154	49	140,977	51	142,131
Social Security Option:						
Age 62 Basic	0	0	2	2,281	2	2,281
Age 62 Survivorship	3	3,102	45	95,475	48	98,577
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	0	0	0	0
15 Years Certain & Life	0	0	1	721	1	721
20 Years Certain & Life	1	6,686	7	8,834	8	15,520
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:	21	$ 31,710	209	$ 493,542	230	$ 525,252

Schedule of Retirants Added to And Removed from Rolls

(Dollar amounts except average allowance expressed in thousands)

Year Ended	Added to Rolls	Removed from Rolls	Rolls End of the Year		% Increase in Annual Benefit	Average Annual Benefit
	Number	Number	Number	Annual Benefits		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2010	54	15	1,223	$ 45,516		$ 37,217
2011	52	12	1,263	47,467	4.3%	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
2019	74	27	1,647	61,404	3.0%	37,282

SECTION 5

ASSESSMENT AND DISCLOSURE OF RISK

Risks Associated with Measuring the Accrued Liability And Actuarially Determined Contribution

(As Required by ASOP No. 51)

The determination of SPRS's accrued liability and actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. The risk measures illustrated in this section are intended to aid stakeholders in understanding the effects of future experience differing from the assumptions used in performing an actuarial valuation. These risk measures may also help with illustrating the potential volatility in the funded status and actuarially determined contributions that result from differences between actual experience and the expected experience based on the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience (economic and demographic) differing from the assumptions, changes in assumptions due to changing conditions, changes in contribution requirements due to modifications to the funding policy, and changes in the liability and cost due to changes in plan provisions or applicable law. The scope of this actuarial valuation does not include any analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the System's future financial condition include:

- Investment risk – actual investment returns may differ from expected returns;
- Longevity risk – members may live longer or shorter than expected and receive pensions for a time period different than assumed;
- Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future contributions differing from expected;
- Salary and payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liabilities or contributions differing from expected;
- Asset/Liability mismatch – changes in assets may be inconsistent with changes in liabilities, thereby altering the relative difference between the assets and liabilities which may alter the funded status and contribution requirements;
- Contribution risk – actual contributions may differ from expected future contributions (for example, actual contributions not being paid in accordance with the System's funding policy, withdrawal liability assessments or other anticipated payments to the plan are not being paid, or material changes occurring in the anticipated number of covered employees, covered payroll, or another relevant contribution base).

Effects of certain experience can generally be anticipated. For example, if investment returns since the most recent actuarial valuation is less (or more) than the assumed rate of return, then the funded status of the plan can be expected to decrease (or increase) more than anticipated.

The contribution rate in this report was established in accordance with applicable Statutes and assumptions adopted by the Board. However, stakeholders should be aware that the scheduled contribution rates specified in State Code do not necessarily guarantee that the contribution requirements will not increase in a future year.

Employer Risk with Contribution Rates

Currently KRS collects contributions from the Commonwealth based on the total payroll of employees who are earning benefits in SPRS (i.e. covered payroll). The actuarially determined contribution rate is comprised of two components - the normal cost rate (to pay for the benefits accruing in the next year) and the unfunded amortization (to pay for the benefits accrued by members in previous years). The unfunded amortization is calculated by first determining the dollar amount necessary to pay for the unfunded liability based on KRS's funding policy, and then by dividing that dollar amount by expected covered payroll to convert that contribution requirement to a percentage of payroll (i.e. a contribution rate).

As the contribution requirement, as a percentage of payroll, increases then there is increased incentive for participating employers to make deliberate business action to reduce their payroll reported to the System in order to reduce their pension cost.

