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GASB STATEMENT NO. 68 REPORT

FOR THE

MISSOURI STATE EMPLOYEES'

RETIREMENT SYSTEM

FOR THE

MISSOURI STATE EMPLOYEES' PLAN

MEASUREMENT DATE: JUNE 30, 2020





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

November 17, 2020

Board of Trustees
Missouri State Employee' Retirement System
907 Wildwood Drive
Jefferson City, Missouri 65109

Dear Board Members:

Presented in this report is information to assist the Missouri State Employees' Retirement System in providing information required under the Governmental Accounting Standards Board (GASB) Statement No. 68 to participating employers. GASB Statement No. 68 establishes accounting and financial reporting requirements for governmental employers who provide pension benefits to their employees through a trust. This report has been prepared as of June 30, 2020, the Measurement Date. The calculations in this report have been made on a basis that is consistent with our understanding of this accounting standard (GASB 68). Please note that the discount rate used to determine the Total Pension Liability changed from 7.10% at the Prior Measurement Date to 6.95% at the current Measurement Date.

The annual actuarial valuation used as a basis for much of the information presented in this report was performed as of June 30, 2020. The valuation was based upon data, furnished by the System's staff, concerning active, inactive and retired members along with pertinent financial information. This information was reviewed for completeness and internal consistency, but was not audited by us. The valuation results depend on the integrity of the data. If any of the information is inaccurate or incomplete, our results may be different and our calculations may need to be revised. Please see the actuarial valuation for additional details on the funding requirements for the Plan, including actuarial assumptions and methods and the funding policy.

To the best of our knowledge, the information contained in this report is complete and accurate. The calculations were performed by qualified actuaries according to generally accepted actuarial principles and practices, as well as in conformity with Actuarial Standards of Practice issued by the Actuarial Standards Board. The calculations are based on the current provisions of the Plan, and on actuarial assumptions that are internally consistent and individually reasonable based on the actual experience of the Plan. In addition, the calculations were completed in compliance with applicable law and, in our opinion, meet the requirements of GASB 68.



Board of Trustees
November 17, 2020
Page 2

These results are only for financial reporting and may not be appropriate for funding purposes or other types of analysis. Calculations for purposes other than satisfying the requirements of GASB 68 may produce significantly different results. Future actuarial results may differ significantly from the current results presented in this report due to such factors as changes in plan experience or changes in economic or demographic assumptions.

We, Patrice A. Beckham, FSA, and Bryan K. Hoge, FSA, are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein. We are available to answer any questions on the material contained in this report or to provide explanations or further details as may be appropriate.

Respectfully submitted,

A handwritten signature in blue ink that reads 'Patrice Beckham' in a cursive script.

Patrice Beckham, FSA, EA, FCA, MAAA
Principal and Consulting Actuary

A handwritten signature in blue ink that reads 'Bryan K. Hoge' in a cursive script.

Bryan K. Hoge, FSA, EA, FCA, MAAA
Consulting Actuary



TABLE OF CONTENTS

<u>Section</u>	<u>Item</u>	<u>Page No.</u>
I	Summary of Principal Results	1
II	Introduction	2
III	Pension Expense	4
IV	Notes to Financial Statements	6
V	Required Supplementary Information	14

Appendix

A	Schedule of Changes in Net Pension Liability	18
B	Summary of Plan Provisions	19
C	Statement of Actuarial Assumptions	32
D	Detailed Information for Employers	38
	Exhibit 1 – Schedule of Employer Allocations	
	Exhibit 2 – Schedule of Deferred Resources	
	Exhibit 3 – Schedule of Pension Amounts by Employer	
	Exhibit 4 – Schedule of Recognition Amounts by Employer	



GASB STATEMENT NO. 68

MISSOURI STATE EMPLOYEES' RETIREMENT SYSTEM

MISSOURI STATE EMPLOYEES' PLAN

SECTION I - SUMMARY OF PRINCIPAL RESULTS

Valuation Date (VD):	June 30, 2020
Prior Measurement Date:	June 30, 2019
Measurement Date (MD):	June 30, 2020
Membership Data:	
Retirees and Beneficiaries	50,857
Inactive Vested Members	17,198
Inactive Nonvested Members	21,735
Active Employees	<u>45,999</u>
Total	135,789
Single Equivalent Interest Rate (SEIR):	
Long-Term Expected Rate of Return	6.95%
Municipal Bond Index Rate at Prior Measurement Date	3.50%
Municipal Bond Index Rate at Measurement Date	2.19%
Year in which Fiduciary Net Position is Projected to be Depleted	N/A
Single Equivalent Interest Rate at Prior Measurement Date	7.10%
Single Equivalent Interest Rate at Measurement Date	6.95%
Net Pension Liability:	
Total Pension Liability (TPL)	\$14,258,408,888
Fiduciary Net Position (FNP)	<u>7,910,830,533</u>
Net Pension Liability (NPL = TPL – FNP)	\$6,347,578,355
FNP as a percentage of TPL	55.48%
Collective Pension Expense:	\$945,045,238
Collective Deferred Outflows of Resources:	\$531,715,810
Collective Deferred Inflows of Resources:	\$90,002,367



SECTION II – INTRODUCTION

The Governmental Accounting Standards Board issued Statement No. 68 (GASB 68), “*Accounting and Financial Reporting for Pensions*” in June 2012. GASB 68’s effective date for employers is the first fiscal year beginning after June 15, 2014.

This report, prepared as of June 30, 2020 (the Measurement Date), presents information to assist the Missouri State Employees’ Retirement System in providing the required information under GASB 68 to participating employers. Employers can use the information in this report for fiscal years ending on or before June 30, 2021. The Missouri State Employees’ Retirement System for the Missouri State Employees’ Plan (MSEP or Plan) is a cost-sharing multiple employer plan, so the Net Pension Liability and Pension Expense are allocated among the participating employers. Those amounts, which are needed for the employers’ financial statements, are provided in Appendix D.

Much of the material provided in this report, including the Net Pension Liability, is based on the results of the GASB 67 report for the Missouri State Employees’ Retirement System for the MSEP, which was issued September 8, 2020. See the GASB 67 report for more information on the member data, actuarial assumptions and methods used in developing the Net Pension Liability and other GASB 67 results.

GASB 68 requires the inclusion of a proportionate share, as appropriate, of the Collective Net Pension Liability (NPL) on the participating employer’s Statement of Net Position and a determination and proportionate share, as appropriate, of a Collective Pension Expense (PE) in the Notes to the Financial Statements that may bear little relationship to the employer’s funding requirements. In fact, it is possible in some years for the NPL to be an asset or the PE to be an income item. The NPL is set equal to the Total Pension Liability (TPL) minus the Fiduciary Net Position (FNP). The benefit provisions recognized in the calculation of the TPL are summarized in Appendix B.

PE includes amounts for Service Cost (the Normal Cost under Entry Age Normal (EAN) for the year), interest on the TPL, employee contributions, administrative expenses, other cash flows during the year, recognition of increases/decreases in the TPL due to changes in the benefit structure, actual versus expected experience, and actuarial assumption changes, and recognition of investment gains/losses. The actual experience and assumption change impacts are recognized over the average expected remaining service life of the Plan membership as of the beginning of the measurement period, while investment gains/losses are recognized equally over five years. The development of the PE is shown in Section III.

The unrecognized portions of each year’s experience, assumption changes and investment gains/losses are used to develop the Collective Deferred Outflows of Resources and Collective Deferred Inflows of Resources, the proportionate share of which, as appropriate, also must be included on the participating employer’s Statement of Net Position.

Among the items needed for the TPL calculation is a discount rate, as defined by GASB, or a Single Equivalent Interest Rate (SEIR). To determine the SEIR, the FNP must be projected into the future for as long as there are anticipated benefits payable under the plan provisions applicable to the membership and



beneficiaries of the Plan on the Measurement Date. If the FNP is not projected to be depleted at any point in the future, the long-term expected rate of return on plan investments expected to be used to finance the benefit payments may be used as the SEIR.

If, however, the FNP is projected to be depleted at a future measurement date, the SEIR is determined as the single rate that will generate a present value of benefit payments equal to the sum of the present value determined by discounting all projected benefit payments through the date of depletion by the long-term expected rate of return, and the present value determined by discounting those benefits after the date of depletion by a 20-year tax-exempt municipal bond (rating AA/Aa or higher) rate. The rate used, if necessary, for this purpose is the monthly average of the Bond Buyers General Obligation 20-year Municipal Bond Index Rate (formerly published monthly by the Board of Governors of the Federal Reserve System).

Our calculations indicate that the FNP is not projected to be depleted, so the Municipal Bond Index Rate is not used in the determination of the SEIR for either the June 30, 2019 or the June 30, 2020 TPL. The SEIR for the Measurement Date is 6.95%, the long-term assumed rate of return on investments. The SEIR for the Prior Measurement Date was 7.10%.

The FNP projections are based on the Plan's financial status on the Measurement Date, the indicated set of methods and assumptions, and the requirements of GASB 67 and 68. As such, the FNP projections are not reflective of the cash flows and asset accumulations that would occur on an ongoing plan basis, reflecting the impact of future members. Therefore, the results of this test do not necessarily indicate whether or not the Plan will actually run out of money, the financial condition of the Plan, or the Plan's ability to make benefit payments in future years.

The sections that follow provide the results of all the required calculations, presented in the order set out in GASB 68 for note disclosure and Required Supplementary Information (RSI).



SECTION III – PENSION EXPENSE

As noted earlier, the Collective Pension Expense (PE) consists of a number of different items. GASB 68 refers to the first as Service Cost, which is the Normal Cost using the Entry Age Normal (EAN) actuarial funding method. The second item is interest on the TPL at 7.10%, the SEIR in effect as of the Prior Measurement Date.

The next three items refer to any changes that occurred in the TPL due to:

- benefit changes,
- actual versus expected experience, or
- changes in actuarial assumptions or other inputs.

Benefit changes, which are reflected immediately in PE, will increase PE if there is a benefit improvement for existing Plan members, or decrease PE if there is a benefit reduction. For the plan year ended June 30, 2020, there were no benefit changes to be recognized.

The next item to be recognized is the portion of current year change in the TPL due to actual versus expected Plan experience for the year. The portion to recognize in the current year is determined by spreading the total change over the average expected remaining service life of the entire Plan membership at the beginning of the measurement period. The average expected remaining service life of active members is the average number of years the active members are expected to remain in covered employment. At the beginning of the measurement period this number is 8.705 years. The average expected remaining service life of the inactive members is zero. Therefore, the recognition period is the weighted average of these two amounts, or 3.084 years.

The last item under changes in TPL is changes in actuarial assumptions or other inputs. There were several changes in the actuarial assumptions or other inputs since the Prior Measurement Date. The biggest change was a decrease in the long-term rate of return from 7.10% to 6.95%. The other changes were decreases in price inflation, the covered payroll, the wage growth assumption and the cost-of-living adjustment assumption. These changes will be recognized over the average expected remaining service life of the entire Plan membership, using the same approach that applied to experience gains and losses, as described earlier.

Employee contributions for the year and projected earnings on the FNP (using the long-term expected rate of return) are subtracted from the amount determined thus far. One-fifth of the current-period difference between projected and actual earnings on the FNP is recognized in the PE.

The current year portions of previously determined experience, assumption changes and earnings amounts, recognized as Collective Deferred Outflows of Resources and Collective Deferred Inflows of Resources are included next. Collective Deferred Outflows of Resources are added to the PE while Collective Deferred Inflows of Resources are subtracted from the PE. Finally, administrative expenses and other miscellaneous items are included.

The calculation of the Collective PE for the year ended June 30, 2020 is shown in the following table.



**Collective Pension Expense
For the Year Ended**

June 30, 2020	
Service Cost at end of year	\$159,559,528
Interest on the Total Pension Liability	960,644,327
Benefit term changes	0
Expensed portion of current-period difference between expected and actual experience in the Total Pension Liability	(22,818,345)
Expensed portion of current-period assumption changes	40,456,141
Employee contributions	(35,141,960)
Projected earnings on plan investments	(547,898,876)
Expensed portion of current-period differences between projected and actual earnings on plan investments	29,482,124
Administrative expenses	8,398,164
Other*	(5,957,390)
Recognition of beginning Deferred Outflows of Resources	410,169,947
Recognition of beginning Deferred Inflows of Resources	(51,848,422)
Total Pension Expense	\$945,045,238

* Other includes (\$1,903,602) in unallocated employer contributions, of which (\$1,632,819) is from MOSERS.

Note: Plan experience and assumption changes are recognized over the average expected remaining service life for all Plan members, which is 3.084 years.



SECTION IV – NOTES TO FINANCIAL STATEMENTS

The material presented herein will follow the order presented in GASB 68. Paragraph numbers are provided for ease of reference. Amounts are shown in the aggregate, unless otherwise indicated.

Paragraph 76(a) – (d): The required information will be supplied by the Missouri State Employees' Retirement System.

Paragraph 77: This paragraph requires information to be disclosed regarding the actuarial assumptions and other inputs used to measure the TPL. The complete set of actuarial assumptions and other inputs utilized in developing the TPL are outlined in Appendix C. The TPL as of June 30, 2020 was determined based on an actuarial valuation prepared as of June 30, 2020, using the following key actuarial assumptions and other inputs:

Price Inflation	2.25 percent
Payroll Growth	2.25 percent
Salary increases, including wage inflation	2.75 to 8.25 percent; General Assembly is assumed to only get wage inflation of 2.50 percent
Long-term Rate of Return, net of investment expense, including price inflation	6.95 percent
Municipal Bond Index Rate	2.19 percent
Year FNP is Projected to be Depleted	N/A
Single Equivalent Interest Rate, net of investment expense, including price inflation	6.95 percent
Cost-of-living adjustment	4.00%, compounded annually, when a minimum COLA of 4.00% is in effect. 1.80%, compounded annually, when no minimum COLA is in effect (80% of price inflation).
Mortality	Pre-retirement mortality rates were based on the RP-2014 Employee mortality table, projected from 2006 to 2026 with Scale MP-2015 (scaled by 95% for males and 90% for females).



Post-retirement mortality rates were based on the RP-2014 Healthy Annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 120%.

Disabled mortality rates were based on the RP-2014 Disabled mortality table, projected from 2006 to 2026 with Scale MP-2015 (scaled by 95% for males and 90% for females).

