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**Teachers' Retirement System
of the State of Kentucky
Report of the Actuary on the
Annual Valuation of the
Retirement Annuity Trust**

Prepared as of June 30, 2022





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

November 14, 2022

Board of Trustees
Teachers' Retirement System of the
State of Kentucky
479 Versailles Road
Frankfort, KY 40601-3800

Members of the Board:

Kentucky Revised Statutes (KRS) 161.400 of the law governing the operation of the Teachers' Retirement System (TRS) of the State of Kentucky provides that the actuary shall make an actuarial valuation of the System. We are pleased to submit the results of the annual actuarial valuation prepared as of June 30, 2022. While not verifying the data at source, the actuary performed tests for consistency and reasonability. The valuation reflects a new tier of benefits for members hired on or after January 1, 2022 (TRS 4).

During the 2021 valuation, a new set of economic and demographic assumptions were adopted by the TRS Board of Trustees (Board) that resulted in an increase in liabilities and contribution requirements. To help alleviate the pressure on increased contributions, a direct-rate smoothing technique was implemented to phase in the required contribution increase, estimated at 8.59% of payroll, over a five-year period beginning with the 2021 valuation. For this 2022 valuation and each of the next three valuations, we will recognize an increase in contributions of at least 1.72% of payroll as a result of the cost of the change in assumptions.

The total combined member and employer contribution rates broken down for members hired before July 1, 2002 (TRS 1), members hired between July 1, 2002 and June 30, 2008 (TRS 2) and members hired between July 1, 2008 and December 31, 2021 (TRS 3), as a percentage of payroll for the fiscal years ending June 30, 2025 and June 30, 2024, required to support the benefits are as follows:

Group	Total Combined Contributions for FYE 2025	Total Combined Contributions for FYE 2024
University TRS 1, TRS 2 and TRS 3 members	37.34%	37.00%
Non-University TRS 1 and TRS 2 members	40.30%	39.96%
Non-University TRS 3 members	41.30%	40.96%

The rates shown in the table above represent an increase since the previous valuation in the total pension actuarially determined employer contribution rates (ADEC) of 0.34% of payroll for the fiscal year ending June 30, 2025.



A breakdown of the changes in the components of the ADEC are as follows:

- an expected increase of 1.72% of payroll for the direct rate smoothing technique of phasing in contribution requirements due to the 2021 assumption changes,
- a net decrease of 0.95% of payroll due to the lump sum contribution of \$479.2 million made by the State to pay off the liability for ad hoc increases and sick leave allowances granted after 1981,
- a decrease of 0.02% of payroll due to the increase in the amount required for life insurance benefits from 0.06% to 0.08% of payroll, and
- a decrease of 0.41% of payroll due to the overall experience of the System for the fiscal year ending June 30, 2022.

The total combined member and employer statutorily required contributions for TRS 4 members are as follows:

Group	Foundational Component	Supplemental Component
University TRS 4 members	10.695%	4.00%
Non-University TRS 4 members	16.92%	4.00%

The financing objective of the system is that contribution rates will remain relatively level over time as a percentage of payroll, except as otherwise noted. The promised benefits of the system are included in the actuarially calculated contribution rates which are developed using the entry age normal cost method.

Five-year market related value of plan assets is used for actuarial valuation purposes. Gains and losses are reflected in the total unfunded actuarial accrued liability that is being amortized by regular annual contributions as a level percentage of payroll in accordance with the funding policy adopted by the Board, on the assumption that payroll will increase by 2.75% annually. The assumptions recommended by the actuary and adopted by the Board are reasonably related to the experience under the system and to reasonable expectations of anticipated experience under the system.

We have prepared the trend information shown in the Schedule of Funding Progress in the Financial Section of the Annual Report and Schedule A, Schedule B, Schedule C, Solvency Test and Analysis of Financial Experience shown in the Actuarial Section of the Annual Report. We have also included a Sensitivity Analysis that is required under Actuarial Standards of Practice Statement No. 51 (ASOP 51).

This is to certify that the independent consulting actuary is a member of the American Academy of Actuaries and has experience in performing valuations for public retirement systems, that the assumptions and methods used for funding purposes meet the parameters set by Actuarial Standards of Practice, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures, based on the current provisions of the retirement system and on actuarial assumptions that are internally consistent and reasonably based on the actual experience of the system.



In order to prepare the results in this report, we have utilized actuarial models that were developed to measure liabilities and develop actuarial costs. These models include tools that we have produced and tested, along with commercially available valuation software that we have reviewed to confirm the appropriateness and accuracy of the output. In utilizing these models, we develop and use input parameters and assumptions about future contingent events along with recognized actuarial approaches to develop the needed results.

Future actuarial results may differ significantly from the current results 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. Since the potential impact of such factors is outside the scope of a normal annual actuarial valuation, an analysis of the range of results is not presented herein.

This actuarial valuation was performed to determine the recommended funding amount for the system. The asset values used to determine unfunded actuarial accrued liabilities and funded ratios are not market values but less volatile market related values. A smoothing technique is applied to market values to determine the market-related values. The unfunded actuarial accrued liability amounts and funded ratios using the market value of assets would be different. The interest rate used for determining liabilities is based on the expected return of assets. Therefore, liability amounts in this report cannot be used to assess a settlement of the obligation.

For fiscal years ending 2007 through 2018, the system was not funded on an actuarially sound basis as the full actuarially determined employer contributions were not made by the State. However, since that time, the State has appropriated enough to satisfy the actuarially determined employer contributions. Also, it is our understanding that the state budget includes an additional appropriation to the pension plan equal to the ADEC for the 2023 fiscal year.

If contributions by the employer to the system in subsequent fiscal years are less than those required, the assets are expected to become insufficient to pay promised benefits. However, assuming that contributions to the system are made by the employer and state from year to year in the future at rates recommended on the basis of the successive actuarial valuations, the continued sufficiency of the assets to provide the benefits called for under the system may be safely anticipated.

Respectfully submitted,

A handwritten signature in blue ink that reads "Edward J. Koebel".

Edward J. Koebel, EA, FCA, MAAA
Chief Executive Officer

A handwritten signature in blue ink that reads "Alisa Bennett".

Alisa Bennett, FSA, EA, FCA, MAAA
President

A handwritten signature in blue ink that reads "Cathy Turcot".

Cathy Turcot
Principal and Managing Director



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Section I – Summary of Principal Results

1. For convenience of reference, the principal results of the aggregate valuation (TRS 1, TRS 2, TRS 3, and TRS 4) and a comparison with the results of the previous valuation are summarized below (all dollar amounts are \$1,000s):

Valuation Date	June 30, 2022	June 30, 2021
Number of active members	74,785	69,256
Annual salaries	\$ 4,033,509	\$ 3,784,400
Number of annuitants and beneficiaries	58,438	57,465
Annual allowances	\$ 2,340,475	\$ 2,265,323
Assets:		
Market value	\$ 22,899,952	\$ 25,935,779
Actuarial value	24,090,355	22,624,398
Actuarial Accrued Liability	\$ 40,970,441	\$ 39,581,704
Unfunded Actuarial Accrued Liability (UAAL)	\$ 16,880,086	\$ 16,957,306
Funded Ratio based on Actuarial Value of Assets	58.8%	57.2%
Amortization period (years)	21.9	22.9



Section I – Summary of Principal Results

2. KRS 161.633 requires that the actuary assess the funding levels, unfunded liabilities, and the actuarially required employer contribution rates payable solely on behalf of individuals who first become members on or after January 1, 2022. The following table shows the results of the valuation as of June 30, 2022, for TRS 4 members:

Group	University		Non-University	
	<u>Foundational</u>	<u>Supplemental</u>	<u>Foundational</u>	<u>Supplemental</u>
Number of active members	54		3,086	
Annual salaries	\$ 776,933		\$ 9,616,595	
Market Value of Assets	\$ 79,566	\$ 29,730	\$ 1,582,461	\$ 373,883
Actuarial Accrued Liability	\$ 18,120	\$ 5,288	\$ 337,922	\$ 66,428
Unfunded Actuarial Accrued Liability/(Surplus)	\$ (61,446)	\$ (24,442)	\$ (1,244,539)	\$ (307,455)
Funded Ratio	439.1%	562.2%	468.3%	562.8%
Actuarial Determined Contribution Rate (ADEC)	0.00%	0.00%	0.00%	0.00%

3. Contribution rates are shown separately for university and non-university members, as well as by member group (TRS 1 through TRS 4) on the following pages.