Plan Specific Risk Measures

Risks faced by a pension plan evolve over time. A relatively new plan with virtually no assets and paying few benefits will experience lower investment risk than a mature plan with a significant amount of assets and large number of members receiving benefits. There are a few measures that can assist stakeholders in understanding and comparing the maturity of a plan to other systems, which include:

- Ratio of market value of assets to payroll: The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. If assets are approximately the same as covered payroll, an investment return that is 5% different than assumed would equal 5% of payroll. In another example, if the assets are approximately twice as large as covered payroll, an investment return that is 5% different than assumed would equal 10% of payroll. A ratio that increases over time generally indicates the potential of an increasing volatility in employer contribution rates as a percentage of payroll.
- Ratio of actuarial accrued liability to payroll: The ratio of actuarial accrued liability to payroll can be used as a measure to indicate the potential volatility of contributions due to volatility in the liability experience. For instance, if the actuarial accrued liability is 5 times the size of the covered payroll, then a change in the liability that is 2% different than expected would be a change in magnitude that is 10% of payroll. A ratio that increases over time generally indicates the potential of an increasing volatility in employer contribution rates as a percentage of payroll.
- Percentage of Expected Contributions Actually Received: This measure identifies the percentage difference between the contributions the fund expects to receive during the fiscal year to and actual contributions received by the fund during the fiscal year. A percentage that is less than 100% means that actual contributions the fund received were less than the expected contributions determined by a prior actuarial valuation. On the other hand, a percentage that is greater than 100% means that actual contributions the fund received were more than the expected contributions.

- Ratio of active to retired members: A relatively mature open plan is likely to have close to the same number of actives to retirees resulting in a ratio that is around 1.0. On the other hand, a super-mature plan, or a plan that is closed to new entrants will have more retirees than active members resulting in a ratio below 1.0. As this ratio declines, a larger portion of the total actuarial accrued liability in the System is attributable to retirees. This metric also typically moves in tandem with the liability to payroll metric, which provides an indication of potential contribution volatility.

The following tables provide a summary of these measures for SPRS for the current year and the prior four years so stakeholders can identify how these measures are trending. While ASOP No. 51 requires this disclosure with respect to only the retirement fund, we have included this information for the insurance fund for completeness.

SPRS

	Retirement Fund					Insurance Fund				
	June 30,					June 30,				
	2019	2018	2017	2016	2015	2019	2018	2017	2016	2015
Ratio of the market value of assets to total payroll	5.99	5.48	5.26	4.78	5.40	4.21	3.91	3.68	3.54	3.61
Ratio of actuarial accrued liability to payroll	21.89	20.27	19.90	17.02	16.04	5.80	5.37	5.69	5.65	5.57
Ratio of net cash flow to market value of assets	1.3%	-2.5%	4.5%	-11.7%	-7.0%	-0.2%	-2.3%	-2.3%	-2.2%	-1.9%
Percentage of Expected Contribution Actually Received	101% [1]	101%	121%	92%	125%	100% [1]	103%	103%	112%	102%
Ratio of actives to retirees and beneficiaries	0.54	0.55	0.59	0.60	0.64					

[1] Expected contribution for FYE2019 based on the actuarially determined contribution rate of 146.28% from the June 30, 2017 valuation and expected compensation based on census data from the June 30, 2018 valuation

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, 2018 and adopted by the Board in April 2019.

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%

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

Assumed annual rate of 0.00%

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
0	12.50%	3.55%	16.05%
1	5.00%	3.55%	8.55%
2	4.00%	3.55%	7.55%
3	2.00%	3.55%	5.55%
4	2.00%	3.55%	5.55%
5	2.00%	3.55%	5.55%
6	2.00%	3.55%	5.55%
7	1.00%	3.55%	4.55%
8	1.00%	3.55%	4.55%
9	0.00%	3.55%	3.55%
10 & Over	0.00%	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.

Service	Members participating Before 9/1/2008[1]	Members participating on or after 9/1/2008[2]	Members participating after 1/1/2014[2]
20	22.0%		
21	22.0%		
22	22.0%		
23	28.0%		
24	28.0%		
25	28.0%	17.6%	16.0%
26	28.0%	17.6%	16.0%
27	28.0%	17.6%	16.0%
28	44.0%	22.4%	16.0%
29	44.0%	22.4%	16.0%
30	44.0%	22.4%	100.0%
31	58.0%	22.4%	
32	58.0%	22.4%	
33	58.0%	35.2%	
34	58.0%	35.2%	
35	58.0%	35.2%	
36	58.0%	46.4%	
37	58.0%	46.4%	
38	58.0%	46.4%	
39	58.0%	46.4%	
40+	58.0%	46.4%	

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

[2] *The annual rate of service retirement is 100% at age 60.*

For members hired after 7/1/2003 and prior to 9/1/2008, the rates shown above are multiplied by 80% if the member is under the age of 55 to reflect the different retiree health insurance benefit.