The demographic actuarial assumptions used in the valuation are based on the results of the most recent comprehensive (all assumptions) actuarial experience study, which covered the five-year period ending June 30, 2015. The experience study report, performed by the prior actuary, is dated March 28, 2016. The economic actuarial assumptions used in the valuation are based on the results of the most recent economic assumptions experience study, which was performed in July, 2018.

Paragraph 78

(a): Discount rate (SEIR). The discount rate used to measure the TPL at June 30, 2020 was 6.95%. The discount rate used to measure the TPL at the Prior Measurement Date was 7.10%.

(b): Projected cash flows. The projection of cash flows used to determine the discount rate assumed that plan contributions from members and the employers will be made at the contribution rates as set in state statute:

- a. Employee contribution rate: 4.00% of salary for members hired on or after 1/1/2011; no contributions for members hired before 1/1/2011.
- b. Employer contribution rate: The actuarial required contribution rate is determined as of the Prior Measurement Date (June 30, 2018 for FYE June 30, 2020) and is subject to a minimum employer contribution rate of 16.97% until the plan is at least 80% funded.
- c. Administrative expenses in the prior year were projected forward with price inflation as an estimate for administrative expenses in the current and future years. The portion of expenses in future years allocated to the current members was based on the proportionate share of covered payroll in each year for the remainder of the existing members to the total covered payroll for all members.

Based on those assumptions, the Plan's FNP was projected to be available to make all projected future benefit payments of current Plan members. Therefore, the long-term expected rate of return on Plan investments of 6.95% was applied to all periods of projected benefit payments to determine the TPL.

The FNP projections are based on the Plan's financial status on the Measurement Date, the indicated set of methods and assumptions, and the requirements of GASB 67 and 68. As such, the FNP projections are not reflective of the cash flows and asset accumulations that would occur on an ongoing plan basis, reflecting the impact of future members. Therefore, the results of this test



do not necessarily indicate whether or not the Plan will actually run out of money, the financial condition of the Plan, or the Plan’s ability to make benefit payments in future years.

(c): Long-term rate of return. The long-term expected rate of return on pension plan investments is reviewed regularly as part of the experience study. The most recent economic assumptions experience analysis was performed and results provided in July, 2018. Generally, several factors are considered in evaluating the long-term rate of return assumption including long-term historical data, estimates inherent in current market data, and an analysis in which best-estimate ranges of expected future real rates of return (expected returns, net of investment expense and inflation), along with estimates of variability and correlations for each asset class, were developed by the System’s investment consultant. These ranges were combined to develop the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and then adding expected inflation. The capital market assumptions developed by investment consultants are often intended for use over a 10-year investment horizon and are not always useful in setting the long-term rate of return for funding pension plans which covers a longer timeframe.

(d): Municipal bond rate. A municipal bond rate was not used in determining the discount rate. If it were required, the rate would be 2.19% on the Measurement Date.

(e): Period of projected benefit payments. Projected future benefit payments for all current plan members were projected through 2119.

(f): Assumed asset allocation. The target asset allocation and best estimates of real rates of return for each major asset class will be supplied by the System.

(g): Sensitivity analysis. This paragraph requires disclosure of the sensitivity of the NPL to changes in the discount rate. The following presents the NPL of the Plan, calculated using the discount rate of 6.95 percent, as well as the Plan’s NPL calculated using a discount rate that is 1-percentage-point lower (5.95 percent) or 1-percentage-point higher (7.95 percent) than the current rate:

	1% Decrease (5.95%)	Current Discount Rate (6.95%)	1% Increase (7.95%)
Total Pension Liability	\$15,858,907,115	\$14,258,408,888	\$12,912,265,142
Fiduciary Net Position	<u>7,910,830,533</u>	<u>7,910,830,533</u>	<u>7,910,830,533</u>
Net Pension Liability	\$7,948,076,582	\$6,347,578,355	\$5,001,434,609

Paragraph 79: The required information will be supplied by the Missouri State Employees’ Retirement System.



Paragraph 80:

(a)-(b): This information for each participating employer is provided in Appendix D of this report.

(c): The Measurement Date of the Collective NPL is June 30, 2020. The TPL as of June 30, 2020 was determined based on the annual actuarial funding valuation report prepared as of June 30, 2020.

(d): There were several changes in the actuarial assumptions or other inputs since the Prior Measurement Date. The biggest change was a decrease in the long-term rate of return from 7.10% to 6.95%. The other changes were decreases in the price inflation, the covered payroll, the wage growth assumption and the cost-of-living adjustment assumption.

(e): There were no changes to the benefit provisions since the Prior Measurement Date.

(f): The information will be supplied by employers participating in the Missouri State Employees' Retirement System.

(g): Please see Section III for the development of the Collective PE. The proportionate share of Collective PE for each participating employer is provided in Appendix D.

(h)(1)-(3): Since certain expense items are recognized over closed periods each year, the deferred portions of these items must be tracked annually. If the amounts will increase PE, then they are labeled Deferred Outflows of Resources. If the amounts serve to reduce PE they are labeled Deferred Inflows of Resources. The recognition of these amounts is accomplished on a level dollar basis, with no interest included in the deferred amounts. Experience gains/losses and the impact of changes in actuarial assumptions or other inputs, if any, are recognized over the average expected remaining service life of the active and inactive Plan members at the beginning of the measurement period. The difference between projected and actual earnings is recognized over a fixed five-year period.



The following tables provide the amounts of the Collective Deferred Outflows of Resources and Collective Deferred Inflows of Resources as of the Measurement Date (June 30, 2020) for the Plan. Per GASB 68, reporting of the differences between projected and actual earnings should be on a net basis, with only one Deferred Outflow or Inflow. This information is provided in the following table. Detail by participating employer is provided in Appendix D of this report.

	Deferred Outflows of Resources	Deferred Inflows of Resources	Net Deferred Outflows/(Inflows) of Resources
Differences between expected and actual experience	\$2,874,625	\$65,930,436	(\$63,055,811)
Changes of assumptions	167,772,652	0	167,772,652
Differences between projected and actual earnings	336,996,602	0	336,996,602
Changes in proportion	<u>24,071,931</u>	<u>24,071,931</u>	<u>0</u>
Total	\$531,715,810	\$90,002,367	\$441,713,443



The following tables show the Collective Deferred Outflows of Resources and Collective Deferred Inflows of Resources separately to provide additional detail. Detail by participating employer is provided in Appendix D of this report.

Deferred Outflows of Resources								
	June 30, 2019		Additions		Recognition		June 30, 2020	
Differences between expected and actual experience								
2016 Base	\$	0	\$	0	\$	0	\$	0
2017 Base		0		0		0		0
2018 Base		0		0		0		0
2019 Base		5,150,655		0		2,276,030		2,874,625
2020 Base		<u>0</u>		<u>0</u>		<u>0</u>		<u>0</u>
Total	\$	5,150,655	\$	0	\$	2,276,030	\$	2,874,625
Changes of assumptions								
2016 Base	\$	0	\$	0	\$	0	\$	0
2017 Base		36,071,400		0		36,071,400		0
2018 Base		153,758,097		0		99,070,938		54,687,159
2019 Base		51,557,868		0		22,782,973		28,774,895
2020 Base		<u>0</u>		<u>124,766,739</u>		<u>40,456,141</u>		<u>84,310,598</u>
Total	\$	241,387,365	\$	124,766,739	\$	198,381,452	\$	167,772,652
Differences between projected and actual earnings								
2016 Base	\$	132,644,553	\$	0	\$	132,644,553	\$	0
2017 Base		132,548,202		0		66,274,100		66,274,102
2018 Base		1,067,564		0		355,855		711,709
2019 Base		202,776,392		0		50,694,098		152,082,294
2020 Base		<u>0</u>		<u>147,410,621</u>		<u>29,482,124</u>		<u>117,928,497</u>
Total	\$	469,036,711	\$	147,410,621	\$	279,450,730	\$	336,996,602
Changes in proportion								
2016 Base	\$	0	\$	0	\$	0	\$	0
2017 Base		613,858		0		613,858		0
2018 Base		11,963,660		0		7,708,544		4,255,116
2019 Base		16,372,201		0		7,234,734		9,137,467
2020 Base		<u>0</u>		<u>15,803,794</u>		<u>5,124,446</u>		<u>10,679,348</u>
Total	\$	28,949,719	\$	15,803,794	\$	20,681,582	\$	24,071,931
Total	\$	744,524,450	\$	287,981,154	\$	500,789,794	\$	531,715,810



Deferred Inflows of Resources						
	June 30, 2019		Additions		Recognition	June 30, 2020
Differences between expected and actual experience						
2016 Base	\$	0	\$	0	\$	0
2017 Base		18,556,746		0		18,556,746
2018 Base		51,668,680		0		33,291,676
2019 Base		0		0		0
2020 Base		0		<u>70,371,777</u>		<u>22,818,345</u>
Total	\$	70,225,426	\$	70,371,777	\$	74,666,767
Changes of assumptions						
2016 Base	\$	0	\$	0	\$	0
2017 Base		0		0		0
2018 Base		0		0		0
2019 Base		0		0		0
2020 Base		<u>0</u>		<u>0</u>		<u>0</u>
Total	\$	0	\$	0	\$	0
Differences between projected and actual earnings						
2016 Base	\$	0	\$	0	\$	0
2017 Base		0		0		0
2018 Base		0		0		0
2019 Base		0		0		0
2020 Base		<u>0</u>		<u>0</u>		<u>0</u>
Total	\$	0	\$	0	\$	0
Changes in proportion						
2016 Base	\$	0	\$	0	\$	0
2017 Base		613,858		0		613,858
2018 Base		11,963,660		0		7,708,544
2019 Base		16,372,201		0		7,234,734
2020 Base		<u>0</u>		<u>15,803,794</u>		<u>5,124,446</u>
Total	\$	28,949,719	\$	15,803,794	\$	20,681,582
Total	\$	99,175,145	\$	86,175,571	\$	95,348,349
						\$ 90,002,367

(h)(4): Changes in each employer's proportionate share are shown on Exhibit 2 in Appendix D. The determination of proportionate share is based on individual employer contribution information, provided by the Missouri State Employees' Retirement System (see Exhibit 1 in Appendix D).

(h)(5): Employer contributions subsequent to the Measurement Date are considered Deferred Outflows of Resources. These amounts, if any, will be provided by each participating employer.



(i): The following table provides the Collective Deferred Outflows of Resources and Collective Deferred Inflows of Resources as of the Measurement Date (June 30, 2020) for the Plan that will be recognized in PE in future years. **These amounts do not reflect the deferred recognition of changes in proportionate share, recognition of actual contributions that differ from the proportionate share, or employer contributions subsequent to the Measurement Period.**

Appendix D contains the schedule, by participating employer, of the recognition of all amounts except for employer contributions subsequent to the Measurement Date.

Year Ending June 30:	Deferred Outflows of Resources	Deferred Inflows of Resources	Net Deferred Outflows/(Inflows) of Resources
2021	\$267,008,482	\$41,195,349	\$225,813,133
2022	127,578,734	22,818,345	104,760,389
2023	83,574,538	1,916,742	81,657,796
2024	29,482,125	0	29,482,125
2025	0	0	0
Thereafter	0	0	0

(j): There were no contributions by non-employer contributing entities during the measurement period.



SECTION V – REQUIRED SUPPLEMENTARY INFORMATION

There are several tables of Required Supplementary Information (RSI) that need to be included in the Plan's financial statements:

Paragraphs 81(a): Information under 81(a)(1) (a)-(b), which is determined as of the Measurement Date of the Collective NPL, is provided in Appendix D of this report.

Paragraphs 81(b): This information is to be determined as of the employer's most recent fiscal year-end. Therefore, each participating employer should have the information available to populate the Schedule of Employer Contributions.

Paragraph 82: Information about factors that significantly affect trends in the amounts reported in the schedules required by paragraph 81 should be presented as notes to the schedules. At this point, only seven years are being reported, but comments on additional years will be added as they occur.

Changes of benefit and funding terms: The following changes to the plan provisions were made by the Missouri General Assembly and reflected in the valuation performed as of June 30 listed below:

2020: None

2019: None

2018: Legislation passed in the 2017 session allowed the MOSERS Board of Trustees to establish a voluntary buyout program prior to May 31, 2018 for terminated vested members (those who left state employment with a vested retirement benefit but prior to reaching retirement eligibility). The Board parameters for the buyout provided that eligible terminated vested members could elect to cash out their future monthly retirement benefit in exchange for a one-time lump sum payment equal to 60% of the actuarial present value of their retirement benefit amount.

2017: Senate Bill 62 (SB 62) made the following changes to the MSEP 2011 benefit provisions:

- Active members are now vested after 5 years of service (previously 10 years of service).
- Active members are now eligible for Normal Retirement at age 67 with 5 years of service (previously age 67 with 10 years of service).
- Active members are now eligible for Early Retirement at age 62 with 5 years of service (previously age 62 with 10 years of service).
- Cost-of-living adjustments for vested former members now commence on the second anniversary of the date of retirement (previously commenced on first anniversary).



- Service credit for unused sick leave is only applied for members who terminate service at their early or normal retirement date.
- Survivor benefits for terminated vested members start at the date the member would have been eligible for normal retirement, not at date of death.

2016: None

2015: None

2014: None

Changes in actuarial assumptions and methods:

6/30/2020 valuation:

- The investment return assumption was lowered from 7.10% to 6.95%.
- The price inflation assumption was lowered from 2.35% to 2.25%.
- The payroll growth assumption was lowered from 2.35% to 2.25%.
- The wage growth assumption was lowered from 2.60% to 2.50%.
- The cost-of-living adjustment (COLA) assumption was lowered from 1.88% to 1.80% when no minimum COLA is in effect (80% of price inflation).

6/30/2019 valuation:

- The investment return assumption was lowered from 7.25% to 7.10%.
- The price inflation assumption was lowered from 2.50% to 2.35%.
- The payroll growth assumption was lowered from 2.50% to 2.35%.
- The wage growth assumption was lowered from 2.75% to 2.60%.
- The cost-of-living adjustment (COLA) assumption was lowered from 2.00% to 1.88% when no minimum COLA is in effect (80% of price inflation).