Section I – Summary of Principal Results

CONTRIBUTION RATES FOR UNIVERSITY MEMBERS – OTHER THAN TRS 4

Valuation Date	June 30, 2022		June 30, 2021	
For fiscal year ending:	June 30, 2025		June 30, 2024	
Member Group:	TRS 1 & TRS 2	TRS 3	TRS 1 & TRS 2	TRS 3
Retirement Annuity Trust:				
Normal*	12.230%	12.230%	12.280%	12.280%
Actuarial Accrued Liability	<u>25.110</u>	<u>25.110</u>	<u>24.720</u>	<u>25.720</u>
Total**	37.340%	37.340%	37.000%	38.000%
Member	7.625%	7.625%	7.625%	7.625%
State/Employer	<u>29.715</u>	<u>29.715</u>	<u>29.375</u>	<u>30.375</u>
Total**	37.340%	37.340%	37.000%	38.000%
Life Insurance Trust:				
State/Employer	0.080%	0.080%	0.060%	0.060%
Health Insurance Trust:				
Member	2.775%	2.775%	2.775%	2.775%
State/Employer Match	<u>2.775</u>	<u>2.775</u>	<u>2.775</u>	<u>1.775</u>
Total	5.550%	5.550%	5.550%	4.550%
Total Contributions	<u>42.970%</u>	<u>42.970%</u>	<u>42.610%</u>	<u>42.610%</u>
Member Fixed	10.400%	10.400%	10.400%	10.400%
State/Employer Fixed	13.650	13.650	13.650	13.650
Required Increase	18.920	18.920	16.180	16.180
State Special	<u>0.000</u>	<u>0.000</u>	<u>2.380</u>	<u>2.380</u>
Total	42.970%	42.970%	42.610%	42.610%

* Includes a load for administrative expenses.

** Total Contribution Rates for fiscal year ending June 30, 2024 and June 30, 2025, shown above apply a 5-year contribution direct rate smoothing methodology and are anticipated to increase each year until the full funding rates are achieved in not more than 5 years from the 2021 valuation. Please see the projections in Schedule H of the report for anticipated increases to the total contribution rates.



Section I – Summary of Principal Results

CONTRIBUTION RATES FOR NON-UNIVERSITY MEMBERS – OTHER THAN TRS 4

Valuation Date	June 30, 2022		June 30, 2021	
For fiscal year ending:	June 30, 2025		June 30, 2024	
Member Group:	TRS 1 & TRS 2	TRS 3	TRS 1 & TRS 2	TRS 3
Retirement Annuity Trust:				
Normal*	16.210%	16.210%	16.410%	16.410%
Accrued liability	<u>24.090</u>	<u>25.090</u>	<u>23.550</u>	<u>24.550</u>
Total**	40.300%	41.300%	39.960%	40.960%
Member	9.105%	9.105%	9.105%	9.105%
State/Employer	<u>31.195</u>	<u>32.195</u>	<u>30.855</u>	<u>31.855</u>
Total**	40.300%	41.300%	39.960%	40.960%
Life Insurance Trust:				
State/Employer	0.080%	0.080%	0.060%	0.060%
Health Insurance Trust:				
Member	3.750%	3.750%	3.750%	3.750%
State/Employer Match	<u>3.750</u>	<u>3.750</u>	<u>3.750</u>	<u>2.750</u>
Total	7.500%	7.500%	7.500%	6.500%
Total Contributions	<u>47.880%</u>	<u>48.880%</u>	<u>47.520%</u>	<u>47.520%</u>
Member Fixed	12.855%	12.855%	12.855%	12.855%
State/Employer Fixed	16.105	17.105	16.105	16.105
Required Increase	18.920	18.920	16.180	16.180
State Special	<u>0.000</u>	<u>0.000</u>	<u>2.380</u>	<u>2.380</u>
Total	47.880%	48.880%	47.520%	47.520%

* Includes a load for administrative expenses.

** Total Contribution Rates for fiscal year ending June 30, 2024 and June 30, 2025, shown above apply a 5-year contribution direct rate smoothing methodology and are anticipated to increase each year until the full funding rates are achieved in not more than 5 years from the 2021 valuation. Please see the projections in Schedule H of the report for anticipated increases to the total contribution rates.



Section I – Summary of Principal Results

CONTRIBUTION RATES FOR TRS 4 MEMBERS

Group	University		Non-University	
	June 30, 2025		June 30, 2025	
For fiscal year ending:	Foundational	Supplemental	Foundational	Supplemental
Retirement Annuity Trust:				
Normal*	7.470%	2.210%	9.490%	2.190%
Accrued liability	<u>3.225</u>	<u>1.790</u>	<u>7.430</u>	<u>1.810</u>
Total**	10.695%	4.000%	16.920%	4.000%
Member	5.000%	2.000%	9.000%	2.000%
Employer	<u>5.695</u>	<u>2.000</u>	<u>7.920</u>	<u>2.000</u>
Total**	10.695%	4.000%	16.920%	4.000%
Life Insurance Trust:				
Employer	0.080%	0.000%	0.080%	0.000%
Health Insurance Trust:				
Member	2.775%	0.000%	3.750%	0.000%
Employer	<u>2.000</u>	<u>0.000</u>	<u>3.750</u>	<u>0.000</u>
Total	4.775%	0.000%	7.500%	0.000%
Total Contributions	<u>15.550%</u>	<u>4.000%</u>	<u>24.500%</u>	<u>4.000%</u>
Member Fixed	7.775%	2.000%	12.750%	2.000%
Employer Fixed	<u>7.775</u>	<u>2.000</u>	<u>11.750</u>	<u>2.000</u>
Total	15.550%	4.000%	24.500%	4.000%

* Includes a load for administrative expenses.



Section I – Summary of Principal Results

4. The valuation includes only the assets and liabilities associated with the pension plan. The valuation of the Health Insurance Trust and the active and retired life insurance benefits has been prepared separately.
5. Comments on the valuation results as of June 30, 2022 are given in Section IV and further discussion of the contribution levels and funding is set out in Sections V and VI.
6. Schedule B shows the development of the actuarial value of assets. The assumed investment rate of return is 7.10%.
7. Schedule D of this report outlines the full set of actuarial assumptions and methods employed in the current valuation. There have been no changes since the previous valuation. Direct-rate smoothing is being used to phase in the impact of the June 30, 2021 assumption changes to the required contributions over a five-year period. The cost of the assumption changes was estimated at 8.59% of payroll beginning with the June 30, 2021 valuation, which represents an expected increase of at least 1.72% of payroll each year over a five-year period to cover the cost of the change in assumptions.
8. Provisions of the system, as summarized in Schedule F, were taken into account in the current valuation. The System was amended to reflect a new tier of benefits for members hired on or after January 1, 2022 (TRS 4). These plan changes are first recognized in this June 30, 2022 valuation.
9. The aggregate funded ratio for TRS 1 through TRS 4, shown in the Summary of Principal Results on page 1, is the ratio of actuarial value of assets to the actuarial accrued liability. The funded status would be different based on the market value of assets. The funded ratio is an indication of progress in funding the promised benefits. The ratio is less than 100% for TRS 1 through TRS 3 and therefore, there is a need for additional contributions toward the payment of the unfunded actuarial accrued liability. For TRS 4, the ratio is above 100%, so there is no need for additional contributions. In addition, this funded ratio does not have any relationship to measuring the sufficiency if the plan had to settle its liabilities.



Section II – Membership Data

1. Data regarding the membership of the system for use as a basis of the valuation were furnished by the Retirement System office. The following table shows the number of active members and their annual salaries as of June 30, 2022 on the basis of which the valuation was prepared.

GROUP	NUMBER	ANNUAL SALARIES (\$1,000s)
<u>University Active Members</u>		
TRS 1 and TRS 2 Members	1,434	\$ 101,598
TRS 3 Members	1,493	85,937
TRS 4 Members	<u>54</u>	<u>777</u>
Total University Active Members	2,981	\$ 188,312
<u>Non-University Active Members</u>		
Full Time TRS 1 and TRS 2 Members	29,322	\$ 2,120,507
Full Time TRS 3 Members	30,726	1,633,131
Full Time TRS 4 Members	436	6,044
Part Time TRS 1 and TRS 2 Members	1,036	10,164
Part Time TRS 3 Members	8,741	71,779
Part Time TRS 4 Members	<u>1,543</u>	<u>3,572</u>
Total Non-University Members	71,804	\$ 3,845,197
Grand Total	74,785	\$ 4,033,509



Section II – Membership Data

2. The following table shows the number and annual retirement allowances payable to annuitants and beneficiaries on the roll of the retirement system as of the valuation date.

**THE NUMBER AND ANNUAL RETIREMENT ALLOWANCES OF
ANNUITANTS AND BENEFICIARIES ON THE ROLL
AS OF JUNE 30, 2022**

GROUP	NUMBER	ANNUAL RETIREMENT ALLOWANCES¹ (\$1,000s)
Service Retirements	50,977	\$ 2,129,595
Disability Retirements	2,784	88,664
Beneficiaries of Deceased Members	<u>4,677</u>	<u>122,216</u>
Total	58,438	\$ 2,340,475

¹ Includes cost-of-living adjustments effective through July 1, 2022.

3. In addition, there are 10,690 terminated vested employees entitled to benefits in the future and 49,637 inactive non-vested members.
4. Table 1 of Schedule G shows a distribution by age and years of service of the number and annual salaries of active members included in the valuation, while Table 2 shows the number and annual retirement allowances of annuitants and beneficiaries included in the valuation, distributed by age.