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 disability and retirement):

Assumed annual rates of withdrawal are shown below and include pre-retirement mortality rates as described on the next page.

Service	Annual Rates of Withdrawal
1	15.00%
2	4.82%
3	3.76%
4	3.15%
5	2.71%
6	2.37%
7	2.09%
8	1.86%
9	1.66%
10	1.48%
11	1.32%
12	1.17%
13	1.04%
14	0.92%
15	0.80%
16	0.70%
17	0.60%
18	0.51%
19	0.42%
20	0.34%
21 & Over	0.00%

Mortality Assumption:

Pre-retirement mortality: PUB-2010 Public Safety Mortality, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2010.

Post-retirement mortality (non-disabled): System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2019.

The following table provides the life expectancy for a non-disabled retiree in future years based on the assumption with full generational projection:

Life Expectancy for an Age 65 Retiree in Years					
Gender	**Year of Retirement**				
	2020	**2025**	**2030**	**2035**	**2040**
Male	21.0	21.4	21.8	22.2	22.6
Female	24.0	24.4	24.8	25.2	25.6

Post-retirement mortality (disabled): PUB-2010 Disabled Mortality table, with a 4-year set-forward for both male and female rates, projected with the ultimate rates from the mortality improvement scale using a base year of 2010.

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

70% 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 who receive a duty-related death or disability 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]
2021	6.25%	5.50%	1.50%
2022	6.25%	5.40%	1.50%
2023	6.25%	5.30%	1.50%
2024	6.00%	5.20%	1.50%
2025	5.80%	5.10%	1.50%
2026	5.60%	5.00%	1.50%
2027	5.40%	4.90%	1.50%
2028	5.20%	4.80%	1.50%
2029	5.00%	4.70%	1.50%
2030	4.80%	4.60%	1.50%
2031	4.60%	4.50%	1.50%
2032	4.40%	4.40%	1.50%
2033	4.20%	4.30%	1.50%
2034	4.05%	4.20%	1.50%
2035 & Beyond	4.05%	4.05%	1.50%

[1]All increases are assumed to occur on January 1. The 2020 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 – 2035

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:

- Active 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 after 7/1/2003
Under 10	100%	100%
10-14	100%	100%
15-19	100%	100%
Over 20	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	85%

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

Health Care Participation Assumptions (continued):

- 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 for members participating before January 1, 2014 and at age 60 for members participating on or after January 1, 2014.

- 75% of future retirees, with hazardous service, are assumed to elect spouse health care coverage. 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 0.9%. 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.

Other Assumptions

1. Valuation payroll (used for determining the amortization contribution rate): Current fiscal year payroll.

2. Individual salaries used to project benefits: For salary amounts prior to the valuation date, the salary from the last fiscal year is projected backward with the valuation salary scale assumption. For future salaries, the salary from the last fiscal year is projected forward with one year's salary scale.

3. Pay increase timing: Beginning of (fiscal) year. This is equivalent to assuming that reported salaries represent amounts paid to members during the year ending on the valuation date.

4. Current active members that terminated employment (for reasons other than retirement, disability, or death) are assumed to commence their retirement benefits at first unreduced retirement eligibility. Members are assumed to elect a refund of member contributions if the value of their account balance exceeds the present value of the deferred benefit. Members participating in the Cash Balance plan are assumed to elect to receive a lump sum of their cash balance account if their account balance exceeds the present value of the deferred benefit and the member is not eligible for insurance benefits at termination.

5. The beneficiaries of current active members that die while active are assumed to commence their survivor benefits at the member's first unreduced retirement eligibility. Beneficiaries are assumed to elect a refund of member contributions if the value of the member's account balance exceeds the present value of the survivor benefit. Beneficiaries of active members that die while in the line of duty are assumed to commence their survivor benefits immediately at the death of the member.