6/30/2018 valuation:

- The investment return assumption was lowered from 7.50% to 7.25%.
- The payroll growth assumption was lowered from 3.00% to 2.50%.
- The wage growth assumption was lowered from 3.00% to 2.75%.
- The asset smoothing method was changed from an open 5-year smoothing method to a closed 5-year smoothing method, with the difference between the actual investment return and the expected investment return on the market value of assets recognized evenly over a closed 5-year period. Due to the change in the asset smoothing method, a transitional plan was necessary. This transitional plan recognizes the unrecognized investment experience as of June 30, 2017 evenly over a closed 7-year period.
- The Unfunded Actuarially Accrued Liability (UAAL) amortization method was changed from one base over a closed 30-year period that began June 30, 2014 to a



“layered” approach first effective June 30, 2018. The “Legacy UAAL”, as determined in the June 30, 2018 valuation, is amortized over a closed 30-year period. Subsequent changes in the UAAL due to actuarial gains/losses or assumption changes are separately financed by establishing amortization bases and payments, as a level percentage of payroll, over closed 30-year periods. Any change in the Plan’s benefit structure shall be amortized over a closed period of 20 years, as set out in state statutes. The total UAAL amortization payment is the sum of the payments for each of the amortization bases.

6/30/2017 valuation:

- The investment return assumption was lowered from 7.65% to 7.50%.

6/30/2016 valuation:

- The long-term rate of return was lowered from 8.00% to 7.65%.
- Salary increases were changed from age based with increases between 3.2% and 5.9% to service based with increase between 3.25% and 8.75%.
- Post-retirement mortality table was updated from the RP-2000 combined healthy mortality table, projected to 2016 with Scale AA to the RP-2014 healthy annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 120%.
- Pre-retirement mortality table was updated from the RP-2000 combined healthy mortality table, projected to 2016 with Scale AA and scaled by 100% for males and 80% for females to the RP-2014 employee mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 95% for males and 90% for females.
- The disabled mortality table was updated from the RP-2000 combined healthy mortality table, projected to 2016 with Scale AA and set forward 10 years to the RP-2014 disabled mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 95% for males and 90% for females.
- Retirement rates were changed to better reflect actual experience of the Plan.
- The assumption for service credit for unused leave upon retirement and military service purchases was changed from 6 months to 8 months (4 months to 5 months for 2011 plan members).
- Withdrawal rates were changed to better reflect actual experience of the Plan.
- Disability rates were changed to better reflect actual experience of the Plan.
- Pre-retirement survivor benefits for spouse of terminated vested member liability loads were reduced.
- The marriage assumption at retirement was reduced from 75% to 70%.
- The marriage assumption for in-service deaths was reduced from 70% to 60%.
- The asset smoothing period changed from an open 3-year period to an open 5-year period.



6/30/2015 valuation:

- For the 2015 valuation only, the wage inflation was assumed to be 0% in the first year and 3% thereafter.

6/30/2014 valuation:

- The unfunded actuarial accrued liability amortization method was changed from a level percentage of payroll amortized over an open 30-year period to a level percentage of payroll amortized over a closed 30-year period beginning with the 6/30/2014 valuation.



APPENDIX A

ADDITIONAL INFORMATION

SCHEDULE OF CHANGES IN THE NET PENSION LIABILITY

Measurement Period Ended June 30, 2020

	Total Pension Liability (a)	Plan Fiduciary Net Position (b)	Net Pension Liability (a) – (b)
Balances at June 30, 2019	\$13,957,626,309	\$7,916,465,279	\$6,041,161,030
Changes for the year:			
Service Cost at end of year	159,559,528		159,559,528
Interest on TPL	960,644,327		960,644,327
Benefit term changes	0		0
Differences between expected and actual experience	(70,371,777)		(70,371,777)
Assumption changes	124,766,739		124,766,739
Employer contributions		436,895,653	(436,895,653)
Non-employer contributions		0	0
Employee contributions		35,141,960	(35,141,960)
Net investment income		400,488,255	(400,488,255)
Benefit payments, including member refunds	(873,816,238)	(873,816,238)	0
Administrative expenses		(8,398,164)	8,398,164
Other		4,053,788	(4,053,788)
Net changes	<u>300,782,579</u>	<u>(5,634,746)</u>	<u>306,417,325</u>
Balances at June 30, 2020	\$14,258,408,888	\$7,910,830,533	\$6,347,578,355



APPENDIX B

SUMMARY OF PLAN PROVISIONS

MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>DEFINITIONS</p> <p>Participants</p> <p>All MOSERS members, vested former members, retirees and survivors who first became members prior to July 1, 2000 and who do not elect to transfer to the MSEP 2000 plan. Election is made at the time benefits commence.</p>	<ol style="list-style-type: none"> (1) All new employees who first become members on or after July 1, 2000, except full-time teaching and senior administrative personnel of the regional colleges and universities hired on or after July 1, 2002 who will be participants in the Colleges and Universities Retirement Plan (CURP). (2) MSEP active members and vested former members who elect to transfer to the MSEP 2000 plan prior to retirement. (3) MSEP retirees who elect to transfer to the MSEP 2000 plan during the election window from July 1, 2000 through June 30, 2001, and their survivors. (4) MSEP non-vested terminations rehired on or after July 1, 2000. (5) Members hired prior to January 1, 2011 participating in the CURP for six years may elect to change to MOSERS. Transferred service is for vesting purposes only. 	<ol style="list-style-type: none"> (1) All new employees who first become employees on or after January 1, 2011, except full-time teaching and senior administrative personnel of the regional colleges and universities hired on or after July 1, 2002 who will be participants in the Colleges and Universities Retirement Plan (CURP). (2) Members hired on or after January 1, 2011 participating in the CURP for six years may elect to change to MOSERS. Transferred service is for vesting purposes only.



MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>Final average earnings</p> <p>The average annual compensation of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining Average Compensation). Non-recurring lump sum payments are excluded. Unused sick leave may be converted to additional credited service (usable only for benefit computation, not eligibility).</p> <p>Member contributions</p> <p>None.</p>	<p>The average annual compensation of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining Average Compensation). Non-recurring lump sum payments are excluded. Unused sick leave may be converted to additional credited service (usable only for benefit computation, not eligibility).</p> <p>Same as MSEP.</p>	<p>The average annual compensation of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining Average Compensation). Non-recurring lump sum payments are excluded. Unused sick leave may be converted to additional credited service (usable only for benefit computation, not eligibility).</p> <p>4.0% of salary, with interest credited to member contributions based on the 52-week Treasury bill rate (4% prior to June 30, 2014).</p>



MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
ELIGIBILITY FOR BENEFITS		
Normal retirement		
<p><i>Members of the General Assembly:</i> Age 55 with completion of at least 3 full biennial assemblies.</p> <p><i>Statewide Elected Officials:</i> The earliest of attaining: (1) Age 65 with at least 4 years of credited service. (2) Age 60 with at least 15 years of credited service. (3) Age 50 with age plus credited service equal to 80 or more.</p> <p><i>General Employees:</i> The earliest of attaining: (1) Age 65 and active with at least 4 years of credited service. (2) Age 65 with at least 5 years of credited service. (3) Age 60 with at least 15 years of credited service. (4) Age 48 with age plus credited service equal to 80 or more.</p>	<p><i>Members of the General Assembly:</i> The earliest of attaining: (1) Age 55 with completion of at least 3 full biennial assemblies. (2) Age 50 with completion of at least 3 full biennial assemblies and with age plus credited service equal to 80 or more.</p> <p><i>Statewide Elected Officials:</i> The earliest of attaining: (1) Age 55 with at least 4 years of credited service. (2) Age 50 with age plus credited service equal to 80 or more.</p> <p><i>General Employees:</i> The earliest of attaining: (1) Age 62 with at least 5 years of credited service. (2) Age 48 with age plus credited service equal to 80 or more.</p>	<p><i>Members of the General Assembly:</i> The earliest of attaining: (1) Age 62 with completion of at least 3 full biennial assemblies. (2) Age 55 with completion of at least 3 full biennial assemblies and with age plus credited service equal to 90 or more.</p> <p><i>Statewide Elected Officials:</i> The earliest of attaining: (1) Age 62 with at least 4 years of credited service as a statewide elected official. (2) Age 55 with age plus credited service equal to 90 or more.</p> <p><i>General Employees:</i> The earliest of attaining: (1) Age 67 with at least 5 years of credited service. (2) Age 55 with age plus credited service equal to 90 or more.</p>



MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p><i>Uniformed Water Patrol Employees:</i> The earliest of attaining:</p> <ol style="list-style-type: none"> (1) Age 55 and active with at least 4 years of credited service. (2) Age 55 with at least 5 years of credited service. (3) Age 48 with age plus credited service equal to 80 or more. <p><i>Administrative Law Judges:</i> The earliest of attaining:</p> <ol style="list-style-type: none"> (1) Age 62 and active with at least 12 years of credited service. (2) Age 60 with at least 15 years of credited service. (3) Age 55 with at least 20 years of credited service. <p>Early retirement for general employees</p> <p>Age 55 with at least 10 years of credited service.</p>	<p>Age 57 with at least 5 years of credited service.</p>	<p>Age 62 with at least 5 years of credited service.</p>



MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
MONTHLY BENEFITS PAYABLE		
Normal Retirement		
<p><i>Members of the General Assembly:</i> \$150 per month per biennial assembly served.</p> <p><i>Statewide Elected Officials:</i></p> <p>1) Less than 12 years of credited service: 1.6% of Average Compensation times years of credited service.</p> <p>2) 12 or more years of credited service: 50% of pay of the highest elected position held prior to retirement.</p> <p><i>General Employees:</i> 1.6% of Average Compensation times years of credited service.</p> <p>2.1% of Average Compensation times years of credited service for any period of non-social security covered employment transferred from the Public School Retirement System.</p> <p><i>Uniformed Water Patrol:</i> 2.13% of Average Compensation times years of credited service.</p>	<p><i>Members of the General Assembly:</i> 1/24 of pay times first 24 years of credited service as a member of the General Assembly.</p> <p><i>Statewide Elected Officials:</i> 1/24 of pay (of the highest elected position held prior to retirement) times the first 12 years of credited service as a statewide elected official.</p> <p><i>General Employees:</i> 1.7% of Average Compensation times years of credited service.</p> <p><i>Temporary Benefit:</i> If member retires between ages 48 and 62 with age plus credited service equal to 80 or more, a temporary benefit is payable until the attainment of the minimum age at which reduced social security benefits are payable, in the amount of 0.8% of Average Compensation times years of credited service.</p>	<p><i>Members of the General Assembly:</i> 1/24 of pay times first 24 years of credited service as a member of the General Assembly.</p> <p><i>Statewide Elected Officials:</i> 1/24 of pay (of the highest elected position held prior to retirement) times the first 12 years of credited service as a statewide elected official.</p> <p><i>General Employees:</i> 1.7% of Average Compensation times years of credited service.</p> <p><i>Temporary Benefit:</i> If member retires between ages 55 and 62 with age plus credited service equal to 90 or more, a temporary benefit is payable until the attainment of the minimum age at which reduced social security benefits are payable, in the amount of 0.8% of Average Compensation times years of credited service.</p>



MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p><i>Administrative Law Judges:</i> 50% of Compensation</p> <p>Early retirement for general employees</p> <p>Normal retirement amount reduced by ½% for each month that retirement precedes eligibility for normal retirement.</p> <ol style="list-style-type: none"> 1) Less than 15 years of service: Normal retirement amount actuarially reduced for years younger than age 65. 2) 15 years but less than 20 years of service, and less than the number of years of service necessary for age and service to total 80: Normal retirement amount actuarially reduced for years younger than age 60. 3) 20 or more years of service, but less than the number of years of service necessary for age and service to total 80: Normal retirement amount reduced for years younger than the 80 and out eligibility date. 	<p>Non-Social Security Covered Service: 2.5% of Average Compensation times years of credited service for any period of non-social security covered employment transferred from the Public School Retirement System.</p> <p>Normal retirement amount reduced by ½% for each month that retirement precedes eligibility for normal retirement, age 62.</p>	<p>Non-Social Security Covered Service: 2.5% of Average Compensation times years of credited service for any period of non-social security covered employment transferred from the Public School Retirement System.</p> <p>Normal retirement amount reduced by ½% for each month that retirement precedes eligibility for normal retirement, age 67.</p>



MSEP (Missouri State Employees' Plan)				MSEP 2000 (Missouri State Employees' Plan 2000)				MSEP 2011 (Missouri State Employees' Plan 2011)			
Vested deferred benefits											
Benefits for employees who terminate prior to eligibility for an immediate benefit are considered to be vested in accordance with the following schedule (benefits commence at the age the individual would have been eligible for early or normal retirement, considering years of credited service). Unused sick leave is not converted.				Benefits for employees who terminate prior to eligibility for an immediate benefit are considered to be vested in accordance with the following schedule (benefits commence at age 57 for early retirement or 62 for normal retirement). Unused sick leave is not converted. CURP to MOSERS transfers with 6 years of service are immediately vested.				Benefits for employees who terminate prior to eligibility for an immediate benefit are considered to be vested in accordance with the following schedule (benefits commence at age 67 normal retirement). Unused sick leave is not converted.			
Years of Service	General Assembly	Elected Officials	General Employees	Years of Service	General Assembly	Elected Officials	General Employees	Years of Service	General Assembly	Elected Officials	General Employees
4		100%		4		100%		4		100%	
5			100%	5			100%	6*	100%		
6*	100%			6*	100%			5			100%
*3 Assemblies				*3 Assemblies, HB1455 prospectively				*3 Assemblies, HB1455 prospectively			
Death prior to retirement											
The surviving spouse benefit is computed as if the member had been normal retirement age on the date of death and elected the joint and 100% survivor optional form of payment, provided the member had at least 5 years of credited service and was married on the date of death. If no eligible spouse survives, 80% of the member's life income annuity is paid to eligible children until age 21. If the death is duty related, the service requirement is waived and the minimum				The surviving spouse benefit is computed as if the member had been normal retirement age on the date of death and elected the joint and 100% survivor optional form of payment, provided the member had at least 5 years of credited service (3 full assemblies for a member of the General Assembly, 4 years of credited service for a statewide elected official). If no eligible spouse survives, 80% of the member's life income annuity is paid to eligible children until age 21. If the death is duty related, the service requirement is waived				The surviving spouse benefit is computed as if the member had been normal retirement age on the date of death and elected the joint and 100% survivor optional form of payment, provided the member had at least 5 years of credited service (2 full assemblies for a member of the General Assembly, 4 years of credited service for a statewide elected official). If no eligible spouse survives, 80% of the member's life income annuity is paid to eligible children until age 21. If the death is duty related, the service requirement is waived			



MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>spouse benefit is 50% of Average Compensation (rate of compensation for members of the General Assembly).</p> <p>Death after retirement</p> <p>50% of the benefit the retired member was receiving on the date of death (the normal form of payment), or the benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement and provided the member was married on their date of retirement. Effective July 1, 2000, a member who is not married at retirement but marries thereafter may designate a spouse as beneficiary within one year of marriage. Additionally, a member may designate a new spouse as beneficiary within one year of marriage in the event of the death of the spouse the member was married to at the date of retirement (this provision does not apply to period certain annuities).</p>	<p>and the minimum spouse benefit is 50% of Average Compensation (rate of compensation for members of the General Assembly).</p> <p>The benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement. A member who is not married at retirement but marries thereafter may designate a spouse as beneficiary within one year of marriage. Additionally, a member may designate a new spouse as beneficiary within one year of marriage in the event of the death of the spouse the member was married to at the date of retirement (this provision does not apply to period certain annuities).</p>	<p>and the minimum spouse benefit is 50% of Average Compensation (rate of compensation for members of the General Assembly).</p> <p>The benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement. A member who is not married at retirement but marries thereafter may designate a spouse as beneficiary upon completion of one year of marriage. Additionally, a member may designate a new spouse as beneficiary upon completion of one year of marriage in the event of the death of the spouse the member was married to at the date of retirement (this provision does not apply to period certain annuities).</p>



MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)												
<p>Disability</p> <p>Normal retirement benefits become payable at the time the member is eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability (if the member retires on or after August 28, 1999, the member's rate of pay is based on the rate of pay at the time of disability indexed to the time of benefit commencement). An exception is Uniformed Water Patrol employees who are eligible for an immediate occupational disability benefit equal to 50% of pay at time of disability.</p> <p>Post-retirement benefit adjustments</p> <p>Benefits are increased to retired members (including survivors) annually in accordance with the following formulas:</p> <table border="1" data-bbox="205 1101 745 1323"> <thead> <tr> <th>Increase in CPI</th> <th>Formula 1 Benefit Increase</th> <th>Formula 2 Benefit Increase</th> </tr> </thead> <tbody> <tr> <td>5.00% or less</td> <td>4%</td> <td>80% of CPI increase</td> </tr> <tr> <td>5.01% - 6.24%</td> <td>80% of CPI increase</td> <td>80% of CPI increase</td> </tr> <tr> <td>6.25% or more</td> <td>5%</td> <td>5%</td> </tr> </tbody> </table>	Increase in CPI	Formula 1 Benefit Increase	Formula 2 Benefit Increase	5.00% or less	4%	80% of CPI increase	5.01% - 6.24%	80% of CPI increase	80% of CPI increase	6.25% or more	5%	5%	<p>Normal retirement benefits become payable at the time the member is eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability indexed to the time of benefit commencement. The annual percentage increase in the pay used to compute benefits is the lesser of: i) 80% of the CPI increase and ii) 5%.</p> <p>Benefits are increased to retired members (including survivors) annually in accordance with the following:</p> <p><i>Members of the General Assembly:</i> Benefit is adjusted annually based on the increase in the pay for an active member of the General Assembly.</p>	<p>Normal retirement benefits become payable at the time the member is eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability indexed to the time of benefit commencement. The annual percentage increase in the pay used to compute benefits is the lesser of: i) 80% of the CPI increase and ii) 5%.</p> <p>Benefits are increased to retired members (including survivors) annually in accordance with the following:</p> <p><i>Members of the General Assembly:</i> Benefit is adjusted annually based on the increase in the pay for an active member of the General Assembly.</p>
Increase in CPI	Formula 1 Benefit Increase	Formula 2 Benefit Increase												
5.00% or less	4%	80% of CPI increase												
5.01% - 6.24%	80% of CPI increase	80% of CPI increase												
6.25% or more	5%	5%												



MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>Members first hired prior to August 28, 1997 receive COLAs based on Formula 1 until an aggregate increase of 65% is reached. At that point subsequent COLAs based on Formula 2 are granted.</p> <p>Members first hired on or after August 28, 1997 receive COLAs based solely on Formula 2.</p> <p>Statewide Elected Officials with 12 or more years of service have their benefit adjusted annually based on the increase in the pay for an active statewide elected official in the member's highest elected position.</p> <p>Members who are fully vested and work beyond age 65 will have their monthly benefit increased upon retirement. The percentage increase in benefit is equal to all COLAs for the years between age 65 and date of retirement, not to exceed 65% and counts toward the Formula 1 65% maximum.</p>	<p><i>Statewide Elected Officials:</i> Benefit is adjusted annually based on the increase in the pay for an active statewide elected official in the retired member's highest elected position.</p> <p><i>General Employees:</i> Annual benefit percentage increase equal to the lesser of: i) 80% of the CPI increase, and 5%.</p> <p>CPI: For the basis of determining CPI, the average monthly reported CPI for the prior calendar year is divided by the average monthly reported CPI for the second prior calendar year to determine the current year increases, if any. If this amount is less than one, benefits are not reduced, nor is there any cumulative effect on future years determination of CPI.</p> <p>Timing of Increase: Benefits are adjusted on the anniversary of the effective date of retirement for most members. Members retiring under the BackDROP provisions have an anniversary based on the retroactive starting date for the BackDROP.</p>	<p><i>Statewide Elected Officials:</i> Benefit is adjusted annually based on the increase in the pay for an active statewide elected official in the retired member's highest elected position.</p> <p><i>General Employees:</i> Annual benefit percentage increase equal to the lesser of: i) 80% of the CPI increase, and 5%.</p> <p>CPI: For the basis of determining CPI, the average monthly reported CPI for the prior calendar year is divided by the average monthly reported CPI for the second prior calendar year to determine the current year increases, if any. If this amount is less than one, benefits are not reduced, nor is there any cumulative effect on future years determination of CPI.</p> <p>Timing of Increase: Benefits are adjusted on the anniversary of the effective date of retirement. For inactive vested General Employees who enter retirement, the first COLA will not be granted until the second anniversary of the effective date of retirement.</p>



MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>Pop-up provision</p> <p>Benefits to members who choose a survivor form of payment and whose spouse precedes the member in death, will "pop-up" or revert to the amount the member would have received had he/she not elected a survivor option.</p> <p>Portability</p> <p>Purchase/Transfer Provisions (in addition to military). Effective August 28, 1999, a member may purchase up to four years of non-federal full-time Missouri public service, provided the member is not vested in another retirement system for that same service.</p>	<p>Same.</p> <p>Purchase/Transfer Provisions (in addition to military). A member may purchase up to four years of non-federal full-time Missouri public service, provided the member is not vested in another retirement system for that same service. Local vested service credit granted after 10 years of state service if the other retirement plan agrees to transfer assets equal to the accrued liability to MOSERS.</p>	<p>Same.</p> <p>May purchase qualifying public sector service at full actuarial cost.</p>



MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>BackDROP</p> <p>To be eligible to participate in the BackDROP, a member must have been eligible to retire under normal retirement age and/or service conditions for at least two years. A retroactive starting date is established for BackDROP purposes which is the later of: 1) the member's normal retirement date or 2) five years prior to the annuity starting date under the retirement plan selected by the member.</p> <p>A member may elect the BackDROP period for the accumulation of the BackDROP account in 12 month increments prior to their actual retirement date or back to the earliest possible date. This results in a BackDROP period of one to five years depending upon the individual situation.</p> <p>A theoretical BackDROP account is accumulated that includes 90% of the value of the benefit payments that would have been paid during the BackDROP period had the member retired at the retroactive starting date with their respective option election. These payments include applicable post-retirement benefit increases.</p>	Same as MSEP.	Not eligible for the BackDROP.



MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
<p>The member is paid the resulting lump sum value of the BackDROP account as of the annuity starting date or as three equal annual installments beginning at the annuity starting date.</p> <p>The annuity benefit payable from the actual retirement date is computed with years of service and average pay as of the retroactive starting date for the BackDROP. Post-retirement benefit increases that occurred during the BackDROP period are applied in the calculation of the monthly annuity.</p>		



APPENDIX C

STATEMENT OF ACTUARIAL ASSUMPTIONS

An experience study which analyzed the System’s economic assumptions was performed in 2018 and the results were presented to the Board. The economic assumptions listed below are a result of that experience study. The demographic assumptions are based on an experience study performed in 2015, by the prior actuary. The next experience study is scheduled for 2021.

Economic Assumptions

- 1. Investment Return 6.95%, compounded annually, net of investment expenses.
- 2. Inflation 2.25% per year
- 3. Salary Increases Rates vary by service. Sample rates are as follows:

Years	Rates by Service			
	Inflation	Productivity	Merit	Total
1	2.25%	0.25%	5.75%	8.25 %
2	2.25	0.25	2.50	5.00
3	2.25	0.25	1.50	4.00
4	2.25	0.25	1.25	3.75
5	2.25	0.25	1.00	3.50
9	2.25	0.25	0.75	3.25
10	2.25	0.25	0.50	3.00
21+	2.25	0.25	0.25	2.75

- 4. Payroll Growth 2.25% per year
4.00% on a compounded basis when a minimum COLA of 4.00% is in effect.
- 5. Cost-of-Living Adjustment (COLA) 1.80% on a compounded basis when no minimum COLA is in effect.
- 6. Interest on Member Contributions 1.50% per year
- 7. Administrative Expenses Actual prior year expenses, included in normal cost rate.



Demographic Assumptions

1. Mortality

The mortality assumption includes an appropriate level of conservatism that reflects expected future mortality improvement.

a. Post-retirement

RP-2014 Healthy Annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 120%

b. Pre-retirement

RP-2014 Employee mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 95% for males and 90% for females

c. Long-term disability

RP-2014 Disabled mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 95% for males and 90% for females

2. Retirement Assumption

Retirement Age	Normal Retirement			MSEP 2011**	Retirement Age	Early Retirement	
	MSEP and MSEP 2000*					MSEP and MSEP 2000	MSEP 2011
	Percent Retiring						
1 st Year	2 nd Year	3 rd Year	Percent Retiring	Percent Retiring	Percent Retiring		
48	20 %						
49	20	10 %					
50	20	10	21 %				
51	20	10	21				
52	20	10	21				
53	20	10	21				
54	20	10	21				
55	20	10	21	45 %			
56	20	10	21	45			
57	20	10	21	35	57	2.4 %	
58	20	10	21	35	58	3.1	
59	20	10	21	30	59	3.0	
60	20	10	21	35	60	5.1	
61	19	10	21	25	61	6.0	
62	18	22	29	40	62	6.0	10 %
63	16	18	24	30	63	6.0	10
64	15	17	17	20	64	6.0	10
65	19	19	27	30	65		50
66	24	25	28	25	66		50
67	10	25	23	20	67		
68	20	25	23	20	68		
69	20	25	23	20	69		
70	20	25	23	20	70		
71	20	25	23	20	71		
72	20	25	23	20	72		
73	20	25	23	20	73		
74	20	25	23	20	74		
75	50	50	23	50	75		
76	50	50	23	50	76		
77	75	75	23	75	77		
78	100	100	100	100	78		

* For members hired prior to January 1, 2011.

** For members hired on or after January 1, 2011.



3. Termination From Active Employment

Percent of Active Members Separating within the Next Year							
Sample Age	Years of Service	Termination**		Death*		Disability	
		Males	Females	Males	Females	Males	Females
	0-1	24.0 %	27.5 %				
	1-2	19.0	21.5				
	2-3	15.5	16.3				
	3-4	13.3	13.5				
	4-5	11.2	11.3				
25	5+	13.5 %	14.0 %	0.03 %	0.01%	0.10 %	0.10 %
30		10.6	11.0	0.03	0.02	0.10	0.10
35		8.2	8.5	0.04	0.03	0.10	0.10
40		5.8	6.0	0.05	0.03	0.36	0.36
45		4.3	4.5	0.07	0.05	0.41	0.41
50		2.9	3.0	0.13	0.08	0.57	0.57
55		2.9	3.0	0.22	0.14	0.77	0.77
60		2.9	3.0	0.40	0.20	1.02	1.02
65		2.9	3.0	0.70	0.30	1.23	1.23
70		2.9	3.0	1.17	0.50	1.23	1.23

* The pre-retirement mortality table used was the RP-2014 Employee mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 95% for males and 90% for females. 2% of the deaths in active service are assumed to be duty related.

** Does not apply to Elected Officials and Legislators.

Elected Officials and Legislators

Years of Service	Percent of Active Members Separating within the Next Year
	Termination Male/Female
0-1	8.0 %
1-2	8.0
2-3	8.0
3-4	8.0
4-5	12.0
5-6	12.0
6-7	12.0
7+	35.0



Other Assumptions

- | | |
|--------------------------------|--|
| 1. Form of Payment | MSEP – 50% joint and survivor
MSEP 2000 and MSEP 2011 – Straight life annuity |
| 2. Marital Status | |
| a. Percent married | 70% married at retirement, 60% of those dying in active service are married |
| b. Spouse’s age | Females assumed to be three years younger than males. |
| 3. Pay Increase Timing | Beginning of the fiscal year. |
| 4. Decrement Timing | Decrements of all types are assumed to occur mid-year. |
| 5. 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. |
| 6. Benefit Service | Exact fractional service is used to determine the amount of the benefit payable. |
| 7. Decrement Relativity | Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects. |
| 8. Decrement Operation | Disability and withdrawal do not operate during normal retirement eligibility. |
| 9. Other Liability Adjustments | Pre-Retirement Survivor Benefits for Spouse of Terminated Vested Member |

Age	Male/Female
<30	1.57/1.31
30-39	1.24/1.13
40-49	1.09/1.05
>50	1.02/1.01

These factors are used to estimate the cost of immediate unreduced survivor annuities upon the death of a vested member.

- | | |
|--------------------------------|---|
| 10. 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. New entrant normal cost |
|--------------------------------|---|



contributions are applied to the funding of new entrant benefits.

11. MSEP 2000 Election

All regular state employees hired on or before June 30, 2000 are assumed to elect MSEP 2000 prior to age 62 and MSEP on or after age 62. Elected Officials, General Assembly, and Uniformed Water Patrol Members hired before July 1, 2000 are assumed to elect MSEP at retirement.