Section III – Assets

1. As of June 30, 2022, the total market value of pension plan assets for valuation purposes held by the system amounted to \$22,899,952,370. This value excludes assets in the Health Insurance Trust, the 403(b) Program Reserve Fund, and the Life Insurance Trust, which are not included in the assets used for pension plan valuation purposes. The investment return for the plan year ending June 30, 2022 on a market value basis was (10.9)%. Schedule C shows the receipts and disbursements for the year preceding the valuation date and a reconciliation of the asset balances for the pension plan.
2. The five-year market related value of pension plan assets used for valuation purposes as of June 30, 2022 was \$24,090,355,038. The estimated investment return for the plan year ending June 30, 2022 on an actuarial value of assets basis was 7.9%, compared to the assumed investment rate of return for the period of 7.10%. Schedule B shows the development of the actuarial value of assets as of June 30, 2022.
3. Below is a history of actual investment rates of return for the pension plan over the past five years:

Fiscal Year End	Market Value Rate of Return	Actuarial Value Rate of Return
2022	(10.9)%	7.9%
2021	29.6%	12.9%
2020	5.5%	7.0%
2019	5.6%	7.1%
2018	10.5%	9.1%



Section IV – Comments on Valuation

1. Schedule A of this report contains the valuation balance sheet which shows the present and prospective assets and liabilities of the system for TRS 1 through TRS 4 as of June 30, 2022. The valuation was prepared in accordance with the actuarial assumptions and the actuarial cost method, which are described in Schedule D and Schedule E.
2. The valuation balance sheet shows that the system has total prospective liabilities of \$20,401,000,179 for benefits expected to be paid on account of the present active members. The liability on account of benefits payable to annuitants and beneficiaries amounts to \$25,474,580,917 of which there are no remaining special appropriations to be made toward funding ad hoc increases and sick leave allowances granted after 1981. The liability for benefits expected to be paid to inactive members and to members entitled to deferred vested benefits is \$527,630,111. The total prospective liability of the system amounts to \$46,403,211,207. Against these liabilities, the system has present assets for valuation purposes of \$24,090,355,038. When this amount is deducted from the total liabilities of \$46,403,211,207, there remains \$22,312,856,169 as the present value contributions to be made in the future.
3. The contributions to the system consist of normal contributions and actuarial accrued liability contributions. The valuation indicates that total normal contributions (including a load for administrative expenses of 0.32% of payroll) are required at the rate of:
 - 12.23% of payroll for University members other than TRS 4,
 - 9.68% of payroll for University TRS 4 members for both Foundational and Supplemental Plans,
 - 16.21% of payroll for Non-University members other than TRS 4, and
 - 11.68% of payroll for Non-University TRS 4 members for both Foundational and Supplemental Plans.



Section IV – Comments on Valuation

4. Prospective normal employer and employee contributions have a present value of \$5,432,770,036. When this amount is subtracted from \$22,312,856,169, which is the present value of the total future contributions to be made by the employer, there remains \$16,880,086,133 as the amount of future unfunded actuarial accrued liability contributions.
5. The unfunded actuarial accrued liability decreased by approximately \$(77.2) million for the plan year ending June 30, 2022, and the funding ratio increased from 57.2% to 58.8%. These results were mainly due to the additional employer contribution of \$479.2 million made for the fiscal year ending June 30, 2022, to pay off the unfunded liability for ad hoc increases and sick leave allowances granted after 1981. See Section VII for a complete breakdown of the experience of the System.



Section V – Contributions Payable Under the System

Employee Contributions

1. KRS 161.540 provides that for members hired before January 1, 2022, each university member will contribute 10.400% of annual compensation to the system and each non-university member will contribute 12.855% of annual compensation. Of this amount, for each university member, 2.775% is paid to the Health Insurance Trust for medical benefits and for each non-university member, 3.75% is paid to the Health Insurance Trust for medical benefits. The remainder, 7.625% for university members and 9.105% for non-university members, is applicable for the retirement benefits taken into account in the valuation.
2. KRS 161.540 also provides that for members hired on and after January 1, 2022, each university member will contribute 9.775% of annual compensation to the system for both Foundational and Supplemental and each non-university member will contribute 14.75% of annual compensation for both Foundational and Supplemental. Of this amount, for each university member, 2.775% is paid to the Health Insurance Trust for medical benefits and for each non-university member, 3.75% is paid to the Health Insurance Trust for medical benefits. Of the remainder, 5.00% for university members and 9.00% for non-university members is applicable to the foundational benefit component of the retirement benefits. Finally, an additional 2.00% is applicable to the supplemental benefit component of the retirement benefits for all TRS 4 members.

Employer Contributions

3. KRS 161.550 provides that, for members hired before January 1, 2022, each employer will contribute an amount to fund pension and life insurance benefits equal to 10.875% of the total annual compensation of university members, 12.355% of the total annual compensation of non-university members hired prior to July 1, 2008, and 13.355% of the total annual compensation of non-university members hired on and after July 1, 2008. Additional contributions are made to the Health Insurance Trust as required under KRS 161.550.
4. KRS 161.550 also provides that, for members hired on or after January 1, 2022, each employer will contribute an amount to fund pension and life insurance benefits equal to 5.775% for university members and 8.00% for non-university members.



Section V – Contributions Payable Under the System

5. Based on the results of the current valuation, of the amounts shown above, 0.08% of payroll will be allocated to the Life Insurance Trust.
6. Based on the results of the current valuation, an additional 24.09% of payroll for both university and non-university members other than TRS 4, would be required in order to maintain the amortization schedule of the unfunded actuarial accrued liability in accordance with the funding policy adopted by the Board. However, due to the results of the experience study adopted by the Board, direct-rate smoothing of contribution rates will be used to phase in the impact over a 5-year period. The resulting required increase based on direct-rate smoothing is 18.92% of payroll for the fiscal year ending June 30, 2025.
7. The State made an additional contribution of \$479.2 million during the fiscal year ended June 30, 2022, to pay off the accrued liability for ad hoc increases and sick leave allowances granted after 1981. Therefore, there are no additional special appropriations needed by the State.
8. The total ADEC to the pension plan is 29.715% for university members other than TRS 4. The total ADEC rate to the pension plan is 31.195% for non-university TRS 1 and TRS 2 members, and 32.195% for non-university TRS 3 members. The total member and employer contribution rates to the pension plan for members other than TRS 4, are shown in the following tables.



Section V – Contributions Payable Under the System

CONTRIBUTION RATES BY SOURCE

UNIVERSITY – OTHER THAN TRS 4

	TRS 1, TRS 2, and TRS 3 Members
<u>Member</u>	
Fixed Total	10.400%
Fixed Health Insurance Trust	<u>(2.775)</u>
Contribution to Retirement Annuity Trust	7.625%
<u>Employer</u>	
Fixed Total	13.650%
Fixed Health Insurance Trust	<u>(2.775)</u>
Subtotal	10.875%
Life Insurance Trust	(0.080)%
Additional to Comply with Board Funding Policy using Direct-Rate Smoothing of the Impact of the Assumption Changes over Five Years	18.920
Special Appropriation	<u>0.000</u>
ADEC Contribution to Retirement Annuity Trust	29.715%
Total Contribution to Retirement Annuity Trust	37.340%



Section V – Contributions Payable Under the System

CONTRIBUTION RATES BY SOURCE

NON-UNIVERSITY – MEMBERS OTHER THAN TRS 4

	TRS 1 and TRS 2 Members	TRS 3 Members
<u>Member</u>		
Fixed Total	12.855%	12.855%
Fixed Medical Insurance Trust	<u>(3.750)</u>	<u>(3.750)</u>
Contribution to Retirement Annuity Trust	9.105%	9.105%
<u>Employer</u>		
Fixed Total	16.105%	17.105%
Fixed Medical Insurance Trust	<u>(3.750)</u>	<u>(3.750)</u>
Subtotal	12.355%	13.355%
Life Insurance Trust	(0.080)%	(0.080)%
Additional to Comply with Board Funding Policy using Direct-Rate Smoothing of the Impact of the Assumption Changes over Five Years	18.920	18.920
Special Appropriation	<u>0.000</u>	<u>0.000</u>
ADEC Contribution to Retirement Annuity Trust	31.195%	32.195%
Total Contribution to Retirement Annuity Trust	40.300%	41.300%

8. The valuation indicates that normal contributions at the rate of 12.23% of active university members' salaries and 16.21% of active non-university members' salaries are required for members other than TRS 4. In addition, the valuation indicates that normal contributions at the rate of 9.68% of active university members' salaries and 11.68% of active non-university members' salaries are required for TRS 4 members. The difference between the total contribution rate and the normal rate remains to be applied toward the liquidation of the unfunded actuarial accrued liability. This actuarial accrued liability rate, based on the assumptions set forth in the Board's funding policy and including the impact of direct-rate smoothing of contributions, is 25.11% for university members other than TRS 4, 24.09% for non-university TRS 1 and TRS 2 members, and 25.09% for non-university TRS 3 members. The actuarial accrued liability rate for TRS 4 members is 5.01% for university members and 9.24% for non-university members. These rates are shown in the following tables:



Section V – Contributions Payable Under the System

COMBINED MEMBER AND EMPLOYER CONTRIBUTION RATES – MEMBERS OTHER THAN TRS 4

RATE	PERCENTAGE OF ACTIVE MEMBERS' SALARIES			
	UNIVERSITY		NON-UNIVERSITY	
	TRS 1 and TRS 2 Members	TRS 3 Members	TRS 1 and TRS 2 Members	TRS 3 Members
Total Normal Cost*	12.23%	12.23%	16.21%	16.21%
Actuarial Accrued liability	<u>25.11</u>	<u>25.11</u>	<u>24.09</u>	<u>25.09</u>
Total**	37.34%	37.34%	40.30%	41.30%

* Includes a load for administrative expenses.

