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January 29, 2021

CONFIDENTIAL

Ms. Erin Leonard
Executive Director
Minnesota State Retirement System
60 Empire Drive, Suite 300
St. Paul, MN 55103

Re: Projection of Contributions and Funding Status – State Employees Fund

Dear Erin:

Attached are 30-year projections of estimated funded status, required contributions, and statutory contributions under three asset return scenarios for the State Employees Retirement Fund. These projections, including the underlying investment return assumptions, are required by the Minnesota Standards for Actuarial Work. Unless noted otherwise, the estimates are based on participant data, assets, and plan provisions as outlined in the State Employees Retirement Fund actuarial funding valuation as of July 1, 2020.

Basis for Projections

For all enclosed projections, liabilities are determined using the statutory investment return assumption of 7.5%. As required by the Minnesota Standards for Actuarial Work, the projections reflect three asset return scenarios (7.5%, 6.0% and 9.0%). Note that we believe the 9.0% rate of return assumption is outside of the range of reasonable expected returns for this plan.

The estimates are based on the market value of assets with no smoothing of investment gains or losses. Payroll is assumed to increase approximately 3.00% per year over the long-term, consistent with the valuation assumption for total payroll growth.

The projection is an open group projection; meaning, active members projected to retire or otherwise terminate in the future are replaced with new active members so that the total active membership of the fund remains at 51,742 members. The profile of these new members is the same as new members hired between July 1, 2014 and June 30, 2019:

- Average age at hire is 37.6
- Average salary at hire is $49,400
- Approximately 57% female, 43% male

If actuarial accrued liability exceeds assets, the unfunded actuarial accrued liability is amortized through June 30, 2048 per Minnesota Statute 356.215, Subdivision 11. Per Minnesota Statute 356.215, Subdivision 11 (l), a negative unfunded actuarial accrued liability (i.e., when assets exceed liability) is amortized over a rolling 30-year period.

Comments

The reader should keep the following in mind when reviewing these results:

- Statutory contributions are defined in statutes as a fixed percentage of payroll plus any supplemental contributions and represent the amount that is actually contributed to the plan. Required contributions are defined in statutes and the LCPR Standard for Actuarial Work and represent the amount needed to fully fund the plan by June 30, 2048 (normal cost, expenses and a payment to amortize the unfunded liability).

- Investment experience that has occurred since the measurement date is not reflected in this report.

- The enclosed projections are based on assumptions as outlined in the State Employees Retirement Fund actuarial funding valuation as of July 1, 2020. Please see that report for comments regarding the 7.5% statutory investment return assumption, and sensitivity test results based on alternate assumptions.

- Note that plan changes may result in behavior changes that are not anticipated in the current assumptions.

- In the 7.5% and 9.0% investment return scenarios, surplus assets reduce the projected required contributions to amounts less than normal cost. We typically recommend the contribution be at least equal to the normal cost of the plan and suggest that plans with considerable surplus assets investigate the pros and cons of reducing the risk of the plan's investment allocation to preserve surplus assets.

- A 2019 analysis of long-term rate of investment return and inflation assumptions concluded that the probability of exceeding the current 7.5% assumption over 20 years is less than 50%. The statutory requirement for projections that are 1.5% above and 1.5% below the assumed rate may give the reader the impression that the 7.5% projection is an accurate (middle of the road) representation of the expected future results. Based on our modeling, the 7.5% scenario is optimistic and not representative of the expected (median) result. We caution against adjusting contribution rates without full consideration of the median results.

- Note that as funding ratios decline, as they are expected to in one of the investment return scenarios shown in this letter, it will be increasingly difficult for the plan to attain the assumed scenario investment return. Each year, a larger proportion of assets is paid out in benefits, and less capital is available to invest.

Disclosures

The purpose of this report is to estimate the Fund's funding progress and required contribution rates over a 30-year period according to prescribed assumptions and the Minnesota Standards for Actuarial Work. To the best of our knowledge and belief, the calculations were completed in accordance with the requirements of Minnesota Statutes, Section 356.215, and the requirements of the Standards for Actuarial Work established by the Legislative Commission on Pensions and Retirement.

This report should not be relied upon for any purpose other than the purpose described herein. Determinations of the financial results associated with the benefits described in this report in a manner other than the intended purpose may produce significantly different results. GRS is not responsible for the consequences of any unauthorized use.

