GRS
Gabriel Roeder Smith & Company
Consultants & Actuaries

One Towne Square
Suite 800
Southfield, MI 48076-3723

248.799.9000 phone
248.799.9020 fax
www.gabrielroeder.com

December 20, 2016

CONFIDENTIAL

Ms. Ronda Stegmann
Legislative & Policy Coordinator
Missouri State Employees'
Retirement System
907 Wildwood Drive
Jefferson City, MO 65109

Re: Senate Bill No. 141 (SB 141)

Dear Ronda:

Enclosed are the results of a supplemental actuarial valuation related to a proposed benefit change for the Missouri State Employees' Retirement System's June 30, 2016 valuation.

If you have any questions or comments, please contact us.

Respectfully submitted,

Brad Lee Armstrong, ASA, EA, FCA, MAAA

David T. Kausch, FSA, EA, FCA, MAAA, PhD

BLA/DTK:ah
Enclosures

Missouri State Employees' Retirement System
Supplemental Actuarial Valuation
as of June 30, 2016

REQUESTED BY: Mr. John Watson, Executive Director

SUBMITTED BY: Brad Lee Armstrong, ASA, EA, FCA, MAAA, and
David T. Kausch, FSA, EA, FCA, MAAA, PhD
Gabriel, Roeder, Smith & Company

DATE: December 20, 2016

This report presents results of a supplemental actuarial valuation to measure the effect of eliminating defined benefit and providing defined contribution retirement benefits for members of the General Assembly (Legislators) and statewide Elected Officials who first take office on or after January 1, 2018.

This report is intended to describe the financial effect of the proposed changes. No statement in this report is intended to be interpreted as a recommendation in favor of the changes, or in opposition to them. The date of the valuation was June 30, 2016. Brad Lee Armstrong and David T. Kausch are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

If the scheduled contributions are made (subject to normal year-to-year experience fluctuations), then the System will be able to pay all benefits promised, when due. Our understanding is that the State is currently paying the appropriate total contribution rate.

Actuarial assumptions and methods were consistent with those used in the regular actuarial valuation of the Retirement System on the valuation date, unless otherwise noted. In particular:

- The assumed rate of interest was 7.65%.
- Payroll was assumed to increase 3% per year.
- For the regular valuation, the Unfunded Actuarial Accrued Liability is amortized over 30 years, beginning with the Fiscal Year Ending 2016.

We believe the assumptions are internally consistent and reasonable, based on the actual experience of MOSERS. These actuarial assumptions and methods comply with current actuarial standards of practice.

The active group size is assumed to remain constant. For purposes of this supplemental valuation, the active group for Legislators and Elected Officials is assumed to decline under the assumptions disclosed herein.

A brief summary of the data used in this valuation follows:

			Group Averages		
Valuation Group	**Number**	**Payroll**	**Salary**	**Age(yrs.)**	**Service(yrs.)**
Elected Officials (EO)	6	$ 659,977	$ 109,996	47.7	8.7
Legislators (L)	194	6,978,820	35,973	52.7	5.1
Total MOSERS (w/ EO & L)	**49,464**	**$ 1,921,528,936**	**$ 38,847**	**45.5**	**11.2**

For Members of the General Assembly (Legislators) or Elected Officials Hired on and after January 1, 2018:

Eliminate defined benefit plan retirement benefits for members of the General Assembly (Legislators) and statewide Elected Officials who first take office on or after January 1, 2018. A retired state employee who retired under the Year 2000 plan and holds one of these elected offices for the first time on or after January 1, 2018 will also be prohibited from receiving retirement benefits from the Missouri State Employees' Retirement System during his or her term of office, and shall not be eligible to accrue additional benefits based on service as a member of the General Assembly or as statewide Elected Official.

Members of the General Assembly and statewide Elected Officials who first take office on or after January 1, 2018, shall be eligible to participate in a defined contribution plan, in which the employer shall contribute 4.0% of the participant's payroll and the member shall contribute 4.0% of the participant's payroll.

The proposed removal of defined benefits for new hires has **no effect** on the MOSERS current benefit obligation for the active members currently covered under the Missouri State Employees' Retirement System MSEP plan, MSEP 2000 plan, and MSEP 2011 plan. To the extent there is an election which results in Members of the General Assembly or Statewide Elected Officials taking office on or after January 1, 2018, there may be an associated reduction in employer normal cost dollar contributions.