** Total Contribution Rates shown above apply a 5-year contribution direct rate smoothing methodology and are anticipated to increase each year until the full funding rates are achieved in not more than 5 years from the 2021 valuation. Please see the projections in Schedule H of the report for anticipated increases to the total contribution rates.

FIXED CONTRIBUTION RATES – TRS 4 MEMBERS

RATE	PERCENTAGE OF ACTIVE MEMBERS' SALARIES			
	UNIVERSITY		NON-UNIVERSITY	
	Foundational	Supplemental	Foundational	Supplemental
Total Normal Cost*	7.470%	2.21%	9.49%	2.19%
Actuarial Accrued liability	<u>3.225</u>	<u>1.79</u>	<u>7.43</u>	<u>1.81</u>
Total	10.695%	4.00%	16.92%	4.00%

* Includes a load for administrative expenses.



Section V – Contributions Payable Under the System

9. The following table shows the components of the total Unfunded Actuarial Accrued Liability (UAAL) and the derivation of the UAAL contribution rate in accordance with the funding policy:

TOTAL UAAL AND UAAL CONTRIBUTION PAYMENT
(Dollar amounts in thousands)

	<u>ORIGINAL UAAL</u>	<u>CURRENT UAAL</u>	<u>REMAINING AMORTIZATION PERIOD (YEARS)</u>	<u>AMORTIZATION PAYMENT</u>
Legacy	\$14,010,205	\$15,369,769	22	\$1,087,449
New Incremental 6/30/2015	(351,610)	(326,576)	13	(33,180)
New Incremental 6/30/2016*	340,766	322,698	14	31,022
New Incremental 6/30/2017	(428,468)	(412,846)	15	(37,741)
New Incremental 6/30/2018	(192,240)	(187,655)	16	(16,383)
New Incremental 6/30/2019	53,306	52,516	17	4,395
New Incremental 6/30/2020	112,464	111,447	18	8,972
New Incremental 6/30/2021*	2,042,379	2,029,763	19	157,625
New Incremental 6/30/2022	(79,030)	<u>(79,030)</u>	20	<u>(5,936)</u>
Total UAAL		\$16,880,086		\$1,196,223**
UAAL as a Percentage of Payroll				29.66%**
Blended amortization period (years)				21.9

* Includes assumption changes

** The UAAL payment provided above is the total payment before any consideration of the direct rate smoothing technique per the Board's Funding Policy.



Section VI – Comments on Level of Funding

1. Our calculations indicate that the contribution rates shown in the previous section will be sufficient to cover the benefits of the system and the annual 1.5% increases in the allowances of retired members and beneficiaries.
2. The valuation indicates that the present fixed contribution rates, if continued at the current level percentage, along with an additional required contribution for members other than TRS 4 members, are sufficient to meet the cost of benefits currently accruing and provide for the amortization of the unfunded actuarial accrued liability in accordance with the Board funding policy and the direct rate smoothing methodology of phasing in the additional required contribution.
3. The Actuarially Determined Employer Contribution (ADEC) is determined based on the Board's funding policy, and the amortization and direct rate smoothing methodologies. Each year, we determine the required increase percentage needed, in addition to the present fixed contribution rates to fund the ADEC over the closed amortization period. The table on the next page provides a historical view of the special appropriations and required increase as a percentage of payroll.



Section VI – Comments on Level of Funding

Valuation Year End June 30	Fiscal Year End June 30	Special Appropriations Rate	Cumulative Required Increase Rate	Cumulative Total State Additional Contribution Rate	Cumulative Total State Required Contribution Amounts
2005	2008	4.17%	1.32%	5.49%	\$162,062,900
2006	2009	4.25	1.88	6.13	197,267,800
2007	2010	4.28	2.46	6.74	225,574,200
2008	2011	4.15	3.59	7.74	261,860,000
2009	2012	3.88	5.81	9.69	347,988,000
2010	2013	3.69	7.27	10.96	393,444,000
2011	2014	3.50	8.02	11.52	430,090,000
2012	2015	3.00	10.42	13.42	497,648,000
2013	2016	2.90	12.97	15.87	596,397,000
2014	2017	2.70	13.80	16.50	622,184,000
2015	2018	2.94	13.49	16.43	624,660,000
2016	2019	2.83	14.61	17.44	660,830,000
2017	2020	3.00	14.10	17.10	652,775,000
2018	2021	2.89	14.27	17.16	662,701,000
2019	2022	3.05	14.82	17.87	698,411,000
2020	2023	2.61	15.78	17.39	733,520,000
2021	2024	2.38	16.18	18.56	741,547,000
2022	2025	0.00	18.92	18.92	805,690,000

4. The amounts above are calculated by the actuary as the minimum additional dollar amounts to be contributed by the State in order to comply with the Board's funding policy and include the impact of direct-rate smoothing of the cost of assumption changes over five years beginning with the 2021 valuation. For the years shaded in light and dark gray, the State required contribution amounts were made or are expected to be made in full.



Section VI – Comments on Level of Funding

5. As can be seen from the table on the previous page, the total State additional contribution rate increase is 0.36% of payroll from FYE24 to FYE25. This increase is based on:
- an expected increase of 1.72% of payroll for the direct rate smoothing technique of phasing in contribution requirements due to the 2021 assumption changes,
 - a net decrease of 0.95% of payroll due to the lump sum contribution of \$479.2 million made by the State to pay off the liability for ad hoc increases and sick leave allowances granted after 1981, and
 - a decrease of 0.41% of payroll due to the overall experience of the System for the fiscal year ending June 30, 2022.
6. Effective September 21, 2020, the amount to be provided by the State shall not be less than the prior year's dollar amount until the plan (TRS 1 through TRS 3) reaches a funded ratio of 100%. Any further benefit improvements or return to work changes must be accompanied by the entire additional contributions necessary to support the benefits.



Section VII – Analysis of Financial Experience

The following table shows the estimated gain or loss from various factors that resulted in a decrease of \$77,220,067 in the unfunded actuarial accrued liability from \$16,957,306,200 to \$16,880,086,133 during the year ending June 30, 2022. The decrease in the unfunded actuarial accrued liability was primarily due to a lump sum contribution made by the State to pay off the liability for ad hoc increases and sick leave allowances granted after 1981. There was also a gain due to investment return on an actuarial value basis that was greater than expected (7.9% vs. 7.1%) and a gain due to mortality (more deaths than expected). These gains were partially offset by a loss due to salary increases that were more than expected.

ANALYSIS OF FINANCIAL EXPERIENCE
(Dollar amounts in thousands)

ITEM	AMOUNT OF INCREASE/ (DECREASE)
Interest (7.10%) added to previous unfunded actuarial accrued liability	\$ 1,203,969
Expected actuarial accrued liability contribution	(1,007,960)
Gain due to excess contributions	(479,200)
Experience:	
Valuation asset growth	(178,612)
Pensioners' mortality	(15,604)
Turnover and retirements	5,897
New entrants	69,124
Salary increases	285,896
Amendments	0
Assumption changes	0
Data changes	<u>39,270</u>
Total	\$ (77,220)



Section VIII – Accounting Information

The information required under Governmental Accounting Standards Board (GASB) Statements No. 67 and 68 will be issued in separate reports. The following information is provided for informational purposes only.

1. The following is a distribution of the number of employees by type of membership.

NUMBER OF ACTIVE AND RETIRED MEMBERS AS OF JUNE 30, 2022

GROUP	NUMBER
Retirees and beneficiaries currently receiving benefits	58,438
Terminated vested employees entitled to benefits but not yet receiving benefits	10,690
Inactive non-vested members	49,637
Active plan members	<u>74,785</u>
Total	193,550

2. The schedule of funding progress is shown below.

SCHEDULE OF FUNDING PROGRESS (Dollar amounts in thousands)

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded AAL (UAAL) (b - a)	Funded Ratio (a / b)	Annual Salaries (c)	UAAL as a Percentage of Annual Salaries ((b - a) / c)
6/30/2017*	\$18,514,638	\$32,819,886	\$14,305,248	56.4%	\$3,563,584	401.4%
6/30/2018	19,496,056	33,795,671	14,299,616	57.7	3,605,116	396.6
6/30/2019	20,154,161	34,676,713	14,522,552	58.1	3,648,428	398.0
6/30/2020	20,796,494	35,582,250	14,785,756	58.4	3,723,482	397.1
6/30/2021	22,624,398	39,581,704	16,957,306	57.2	3,784,400	448.1
6/30/2022*	24,090,355	40,970,441	16,880,086	58.8	4,033,509	418.5

* Reflects change in assumptions



Section VIII – Accounting Information

3. The information presented above was determined as part of the actuarial valuation at June 30, 2022. Additional information as of the latest actuarial valuation follows.