12. Service Adjustment

It is assumed that each member will be granted 8 months of service credit, 4 months for unused leave upon retirement and 4 months for military service purchases. For members hired on or after January 1, 2011 it is assumed that each member will be granted 5 months for unused leave.

13. Forfeitures

MSEP - For those hired on or after January 1, 2011, 50% of state employees terminating at first vesting eligibility are assumed to take a refund and forfeit their deferred pension. This percentage decreases to 0% at first retirement eligibility.

14. Salary and Benefit Limits

For purposes of the valuation, no limits were applied to member compensation or benefits.

15. Commencement age for deferred vested benefit

Normal Retirement Date



Data Adjustments

Active and retired member data was reported as of May 31, 2020. It was brought forward to June 30, 2020 by adding one month of service for all active members, one month of contributions and interest for MSEP 2011 members, and the June COLA for certain retired members. Financial information continues to be reported as of June 30. This procedure was instituted to provide sufficient time for the Board of Trustees to certify the appropriate contribution rate prior to the October 1 statutory deadline.

Active members reported with less than a \$100 annualized salary were assumed to receive the average active member pay.

When the option of choosing plans is available, terminated vested members are reported with two records, one with benefits under the MSEP plan and one with benefits under the MSEP 2000 plan. Because it is unknown what the member will elect at retirement, both records are valued and the plan that produces the higher present value of future benefits is used for valuation purposes.

For any retired member who has elected a joint and survivor benefit yet has no beneficiary date of birth provided, it was assumed that the beneficiary is 3 years younger for male retirees and 3 years older for female retirees.

For members reported with no gender, the member is assumed to be male.

Due to limitations in our valuation program, members who are not eligible for normal retirement prior to age 85 had their date of birth adjusted.

TECHNICAL VALUATION PROCEDURES

Other Valuation Procedures

Salary increases are assumed to apply to annual amounts.

Decrementations are assumed to occur mid-year, except that immediate retirement is assumed for those who are at or above the age at which retirement rates are 100%. Standard adjustments are made for multiple decrementations.

No actuarial liability is included for participants who terminated without being vested prior to the valuation date, except those due a refund of contributions.



APPENDIX D

DETAILED INFORMATION FOR PARTICIPATING EMPLOYERS



Exhibit 1

Missouri State Employees' Retirement System Schedule of Employer Allocations For the Years Ended 6/30/2019 and 6/30/2020

Entity	Year Ended June 30, 2019		Year Ended June 30, 2020	
	Employer Contributions	Employer Allocated Proportion	Employer Contributions	Employer Allocated Proportion
Total	\$392,620,169		\$434,992,051	
State of Missouri	326,370,414	83.126249%	362,327,948	83.295301%
Environmental Improvement and Energy Resource Authority	29,444	0.007499%	49,538	0.011388%
Missouri Agriculture and Small Business Development Authority	37,150	0.009462%	42,403	0.009748%
Missouri Consolidated Health Care Plan	580,484	0.147849%	622,331	0.143067%
Missouri Development Finance Board	103,172	0.026278%	116,712	0.026831%
Missouri Housing Development Commission	1,125,887	0.286762%	1,215,666	0.279469%
Missouri Public Entity Risk Management	127,449	0.032461%	145,913	0.033544%
Missouri Technology Corporation	29,309	0.007465%	18,914	0.004348%
Missouri Wine and Grape Board	54,145	0.013791%	59,784	0.013744%
Harris Stowe State University	1,758,900	0.447990%	2,042,747	0.469606%
Lincoln University	2,937,435	0.748162%	3,238,258	0.744441%
Missouri Southern State University	3,929,618	1.000870%	4,305,559	0.989802%
Missouri State University	19,482,117	4.962077%	21,455,055	4.932287%
Missouri Western State University	4,151,724	1.057440%	4,135,387	0.950681%
Northwest Missouri State University	6,029,695	1.535758%	6,882,459	1.582203%
Southeast Missouri State University	8,330,406	2.121747%	9,055,206	2.081695%
State Technical College of Missouri	1,847,794	0.470631%	2,036,096	0.468077%
Truman State University	6,221,531	1.584618%	6,528,844	1.500911%
University of Central Missouri	9,473,495	2.412891%	10,713,231	2.462857%



Exhibit 2

Missouri State Employees' Retirement System
 Schedule of Deferred Resources
 Measurement Date: 6/30/2020

Entity	Deferred Outflows of Resources							Deferred Inflows of Resources				
	6/30/19 Net Pension Liability (NPL)	6/30/20 Net Pension Liability (NPL)	Differences Between Expected and Actual Experience	Net Difference Between Projected and Actual Earnings on Pension Plan Investments	Changes of Assumptions	Changes in Proportion	Total Deferred Outflows of Resources	Differences Between Expected and Actual Experience	Net Difference Between Projected and Actual Earnings on Pension Plan Investments	Changes of Assumptions	Changes in Proportion	Total Deferred Inflows of Resources
Total	\$6,041,161,030	\$6,347,578,355	\$2,874,625	\$336,996,602	\$167,772,652	\$24,071,931	\$531,715,810	\$65,930,436	\$0	\$0	\$24,071,931	\$90,002,367
State of Missouri	5,021,790,560	5,287,234,496	2,394,428	280,702,334	139,746,735	17,908,869	440,752,366	54,916,956	0	0	0	54,916,956
Environmental Improvement and Energy Resource Authority	453,027	722,862	327	38,377	19,106	141,800	199,610	7,508	0	0	163,600	171,108
Missouri Agriculture and Small Business Development Authority	571,615	618,762	280	32,850	16,354	24,955	74,439	6,427	0	0	2,709	9,136
Missouri Consolidated Health Care Plan	8,931,796	9,081,290	4,113	482,131	240,027	0	726,271	94,325	0	0	231,137	325,462
Missouri Development Finance Board	1,587,496	1,703,119	771	90,420	45,015	31,699	167,905	17,690	0	0	0	17,690
Missouri Housing Development Commission	17,323,754	17,739,514	8,034	941,801	468,873	0	1,418,708	184,255	0	0	578,539	762,794
Missouri Public Entity Risk Management	1,961,021	2,129,232	964	113,042	56,278	82,122	252,406	22,116	0	0	18,345	40,461
Missouri Technology Corporation	450,973	275,993	125	14,653	7,295	6,699	28,772	2,867	0	0	171,343	174,210
Missouri Wine and Grape Board	833,137	872,411	395	46,317	23,059	9,373	79,144	9,061	0	0	8,635	17,696
Harris Stowe State University	27,063,797	29,808,609	13,499	1,582,556	787,870	1,237,674	3,621,599	309,613	0	0	0	309,613
Lincoln University	45,197,671	47,253,976	21,400	2,508,741	1,248,968	77,127	3,856,236	490,813	0	0	594,280	1,085,093
Missouri Southern State University	60,464,168	62,828,458	28,453	3,335,599	1,660,617	197,524	5,222,193	652,581	0	0	728,347	1,380,928
Missouri State University	299,767,062	313,080,782	141,785	16,621,640	8,275,029	0	25,038,454	3,251,878	0	0	1,640,259	4,892,137
Missouri Western State University	63,881,653	60,345,221	27,329	3,203,763	1,594,983	0	4,826,075	626,788	0	0	4,059,457	4,686,245
Northwest Missouri State University	92,777,614	100,431,575	45,482	5,331,970	2,654,504	2,092,335	10,124,291	1,043,153	0	0	395,210	1,438,363
Southeast Missouri State University	128,178,153	132,137,221	59,841	7,015,241	3,492,515	0	10,567,597	1,372,471	0	0	5,703,102	7,075,573
State Technical College of Missouri	28,431,577	29,711,554	13,455	1,577,404	785,305	439,895	2,816,059	308,605	0	0	93,125	401,730
Truman State University	95,729,325	95,271,502	43,146	5,058,019	2,518,118	0	7,619,283	989,557	0	0	3,790,116	4,779,673
University of Central Missouri	145,766,631	156,331,778	70,798	8,299,744	4,132,001	1,821,859	14,324,402	1,623,772	0	0	5,893,727	7,517,499

In addition, it is the employer's responsibility to adjust these numbers for any employer contributions subsequent to the Measurement Date, which are to be reported as a Deferred Outflow of Resources. Please consult GASB 68, Paragraph 89.



Exhibit 3

Missouri State Employees' Retirement System Schedule of Pension Amounts by Employer Measurement Date: 6/30/2020

Entity	Pension Expense		
	Proportionate Share of Plan Pension Expense	Net Recognition of Deferred Amounts from Changes in Proportionate Share	Total Employer Pension Expense
Total	\$945,045,238	\$0	\$945,045,238
State of Missouri	787,178,276	16,211,300	803,389,576
Environmental Improvement and Energy Resource Authority	107,622	(75,993)	31,629
Missouri Agriculture and Small Business Development Authority	92,123	(6,073)	86,050
Missouri Consolidated Health Care Plan	1,352,048	(169,293)	1,182,755
Missouri Development Finance Board	253,565	28,061	281,626
Missouri Housing Development Commission	2,641,108	(471,517)	2,169,591
Missouri Public Entity Risk Management	317,006	13,450	330,456
Missouri Technology Corporation	41,091	(89,061)	(47,970)
Missouri Wine and Grape Board	129,887	6,789	136,676
Harris Stowe State University	4,437,989	995,606	5,433,595
Lincoln University	7,035,304	(857,929)	6,177,375
Missouri Southern State University	9,354,077	(919,072)	8,435,005
Missouri State University	46,612,343	(1,177,373)	45,434,970
Missouri Western State University	8,984,366	(1,975,415)	7,008,951
Northwest Missouri State University	14,952,534	630,901	15,583,435
Southeast Missouri State University	19,672,959	(4,967,467)	14,705,492
State Technical College of Missouri	4,423,539	334,149	4,757,688
Truman State University	14,184,288	(2,513,238)	11,671,050
University of Central Missouri	23,275,113	(4,997,825)	18,277,288



Exhibit 4

Missouri State Employees' Retirement System Schedule of Recognition Amounts by Employer Measurement Date: 6/30/2020

Entity	NPL Sensitivities			Schedule of Recognition of Deferred Outflows/(Inflows) of Resources for Fiscal Year					
	Current			2021	2022	2023	2024	2025	Thereafter
	1% Decrease (5.95%)	Discount Rate (6.95%)	1% Increase (7.95%)						
Total	\$7,948,076,582	\$6,347,578,355	\$5,001,434,609	\$225,813,133	\$104,760,389	\$81,657,796	\$29,482,125	\$0	\$0
State of Missouri	6,620,374,312	5,287,234,496	4,165,960,014	201,184,518	91,828,107	68,265,562	24,557,226	0	0
Environmental Improvement and Energy Resource Authority	905,127	722,862	569,563	(38,562)	48,692	15,015	3,357	0	0
Missouri Agriculture and Small Business Development Authority	774,779	618,762	487,540	35,811	18,240	8,379	2,874	0	0
Missouri Consolidated Health Care Plan	11,371,075	9,081,290	7,155,402	190,186	58,647	109,797	42,179	0	0
Missouri Development Finance Board	2,132,548	1,703,119	1,341,935	79,807	39,775	22,724	7,910	0	0
Missouri Housing Development Commission	22,212,410	17,739,514	13,977,459	237,124	118,905	217,491	82,393	0	0
Missouri Public Entity Risk Management	2,666,103	2,129,232	1,677,681	110,104	62,967	28,984	9,889	0	0
Missouri Technology Corporation	345,582	275,993	217,462	(83,695)	(61,993)	(1,031)	1,282	0	0
Missouri Wine and Grape Board	1,092,384	872,411	687,397	34,107	12,133	11,155	4,052	0	0
Harris Stowe State University	37,324,645	29,808,609	23,487,037	1,823,014	935,285	415,238	138,450	0	0
Lincoln University	59,168,741	47,253,976	37,232,730	1,218,405	730,836	602,425	219,477	0	0
Missouri Southern State University	78,670,221	62,828,458	49,504,300	1,873,062	884,406	791,983	291,815	0	0
Missouri State University	392,021,948	313,080,782	246,685,109	10,143,085	4,565,273	3,983,815	1,454,143	0	0
Missouri Western State University	75,560,854	60,345,221	47,547,689	146,533	(906,388)	619,403	280,281	0	0
Northwest Missouri State University	125,754,706	100,431,575	79,132,848	4,306,025	2,553,186	1,360,250	466,467	0	0
Southeast Missouri State University	165,454,713	132,137,221	104,114,614	453,567	783,726	1,641,003	613,728	0	0
State Technical College of Missouri	37,203,118	29,711,554	23,410,565	1,378,591	519,273	378,466	137,999	0	0
Truman State University	119,293,556	95,271,502	75,067,082	1,243,875	50,645	1,102,588	442,500	0	0
University of Central Missouri	195,749,760	156,331,778	123,178,182	1,477,576	2,518,674	2,084,549	726,103	0	0

Deferred Outflows for contributions made after 6/30/20 are not reflected. Please consult GASB 68, Paragraph 89.

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GASB STATEMENT NO. 68 REPORT

FOR THE

MISSOURI STATE EMPLOYEES'

RETIREMENT SYSTEM

FOR THE

JUDICIAL RETIREMENT PLAN

MEASUREMENT DATE: JUNE 30, 2020





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

November 17, 2020

Board of Trustees
Missouri State Employee' Retirement System
907 Wildwood Drive
Jefferson City, Missouri 65109

Dear Board Members:

Presented in this report is information to assist the Missouri State Employees' Retirement System in providing information required under the Governmental Accounting Standards Board (GASB) Statement No. 68 to the State of Missouri. GASB Statement No. 68 establishes accounting and financial reporting requirements for governmental employers who provide pension benefits to their employees through a trust. This report has been prepared as of June 30, 2020. The calculations in this report have been made on a basis that is consistent with our understanding of this accounting standard (GASB 68). Please note that the discount rate used to determine the Total Pension Liability changed from 7.10% at the Prior Measurement Date to 6.95% at the current Measurement Date.

The annual actuarial valuation used as a basis for much of the information presented in this report was performed as of June 30, 2020. The valuation was based upon data, furnished by the System's staff, concerning active, inactive and retired members along with pertinent financial information. This information was reviewed for completeness and internal consistency, but was not audited by us. The valuation results depend on the integrity of the data. If any of the information is inaccurate or incomplete, our results may be different and our calculations may need to be revised. Please see the actuarial valuation for additional details on the funding requirements for the Plan, including actuarial assumptions and methods and the funding policy.