Actuarial Statement

	Impact on MOSERS DB Employer Contributions		
	Present Benefits	Proposed Benefits	Increase/ (Decrease)
FY 2017-2018 Contribution			
Total Normal Cost	8.60 %	8.60 %	0.00 %
Member Contribution Rate	(1.41)	(1.41)	0.00
UAAL%	12.26	12.26	0.00
Total Employer Contribution Rate	19.45 %	19.45 %	0.00 %
Employer Normal Cost ($ millions)	$ 146.6	$ 146.6	$ -
Estimated Employer Contribution ($ millions)*	$ 396.5	$ 396.5	$ -
Valuation Results as of June 30, 2016 ($ millions)			
Market Value of Assets (MVA)	$ 8,109.2	$ 8,109.2	$ -
Actuarial Accrued Liability (AAL)	12,751.2	12,751.2	-
Actuarial Value of Assets (AVA)	8,878.1	8,878.1	-
Unfunded Actuarial Accrued Liability (UAAL)	$ 3,873.1	$ 3,873.1	$ -
Percent Funded	69.6 %	69.6 %	0.0 %

* *Illustrative only. Estimated employer contribution amounts (shown in $ millions) are based on the Total Computed Employer Contribution Rate shown and valuation payroll projected two years to the applicable fiscal year using the valuation assumptions of 3% per year. The projection on the following page uses a similar procedure, but it is applied to each individual participant as opposed to the aggregated approach used in this page, which results in small differences when computed.*

The Estimated employer contribution amount for the 'Proposed' scenario reflects the reduction in payroll anticipated for the fiscal year ending 2018 due to the elimination of defined benefit plan retirement benefits for members of the General Assembly (Legislators) and statewide Elected Officials who first take office on or after January 1, 2018.

Missouri State Employees' Retirement System
Supplemental Actuarial Valuation
as of June 30, 2016

Projected Change in Annual Employer Contributions (in Thousands)

	Current Provisions (Beginning of Year)				Proposed Provisions (Beginning of Year)				Projected DB Employer Contributions						Projected DC Employer Contributions@	Total Projected (DB +DC) Employer Contributions
									Current		Est. Impact		Proposed		Proposed	Proposed
Fiscal Year	Projected AAL	Projected AVA	Funded Ratio	Projected MVA	Projected AAL	Projected AVA	Funded Ratio	Projected MVA	Rate	Dollars	Rate#	Dollars	Rate	Dollars	Dollars	Dollars
2017	$12,751,163	$ 8,878,057	69.6%	$ 8,109,161	$12,751,163	$ 8,878,057	69.6%	$8,109,161	-	-	-	-	-	-	-	-
2018	13,107,822	9,143,553	69.8%	9,144,302	13,107,824	9,143,552	69.8%	9,144,302	19.45%	$ 388,957	0.00%	$ (168)	19.45%	$ 388,789	$ 35	$ 388,824
2019	13,450,197	9,442,796	70.2%	9,443,521	13,449,974	9,442,792	70.2%	9,443,521	19.14%	391,342	(0.02%)	(878)	19.12%	390,463	98	390,562
2020	13,763,267	9,718,030	70.6%	9,718,840	13,762,172	9,717,210	70.6%	9,718,840	18.86%	394,592	(0.05%)	(1,756)	18.81%	392,836	151	392,987
2021	14,047,649	9,969,864	71.0%	9,970,755	14,044,998	9,967,351	71.0%	9,970,755	18.59%	398,256	(0.06%)	(2,206)	18.53%	396,050	199	396,248
2022	14,305,373	10,200,855	71.3%	10,201,818	14,300,472	10,196,201	71.3%	10,201,818	18.35%	402,772	(0.09%)	(3,067)	18.26%	399,705	239	399,944
2023	14,540,497	10,415,898	71.6%	10,416,922	14,532,601	10,408,164	71.6%	10,416,922	18.12%	407,787	(0.10%)	(3,482)	18.02%	404,305	273	404,578
2024	14,755,248	10,617,775	72.0%	10,618,853	14,743,704	10,606,316	71.9%	10,618,853	17.90%	413,304	(0.12%)	(4,110)	17.78%	409,195	301	409,496
2025	14,949,931	10,807,485	72.3%	10,808,613	14,934,010	10,791,549	72.3%	10,808,613	17.71%	419,769	(0.13%)	(4,502)	17.58%	415,267	323	415,591
2026	15,124,493	10,985,987	72.6%	10,987,161	15,103,613	10,965,162	72.6%	10,987,161	17.53%	426,781	(0.14%)	(4,890)	17.39%	421,891	341	422,232
2027	15,279,840	11,155,213	73.0%	11,156,429	15,253,482	11,128,633	73.0%	11,156,429	17.36%	434,359	(0.14%)	(5,033)	17.22%	429,325	356	429,681
2028	15,417,734	11,317,592	73.4%	11,318,843	15,385,466	11,285,170	73.3%	11,318,843	17.21%	442,703	(0.15%)	(5,431)	17.06%	437,272	369	437,640

 # The ultimate impact on the normal cost is a decrease of 0.15% of projected valuation payroll.

@ The ultimate DC contribution is 0.015% of projected total valuation payroll.