6. There will be no recoveries once disabled.

7. Cash Balance Provisions: The cash balance interest crediting rate while a member is an active employee is assumed to equal 4.9375% (based upon the 5.25% assumed investment return). The interest crediting rate after a member terminates employment is 4%.

8. Decrement timing: Decrements of all types are assumed to occur mid-year. Decrement rates are used as described in this report, without adjustment for multiple decrement table effects.

9. Service: All members are assumed to accrue 1 year of benefit and eligibility service each year.

10. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.

11. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.

12. Current Inactive Population (Retirement Fund): All non-vested members are assumed to take an immediate refund of member contributions. Vested members are assumed to elect an immediate refund of member contributions at the valuation date if the value of their account balance exceeds the present value of their deferred benefit. Members hired prior to September 1, 2008 are assumed to retire at age 55 and members hired on or after September 1, 2008 are assumed to retire at age 60.

Participant Data

Participant data was supplied in electronic text files. There were separate files for (i) active and inactive members, and (ii) members and beneficiaries receiving benefits.

The data for active and terminated members included date of birth, gender, date of participation, benefit tier indicator, service with the current system, total vesting service, salary, employee contribution account balances, and employer pay credits for members participating in the cash balance plan. For retired members and beneficiaries, the data included date of birth, gender, spouse's date of birth (where applicable), amount of monthly benefit, date of retirement, and form of payment code.

Assumptions were made to correct for missing, bad, or inconsistent data. These had no material impact on the results presented.

Changes in assumptions since the prior valuation:

- Annual salary increases were updated based on the 2018 Experience Study
- Annual rates of retirement, disability, withdrawal, and mortality were updated based on the 2018 Experience Study
- The percent of disabilities assumed to occur in the line of duty was updated from 0% to 70%
- The assumed increase in future health care costs, or trend assumption, is reviewed on an annual basis and was updated (i.e. increased) to better reflect more current expectations relating to anticipated future increases in the medical costs for post-age 65 retirees.
- The assumed impact of the Cadillac Tax was changed from a 3.6% to a 0.9% load on employer paid premiums for Non-Medicare retirees who became participants prior to July 1, 2003.

Development of Baseline Claims Cost

For non-Medicare retirees, the initial per capita costs were based on the plan premiums effective January 1, 2020, 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 $870.41 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.

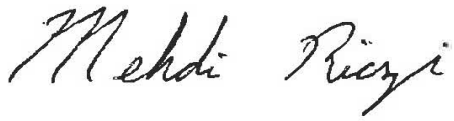
For those not eligible for Medicare		
Age	Member	Spouse/Dependents
<65	$728.75	$870.41

For Medicare retirees, the initial per capita costs were estimated based on the plan premiums effective January 1, 2020, 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	$207.21	$195.44
75	242.43	236.56
85	256.36	259.38

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, 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	1.30%
10-20	1.50%
20-25	2.25%
Greater than 25	2.50%

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 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

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 the final monthly 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

There have been no changes in benefit provisions since the prior actuarial valuation.

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, 2019, the Non-Hazardous monthly contribution was $13.58/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, 2019, the Hazardous monthly contribution was $20.37/year of service. Upon the retiree's death, the surviving spouse of a hazardous duty member will receive a monthly contribution of $10 ($13.58 as of July 1, 2019) 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, 2020

Non-Medicare Plan Options					
Plan Option	Single	Parent Plus	Couple	Family	Family X-Ref
LivingWell PPO*	$731.82	$1,044.12	$1,604.96	$1,787.46	$881.40
LivingWell CDHP	710.94	982.30	1,342.78	1,500.50	821.36
LivingWell Basic	683.58	942.52	1,457.82	1,624.66	801.82
Living Well Limited	608.24	866.76	1,334.18	1,485.46	731.68

Medicare Plan Options	
Kentucky Retirement Systems - Medical Only Plan	$176.26
Kentucky Retirement Systems – Medicare Advantage/Essential Plan	63.15
Kentucky Retirement Systems – Medicare Advantage/Premium Plan*	250.75

*For 2020, 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, 2019.

Non-Hazardous Service	Hazardous Service
$13.58	$20.37

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

Changes since the Prior Valuation

There have been no changes to benefit provisions since the prior valuation.

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.