To the best of our knowledge, the information contained in this report is complete and accurate. The calculations were performed by qualified actuaries according to generally accepted actuarial principles and practices, as well as in conformity with Actuarial Standards of Practice issued by the Actuarial Standards Board. The calculations are based on the current provisions of the Plan, and on actuarial assumptions that are internally consistent and individually reasonable based on the actual experience of the Plan. In addition, the calculations were completed in compliance with applicable law and, in our opinion, meet the requirements of GASB 68.



Board of Trustees
November 17, 2020
Page 2

These results are only for financial reporting and may not be appropriate for funding purposes or other types of analysis. Calculations for purposes other than satisfying the requirements of GASB 68 may produce significantly different results. Future actuarial results may differ significantly from the current results presented in this report due to such factors as changes in plan experience or changes in economic or demographic assumptions.

We, Patrice A. Beckham, FSA, and Bryan K. Hoge, FSA, are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein. We are available to answer any questions on the material contained in this report or to provide explanations or further details as may be appropriate.

Respectfully submitted,

A handwritten signature in blue ink that reads 'Patrice Beckham'.

Patrice Beckham, FSA, EA, FCA, MAAA
Principal and Consulting Actuary

A handwritten signature in blue ink that reads 'Bryan K. Hoge'.

Bryan K. Hoge, FSA, EA, FCA, MAAA
Consulting Actuary



TABLE OF CONTENTS

<u>Section</u>	<u>Item</u>	<u>Page No.</u>
I	Summary of Principal Results	1
II	Introduction	2
III	Pension Expense	4
IV	Notes to Financial Statements	6
V	Required Supplementary Information	16
 <u>Appendix</u>		
A	Schedule of Changes in Net Pension Liability	20
B	Summary of Plan Provisions	24
C	Statement of Actuarial Assumptions	27



GASB STATEMENT NO. 68

MISSOURI STATE EMPLOYEES' RETIREMENT SYSTEM

JUDICIAL RETIREMENT PLAN

SECTION I - SUMMARY OF PRINCIPAL RESULTS

Valuation Date (VD):	June 30, 2020
Prior Measurement Date:	June 30, 2019
Measurement Date (MD):	June 30, 2020
Membership Data:	
Retirees and Beneficiaries	590
Inactive Vested Members	35
Inactive Nonvested Members	0
Active Employees	<u>418</u>
Total	1,043
Single Equivalent Interest Rate (SEIR):	
Long-Term Expected Rate of Return	6.95%
Municipal Bond Index Rate at Prior Measurement Date	3.50%
Municipal Bond Index Rate at Measurement Date	2.19%
Year in which Fiduciary Net Position is Projected to be Depleted	N/A
Single Equivalent Interest Rate at Prior Measurement Date	7.10%
Single Equivalent Interest Rate at Measurement Date	6.95%
Net Pension Liability:	
Total Pension Liability (TPL)	\$624,847,011
Fiduciary Net Position (FNP)	<u>167,288,066</u>
Net Pension Liability (NPL = TPL – FNP)	\$457,558,945
FNP as a percentage of TPL	26.77%
Collective Pension Expense:	\$49,440,472
Collective Deferred Outflows of Resources:	\$17,129,766
Collective Deferred Inflows of Resources:	\$11,770,524



SECTION II – INTRODUCTION

The Governmental Accounting Standards Board issued Statement No. 68 (GASB 68), “*Accounting and Financial Reporting for Pensions*” in June 2012. GASB 68’s effective date for employers was the first fiscal year beginning after June 15, 2014. The Missouri State Employees’ Retirement System for the Judicial Retirement Plan (Judges or Plan) is a single-employer defined benefit pension plan.

This report, prepared as of June 30, 2020 (the Measurement Date), presents information to assist Missouri State Employees’ Retirement System for the Judicial Retirement Plan in providing the required information under GASB 68 to the State of Missouri. Much of the material provided in this report, including the Net Pension Liability, is based on the results of the GASB 67 report for the Missouri State Employees’ Retirement System for the Judicial Retirement Plan, which was issued September 8, 2020. See the GASB 67 report for more information on the member data, actuarial assumptions, and methods used in developing the GASB 67 results.

GASB 68 requires the inclusion of a Net Pension Liability (NPL) on the employer’s Statement of Net Position and a determination of a Pension Expense (PE) in the Notes to the Financial Statements, that may bear little relationship to the employer’s funding requirements. In fact, it is possible in some years for the NPL to be an asset or the PE to be an income item. The NPL is set equal to the Total Pension Liability (TPL) minus the Fiduciary Net Position (FNP). The benefit provisions recognized in the calculation of the TPL are summarized in Appendix B.

PE includes amounts for Service Cost (the Normal Cost under Entry Age Normal (EAN) for the year), interest on the TPL, employee contributions, administrative expenses, other cash flows during the year, recognition of increases/decreases in the TPL due to changes in the benefit structure, actual versus expected experience, actuarial assumption changes, and recognition of investment gains/losses. The actual experience and assumption change impacts are recognized over the average expected remaining service life of the Plan membership as of the beginning of the measurement period, while investment gains/losses are recognized equally over five years. The development of the PE is shown in Section III.

The unrecognized portions of each year’s experience, assumption changes and investment gains/losses are used to develop the Deferred Outflows of Resources and Deferred Inflows of Resources, which also must be included on the employer’s Statement of Net Position.

Among the items needed for the TPL calculation is a discount rate, as defined by GASB, or a Single Equivalent Interest Rate (SEIR). To determine the SEIR, the FNP must be projected into the future for as long as there are anticipated benefits payable under the plan provisions applicable to the membership and beneficiaries of the Plan on the Measurement Date. If the FNP is not projected to be depleted at any point in the future, the long-term expected rate of return on plan investments expected to be used to finance the benefit payments may be used as the SEIR.



If, however, the FNP is projected to be depleted at a future measurement date, the SEIR is determined as the single rate that will generate a present value of benefit payments equal to the sum of the present value determined by discounting all projected benefit payments through the date of depletion by the long-term expected rate of return, and the present value determined by discounting those benefits after the date of depletion by a 20-year tax-exempt municipal bond (rating AA/Aa or higher) rate. The rate used, if necessary, for this purpose is the monthly average of the Bond Buyers General Obligation 20-year Municipal Bond Index Rate (formerly published monthly by the Board of Governors of the Federal Reserve System).

Our calculations indicate that the FNP is not projected to be depleted, so the Municipal Bond Index Rate is not used in the determination of the SEIR for either the June 30, 2019 or the June 30, 2020 TPL. The SEIR for the Measurement Date is 6.95%, the long-term assumed rate of return on investments. The SEIR for the Prior Measurement Date was 7.10%.

The FNP projections are based on the Plan's financial status on the Measurement Date, the indicated set of methods and assumptions, and the requirements of GASB 67 and 68. As such, the FNP projections are not reflective of the cash flows and asset accumulations that would occur on an ongoing plan basis, reflecting the impact of future members. Therefore, the results of this test do not necessarily indicate whether or not the fund will actually run out of money, the financial condition of the Plan, or the Plan's ability to make benefit payments in future years.

The sections that follow provide the results of all the required calculations, presented in the order laid out in GASB 68 for note disclosure and Required Supplementary Information (RSI).



SECTION III – PENSION EXPENSE

As noted earlier, the Pension Expense (PE) consists of a number of different items. GASB 68 refers to the first item as Service Cost, which is the Normal Cost using the Entry Age Normal (EAN) actuarial funding method. The second item is interest on the TPL at 7.10%, the SEIR in effect as of the Prior Measurement Date.

The next three items refer to any changes that occurred in the TPL due to:

- benefit changes,
- actual versus expected experience, or
- changes in actuarial assumptions or other inputs.

Benefit changes, which are reflected immediately in PE, will increase PE if there is a benefit improvement for existing Plan members, or decrease PE if there is a benefit reduction. For the plan year ended June 30, 2020, there were no benefit changes to be recognized.

The next item to be recognized is the portion of current year change in TPL due to actual versus expected Plan experience for the year. The portion to recognize in the current year is determined by spreading the total change over the average expected remaining service life of the entire Plan membership at the beginning of the measurement period. The average expected remaining service life of active members is the average number of years the active members are expected to remain in covered employment. At the beginning of the measurement period, this number is 10.421 years. The average expected remaining service life of the inactive members is zero. Therefore, the recognition period is the weighted average of these two amounts, or 4.168 years.

The last item under changes in TPL is changes in actuarial assumptions or other inputs. There were several changes in the actuarial assumptions or other inputs since the Prior Measurement Date. The biggest change was a decrease in the long-term rate of return from 7.10% to 6.95%. The other changes were decreases in price inflation, the covered payroll, the wage growth assumption and the cost-of-living adjustment assumption. These changes will be recognized over the average expected remaining service life of the entire Plan membership, using the same approach that applied to experience gains and losses, as described earlier.

Employee contributions for the year and projected earnings on the FNP (using long-term expected rate of return) are subtracted from the amount determined thus far. One-fifth of the current-period difference between projected and actual earnings on the FNP is recognized in the PE.

The current year portions of previously determined experience, assumption changes and earnings amounts, recognized as Deferred Outflows of Resources and Deferred Inflows of Resources are included next. Deferred Outflows of Resources are added to the PE while Deferred Inflows of Resources are subtracted from the PE. Finally, administrative expenses and other miscellaneous items are included.

The calculation of the PE for the year ended June 30, 2020 is shown in the following table.



**Pension Expense
For the Year Ended**

June 30, 2020	
Service Cost at end of year	\$13,119,646
Interest on the Total Pension Liability	42,458,800
Benefit term changes	0
Expensed portion of current-period difference between expected and actual experience in the Total Pension Liability	(3,582,928)
Expensed portion of current-period assumption changes	1,521,538
Employee contributions	(1,314,570)
Projected earnings on plan investments	(11,269,289)
Expensed portion of current-period differences between projected and actual earnings on plan investments	621,316
Administrative expenses	74,450
Other	0
Recognition of beginning Deferred Outflows of Resources	10,502,942
Recognition of beginning Deferred Inflows of Resources	<u>(2,691,433)</u>
Total Pension Expense	\$49,440,472

Note: Plan experience and assumption changes are recognized over the average expected remaining service life for all Plan members, which is 4.168 years.



SECTION IV – NOTES TO FINANCIAL STATEMENTS

The material presented herein will follow the order presented in GASB 68. Paragraph numbers are provided for ease of reference.

Paragraph 37: The information required is to be prepared by the System and employer.

Paragraph 38: The information required is to be prepared by the System and employer.

Paragraph 39: Not Applicable.

Paragraph 40(a) – (b): The information required is to be supplied by the System.

Paragraph 40(c): The data required regarding the membership of the Plan were furnished by the System. The following table summarizes the membership of the Plan as of June 30, 2020, the date of the valuation used to determine the June 30, 2020 TPL.

Membership

Number as of June 30, 2020	
Inactive Members Or Their Beneficiaries	590
Currently Receiving Benefits	
Inactive Members Entitled To But Not Yet Receiving Benefits	35
Inactive Nonvested Members	0
Active Members	418
Total	1,043

Paragraph 40(d) – (e): The information required is to be supplied by the System.

Paragraph 41: This paragraph requires information to be disclosed regarding the actuarial assumptions and other inputs used to measure the TPL. The complete set of actuarial assumptions and other inputs utilized in developing the TPL are outlined in Appendix C. The TPL as of June 30, 2020 was determined based on an actuarial valuation prepared as of June 30, 2020, using the following key actuarial assumptions and other inputs:



Price Inflation	2.25 percent
Payroll Growth	2.25 percent
Salary increases, including wage inflation	2.50 to 4.70 percent
Long-term Rate of Return, net of investment expense, including price inflation	6.95 percent
Municipal Bond Index Rate	2.19 percent
Year FNP is projected to be depleted	N/A
Single Equivalent Interest Rate, net of investment expense, including price inflation	6.95 percent
Cost-of-living adjustment	4.00%, compounded annually, when a minimum COLA of 4.00% is in effect. 1.80%, compounded annually, when no minimum COLA is in effect (80% of price inflation).
Mortality	<p>Pre-retirement mortality rates were based on the RP-2014 Employee mortality table, projected from 2006 to 2026 with Scale MP-2015.</p> <p>Post-retirement mortality rates were based on the RP-2014 Healthy Annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 98%.</p> <p>Disabled mortality rates were based on the RP-2014 Disabled mortality table, projected from 2006 to 2026 with Scale MP-2015.</p>

The demographic actuarial assumptions used in the valuation are based on the results of the most recent comprehensive (all assumptions) actuarial experience study, which covered the five-year period ending June 30, 2015. The experience study report, performed by the prior actuary, is dated March 28, 2016. The economic actuarial assumptions used in the valuation are based on the results of the most recent economic assumptions experience study, which was performed in July, 2018.



Paragraph 42:

(a): Discount rate (SEIR). The discount rate used to measure the TPL at June 30, 2020 was 6.95%. The discount rate used to measure the TPL at the Prior Measurement Date was 7.10%.

(b): Projected cash flows. The projection of cash flows used to determine the discount rate assumed that plan contributions from members and the State of Missouri will be made at the contribution rates as set in state statute:

- a. Employee contribution rate: 4.00% of salary for members hired on or after 1/1/2011; no contributions for members hired before 1/1/2011.
- b. Employer contribution rate: The actuarial required contribution rate is determined as of the Prior Measurement Date (June 30, 2018 for FYE June 30, 2020) and is subject to a minimum contribution rate of 58.45% until the plan is at least 80% funded.
- c. Administrative expenses in the prior year were projected forward with price inflation as an estimate for administrative expenses in the current and future years. The portion of expenses in future years allocated to the current members was based on the proportionate share of covered payroll in each year for the remainder of the existing members to the total covered payroll for all members.

Based on those assumptions, the Plan's FNP was projected to be available to make all projected future benefit payments of current Plan members. Therefore, the long-term expected rate of return on Plan investments of 6.95% was applied to all periods of projected benefit payments to determine the TPL.

The FNP projections are based on the Plan's financial status on the Measurement Date, the indicated set of methods and assumptions, and the requirements of GASB 67 and 68. As such, the FNP projections are not reflective of the cash flows and asset accumulations that would occur on an ongoing plan basis, reflecting the impact of future members. Therefore, the results of this test do not necessarily indicate whether or not the Plan will actually run out of money, the financial condition of the Plan, or the Plan's ability to make benefit payments in future years.