Valuation date	6/30/2022
Actuarial cost method	Entry Age
Amortization method	Level percent of pay, closed
Remaining amortization period	21.9 years
Asset valuation method	5-year smoothed market
Actuarial assumptions:	
Investment Rate of Return*	7.10%
Projected salary Increases**	3.00% - 7.50%
Cost-of-living adjustments	1.50% Annually
*Includes price inflation at	2.50%
**Includes wage inflation at	2.75%

SCHEDULE OF EMPLOYER CONTRIBUTIONS

Fiscal Year Ending June 30	Actuarially Determined Employer Contributions	Actual Employer Contributions	Percentage Contributed
2017	\$ 1,076,617,093	\$ 1,060,719,993	99%
2018	1,080,892,201	1,048,671,201	97
2019	1,123,034,823	1,123,034,823	100
2020	1,134,281,095	1,134,281,095	100
2021	1,146,977,669	1,146,977,669	100
2022	1,200,342,369	1,679,584,669	140



Section IX – Risk Assessment

Actuarial Standards of Practice (ASOP) No. 51, issued by the Actuarial Standards Board, provides guidance on assessing and disclosing risks related to pension plan funding. This guidance is binding on all credentialed actuaries practicing in the United States. This standard was issued as final in September 2017 with application to measurement dates on or after November 1, 2018.

The term “risk” frequently has a negative connotation, but from an actuarial perspective, it may be thought of as simply the fact that what actually happens in the real world will not always match what was expected, based on actuarial assumptions. Of course, when actual experience is better than expected, the favorable risk is easily absorbed. The risk of unfavorable experience will likely be unpleasant, and so there is an understandable focus on aspects of risk that are negative.

Risk usually can be reduced or eliminated at some cost. Consumers, for example, buy auto and home insurance to reduce the risk associated with accidents or catastrophes. Another way to express this concept, however, is that there is generally some reward for assuming risk. Thus, retirement plans invest not just in US Treasury bonds which have almost no risk, but also in equities which are considerably riskier – because they have an expected reward of a higher return that justifies the risk.

Under ASOP 51, the actuary is called on to identify the significant risks to the pension plan and provide information to help those sponsoring and administering the plan understand the implications of these risks. In this section, we identify some of the key risks for the Plan and provide information to help interested parties better understand these risks.



Section IX – Risk Assessment

Sensitivity Analysis

The valuation results are a projection of expected benefit payments based on the actuarial assumptions. Actual experience will differ from these assumptions, either increasing or decreasing liabilities and valuation results. The charts on the following pages provide a simple analysis on how the costs are sensitive to changes in the assumed discount rate, the assumed price inflation rate and the rate of wage inflation. The charts show the actuarial accrued liability, the unfunded actuarial accrued liability, the funded ratio and the employer contribution rate under each of the following scenarios:

- **TABLE 1** - The discount rate assumption sensitivity analysis shows the valuation results with the baseline discount rate assumption, 7.10%, together with an increase and a decrease of 1.00% in the discount rate. Under this scenario, the underlying price inflation rate assumption is held constant at 2.50% and the wage inflation assumption is held constant at 2.75%.
- **TABLE 2** - The price inflation assumption sensitivity analysis shows the valuation results with the baseline underlying price inflation rate assumption, 2.50%, together with decreases in the price inflation rate to 2.25% and 2.00%. Under this scenario, the decrease in the underlying price inflation rate assumption leads to corresponding decreases in the discount rate (6.85% and 6.60%, respectively), the wage inflation assumption (2.50% and 2.25%, respectively), and the assumed rates of salary increase for active members.
- **TABLE 3** - The wage inflation assumption sensitivity analysis shows the valuation results with the baseline underlying wage inflation assumption, 2.75%, together with decreases in the wage inflation assumption to 1.25% and 0.00%. Under this scenario, all other assumptions, including the individual member salary scale, are held constant so that the only impact is in the amortization of the unfunded actuarial accrued liability, leading to higher employer contribution rates.



Section IX – Risk Assessment

TABLE 1

TRS KENTUCKY ASSUMED DISCOUNT RATE SENSITIVITY ANALYSIS AS OF JUNE 30, 2022 (\$1,000s)			
	Decrease Discount Rate	Valuation Results	Increase Discount Rate
Actuarial Accrued Liability	\$ 45,965,283	\$ 40,970,441	\$ 36,819,951
Actuarial Value of Assets	<u>24,090,355</u>	<u>24,090,355</u>	<u>24,090,355</u>
Unfunded Actuarial Accrued Liability	\$ 21,874,928	\$ 16,880,086	\$ 12,729,596
Funded Ratio	52.4%	58.8%	65.4%
Employer ADEC – University	45.135%	34.865%	25.945%
Employer ADEC – Non-University*	47.615%	37.345%	28.425%
Discount Rate	6.10%	7.10%	8.10%
Wage Inflation Rate	2.75%	2.75%	2.75%
Price Inflation Rate	2.50%	2.50%	2.50%

* Less 1% for TRS 1 and TRS 2 members. The ADEC rates do not include the impact of direct-rate smoothing.

TABLE 2

TRS KENTUCKY PRICE INFLATION ASSUMPTION SENSITIVITY ANALYSIS AS OF JUNE 30, 2022 (\$1,000s)			
	Valuation Results	Decrease Inflation Rate 0.25%	Decrease Inflation Rate 0.50%
Actuarial Accrued Liability	\$ 40,970,441	\$ 41,986,727	\$ 43,048,890
Actuarial Value of Assets	<u>24,090,355</u>	<u>24,090,355</u>	<u>24,090,355</u>
Unfunded Actuarial Accrued Liability	\$ 16,880,086	\$ 17,896,372	\$ 19,785,465
Funded Ratio	58.8%	57.4%	56.0%
Employer ADEC – University	34.865%	37.305%	39.865%
Employer ADEC – Non-University*	37.345%	39.785%	42.345%
Discount Rate	7.10%	6.85%	6.60%
Wage Inflation Rate	2.75%	2.50%	2.25%
Price Inflation Rate	2.50%	2.25%	2.00%

* Less 1% for TRS 1 and TRS 2 members. The ADEC rates do not include the impact of direct-rate smoothing.



Section IX – Risk Assessment

TABLE 3

TRS KENTUCKY WAGE INFLATION ASSUMPTION SENSITIVITY ANALYSIS AS OF JUNE 30, 2022			
	(\$1,000s)		
	Valuation Results	Decrease Wage Inflation to 1.25%	No Wage Inflation
Actuarial Accrued Liability	\$ 40,970,441	\$ 40,970,441	\$ 40,970,441
Actuarial Value of Assets	<u>24,090,355</u>	<u>24,090,355</u>	<u>24,090,355</u>
Unfunded Actuarial Accrued Liability	\$ 16,880,086	\$ 16,880,086	\$ 16,880,086
Funded Ratio	58.8%	58.8%	58.8%
Employer ADEC – University	34.865%	39.345%	43.415%
Employer ADEC – Non-University*	37.345%	41.825%	45.895%
Discount Rate	7.10%	7.10%	7.10%
Wage Inflation Rate	2.75%	1.25%	0.00%
Price Inflation Rate	2.50%	2.50%	2.50%

* Less 1% for TRS 1 and TRS 2 members. The ADEC rates do not include the impact of direct-rate smoothing.



Schedule A – Valuation Balance Sheet and Solvency Test

**SHOWING THE PRESENT AND PROSPECTIVE ASSETS AND LIABILITIES
AS OF JUNE 30, 2022
FOR TRS 1 THROUGH TRS 4
(Dollar amounts in thousands)**

ACTUARIAL LIABILITIES		
(1)	Present value of prospective benefits payable on account of present active members	
-	Service retirement benefits	\$ 19,332,819
-	Disability retirement benefits	711,865
-	Death and survivor benefits	117,441
-	Refunds of member contributions	<u>238,875</u>
	Total	\$ 20,401,000
(2)	Present value of prospective benefits payable on account of present retired and disabled members, and beneficiaries of deceased members	
-	Service retirement benefits	\$ 23,458,959
-	Disability retirement benefits	991,565
-	Death and survivor benefits	<u>1,024,057</u>
	Total	\$ 25,474,581
(3)	Present value of prospective benefits payable on account of inactive members and members entitled to deferred vested benefits	<u>\$ 527,630</u>
(4)	TOTAL ACTUARIAL LIABILITIES	<u>\$ 46,403,211</u>
PRESENT AND PROSPECTIVE ASSETS		
(5)	Actuarial value of assets	\$ 24,090,355
(6)	Present value of total future contributions = (4)-(5)	\$ 22,312,856
(7)	Present value of future member contributions and employer normal contributions	\$ 5,432,770
(8)	Prospective unfunded actuarial accrued liability contributions = (6)-(7)	<u>\$ 16,880,086</u>
(9)	TOTAL PRESENT AND PROSPECTIVE ASSETS	<u>\$ 46,403,211</u>