Actuarial assumptions, including discount rates, mortality tables and others identified in this report, are prescribed by Minnesota Statutes Section 356.215, the Legislative Commission on Pensions and Retirement (LCPR), and the Board of Directors. These parties are responsible for selecting the plan's funding policy, actuarial valuation methods, asset valuation methods, and assumptions. The policies, methods and assumptions used in this valuation are those that have been so prescribed and are described in the Actuarial Basis section of the valuation report, except as noted. MSRS is solely responsible for communicating to GRS any changes required thereto.

In a 2019 analysis of long-term rate of investment return and inflation assumptions, GRS determined that an investment return assumption of 7.5% was reasonable. Please see our experience study report dated June 27, 2019 for additional information. This report also concluded that the probability of exceeding the current 7.50% assumption over 10 years is 44%. If capital market assumptions decline from present levels, the 7.50% return assumption might not comply with the actuarial standards for the July 1, 2021 valuation. For informational purposes, results based on a 6.5% discount rate are shown on page 5 of the July 1, 2020 valuation report.

The projections assume the continuing ability of the plan sponsor to make the contributions necessary to fund this plan. A determination regarding whether or not the plan sponsor is actually able to do so is outside our scope of expertise and was not performed.

The contribution rates shown in this report have been determined using the actuarial assumptions and methods disclosed in the Actuarial Basis section of the July 1, 2020 valuation report. This valuation report includes risk metrics on page 9, but does not include a robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

The valuation was based upon information furnished by the Minnesota State Retirement System (MSRS), concerning benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by MSRS.

This report was prepared using our proprietary valuation model and related software which, in our professional judgement, has the capability to provide results that are consistent with the purposes of the valuation and has no material limitations or known weaknesses. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

This report does not fully reflect the recent and still developing impact of COVID-19, which is likely to influence demographic and investment experience, at least in the short term. We will continue to monitor these developments and their impact on the plan.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law.

Professional Qualifications

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge and belief, the information contained in this report is accurate and fairly presents the actuarial position of the State Employees Retirement Fund as of the valuation date and was performed in accordance with the requirements of Minnesota Statutes Section 356.215, and the requirements of the Standards for Actuarial Work established by the LCPR. All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board and with applicable statutes.

Bonita J. Wurst and Brian B. Murphy 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. The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

Sincerely,

Bonita J. Wurst

Bonita J. Wurst, ASA, EA, FCA, MAAA

Brian B. Murphy

Brian B. Murphy, FSA, EA, FCA, MAAA, PhD

BJW/BBM:bd
Enclosures

Other Observations

General Implications of Contribution Allocation Procedure or Funding Policy on Future Expected Plan Contributions and Funded Status

Given the plan's contribution allocation procedure, if there are no changes in benefits or contributions and all actuarial assumptions are met (including the assumption of the plan earning 7.50% on the market value of assets), it is expected that:

(1) The normal cost of the plan is expected to remain approximately level as a percent of pay,
(2) The funded status of the plan is expected to gradually improve and is expected to be 100% funded within the next 28 years, and
(3) The unfunded liability will grow initially as a dollar amount before beginning to decline.

Limitations of Funded Status Measurements

Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the market value of assets. Unless otherwise indicated, with regard to any funded status measurements presented in this report:

(1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations; in other words, of transferring the obligations to an unrelated third party in an arm's length market value type transaction.
(2) The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. The amounts of future contributions will most certainly differ from those assumed in this report due to future actual experience differing from assumed experience based upon the actuarial assumptions. A funded status measurement in this report of 100% is not synonymous with no required future contributions. If the funded status were 100%, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit).
(3) The measurement would produce a different result if the actuarial value of assets were used instead of the market value of assets.