(c): Long-term rate of return. The long-term expected rate of return on pension plan investments is reviewed regularly as part of the experience study. The most recent economic assumptions experience analysis was performed and results provided in July, 2018. Generally, several factors are considered in evaluating the long-term rate of return assumption including long-term historical data, estimates inherent in current market data, and an analysis in which best-estimate ranges of expected future real rates of return (expected returns, net of investment expense and inflation), along with estimates of variability and correlations for each asset class, were developed by the System's investment consultant. These ranges were combined to develop the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and then adding expected inflation. The capital market assumptions developed by



investment consultants are often intended for use over a 10-year investment horizon and are not always useful in setting the long-term rate of return for funding pension plans which covers a longer timeframe.

(d): Municipal bond rate. A municipal bond rate was not used in determining the discount rate. If it were required, the rate would be 2.19% on the Measurement Date.

(e): Periods of projected benefit payments. Projected future benefit payments for all current plan members were projected through 2119.

(f): Assumed asset allocation. The target asset allocation and best estimates of real rates of return for each major asset class will be supplied by the System.

(g): Sensitivity analysis. This paragraph requires disclosure of the sensitivity of the NPL to changes in the discount rate. The following presents the NPL of the Plan, calculated using the discount rate of 6.95 percent, as well as the Plan’s NPL calculated using a discount rate that is 1-percentage-point lower (5.95 percent) or 1-percentage-point higher (7.95 percent) than the current rate:

	1% Decrease (5.95%)	Current Discount Rate (6.95%)	1% Increase (7.95%)
Total Pension Liability	\$687,405,621	\$624,847,011	\$571,270,148
Fiduciary Net Position	<u>167,288,066</u>	<u>167,288,066</u>	<u>167,288,066</u>
Net Pension Liability	\$520,117,555	\$457,558,945	\$403,982,082

Paragraph 43: The required information will be supplied by the System.



Paragraph 44 (a) – (c): This paragraph requires a schedule of changes in the NPL. The needed information is provided in the table below for reporting year ended June 30:

	Total Pension Liability (a)	Plan Fiduciary Net Position (b)	Net Pension Liability (a) – (b)
Balances at June 30, 2019	\$617,482,705	\$158,332,990	\$459,149,715
Changes for the year:			
Service Cost at end of year	13,119,646		13,119,646
Interest on TPL	42,458,800		42,458,800
Benefit term changes	0		0
Differences between expected and actual experience	(14,933,643)		(14,933,643)
Assumption changes	6,341,771		6,341,771
Employer contributions		39,174,515	(39,174,515)
Non-employer contributions		0	0
Employee contributions		1,314,570	(1,314,570)
Net investment income		8,162,709	(8,162,709)
Benefit payments, including member refunds	(39,622,268)	(39,622,268)	0
Administrative expenses		(74,450)	74,450
Other		0	0
Net changes	<u>7,364,306</u>	<u>8,955,076</u>	<u>(1,590,770)</u>
Balances at June 30, 2020	\$624,847,011	\$167,288,066	\$457,558,945

Paragraph 44(d): There is no special funding situation.



Paragraph 45:

(a): The Measurement Date of the NPL is June 30, 2020. The TPL as of June 30, 2020 was determined based on the annual actuarial valuation report prepared as of June 30, 2020.

(b): There is no special funding situation.

(c): There were several changes in the actuarial assumptions or other inputs since the Prior Measurement Date. The biggest change was a decrease in the long-term rate of return from 7.10% to 6.95%. The other changes were decreases in the price inflation assumption, the covered payroll, the wage growth assumption and the cost-of-living adjustment assumption

(d): There were no changes in the benefit terms since the Prior Measurement Date.

(e): There were no benefit payments in the measurement period attributable to the purchase of allocated insurance contracts.

(f): The information will be supplied by the System and employer.

(g): Please see Section III for the development of the PE.

(h): Since certain expense items are recognized over closed periods each year, the deferred portions of these items must be tracked annually. If the amounts will increase PE they are labeled Deferred Outflows of Resources. If the amounts serve to reduce PE they are labeled Deferred Inflows of Resources. The recognition of these amounts is accomplished on a level dollar basis, with no interest included in the deferred amounts. Experience gains/losses and the impact of changes in actuarial assumptions or other inputs, if any, are recognized over the average expected remaining service life of the active and inactive Plan members at the beginning of the measurement period. The difference between projected and actual earnings is recognized over a fixed five-year period.



The following tables provide a summary of the amounts of the Deferred Outflows of Resources and Inflows of Resources as of the Measurement Date (June 30, 2020). Per GASB 68, reporting of the differences between projected and actual earnings should be on a net basis, with only one Deferred Outflow or Inflow. This information is provided in the following table.

	Deferred Outflows of Resources	Deferred Inflows of Resources	Net Deferred Outflows/(Inflows) of Resources
Differences between expected and actual experience	\$484,748	\$11,656,300	(\$11,171,552)
Changes of assumptions	10,163,744	0	10,163,744
Differences between projected and actual earnings	<u>6,481,274</u>	<u>114,224</u>	<u>6,367,050</u>
Total	\$17,129,766	\$11,770,524	\$5,359,242



The following tables show the Deferred Outflows of Resources and Deferred Inflows of Resources separately to provide additional detail.

Deferred Outflows of Resources							
	June 30, 2019		Additions		Recognition		June 30, 2020
Differences between expected and actual experience							
2016 Base	\$ 0	\$	0	\$	0	\$	0
2017 Base	0		0		0		0
2018 Base	0		0		0		0
2019 Base	731,816		0		247,068		484,748
2020 Base	<u>0</u>		<u>0</u>		<u>0</u>		<u>0</u>
Total	\$ 731,816	\$	0	\$	247,068	\$	484,748
Changes of assumptions							
2016 Base	\$ 0	\$	0	\$	0	\$	0
2017 Base	1,698,610		0		1,698,610		0
2018 Base	6,014,398		0		3,158,822		2,855,576
2019 Base	3,755,996		0		1,268,061		2,487,935
2020 Base	<u>0</u>		<u>6,341,771</u>		<u>1,521,538</u>		<u>4,820,233</u>
Total	\$ 11,469,004	\$	6,341,771	\$	7,647,031	\$	10,163,744
Differences between projected and actual earnings							
2016 Base	\$ 2,097,419	\$	0	\$	2,097,419	\$	0
2017 Base	2,102,870		0		1,051,436		1,051,434
2018 Base	0		0		0		0
2019 Base	3,926,102		0		981,526		2,944,576
2020 Base	<u>0</u>		<u>3,106,580</u>		<u>621,316</u>		<u>2,485,264</u>
Total	\$ 8,126,391	\$	3,106,580	\$	4,751,697	\$	6,481,274
Total	\$ 20,327,211	\$	9,448,351	\$	12,645,796	\$	17,129,766



Deferred Inflows of Resources				
	June 30, 2019	Additions	Recognition	June 30, 2020
Differences between expected and actual experience				
2016 Base	\$ 0	\$ 0	\$ 0	\$ 0
2017 Base	2,296,283	0	2,296,283	0
2018 Base	643,622	0	338,037	305,585
2019 Base	0	0	0	0
2020 Base	<u>0</u>	<u>14,933,643</u>	<u>3,582,928</u>	<u>11,350,715</u>
Total	\$ 2,939,905	\$ 14,933,643	\$ 6,217,248	\$ 11,656,300
Changes of assumptions				
2016 Base	\$ 0	\$ 0	\$ 0	\$ 0
2017 Base	0	0	0	0
2018 Base	0	0	0	0
2019 Base	0	0	0	0
2020 Base	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	\$ 0	\$ 0	\$ 0	\$ 0
Differences between projected and actual earnings				
2016 Base	\$ 0	\$ 0	\$ 0	\$ 0
2017 Base	0	0	0	0
2018 Base	171,337	0	57,113	114,224
2019 Base	0	0	0	0
2020 Base	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	\$ 171,337	\$ 0	\$ 57,113	\$ 114,224
Total	\$ 3,111,242	\$ 14,933,643	\$ 6,274,361	\$ 11,770,524



(i): Amounts reported as Deferred Outflows of Resources and Deferred Inflows of Resources related to pensions will be recognized in PE in future fiscal years as follows:

Year Ending June 30:	Deferred Outflows of Resources	Deferred Inflows of Resources	Net Deferred Outflows/(Inflows) of Resources
2021	\$8,546,519	\$3,945,626	\$4,600,893
2022	4,581,934	3,640,039	941,895
2023	3,124,378	3,582,928	(458,550)
2024	876,935	601,931	275,004
2025	0	0	0
Thereafter	0	0	0

(j): Based on information supplied by the System, the Missouri State Employees' Retirement System for the Judicial Retirement Plan receives no revenue from non-employer contributing entities.



SECTION V – REQUIRED SUPPLEMENTARY INFORMATION

There are several tables of Required Supplementary Information (RSI) that need to be included in the Plan's financial statements:

Paragraphs 46(a) - (c): The required tables of schedules are provided in Appendix A.

Paragraph 47: Significant methods and assumptions used in calculating the Actuarially Determined Contributions, if any, should be presented as notes to the schedule required by paragraph 46(c). In addition, for each of the schedules required by paragraph 46, information should be presented about factors that significantly affect trends in the amounts reported.

Changes of benefit and funding terms: The following changes were made by the Missouri General Assembly and reflected in the valuation performed as of June 30 listed below:

None

Changes in actuarial assumptions and methods:

6/30/2020 valuation:

- The investment return assumption was lowered from 7.10% to 6.95%.
- The price inflation assumption was lowered from 2.35% to 2.25%.
- The payroll growth assumption was lowered from 2.35% to 2.25%.
- The wage growth assumption was lowered from 2.60% to 2.50%.
- The cost-of-living adjustment (COLA) assumption was lowered from 1.88% to 1.80% when no minimum COLA is in effect (80% of price inflation).

6/30/2019 valuation:

- The investment return assumption was lowered from 7.25% to 7.10%.
- The price inflation assumption was lowered from 2.50% to 2.35%.
- The payroll growth assumption was lowered from 2.50% to 2.35%.
- The wage growth assumption was lowered from 2.75% to 2.60%.
- The cost-of-living adjustment (COLA) assumption was lowered from 2.00% to 1.88% when no minimum COLA is in effect (80% of price inflation).



6/30/2018 valuation:

- The investment return assumption was lowered from 7.50% to 7.25%.
- The payroll growth assumption was lowered from 3.00% to 2.50%.
- The wage growth assumption was lowered from 3.00% to 2.75%.
- The asset smoothing method was changed from an open 5-year smoothing method to a closed 5-year smoothing method, with the difference between the actual investment return and the expected investment return on the market value of assets recognized evenly over a closed 5-year period. Due to the change in the asset smoothing method, a transitional plan was necessary. This transitional plan recognizes the unrecognized investment experience as of June 30, 2017 evenly over a closed 7-year period.
- The Unfunded Actuarially Accrued Liability (UAAL) amortization method was changed from one base over a closed 30-year period that began June 30, 2014 to a “layered” approach first effective June 30, 2018. The “Legacy UAAL”, as determined in the June 30, 2018 valuation, is amortized over a closed 30-year period. Subsequent changes in the UAAL due to actuarial gains/losses or assumption changes are separately financed by establishing amortization bases and payments, as a level percentage of payroll, over closed 30-year periods. Any change in the Plan’s benefit structure shall be amortized over a closed period of 20 years, as set out in state statutes. The total UAAL amortization payment is the sum of the payments for each of the amortization bases.

6/30/2017 valuation:

- The investment return assumption was lowered from 7.65% to 7.50%.

6/30/2016 valuation:

- The long-term rate of return was lowered from 8.00% to 7.65%.
- Post-retirement mortality table was updated from the RP-2000 combined healthy mortality table, projected to 2016 with Scale AA to the RP-2014 healthy annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 98%.
- Pre-retirement mortality table was updated from the RP-2000 combined healthy mortality table, projected to 2016 with Scale AA to the RP-2014 employee mortality table, projected from 2006 to 2026 with Scale MP-2015.
- The disabled mortality table was updated from the RP-2000 combined healthy mortality table, projected to 2016 with Scale AA and set forward 10 years to the RP-2014 disabled mortality table, projected from 2006 to 2026 with Scale MP-2015.
- Retirement rates were changed to better reflect actual experience of the Plan.
- Withdrawal rates were changed to better reflect actual experience of the Plan.
- The marriage assumption at retirement was increased from 70% to 80%.
- The marriage assumption for in-service deaths was increased from 70% to 80%.
- The asset smoothing period changed from an open 3-year period to an open 5-year period.



6/30/2014 valuation:

- For the 2014 valuation only, a one-time adjustment to the payroll growth from 3.00% to 14.38% was assumed for the year after the valuation date to reflect the average planned salary increase for 2015.
- The unfunded actuarial accrued liability amortization method was changed from a level percentage of payroll amortized over an open 30-year period to a level percentage of payroll amortized over a closed 30-year period beginning with the 6/30/2014 valuation.



Method and assumptions used in calculations of actuarially determined contributions.

The Plan is funded with contribution rates that are 4.00% of monthly salary for members hired on or after January 1, 2011 (0% for all other members) and an actuarially determined rate for the State of Missouri (subject to a minimum rate of 58.45% until the Plan is 80% funded on an actuarial basis). The Actuarially Determined Contributions in the *Schedule of Employer Contributions* are calculated as of the fiscal year two years prior to which contributions are reported.

The following actuarial methods and assumptions were used to determine the Actuarially Determined Contribution reported for the most recent Measurement Date, June 30, 2020 (based on the June 30, 2018 actuarial valuation):

Actuarial cost method	Entry Age Normal
Amortization method	Level percentage of payroll, closed
Remaining amortization period	Layered bases with the Legacy Base amortized over a 30-year period beginning June 30, 2018. All subsequent bases are amortized over a new 30-year period.
Asset valuation method	Closed 5-year smoothing based on actual market return. Deferred asset experience as of June 30, 2017 is recognized evenly over a closed 7-year period beginning June 30, 2018.
Price Inflation	2.50 percent
Payroll Growth	2.50 percent
Salary increases, including inflation	2.75 to 4.95 percent
Long-term Rate of Return, net of investment expense, including price inflation	7.25 percent
Cost-of-living adjustment	4.00%, compounded annually, when a minimum COLA of 4.00% is in effect. 2.00%, compounded annually, when no minimum COLA is in effect (80% of price inflation).