			Post 1/1/2018 Payroll	
Fiscal Year	BOY Valuation Payroll Projected	Pre 1/1/2018 Payroll*	All Others	Elected Officials & General Assembly
2017	$ 1,958,394	$ 1,958,394	$ -	$ -
2018	1,999,781	1,896,769	102,148	864
2019	2,044,628	1,749,291	292,882	2,455
2020	2,092,217	1,626,811	461,632	3,774
2021	2,142,312	1,520,919	616,424	4,969
2022	2,194,942	1,426,342	762,625	5,975
2023	2,250,480	1,339,117	904,528	6,835
2024	2,308,962	1,256,204	1,045,228	7,530
2025	2,370,240	1,176,441	1,185,717	8,081
2026	2,434,575	1,099,753	1,326,302	8,520
2027	2,502,066	1,026,069	1,467,109	8,888
2028	2,572,360	956,249	1,606,891	9,220

** DB, DC and Total Contribution Rates are based on open group payroll.*
DC Contributions based on 4% employer contribution for Post-2018 hires for Elected Officials and members of the General Assembly only.

Numbers may not add due to rounding.

Comment A: The long-term effect of the proposed changes on Defined Benefit contributions is a decrease in the employer normal cost of approximately 0.15% of total MOSERS payroll. The UAAL rate may increase as the payroll decreases due to future Elected Officials joining the DC plan.

Comment B: We assumed that all current DB Elected Officials would stay in the DB plan.

Comment C: Term limits may result in turnover different than assumed in the short run. The valuation assumption is a long-term assumption. Additional information was provided by the system staff regarding pending term limits. No adjustments were made in this valuation to reflect those estimates due to the immateriality on the system as a whole.

Comment D: While we did not test the benefit, the DC benefit based off 8% of payroll contributions is likely less than the benefit from the DB plan.

Comment E: The Board has expressed intent to reduce the assumed rate of return by 0.15% per year for the next for years but has not yet adopted a lower rate. For purposes of this valuation, the assumed rate of return is 7.65% for all years.

Comment F: The calculations are based upon assumptions regarding future events, which may or may not materialize. They are also based upon present and proposed assumptions that are outlined in the report. If you have reason to believe that the assumptions that were used are unreasonable, that the plan provisions are incorrectly described, that important plan provisions relevant to this proposal are not described, or that conditions have changed since the calculations were made, you should contact the authors of this report prior to relying on information in the report.

Comment G: If you have reason to believe that the information provided in this report is inaccurate, or is in any way incomplete, or if you need further information in order to make an informed decision on the subject matter of this report, please contact the authors of the report prior to making such decision.

Comment H: In the event that more than one plan change is being considered, it is very important to remember that the results of separate actuarial valuations cannot generally be added together to produce a correct estimate of the combined effect of all of the changes. The total can be considerably greater than the sum of the parts due to the interaction of various plan provisions with each other, and with the assumptions that must be used.

Comment I: This report is intended to describe the financial effect of the proposed plan changes on the Retirement System. Except as otherwise noted, potential effects on other benefit plans were not considered.

Comment J: The reader of this report should keep in mind that actuarial calculations are mathematical estimates based on current data and assumptions about future events (which may or may not materialize). Please note that actuarial calculations can and do vary from one valuation year to the next. As a result, the cost impact of a benefit change may fluctuate over time, as the demographics of the group changes. Fluctuations from one year to the next may be more pronounced when dealing with small group sizes.

All actuarial assumptions are expectations of future experience, not market measures. The rationale for the actuarial assumption is based on the System's investment policy, capital market expectations, and demographic experience as described in the experience study reports. Actuarial assumptions were last reviewed in conjunction with the July 1, 2010 through June 30, 2015 5-Year Experience Study dated March 28, 2016 and subsequent presentation.

- - - - - - - - - - -*Economic Assumptions* - - - - - - - - - -

The economic assumptions were adopted by the Board on July 16, 2016 to be first effective for the June 30, 2016 valuation.