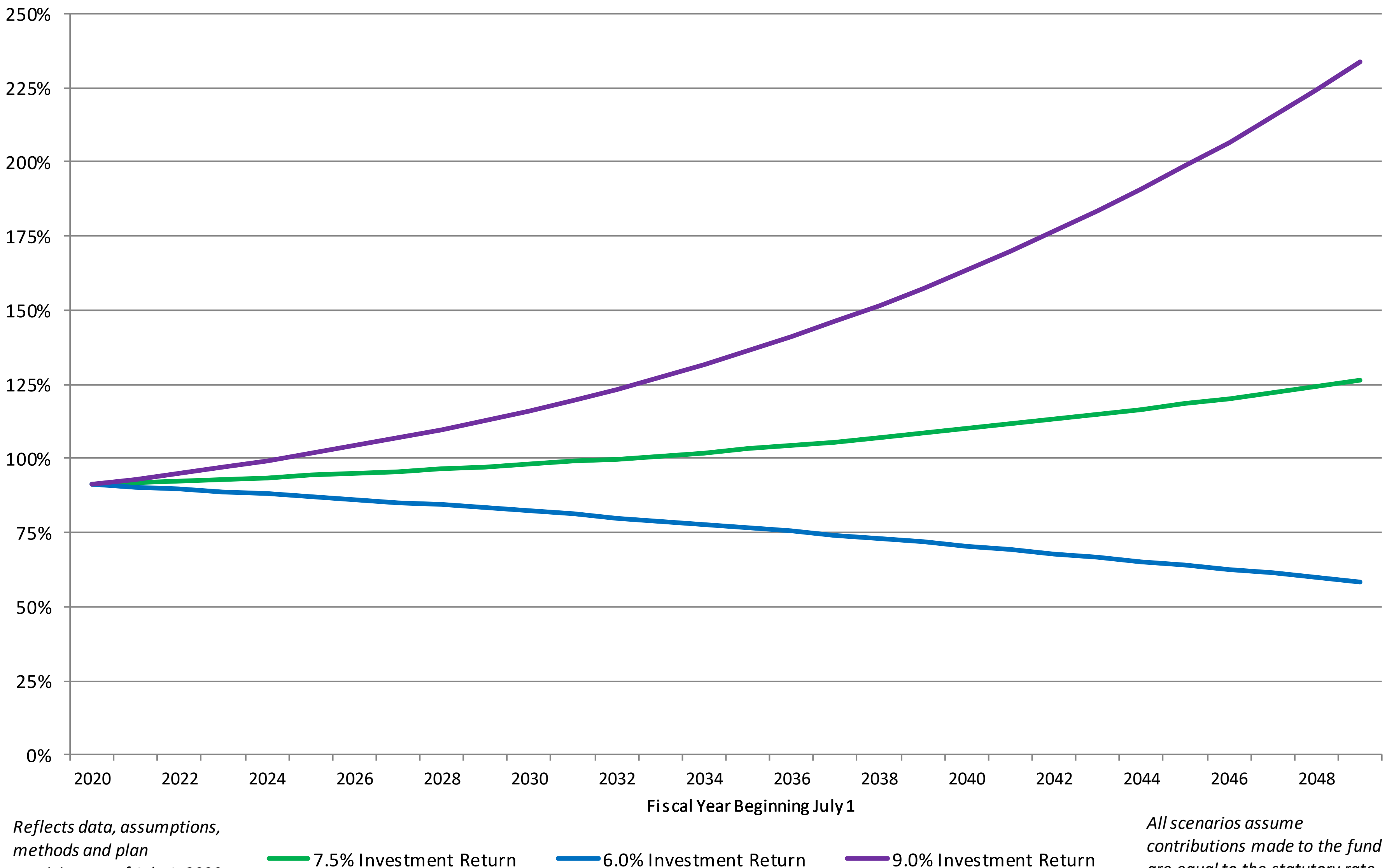
Limitations of Project Scope

Actuarial standards do not require the actuary to evaluate the ability of the plan sponsor or other contributing entity to make required contributions to the plan when due. Such an evaluation was not within the scope of this project and is not within the actuary's domain of expertise. Consequently, the actuary performed no such evaluation.

This exhibit should only be viewed in conjunction with GRS' January 29, 2021 letter to MSRS.

MSRS State Employees Retirement Fund
Estimated Funded Ratio

In all scenarios, the interest rate used to discount liabilities was 7.50%.



Reflects data, assumptions, methods and plan provisions as of July 1, 2020.

All scenarios assume contributions made to the fund are equal to the statutory rate.