Please see the information presented earlier in regard to Paragraph 47 for detailed information on the benefit changes and assumption changes that may have impacted the Actuarially Determined Contributions shown in the *Schedule of Employer Contributions*.



APPENDIX A

REQUIRED SUPPLEMENTARY INFORMATION



Exhibit A

**GASB 68 Paragraphs 46(a)
SCHEDULE OF CHANGES IN THE NET PENSION LIABILITY**

	2020	2019	2018	2017	2016	2015	2014
Total Pension Liability							
Service Cost	13,119,646	13,573,453	12,997,198	12,945,567	10,932,097	10,613,686	8,990,293
Interest	42,458,800	41,710,768	41,018,371	40,617,091	37,755,240	36,161,612	34,013,615
Benefit term changes	0	0	0	0	0	0	0
Differences between expected and actual experience	(14,933,643)	978,884	(1,319,696)	(10,687,091)	(5,036,696)	5,103,664	13,360,614
Assumption changes	6,341,771	5,024,057	12,332,042	7,905,466	53,991,379	0	0
Benefit payments, including member refunds	<u>(39,622,268)</u>	<u>(37,593,049)</u>	<u>(35,657,248)</u>	<u>(33,984,725)</u>	<u>(32,989,714)</u>	<u>(31,245,906)</u>	<u>(29,406,625)</u>
Net change in Total Pension Liability	7,364,306	23,694,113	29,370,667	16,796,308	64,652,306	20,633,056	26,957,897
Total Pension Liability - beginning	617,482,705	593,788,592	564,417,925	547,621,617	482,969,311	462,336,255	435,378,358
Total Pension Liability - ending (a)	624,847,011	617,482,705	593,788,592	564,417,925	547,621,617	482,969,311	462,336,255
Plan Fiduciary Net Position							
Employer contributions	39,174,515	38,604,668	36,892,203	34,246,826	33,642,497	32,696,686	29,264,877
Employee contributions	1,314,570	1,138,101	902,319	786,745	661,206	488,193	294,810
Net investment income	8,162,709	6,055,836	10,677,666	4,680,131	28,082	(3,610,352)	21,394,750
Benefit payments, including member refunds	<u>(39,622,268)</u>	<u>(37,593,049)</u>	<u>(35,657,248)</u>	<u>(33,984,725)</u>	<u>(32,989,714)</u>	<u>(31,245,906)</u>	<u>(29,406,625)</u>
Administrative expenses	(74,450)	(72,141)	(181,595)	(150,387)	(136,983)	(123,015)	(105,693)
Other	<u>0</u>	<u>0</u>	<u>(68,711)</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Net change in Plan Fiduciary Net Position	8,955,076	8,133,415	12,564,634	5,578,590	1,205,088	(1,794,394)	21,442,119
Plan Fiduciary Net Position – beginning	158,332,990	150,199,575	137,634,941	132,056,351	130,851,263	132,645,657	111,203,538
Plan Fiduciary Net Position - ending (b)	167,288,066	158,332,990	150,199,575	137,634,941	132,056,351	130,851,263	132,645,657
Net Pension Liability - ending (a) - (b)	457,558,945	459,149,715	443,589,017	426,782,984	415,565,266	352,118,048	329,690,598

Note: Schedule is intended to show 10-year trend. Additional years will be reported as they become available.



Exhibit A (cont.)

**GASB 68 Paragraphs 46(b)
SCHEDULE OF CHANGES IN THE NET PENSION LIABILITY**

	2020	2019	2018	2017	2016	2015	2014
Total Pension Liability	624,847,011	617,482,705	593,788,592	564,417,925	547,621,617	482,969,311	462,336,255
Plan Fiduciary Net Position	167,288,066	158,332,990	150,199,575	137,634,941	132,056,351	130,851,263	132,645,657
Net Pension Liability	457,558,945	459,149,715	443,589,017	426,782,984	415,565,266	352,118,048	329,690,598
Plan Fiduciary Net Position as a percentage of the Total Pension Liability	26.77%	25.64%	25.30%	24.39%	24.11%	27.09%	28.69%
Covered payroll	61,402,061	60,594,362	59,417,302	58,591,661	57,421,016	55,656,457	49,587,936
Employers' Net Pension Liability as a percentage of covered payroll	745.18%	757.74%	746.57%	728.40%	723.72%	632.66%	664.86%

Note: Schedule is intended to show 10-year trend. Additional years will be reported as they become available.



Exhibit B
GASB 68 Paragraphs 46(c)
SCHEDULE OF EMPLOYER CONTRIBUTIONS
Fiscal Year Ended June 30

	2020	2019	2018	2017	2016	2015	2014
Actuarially determined employer contribution	\$39,174,515	\$38,604,668	\$36,892,203	\$32,670,710	\$33,642,497	\$32,696,686	\$29,264,877
Actual employer contributions	<u>39,174,515</u>	<u>38,604,668</u>	<u>36,892,203</u>	<u>34,246,826</u>	<u>33,642,497</u>	<u>32,696,686</u>	<u>29,264,877</u>
Annual contribution deficiency (excess)	<u>\$0</u>	<u>\$0</u>	<u>\$0</u>	<u>(\$1,576,116)</u>	<u>\$0</u>	<u>\$0</u>	<u>\$0</u>
Covered payroll	\$61,402,061	\$60,594,362	\$59,417,302	\$58,591,661	\$57,421,016	\$55,656,457	\$49,587,936
Actual contributions as a percentage of covered payroll	63.80%	63.71%	62.09%	58.45%	58.59%	58.75%	59.02%

Note: Information prior to 2017 was produced by the prior actuary.



APPENDIX B

SUMMARY OF PLAN PROVISIONS

Age and Service Retirement

Eligibility for Unreduced Benefit (for Members Hired Before 1/1/2011)

The earliest of attaining:

- (1) At least 62 with 12 years of creditable service.
- (2) At least 60 with 15 years of creditable service.
- (3) At least 55 with 20 years of creditable service.

Eligibility for Unreduced Benefit (for Members Hired On or After 1/1/2011)

The earliest of attaining:

- (1) At least 67 with 12 years of creditable service.
- (2) At least 62 with 20 years of creditable service.

Benefit Amount

50% of compensation

Early Retirement

Eligibility for Reduced Benefit (for Members Hired Before 1/1/2011)

Age 60

Benefit Amount

- (1) If between 60 and 62, years of service divided by 15 multiplied by 50% of compensation.
- (2) If at least 62, years of service divided by 12 and multiplied by 50% of compensation.

Eligibility for Reduced Benefit (for Members Hired On or After 1/1/2011)

Age 62

Benefit Amount

- (1) If between 60 and 67, years of service divided by 20 multiplied by 50% of compensation.
- (2) If at least 67, years of service divided by 12 and multiplied by 50% of compensation.

Compensation used for Benefit Determination

The annual salary at date of termination of the highest position held.



Vested Deferred Benefits

Benefits for employees who terminate prior to eligibility for an immediate benefit are considered to be vested. Benefits commence once the individual qualifies for normal or early retirement based on age and service.

Death Benefits

Death Prior to Retirement

50% of the benefit the member would have been eligible to receive based on service to age 70 is payable to an eligible spouse or minor children.

Death After Retirement

50% of the benefit the retired member was receiving at the date of death to an eligible surviving spouse for members hired before January 1, 2011.

Disability Benefits

Disability benefits become payable at the time the member is eligible for normal retirement (50% of salary for remainder of term) and are computed based on the service that would have accrued if active employment had continued until normal retirement age, and member's compensation while an active employee.

Post-Retirement Benefit Adjustments

Benefits are increased to benefit recipients (including survivors) annually in accordance with the following formulas:

Increase in CPI	Formula 1 Benefit Increase	Formula 2 Benefit Increase
5.00% or less	4.00%	80% of CPI increase
5.01% - 6.24%	80% of CPI increase	80% of CPI increase
6.25% or more	5.00%	5.00%

Members first hired prior to August 28, 1997 receive COLAs based on Formula 1 until an aggregate increase of 65% is reached. At that point, subsequent COLAs based on Formula 2 are granted.

Members first hired on or after August 28, 1997 receive COLAs based solely on Formula 2.

Members hired prior to January 1, 2011 who work beyond the later of age 60 or the date when first eligible for age and service retirement will have their monthly benefit increased upon retirement. The percentage increase is equal to all COLAs for the years between (i) the later of age 60 or the date when first eligible for age and service retirement and (ii) date of actual retirement, not to exceed 65%.



Member Contributions

For members hired prior to 1/1/2011: None

For members hired on or after 1/1/2011: 4.00% of salary, with interest credited at 4.00%.



APPENDIX C

STATEMENT OF ACTUARIAL ASSUMPTIONS

An experience study which analyzed the System’s economic assumptions was performed in 2018 and the results were presented to the Board. The economic assumptions listed below are a result of that experience study. The demographic assumptions are based on an experience study performed in 2015, by the prior actuary. The next experience study is scheduled for 2021.

- 1. Investment Return 6.95%, compounded annually, net of investment expenses.
- 2. Inflation 2.25% per year
- 3. Salary Increases

Sample Ages	Inflation	Productivity	Merit	Increase Next Year
25	2.25%	0.25%	2.20%	4.70%
30	2.25	0.25	2.20	4.70
35	2.25	0.25	1.48	3.98
40	2.25	0.25	0.76	3.26
45	2.25	0.25	0.60	3.10
50	2.25	0.25	0.54	3.04
55	2.25	0.25	0.44	2.94
60	2.25	0.25	0.00	2.50
65	2.25	0.25	0.00	2.50
70	2.25	0.25	0.00	2.50

- 4. Payroll Growth 2.25% per year
4.00% on a compounded basis when a minimum COLA of 4.00% is in effect.
- 5. Cost-of-Living Adjustment (COLA) 1.80% on a compounded basis when no minimum COLA is in effect.
- 6. Administrative Expenses Actual prior year expenses, included in normal cost rate.



Demographic Assumptions

1. Mortality

The mortality assumption includes an appropriate level of conservatism that reflects expected future mortality improvement.

a. Post-retirement

RP-2014 Healthy Annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 98%

b. Pre-retirement

RP-2014 Employee mortality table, projected from 2006 to 2026 with Scale MP-2015

c. Long-term disability

RP-2014 Disabled mortality table, projected from 2006 to 2026 with Scale MP-2015

Sample Ages	Pre-Retirement Mortality Rates*	
	Males	Females
25	0.03%	0.01%
30	0.03	0.02
35	0.04	0.03
40	0.05	0.04
45	0.07	0.05
50	0.13	0.09
55	0.24	0.16
60	0.42	0.23
65	0.74	0.33
70	1.23	0.55

* The pre-retirement mortality table used was the RP-2014 Employee mortality table, projected from 2006 to 2026 with Scale MP-2015.



2. Retirement Assumption

Retirement Age	<u>Hired Before 1/1/2011</u>				<u>Hired On or After 1/1/2011</u>		
	Normal Retirement		Early Retirement		Retirement Age	Normal Retirement	
	Male	Female	Male	Female		Male	Female
55	20%	3%					
56	16%	3%					
57	13%	3%					
58	9%	3%					
59	5%	3%					
60	8%	8%					
61	5%	8%					
62	8%	8%	6%	3%	62	30%	35%
63	10%	8%	6%	3%	63	20%	20%
64	12%	8%	6%	3%	64	15%	20%
65	12%	15%	6%	3%	65	30%	50%
66	20%	15%	6%	3%	66	25%	25%
67	20%	15%	6%	3%	67	20%	25%
68	30%	15%	6%	3%	68	20%	25%
69	30%	15%	6%	3%	69	30%	50%
70	100%	100%	100%	100%	70	100%	100%

3. Disability Assumption

Sample Ages	Sample	
	Males	Females
25	0.01 %	0.01 %
30	0.02	0.01
35	0.03	0.02
40	0.04	0.03
45	0.05	0.04
50	0.08	0.07
55	0.13	0.12
60	0.20	0.19
65	0.20	0.19
70	0.20	0.19



4. Termination Assumption

Service Index	Percent of Active Members Separating within the Next Year	
	Withdrawal	
	Males	Females
1	0.040 %	0.040 %
2	0.010	0.023
3	0.013	0.023
4	0.013	0.023
5	0.013	0.023
6-10	0.013	0.023
11-15	0.017	0.023
16+	0.010	0.010

Other Assumptions

- | | |
|--------------------------------|--|
| 1. Form of Payment | Hired before 1/1/2011 – 50% joint and survivor
Hired on or after 1/1/2011 – Straight life annuity |
| 2. Marital Status | |
| a. Percent married | 100% married |
| b. Spouse's age | Females assumed to be four years younger than males. |
| 3. Pay Increase Timing | Beginning of the fiscal year. |
| 4. Decrement Timing | Decrements of all types are assumed to occur mid-year. |
| 5. 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. |
| 6. Benefit Service | Exact fractional service is used to determine the amount of the benefit payable. |
| 7. Decrement Relativity | Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects. |
| 8. Decrement Operation | Disability and withdrawal do not operate during normal retirement eligibility. |
| 9. Other Liability Adjustments | None |



- | | |
|--|---|
| 10. 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. New entrant normal cost contributions are applied to the funding of new entrant benefits. |
| 11. Forfeitures | No vested member are assumed to take a refund of employee contributions. |
| 12. Salary and Benefit Limits | For purposes of the valuation, no limits were applied to member compensation or benefits. |
| 13. Commencement age for deferred vested benefit | Normal retirement age |

Data Adjustments

Active and retired member data was reported as of May 31, 2020. It was brought forward to June 30, 2020 by adding one month of service for all active members, one month of contributions and interest for Judicial Plan 2011 members, and the June COLA for certain retired members. Financial information continues to be reported as of June 30. This procedure was instituted to provide sufficient time for the Board of Trustees to certify the appropriate contribution rate prior to the October 1 statutory deadline.

Active members reported with no annualized salary were assumed to receive the average active member pay.

TECHNICAL VALUATION PROCEDURES

Other Valuation Procedures

Salary increases are assumed to apply to annual amounts.

Decrement are assumed to occur mid-year, except that immediate retirement is assumed for those who are at or above the age at which retirement rates are 100%. Standard adjustments are made for multiple decrements.

No actuarial liability is included for participants who terminated without being vested prior to the valuation date, except those due a refund of contributions.