Schedule A – Valuation Balance Sheet and Solvency Test

**SOLVENCY TEST
FOR TRS 1 THROUGH TRS 4
(Dollar amounts in millions)**

Valuation Date	Aggregate Actuarial Accrued Liability For			Valuation Assets	Portion of Accrued Liabilities Covered by Assets		
	(1)	(2)	(3)		(1)	(2)	(3)
	Active Member Contributions	Retirants And Beneficiaries	Active Members (Employer Financed Portion)				
6/30/2017	\$3,849.9	\$21,108.0	\$7,862.0	\$18,514.6	100%	69%	0%
6/30/2018	3,927.8	21,922.5	7,945.4	19,496.1	100	71	0
6/30/2019	4,022.4	22,601.6	8,052.8	20,154.2	100	71	0
6/30/2020	4,158.7	23,158.6	8,264.8	20,796.5	100	72	0
6/30/2021	4,282.8	25,367.6	9,931.4	22,624.4	100	72	0
6/30/2022	4,420.7	26,002.2	10,547.5	24,090.4	100	76	0



Schedule B – Development of the Actuarial Value of Assets

AS OF JUNE 30, 2022 FOR TRS 1 THROUGH TRS 4

(1)	Actuarial Value of Assets Beginning of Year	\$ 22,624,398,184
(2)	Net Position at Market Value at End of Year	\$ 22,899,952,370
(3)	Net Position at Market Value at Beginning of Year	\$ 25,935,779,206
(4)	Cash Flow	
a.	Contributions	\$ 2,036,551,289
b.	Benefit Payments	2,332,597,975
c.	Administrative Expense	<u>12,005,095</u>
d.	Net: (4)a – (4)b – (4)c	\$ (308,051,781)
(5)	Investment Income	
a.	Market total: (2) – (3) – (4)d	\$ (2,727,775,055)
b.	Assumed Rate	7.10%
c.	Amount for Immediate Recognition: [(3) x (5)b] + [(4)d x 0.5]	\$ 1,830,504,485
d.	Amount for Phased-In Recognition: (5)a – (5)c	\$ (4,558,279,540)
(6)	Phased-In Recognition of Investment Income	
a.	Current Year: 0.20 x (5)d	\$ (911,655,908)
b.	First Prior Year	898,669,898
c.	Second Prior Year	(81,156,976)
d.	Third Prior Year	(77,474,783)
e.	Fourth Prior Year	<u>115,121,919</u>
f.	Total Recognized Investment Income	\$ (56,495,850)
(7)	Actuarial Value of Assets End of Year: (1) + (4)d + (5)c + (6)f	\$ 24,090,355,038
(8)	Difference Between Market & Actuarial Values: (2) – (7)	\$ (1,190,402,668)
(9)	Net Investment Rate of Return on Actuarial Value:	7.9%



Schedule C – Summary of Receipts and Disbursements

SUMMARY OF RECEIPTS AND DISBURSEMENTS* FOR TRS 1 THROUGH TRS 4 (Market Value)

	For the Year Ending	
	June 30, 2022	June 30, 2021
Receipts for the Year		
Contributions		
Members	\$ 356,966,620	\$ 327,833,177
Employers	<u>1,679,584,669</u>	<u>1,146,977,669</u>
Total	2,036,551,289	1,474,810,846
Net Investment Income	<u>(2,727,775,055)</u>	<u>6,017,184,311</u>
TOTAL	\$ (691,223,766)	\$ 7,491,995,157
Disbursements for the Year		
Benefit Payments	\$ 2,305,852,772	\$ 2,235,240,616
Refunds to Members	26,745,203	25,373,818
Miscellaneous, including expenses	<u>12,005,095</u>	<u>12,601,841</u>
TOTAL	\$ 2,344,603,070	\$ 2,273,216,275
Excess of Receipts over Disbursements	\$ (3,035,826,836)	\$ 5,218,778,882
Reconciliation of Net Position		
Net Position as of the Beginning of the Year	\$ 25,935,779,206	\$ 20,717,000,324
Excess of Receipts over Disbursements	<u>(3,035,826,836)</u>	<u>5,218,778,882</u>
Net Position as of the End of the Year	<u>\$ 22,899,952,370</u>	<u>\$ 25,935,779,206</u>
Net Investment Rate of Return on Market Value	(10.9)%	29.6%

* Excludes assets for Health Insurance Trust, the 403(b) Program Reserve Fund and the Life Insurance Trust.



Schedule D – Outline of Actuarial Assumptions and Methods

The assumptions and methods used in the valuation were selected based on the actuarial experience study prepared as of June 30, 2020, submitted to, and adopted by the Board on September 20, 2021.

INVESTMENT RATE OF RETURN: 7.10% per annum, compounded annually, including price inflation at 2.50% per annum.

SALARY INCREASES: Representative values of the assumed annual rates of future salary increases are as follows and include wage inflation at 2.75% per annum:

Service	Annual Rate
1	7.50%
2	5.50%
3	5.00%
4	5.00%
5	5.00%
6	4.75%
7	4.50%
8	4.25%
9	4.00%
10	4.00%
11	4.00%
12	3.75%
13	3.50%
14	3.50%
15	3.25%
16	3.25%
>=17	3.00%



Schedule D – Outline of Actuarial Assumptions and Methods

SEPARATIONS FROM SERVICE: Representative values of the assumed annual rates of death, disability, withdrawal, service retirement and early retirement are as follows:

MALES							
Age	Annual Rate of						
	DEATH*	DISABILITY	WITHDRAWAL			RETIREMENT	
			Service			Before 27 Years of Service	After 27 Years of Service**
			0 – 4	5 – 9	10+		
20	0.030%	0.01%	20.00%				
25	0.017	0.01	11.00	3.25%			
30	0.024	0.01	10.00	3.60	2.80%		
35	0.032	0.02	11.00	3.60	1.55		
40	0.046	0.07	12.50	4.00	1.25		
45	0.074	0.18	11.50	4.00	1.10		17.00%
50	0.122	0.28	14.25	4.50	1.10		25.00
55	0.187	0.40	15.00	6.00	1.25	5.25%	40.00
60	0.291	0.50	15.00	0.00	0.00	13.50	33.00
62	0.354	0.50	15.00	0.00	0.00	15.00	30.00
65	0.481	0.50	20.00	0.00	0.00	20.00	30.00
70	0.774	0.50	20.00	0.00	0.00	25.00	30.00
75	1.234	0.50	20.00	0.00	0.00	100.00	100.00

*Base Rates.

**Plus 8.5% in year when first eligible for unreduced retirement with 27 years of service.

FEMALES							
Age	Annual Rate of						
	DEATH*	DISABILITY	WITHDRAWAL			RETIREMENT	
			Service			Before 27 Years of Service	After 27 Years of Service**
			0 – 4	5 – 9	10+		
20	0.013%	0.01%	13.00%				
25	0.009	0.01	9.00	4.50%			
30	0.011	0.02	11.00	4.25	1.00%		
35	0.017	0.06	11.00	3.50	1.60		
40	0.026	0.10	12.50	4.00	1.20		
45	0.040	0.24	13.50	4.00	1.00		17.00%
50	0.062	0.38	15.00	4.50	1.25		20.00
55	0.090	0.50	15.00	5.00	1.60	5.00%	50.00
60	0.132	0.60	17.50	0.00	0.00	15.00	40.00
62	0.158	0.62	17.50	0.00	0.00	15.00	40.00
65	0.213	0.65	25.00	0.00	0.00	25.00	40.00
70	0.372	0.65	25.00	0.00	0.00	30.00	35.00
75	0.696	0.65	25.00	0.00	0.00	100.00	100.00

*Base Rates.

**Plus 10.0% in year when first eligible for unreduced retirement with 27 years of service.



Schedule D – Outline of Actuarial Assumptions and Methods

DEATHS AFTER RETIREMENT:

Mortality Assumption: All mortality rates use Pub-2010 benefit-weighted tables.

Mortality Projection: All mortality rates are projected from 2010 using generational improvement with Scale MP-2020 adjusted to 75% of the standard rates.

Service Retirements: Mortality rates are based on the Teachers Mortality Table for Retirees. Rates for male members are set forward 2 years and multiplied by 102%. Rates for female members are set forward 2 years and multiplied by 98%.

Survivors of Deceased Members: Mortality rates are based on the Teachers Mortality Table for Contingent Survivors. Rates for male members are set forward 2 years and multiplied by 101%.

Disabled Members at Retirement: Mortality rates are based on the Teachers Mortality Table for Disabled Retirees. Rates for male members are set forward 1 year and multiplied by 96%. Rates for female members are set back 2 years and multiplied by 94%.

Representative values of the assumed annual rates of death after service retirement, disability retirement, and survivors of deceased members are shown below:

Age	Annual Rate of Death After*					
	Service Retirement		Disability Retirement		Survivors of Deceased Members	
	Male	Female	Male	Female	Male	Female
45	0.0836%	0.0568%	1.0646%	0.7755%	0.6020%	0.2620%
50	0.1357	0.0843	1.6435	1.1910	0.7545	0.3200
55	0.2744	0.2215	2.1130	1.5416	0.8959	0.4460
60	0.4427	0.3322	2.4806	1.7616	1.1413	0.6220
65	0.7579	0.5351	3.0653	1.9834	1.6443	0.8990
70	1.4066	0.9682	3.9485	2.4149	2.5876	1.3530
75	2.6816	1.8649	5.3155	3.2562	4.1006	2.1510
80	5.0500	3.5819	7.6118	4.7705	6.5630	3.5730
85	9.4585	6.8071	11.2109	7.3423	10.7717	6.3160
90	16.9116	12.6077	16.9738	11.1653	17.7306	11.3290
95	26.9423	21.5110	24.2170	15.7356	26.8670	18.5900

*Base Rates.