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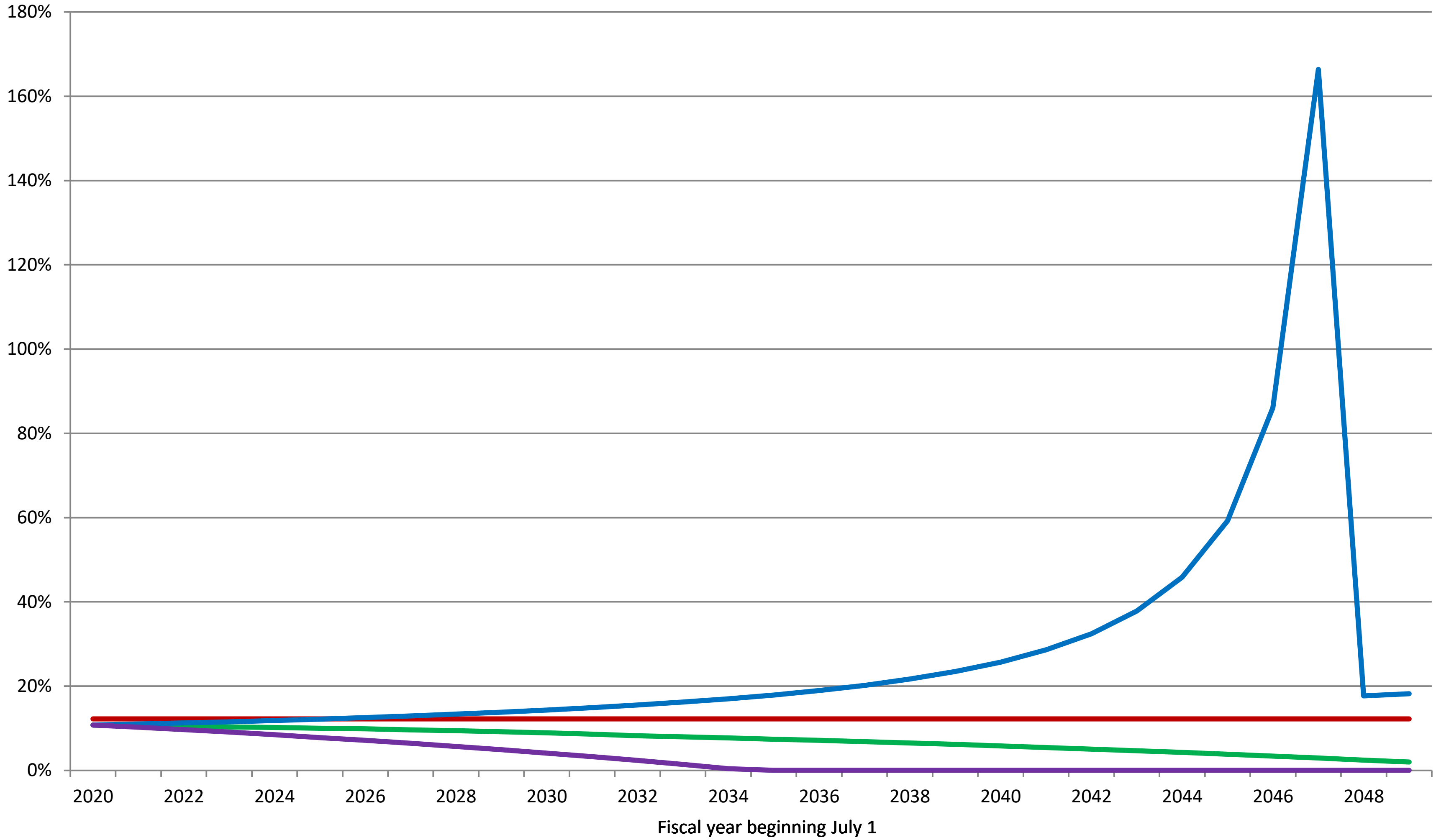
MSRS State Employees Retirement Fund

Estimated Required Contribution Rates (% of Pay)

In all scenarios, the interest rate used to discount liabilities was 7.50%.



Reflects data, assumptions, methods and plan provisions as of July 1, 2020.

All scenarios assume contributions made to the fund are equal to the statutory rate.

This exhibit should only be viewed in conjunction with GRS' January 29, 2021 letter to MSRS.