The investment return rate used in the valuations was 7.65% per year, compounded annually (net after investment expenses). This assumption is used to account for the fact that equal amounts of money payable at different points in time in the future do not have the same value presently.

Pay increase assumptions for individual active members are shown for sample ages on page 12. Part of the assumption for each age is for merit and/or seniority increase, and the other 3.0% recognizes wage inflation. This assumption is used to project a member's current salary to the salaries upon which benefits will be based.

Price inflation is assumed to be 2.5% per year.

The active member payroll is assumed to increase 3.0% annually, which is the portion of the individual pay increase assumptions attributable to wage inflation.

The annual Cost-of-Living Adjustment (COLA) is assumed to be 4.00%, on a compounded basis, when a minimum COLA of 4% is in effect (4.0% for 12 years, 3.06% the next year to reach a cumulative 65% followed by 2.0%). When no minimum COLA is in effect, price inflation is assumed to be 2.5% and the annual COLA is assumed to be 2.0% (80% of 2.5%), on a compounded basis.

The demographic assumptions were adopted by the Board on June 16, 2016 to be first effective for the June 30, 2016 valuation.

The mortality table, for post-retirement mortality, used in evaluating allowances to be paid was the RP-2014 Healthy Annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 120%. Related values are shown on page 10. This assumption is used to measure the probabilities of each benefit payment being made after retirement.

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. The pre-retirement mortality table used for Long-Term Disability (LTD) members was 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.

The probabilities of age and service retirement are shown on page 11. It was assumed that each member will be granted 4 months (5 months for 2011 plan members) of service credit for unused leave upon retirement and 4 months of military service purchases (0 months for 2011 plan members).

The probabilities of withdrawal from service, disability and death-in-service are shown for sample ages on page 10. For disability retirement, impaired longevity was recognized by use of special mortality tables.

The entry age normal actuarial cost method of valuation was used in determining liabilities and normal cost. Each member's normal cost was based on the benefit provisions applicable to that member. The normal cost is projected to the applicable fiscal year. Differences in the past between assumed experience and actuarial experience ("actuarial gains and losses") become part of actuarial accrued liabilities. Unfunded actuarial accrued liabilities are amortized to produce payments, (principal & interest) which are level percents of payroll contributions.

The amortization of the unfunded actuarial accrued liability is based on a closed 30-year amortization period, level percent-of-payroll amortization as adopted by the Board. This method was first effective with the June 30, 2014 valuation. As of June 30, 2016 valuation, 28 years remain. The amortization is based on the projected unfunded actuarial accrued liability to the beginning of the fiscal year during which the contributions are expected to be made.

- - - - - - - - - - *Non-Economic Assumptions (concluded)* - - - - - - - - - -

Employer contribution dollars were assumed to be ***paid in equal installments*** throughout the employer's fiscal year.

Actuarial value of assets. Valuation assets recognize assumed investment return fully each year. Differences between actual and assumed investment return are phased-in over an open five-year period. Valuation assets are not permitted to deviate from the market value by less than 80% or more than 125%.

The data about persons now covered and about present assets were furnished by the System's administrative staff. Although examined for general reasonableness, the data was not audited by the Actuary.

The liabilities for active members hired on or after January 1, 2011 were based on MSEP 2011 benefits. The liabilities for active members hired on or after July 1, 2000 (April 26, 2005 for Administrative Law Judges) were based on MSEP 2000 benefits. The liabilities for active members hired before July 1, 2000 for Elected Officials, General Assembly, and Uniformed Water Patrol were based on MSEP benefits. The liabilities for all other active members hired before July 1, 2000 were based on the assumption that members would elect MSEP 2000 prior to age 62 and MSEP on or after age 62.

For members on long-term disability, the actuarial accrued liability is the present value of benefit under active assumptions and projecting salary by 3.0% (wage inflation assumption) per year from the year of disability to the current year to reflect indexing of pay in ultimate retirement benefits.

- -

The actuarial valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (MAAA).

Missouri State Employees' Retirement System
Separations from Active Employment Before Service Retirement
June 30, 2016

Sample Ages	Years of Service	Percent of Active Members - - - - - - Separating within the Next Year - - - - -					
		Withdrawal **		Death*		Disability	
		Men	Women	Men	Women	Men	Women
	0	24.0 %	27.5 %				
	1	19.0	21.5				
	2	15.5	16.3				
	3	13.3	13.5				
	4	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
	Withdrawal
	Male/Female
1	8.0 %
2	8.0
3	8.0
4	8.0
5	12.0
6	12.0
7	12.0
8+	35.0

Missouri State Employees' Retirement System
Post-Retirement and Pre-Retirement Long-Term Disability Mortality Rates

The mortality table for post-retirement mortality was the RP-2014 Healthy Annuitant mortality table, projected from 2006 to 2026 with Scale MP-2015 and scaled by 120%. The pre-retirement mortality table used for Long-Term Disability (LTD) members was 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.