Schedule D – Outline of Actuarial Assumptions and Methods

ASSETS: Five-year market related actuarial value, as developed in Schedule B. The actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected actuarial value of assets, based on the ultimate assumed valuation rate of return of 7.10%. The amount recognized each year is 20% of the difference between market value and expected actuarial value.

ADMINISTRATIVE EXPENSE LOAD: 0.32% of payroll added to the normal cost rate.

PERCENT MARRIED: 100%, with females 3 years younger than males.

UNUSED SICK LEAVE LOAD: 3% of active liability at the time of retirement for members other than TRS 4.



Schedule E – Actuarial Cost Method

1. The valuation is prepared on the projected benefit basis, under which the present value, at the interest rate assumed to be earned in the future, of each active member's expected benefit at retirement or death is determined, based on his/her age, service, sex and compensation. The calculations take into account the probability of a member's death or termination of employment prior to becoming eligible for a benefit, as well as the possibility of his/her terminating with a service, disability or survivor's benefit. Future salary increases and post-retirement cost-of-living adjustments are also anticipated. The present value of the expected benefits payable on account of the active members is added to the present value of the expected future payments to retired members and beneficiaries and inactive members to obtain the present value of all expected benefits payable from the system on account of the present group of members and beneficiaries.
2. The employer contributions required to support the benefits of the system are determined following a level funding approach and consist of a normal contribution and an actuarial accrued liability contribution.
3. Under the entry age normal cost method, the actuarial present value of each member's projected benefits is allocated on a level basis over the member's compensation between the entry age of the member and the assumed exit ages. The portion of the actuarial present value allocated to the valuation year is called the normal cost. The actuarial present value of benefits allocated to prior years of service is called the actuarial liability. The unfunded actuarial liability represents the difference between the actuarial liability and the actuarial value of assets as of the valuation date. The unfunded actuarial liability is calculated each year and reflects experience gains/losses. The accrued liability contribution amortizes the balance of the unfunded actuarial accrued liability over a period of years from the valuation date.



Schedule F – Summary of Main System Provisions

AS INTERPRETED FOR VALUATION PURPOSES

The Teachers' Retirement System of the State of Kentucky was established on July 1, 1940. The valuation took into account amendments to the system effective through June 30, 2022. The following summary describes the main benefit and contribution provisions of the system as interpreted for the valuation.

1 - DEFINITIONS

"Final average salary" means the average of the five highest annual salaries which the member has received for service in a covered position and on which the member has made contributions or on which the public board, institution or agency has picked up the member contributions. For a member who retires after attaining age 55 with 27 years of service, "final average salary" means the average of the three highest annual salaries.

2 - BENEFITS

Service Retirement Allowance

TRS 1 and TRS 2 Members

Condition for Allowance	Completion of 27 years of service or attainment of age 55 and 5 years of service.
Amount of Allowance	The annual retirement allowance for non-university members is equal to: <ul style="list-style-type: none"> (a) 2.0% of final average salary multiplied by service before July 1, 1983, plus (b) 2.5% of final average salary multiplied by service after July 1, 1983. (c) For individuals who become members of the retirement system on or after July 1, 2002 and have less than 10 years of service at retirement, the retirement allowance is 2.0% of final average salary multiplied by service. If, however, they have 10 or more years, they receive a benefit percentage of 2.5% for all years of service up to 30 years.



Schedule F – Summary of Main System Provisions

- (d) For members retiring on or after July 1, 2004, the retirement allowance formula is 3.0% of final average salary for each year of service credit earned in excess of 30 years.

The annual retirement allowance for university members is equal to 2.0% of final average salary multiplied by all years of service.

For all members, the annual allowance is reduced by 5% per year from the earlier of age 60 or the date the member would have completed 27 years of service.

The minimum annual service allowance for all members is \$440 multiplied by credited service.

TRS 3 Members

Condition for Retirement

Completion of 27 years of service, attainment of age 60 and 5 years of service or attainment of age 55 and 10 years of service.

Amount of Allowance

The annual retirement allowance for non-university members is equal to:

- 1.7% of final average salary if service is 10 years or less.
- 2.0% of final average salary if service is greater than 10 years and no more than 20 years.
- 2.3% of final average salary if service is greater than 20 years but no more than 26 years.
- 2.5% of final average salary if service is greater than 26 years but no more than 30 years.
- 3.0% of final average salary for years of service greater than 30 years.

The annual retirement allowance for university members is equal to:

- 1.5% of final average salary if service is 10 years or less.
- 1.7% of final average salary if service is greater than 10 years and no more than 20 years.
- 1.85% of final average salary if service is greater than 20 years but less than 27 years.
- 2.0% of final average salary if service is greater than or equal to 27 years.

For all members, the annual allowance is reduced by 6% per year from the earlier of age 60 or the date the member would have completed 27 years of service.



Schedule F – Summary of Main System Provisions

TRS 4 Members

Condition for Retirement

Attainment of age 57 and 10 years of service or attainment of age 65 and 5 years of service.

Amount of Allowance

Foundational Benefit

The annual foundational benefit for members is equal to service times a multiplier times final average salary.

The multiplier for non-university members is shown in the following table:

Age	Years of Service			
	5-9.99	10-19.99	20-29.99	30 or more
57-60	-	1.70%	1.95%	2.20%
61	-	1.74%	1.99%	2.24%
62	-	1.78%	2.03%	2.28%
63	-	1.82%	2.07%	2.32%
64	-	1.86%	2.11%	2.36%
65 & over	1.90%	1.90%	2.15%	2.40%

The multiplier for university members is shown in the following table:

Age	Years of Service			
	5-9.99	10-19.99	20-29.99	30 or more
57-60	-	0.70%	0.95%	1.20%
61	-	0.74%	0.99%	1.24%
62	-	0.78%	1.03%	1.28%
63	-	0.82%	1.07%	1.32%
64	-	0.86%	1.11%	1.36%
65 & over	0.90%	0.90%	1.15%	1.40%

The annual foundational benefit is reduced by 6% per year from the earlier of age 60 or the date the member would have completed 30 years of service.

Supplemental Benefit

The annual supplemental benefit is equal to the account balance which includes member and employer contributions and interest credited annually on June 30. Options include annuitizing the balance or receiving the balance as a lump sum either at the time of retirement or at a later date.



Schedule F – Summary of Main System Provisions

Disability Retirement Allowance

Condition for Allowance

For members hired before January 1, 2022, totally and permanently incapable of being employed as a teacher and under 27 years of service but after completing 5 years of service.

Amount of Allowance

The disability allowance is equal to 60% of the member's final average salary. The disability allowance is payable over an entitlement period equal to 25% of the service credited to the member at the date of disability or five years, whichever is longer. After the disability entitlement period has expired and if the member remains disabled, he will be retired under service retirement. The service retirement allowance will be computed with service credit given for the period of disability retirement. The allowance will not be less than \$6,000 per year. The service retirement allowance will not be reduced for commencement of the allowance before age 60 or the completion of 27 years of service.

Benefits Payable on Separation from Service

Any member who ceases to be in service is entitled to receive his contributions with allowable interest. A member who has completed 5 years of creditable service and leaves his contributions with the system may be continued in the membership of the system after separation from service, and file application for service retirement after the attainment of age 60.

Life Insurance

A separate Life Insurance Trust has been created as of June 30, 2000 to pay benefits on behalf of deceased TRS active and retired members.



Schedule F – Summary of Main System Provisions

Death Benefits

A surviving spouse of an active member with less than 10 years of service may elect to receive an annual allowance of \$2,880 except that if income from other sources exceeds \$6,600 per year the annual allowance will be \$2,160.

A surviving spouse of an active member with 10 or more years of service may elect to receive an allowance which is the actuarial equivalent of the allowance the deceased member would have received upon retirement. The allowance will commence on the date the deceased member would have been eligible for service retirement and will be payable during the life of the spouse.

If the deceased member is survived by unmarried children under age 18 the following schedule of annual allowances applies:

<u>Number of Children</u>	<u>Annual Allowance</u>
1	\$ 2,400
2	4,080
3	4,800
4 or more	5,280

The allowances are payable until a child attains age 18, or age 23 if a full-time student.

If the member has no eligible survivor, a refund of his accumulated contributions is payable to his estate.

Options

In lieu of the regular Option 1, a retirement allowance payable in the form of a life annuity with refundable balance, any member before retirement may elect to receive a reduced allowance which is actuarially equivalent to the full allowance, in one of the following forms:

Option 2. A single life annuity payable during the member's lifetime with payments for 10 years certain.

Option 3. At the death of the member his allowance is continued throughout the life of his beneficiary.

Option 3(a). At the death of the beneficiary designated by the member under Option 3, the member's benefit will revert to what would have been paid had he not selected an option.

Option 4. At the death of the member one half of his allowance is continued throughout the life of his beneficiary.



Schedule F – Summary of Main System Provisions

Option 4(a). At the death of the beneficiary designated by the member under Option 4, the member's benefit will revert to what would have been paid had he not selected an option.

Post-Retirement Adjustments

The retirement allowance of each retired member and of each beneficiary shall be increased by 1.50% each July 1.