State Employees Retirement Fund

Scenario: 7.5% investment return for all years

Fiscal year beginning July 1

$ in Thousands	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Contributions (% of Payroll)										
Statutory - Chapter 352	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%
Required - Chapter 356 (MVA)	10.74%	10.63%	10.48%	10.34%	10.19%	10.02%	9.84%	9.64%	9.42%	9.17%
Sufficiency / (Deficiency)	1.51%	1.62%	1.77%	1.91%	2.06%	2.23%	2.41%	2.61%	2.83%	3.08%
Contributions										
Statutory - Chapter 352	415,479	425,669	439,582	453,157	467,124	481,689	496,726	512,291	528,357	544,921
Required - Chapter 356 (MVA)	364,341	369,222	376,176	382,628	388,613	394,196	399,109	403,195	406,240	407,993
Sufficiency / (Deficiency)	51,138	56,447	63,406	70,528	78,511	87,493	97,617	109,096	122,117	136,928
Funding Ratios										
Current Assets (MVA)	13,855,691	14,339,710	14,822,786	15,309,578	15,803,416	16,303,029	16,811,953	17,333,857	17,871,467	18,428,784
Actuarial Accrued Liability (AAL)	15,183,843	15,620,778	16,050,080	16,472,934	16,893,062	17,308,276	17,721,093	18,134,147	18,548,963	18,968,311
Unfunded AAL	1,328,152	1,281,068	1,227,294	1,163,356	1,089,646	1,005,247	909,140	800,290	677,496	539,527
Funding Ratio	91.3%	91.8%	92.4%	92.9%	93.6%	94.2%	94.9%	95.6%	96.4%	97.2%
Benefit Payments	940,056	985,887	1,030,788	1,072,417	1,116,164	1,157,502	1,196,438	1,234,198	1,269,726	1,303,269
Ratio of Assets to Benefit Payments	14.74	14.54	14.38	14.28	14.16	14.08	14.05	14.04	14.08	14.14

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

This exhibit should only be viewed in conjunction with GRS' January 29, 2021 letter to MSRS.

State Employees Retirement Fund

Scenario: 7.5% investment return for all years

Fiscal year beginning July 1

$ in Thousands	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**
Contributions (% of Payroll)										
Statutory - Chapter 352	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%
Required - Chapter 356 (MVA)	8.90%	8.59%	8.24%	7.97%	7.70%	7.41%	7.12%	6.81%	6.49%	6.15%
Sufficiency / (Deficiency)	3.35%	3.66%	4.01%	4.28%	4.55%	4.84%	5.13%	5.44%	5.76%	6.10%
Contributions										
Statutory - Chapter 352	562,024	579,699	597,901	616,643	635,931	655,780	676,296	697,459	719,222	741,524
Required - Chapter 356 (MVA)	408,178	406,440	402,245	401,091	399,484	396,750	392,849	387,625	380,899	372,487
Sufficiency / (Deficiency)	153,845	173,259	195,656	215,552	236,447	259,030	283,448	309,834	338,323	369,037
Funding Ratios										
Current Assets (MVA)	19,009,850	19,618,629	20,259,103	20,936,071	21,653,616	22,415,999	23,226,690	24,090,751	25,014,261	26,003,856
Actuarial Accrued Liability (AAL)	19,394,911	19,831,287	20,279,863	20,743,797	21,225,389	21,727,000	22,250,040	22,797,309	23,372,479	23,979,639
Unfunded AAL	385,061	212,658	20,761	(192,274)	(428,226)	(688,999)	(976,650)	(1,293,442)	(1,641,782)	(2,024,217)
Funding Ratio	98.0%	98.9%	99.9%	100.9%	102.0%	103.2%	104.4%	105.7%	107.0%	108.4%
Benefit Payments	1,335,232	1,365,919	1,394,784	1,422,880	1,450,333	1,478,229	1,505,390	1,531,180	1,555,454	1,579,364
Ratio of Assets to Benefit Payments	14.24	14.36	14.52	14.71	14.93	15.16	15.43	15.73	16.08	16.46

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

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State Employees Retirement Fund