	Post-Retirement		Pre-Retirement LTD	
Age	Men	Women	Men	Women
45	0.0025	0.0021	0.0121	0.0069
50	0.0038	0.0028	0.0152	0.0090
55	0.0058	0.0040	0.0187	0.0121
60	0.0083	0.0058	0.0225	0.0142
65	0.0118	0.0086	0.0268	0.0167
70	0.0179	0.0136	0.0341	0.0223
75	0.0288	0.0223	0.0462	0.0327
80	0.0485	0.0382	0.0658	0.0502
85	0.0848	0.0679	0.0982	0.0761

Sample	Future Life Expectancy (Years)			
Attained	Post-Retirement		Pre-Retirement LTD	
Ages	Men	Women	Men	Women
40	40.95	43.52	31.67	37.37
45	36.33	38.90	28.24	33.43
50	31.84	34.33	25.02	29.63
55	27.52	29.85	21.99	26.06
60	23.38	25.49	19.08	22.66
65	19.40	21.29	16.23	19.25
70	15.62	17.28	13.44	15.89
75	12.13	13.56	10.80	12.77
80	9.03	10.22	8.40	10.01
85	6.42	7.37	6.33	7.71

Retirement Values - June 30, 2016

Sample	Present Value of $1/Month the First Year Increasing 4.0% / 2.0% Yearly (50% J & S)		Present Value of $1/Month the First Year Increasing 2.0% Yearly	
Attained	Old Plan COLA		New Plan COLA	
Ages	Men	Women	Men	Women
40	$232.55	$233.39	$188.71	$192.71
45	224.67	225.75	180.96	186.10
50	215.04	216.17	171.72	177.90
55	203.45	204.34	160.97	167.90
60	189.59	189.93	148.53	155.96
65	172.99	172.53	133.99	141.77
70	153.41	152.07	117.23	125.31
75	131.21	128.92	98.73	106.89
80	107.27	104.17	79.34	87.21
85	83.33	79.90	60.48	67.65

Missouri State Employees' Retirement System
Percent of Eligible Active Members Retiring Next Year

Normal Retirement Pattern					Early Retirement Pattern		
Retirement Age	MSEP and MSEP 2000* Percent Eligible 1st Year	MSEP and MSEP 2000* Percent Eligible 2nd Year	MSEP and MSEP 2000* Percent Eligible 3rd Year	MSEP 2011** Percent Eligible	Retirement Age	MSEP and MSEP 2000 Percent Eligible	MSEP 2011 Percent Eligible
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	6.0%	50
66	24%	25%	28%	25%	66	6.0%	50
67	10%	25%	23%	20%	67	6.0%	
68	20%	25%	23%	20%	68	6.0%	
69	20%	25%	23%	20%	69	6.0%	
70	20%	25%	23%	20%	70	6.0%	
71	20%	25%	23%	20%	71	6.0%	
72	20%	25%	23%	20%	72	6.0%	
73	20%	25%	23%	20%	73	6.0%	
74	20%	25%	23%	20%	74	6.0%	
75	50%	50%	23%	50%	75	6.0%	
76	50%	50%	23%	50%	76	6.0%	
77	75%	75%	23%	75%	77	6.0%	
78	100%	100%	100%	100%	78	100.0	

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

Missouri State Employees' Retirement System
Individual Pay Increase Assumptions
June 30, 2016

Service Index	Merit & Seniority*	Base (Economy)	Increase Next Year
1	5.75%	3.00%	8.75%
2	2.50%	3.00%	5.50%
3	1.50%	3.00%	4.50%
4	1.25%	3.00%	4.25%
5	1.00%	3.00%	4.00%
6	1.00%	3.00%	4.00%
7	1.00%	3.00%	4.00%
8	1.00%	3.00%	4.00%
9	0.75%	3.00%	3.75%
10	0.50%	3.00%	3.50%
15	0.50%	3.00%	3.50%
20	0.50%	3.00%	3.50%
25	0.25%	3.00%	3.25%
30	0.25%	3.00%	3.25%

* *Does not apply to members of the General Assembly.*