3 - CONTRIBUTIONS

Member Contributions

- University members other than TRS 4 contribute 7.625% of salary to the retirement system.
- Non-university members other than TRS 4 contribute 9.105% of salary to the retirement system.

- University TRS 4 members contribute 7.00% of salary to the retirement system.
- Non-university TRS 4 members contribute 11.00% of salary to the retirement system.
- 2.00% of each is for the supplemental plan.



Schedule G – Tables of Employee Data

**TABLE 1
AGE – SERVICE TABLE**

Distribution of Active Members as of June 30, 2022 by Age and Service Groups

Attained Age	Completed Years of Service										Total	
	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 & Over	No.	Payroll	
Under 25	2,818	2,029	6							4,853	\$ 102,977,337	
25 to 29	943	4,769	1,996							7,708	326,849,945	
30 to 34	633	2,004	4,246	1,436	5					8,324	417,040,756	
35 to 39	613	1,446	2,176	4,167	1,511	4				9,917	557,755,235	
40 to 44	622	1,343	1,482	1,983	4,465	1,298	6			11,199	692,913,011	
45 to 49	387	910	1,014	1,313	1,997	3,953	960	3		10,537	706,613,173	
50 to 54	578	837	725	1,011	1,433	2,115	2,655	374	2	9,730	648,449,305	
55 to 59	783	857	462	536	820	1,003	826	325	37	5,649	325,178,567	
60 to 64	597	945	306	282	397	418	343	112	57	3,457	159,118,198	
65 to 69	501	658	248	122	117	154	135	49	33	2,017	65,610,308	
70 & Over	373	551	206	69	57	43	43	24	28	1,394	31,003,343	
Total Count	8,848	16,349	12,867	10,919	10,802	8,988	4,968	887	157	74,785	\$ 4,033,509,178	

Average Age: 43.2

Average Service: 11.1



Schedule G – Tables of Employee Data

TABLE 2

SCHEDULE OF ACTIVE MEMBER VALUATION DATA

<u>Valuation Date</u>	<u>Number</u>	<u>Annual Payroll</u>	<u>Annual Average Pay</u>	<u>% Increase in Average Pay</u>
6/30/2022	74,785	\$ 4,033,509,178	\$ 53,935	(1.30)%
6/30/2021	69,256	3,784,400,223	54,644	7.35
6/30/2020	73,151	3,723,481,576	50,901	1.35
6/30/2019	72,647	3,648,427,710	50,221	0.58
6/30/2018	72,205	3,605,115,787	49,929	1.06
6/30/2017	72,130	3,563,584,342	49,405	0.35
6/30/2016	71,848	3,537,226,348	49,232	1.19
6/30/2015	72,246	3,515,113,127	48,655	2.45
6/30/2014	73,407	3,486,326,799	47,493	2.12
6/30/2013	74,831	3,480,066,406	46,506	1.51



Schedule G – Tables of Employee Data

TABLE 3

**NUMBER OF RETIRED MEMBERS AND BENEFICIARIES
AND THEIR BENEFITS BY AGE
AS OF JUNE 30, 2022**

Attained Age	Number of Members	Total Annual Benefits	Average Annual Benefits
49 & Under	782	\$ 8,670,509	\$ 11,088
50 - 54	1,631	68,255,143	41,849
55 - 59	4,366	199,377,476	45,666
60 - 64	6,934	301,299,968	43,453
65 - 69	10,308	429,420,999	41,659
70 - 74	13,744	562,447,389	40,923
75 - 79	10,242	401,363,909	39,188
80 - 84	5,793	217,586,500	37,560
85 - 89	2,983	102,712,970	34,433
90 - 94	1,281	39,294,085	30,675
95 & Over	<u>374</u>	<u>10,045,515</u>	<u>26,860</u>
Total	58,438	\$ 2,340,474,463	\$ 40,051

Average Current Age: 71.0

Average Age at Retirement: 56.2



Schedule G – Tables of Employee Data

TABLE 4

SCHEDULE OF RETIRANTS, BENEFICIARIES AND SURVIVORS ADDED TO AND REMOVED FROM ROLLS

Fiscal Year Ending June 30	ADDED TO ROLLS		REMOVED FROM ROLLS		ROLLS AT END OF YEAR		Increase In Annual Allowances	Average Annual Allowance
	Number	Annual Allowances (in millions)	Number	Annual Allowances (in millions)	Number	Annual Allowances (in millions)		
2013	2,303	\$105.7	991	\$22.2	47,406	\$1,608.7	5.5%	\$33,934
2014	2,146	99.6	976	23.4	48,576	1,684.9	4.7%	34,685
2015	2,917	119.1	1,671	36.3	49,822	1,767.6	4.9%	35,479
2016	2,753	128.2	1,012	26.9	51,563	1,868.9	5.7%	36,244
2017	2,638	119.8	1,235	35.2	52,966	1,953.5	4.5%	36,881
2018	2,499	120.0	1,088	30.0	54,377	2,043.5	4.6%	37,581
2019	2,355	113.8	1,119	32.8	55,613	2,124.5	4.0%	38,201
2020	2,145	107.6	1,129	34.0	56,629	2,198.1	3.5%	38,816
2021	2,137	108.3	1,301	41.1	57,465	2,265.3	3.1%	39,421
2022	2,308	117.2	1,335	42.0	58,438	2,340.5	3.3%	40,051



Schedule H – 30-year Baseline Projection of TRS

The results of actuarial valuations are a “snapshot” of the financial position on the valuation date, based on the assumed number of active employees and current beneficiaries. Projections simulate future actuarial valuation results over a forecast period (twenty years in this case) by “creating” future new hires and performing valuations using the projected membership. The following items are assumed for the projected results provided on the following page.

- Active Employee Growth Rate: 0.00%
- Valuation Discount Rate: 7.10%
- Investment Rate of Return: 7.10% each year
- Actuarial Value of Assets: 5-year smoothing, No Corridor
- Amortization Method: Level Percent of Payroll, Closed
- Amortization Bases:
 - Legacy amortization from 2014 valuation amortized over closed 30-year period
 - Subsequent bases amortized over closed 20-year period from date of valuation
- Amortization Period: Weighted 21.9-year period as of Valuation Date
- Future Contributions: Based on Expected Actuarially Determined Contributions including the impact of direct-rate smoothing of the impact of the assumption changes over a 5-year period beginning with the 2021 valuation

All other demographic and economic changes are assumed to occur in accordance with the actuarial assumptions used for the actuarial valuation.



Schedule H – 30-year Baseline Projection of TRS

(\$ in millions)

Fiscal Year End	Non-University Payroll (1)	University Payroll (2)	Total Payroll (3)=(1)+(2)	Unfunded Accrued Liability (4)	Funding Ratio (5)	Direct Rate Smoothing Contribution in Dollars (6)	Salary Percentage Contribution in Dollars (7)	Additional for Unfunded Accrued Liability (8)=(6)-(7)
2025	\$3,995	\$186	\$4,181	\$16,880	58.8%	\$1,316	\$533	\$783
2026	4,074	187	4,261	17,180	58.9%	1,446	543	903
2027	4,153	189	4,342	17,513	59.1%	1,585	555	1,030
2028	4,230	192	4,422	17,750	59.5%	1,723	565	1,158
2029	4,308	196	4,504	18,762	58.1%	1,852	577	1,275
2030	4,390	199	4,589	18,726	59.0%	1,909	588	1,321
2031	4,474	203	4,677	18,538	60.3%	1,962	600	1,362
2032	4,563	207	4,770	18,199	61.7%	2,010	612	1,398
2033	4,655	210	4,865	17,773	63.3%	2,058	624	1,434
2034	4,748	215	4,963	17,259	65.0%	2,105	637	1,468
2035	4,847	219	5,066	16,657	66.8%	2,154	651	1,503
2036	4,952	223	5,175	15,957	68.7%	2,205	664	1,541
2037	5,062	228	5,290	15,155	70.7%	2,258	679	1,579
2038	5,179	233	5,412	14,242	72.9%	2,361	694	1,667
2039	5,301	238	5,539	13,208	75.2%	2,374	710	1,664
2040	5,430	244	5,674	12,043	77.7%	2,490	727	1,763
2041	5,567	251	5,818	10,685	80.5%	2,578	745	1,833
2042	5,711	257	5,968	9,215	83.4%	2,640	764	1,876
2043	5,860	265	6,125	7,517	86.7%	2,688	784	1,904
2044	6,017	272	6,289	5,607	90.2%	2,472	805	1,667
2045	6,180	281	6,461	3,494	94.0%	2,517	827	1,690
2046	6,350	289	6,639	1,180	98.0%	2,505	850	1,655
2047	6,527	299	6,826	0	100.0%	0	873	0
2048	6,712	308	7,020	0	100.0%	0	898	0
2049	6,903	318	7,221	0	100.0%	0	924	0
2050	7,105	328	7,433	0	100.0%	0	951	0
2051	7,323	338	7,661	0	100.0%	0	979	0
2052	7,548	348	7,896	0	100.0%	0	1,008	0
2053	7,780	357	8,137	0	100.0%	0	1,039	0
2054	8,019	367	8,386	0	100.0%	0	1,071	0