Scenario: 7.5% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Contributions (% of Payroll)										
Statutory - Chapter 352	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%
Required - Chapter 356 (MVA)	5.81%	5.44%	5.07%	4.68%	4.27%	3.84%	3.40%	2.94%	2.46%	1.97%
Sufficiency / (Deficiency)	6.44%	6.81%	7.18%	7.57%	7.98%	8.41%	8.85%	9.31%	9.79%	10.28%
Contributions										
Statutory - Chapter 352	764,409	787,988	812,327	837,356	863,110	889,631	917,054	945,440	974,795	1,005,142
Required - Chapter 356 (MVA)	362,276	350,175	336,032	319,591	300,674	279,073	254,620	227,064	196,104	161,435
Sufficiency / (Deficiency)	402,133	437,813	476,295	517,765	562,436	610,558	662,434	718,376	778,691	843,707
Funding Ratios										
Current Assets (MVA)	27,065,418	28,203,705	29,424,066	30,732,598	32,135,388	33,637,612	35,244,157	36,960,426	38,792,713	40,747,408
Actuarial Accrued Liability (AAL)	24,621,964	25,301,304	26,019,819	26,780,141	27,584,707	28,434,755	29,330,923	30,273,956	31,265,120	32,305,408
Unfunded AAL	(2,443,454)	(2,902,401)	(3,404,247)	(3,952,458)	(4,550,681)	(5,202,857)	(5,913,233)	(6,686,470)	(7,527,592)	(8,442,000)
Funding Ratio	109.9%	111.5%	113.1%	114.8%	116.5%	118.3%	120.2%	122.1%	124.1%	126.1%
Benefit Payments	1,604,457	1,630,617	1,657,575	1,685,713	1,716,382	1,750,276	1,787,382	1,827,293	1,870,375	1,917,209
Ratio of Assets to Benefit Payments	16.87	17.30	17.75	18.23	18.72	19.22	19.72	20.23	20.74	21.25

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

This exhibit should only be viewed in conjunction with GRS' January 29, 2021 letter to MSRS.

State Employees Retirement Fund

Scenario: 6.0% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Contributions (% of Payroll)										
Statutory - Chapter 352	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%
Required - Chapter 356 (MVA)	10.74%	11.00%	11.25%	11.54%	11.85%	12.19%	12.55%	12.93%	13.35%	13.81%
Sufficiency / (Deficiency)	1.51%	1.25%	1.00%	0.71%	0.40%	0.06%	(0.30)%	(0.68)%	(1.10)%	(1.56)%
Contributions										
Statutory - Chapter 352	415,479	425,669	439,582	453,157	467,124	481,689	496,726	512,291	528,357	544,921
Required - Chapter 356 (MVA)	364,341	382,173	403,856	427,046	452,049	479,252	508,771	540,906	575,999	614,475
Sufficiency / (Deficiency)	51,138	43,496	35,726	26,111	15,075	2,437	(12,045)	(28,614)	(47,642)	(69,554)
Funding Ratios										
Current Assets (MVA)	13,855,691	14,135,888	14,395,921	14,639,277	14,867,983	15,079,376	15,275,495	15,458,375	15,628,960	15,789,315
Actuarial Accrued Liability (AAL)	15,183,843	15,620,778	16,050,080	16,472,934	16,893,062	17,308,276	17,721,093	18,134,147	18,548,963	18,968,311
Unfunded AAL	1,328,152	1,484,890	1,654,159	1,833,657	2,025,079	2,228,900	2,445,597	2,675,772	2,920,003	3,178,996
Funding Ratio	91.3%	90.5%	89.7%	88.9%	88.0%	87.1%	86.2%	85.2%	84.3%	83.2%
Benefit Payments	940,056	985,887	1,030,788	1,072,417	1,116,164	1,157,502	1,196,438	1,234,198	1,269,726	1,303,269
Ratio of Assets to Benefit Payments	14.74	14.34	13.97	13.65	13.32	13.03	12.77	12.53	12.31	12.12

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

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State Employees Retirement Fund

Scenario: 6.0% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Contributions (% of Payroll)										
Statutory - Chapter 352	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%
Required - Chapter 356 (MVA)	14.32%	14.87%	15.50%	16.19%	16.99%	17.89%	18.95%	20.18%	21.66%	23.46%
Sufficiency / (Deficiency)	(2.07)%	(2.62)%	(3.25)%	(3.94)%	(4.74)%	(5.64)%	(6.70)%	(7.93)%	(9.41)%	(11.21)%
Contributions										
Statutory - Chapter 352	562,024	579,699	597,901	616,643	635,931	655,780	676,296	697,459	719,222	741,524
Required - Chapter 356 (MVA)	656,890	703,920	756,329	815,167	881,766	957,885	1,045,937	1,149,073	1,271,712	1,420,269
Sufficiency / (Deficiency)	(94,866)	(124,221)	(158,428)	(198,524)	(245,835)	(302,105)	(369,640)	(451,614)	(552,491)	(678,745)
Funding Ratios										
Current Assets (MVA)	15,941,372	16,086,800	16,227,091	16,364,343	16,499,706	16,634,279	16,768,121	16,902,613	17,039,858	17,182,184
Actuarial Accrued Liability (AAL)	19,394,911	19,831,287	20,279,863	20,743,797	21,225,389	21,727,000	22,250,040	22,797,309	23,372,479	23,979,639
Unfunded AAL	3,453,539	3,744,487	4,052,772	4,379,454	4,725,683	5,092,721	5,481,919	5,894,696	6,332,620	6,797,455
Funding Ratio	82.2%	81.1%	80.0%	78.9%	77.7%	76.6%	75.4%	74.1%	72.9%	71.7%
Benefit Payments	1,335,232	1,365,919	1,394,784	1,422,880	1,450,333	1,478,229	1,505,390	1,531,180	1,555,454	1,579,364
Ratio of Assets to Benefit Payments	11.94	11.78	11.63	11.50	11.38	11.25	11.14	11.04	10.95	10.88

Numbers may not add due to rounding.

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State Employees Retirement Fund

Scenario: 6.0% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Contributions (% of Payroll)										
Statutory - Chapter 352	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%
Required - Chapter 356 (MVA)	25.71%	28.60%	32.44%	37.81%	45.86%	59.27%	86.07%	166.41%	17.66%	18.18%
Sufficiency / (Deficiency)	(13.46)%	(16.35)%	(20.19)%	(25.56)%	(33.61)%	(47.02)%	(73.82)%	(154.16)%	(5.41)%	(5.93)%
Contributions										
Statutory - Chapter 352	764,409	787,988	812,327	837,356	863,110	889,631	917,054	945,440	974,795	1,005,142
Required - Chapter 356 (MVA)	1,604,471	1,839,620	2,151,110	2,584,533	3,231,237	4,304,308	6,442,994	12,843,052	1,405,609	1,491,907
Sufficiency / (Deficiency)	(840,062)	(1,051,632)	(1,338,783)	(1,747,177)	(2,368,127)	(3,414,677)	(5,525,940)	(11,897,612)	(430,814)	(486,765)
Funding Ratios										
Current Assets (MVA)	17,330,812	17,485,487	17,646,170	17,813,160	17,986,316	18,164,128	18,344,323	18,524,642	18,703,169	18,877,502
Actuarial Accrued Liability (AAL)	24,621,964	25,301,304	26,019,819	26,780,141	27,584,707	28,434,755	29,330,923	30,273,956	31,265,120	32,305,408
Unfunded AAL	7,291,151	7,815,817	8,373,650	8,966,981	9,598,391	10,270,627	10,986,600	11,749,314	12,561,952	13,427,906
Funding Ratio	70.4%	69.1%	67.8%	66.5%	65.2%	63.9%	62.5%	61.2%	59.8%	58.4%
Benefit Payments	1,604,457	1,630,617	1,657,575	1,685,713	1,716,382	1,750,276	1,787,382	1,827,293	1,870,375	1,917,209
Ratio of Assets to Benefit Payments	10.80	10.72	10.65	10.57	10.48	10.38	10.26	10.14	10.00	9.85

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

This exhibit should only be viewed in conjunction with GRS' January 29, 2021 letter to MSRS.

State Employees Retirement Fund

Scenario: 9.0% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Contributions (% of Payroll)										
Statutory - Chapter 352	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%
Required - Chapter 356 (MVA)	10.74%	10.25%	9.70%	9.11%	8.45%	7.80%	7.14%	6.44%	5.70%	4.93%
Sufficiency / (Deficiency)	1.51%	2.00%	2.55%	3.14%	3.80%	4.45%	5.11%	5.81%	6.55%	7.32%
Contributions										
Statutory - Chapter 352	415,479	425,669	439,582	453,157	467,124	481,689	496,726	512,291	528,357	544,921
Required - Chapter 356 (MVA)	364,341	356,270	348,099	336,920	322,375	306,770	289,445	269,285	245,992	219,243
Sufficiency / (Deficiency)	51,138	69,398	91,483	116,236	144,750	174,919	207,282	243,006	282,365	325,679
Funding Ratios										
Current Assets (MVA)	13,855,691	14,543,532	15,255,766	15,999,349	16,780,180	17,599,797	18,464,815	19,382,314	20,358,782	21,402,369
Actuarial Accrued Liability (AAL)	15,183,843	15,620,778	16,050,080	16,472,934	16,893,062	17,308,276	17,721,093	18,134,147	18,548,963	18,968,311
Unfunded AAL	1,328,152	1,077,246	794,315	473,584	112,882	(291,521)	(743,723)	(1,248,167)	(1,809,819)	(2,434,058)
Funding Ratio	91.3%	93.1%	95.1%	97.1%	99.3%	101.7%	104.2%	106.9%	109.8%	112.8%
Benefit Payments	940,056	985,887	1,030,788	1,072,417	1,116,164	1,157,502	1,196,438	1,234,198	1,269,726	1,303,269
Ratio of Assets to Benefit Payments	14.74	14.75	14.80	14.92	15.03	15.20	15.43	15.70	16.03	16.42

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

This exhibit should only be viewed in conjunction with GRS' January 29, 2021 letter to MSRS.

State Employees Retirement Fund

Scenario: 9.0% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Contributions (% of Payroll)										
Statutory - Chapter 352	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%
Required - Chapter 356 (MVA)	4.11%	3.26%	2.35%	1.40%	0.40%	0.00%	0.00%	0.00%	0.00%	0.00%
Sufficiency / (Deficiency)	8.14%	8.99%	9.90%	10.85%	11.85%	12.25%	12.25%	12.25%	12.25%	12.25%
Contributions										
Statutory - Chapter 352	562,024	579,699	597,901	616,643	635,931	655,780	676,296	697,459	719,222	741,524
Required - Chapter 356 (MVA)	188,717	154,058	114,787	70,458	20,558	-	-	-	-	-
Sufficiency / (Deficiency)	373,306	425,641	483,114	546,185	615,373	655,780	676,296	697,459	719,222	741,524
Funding Ratios										
Current Assets (MVA)	22,521,698	23,725,786	25,024,176	26,427,798	27,947,474	29,594,880	31,381,619	33,321,677	35,430,945	37,726,848
Actuarial Accrued Liability (AAL)	19,394,911	19,831,287	20,279,863	20,743,797	21,225,389	21,727,000	22,250,040	22,797,309	23,372,479	23,979,639
Unfunded AAL	(3,126,788)	(3,894,498)	(4,744,313)	(5,684,001)	(6,722,085)	(7,867,881)	(9,131,579)	(10,524,368)	(12,058,467)	(13,747,209)
Funding Ratio	116.1%	119.6%	123.4%	127.4%	131.7%	136.2%	141.0%	146.2%	151.6%	157.3%
Benefit Payments	1,335,232	1,365,919	1,394,784	1,422,880	1,450,333	1,478,229	1,505,390	1,531,180	1,555,454	1,579,364
Ratio of Assets to Benefit Payments	16.87	17.37	17.94	18.57	19.27	20.02	20.85	21.76	22.78	23.89

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

This exhibit should only be viewed in conjunction with GRS' January 29, 2021 letter to MSRS.

State Employees Retirement Fund

Scenario: 9.0% investment return for all years

Fiscal year beginning July 1

$ in Thousands	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Contributions (% of Payroll)										
Statutory - Chapter 352	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%
Required - Chapter 356 (MVA)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Sufficiency / (Deficiency)	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%	12.25%
Contributions										
Statutory - Chapter 352	764,409	787,988	812,327	837,356	863,110	889,631	917,054	945,440	974,795	1,005,142
Required - Chapter 356 (MVA)	-	-	-	-	-	-	-	-	-	-
Sufficiency / (Deficiency)	764,409	787,988	812,327	837,356	863,110	889,631	917,054	945,440	974,795	1,005,142
Funding Ratios										
Current Assets (MVA)	40,227,112	42,949,488	45,913,556	49,141,010	52,655,024	56,479,482	60,639,736	65,163,568	70,081,751	75,427,448
Actuarial Accrued Liability (AAL)	24,621,964	25,301,304	26,019,819	26,780,141	27,584,707	28,434,755	29,330,923	30,273,956	31,265,120	32,305,408
Unfunded AAL	(15,605,149)	(17,648,184)	(19,893,737)	(22,360,869)	(25,070,317)	(28,044,727)	(31,308,813)	(34,889,612)	(38,816,630)	(43,122,040)
Funding Ratio	163.4%	169.8%	176.5%	183.5%	190.9%	198.6%	206.7%	215.3%	224.2%	233.5%
Benefit Payments	1,604,457	1,630,617	1,657,575	1,685,713	1,716,382	1,750,276	1,787,382	1,827,293	1,870,375	1,917,209
Ratio of Assets to Benefit Payments	25.07	26.34	27.70	29.15	30.68	32.27	33.93	35.66	37.47	39.34

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.