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January 29, 2021

CONFIDENTIAL

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

Re: Projection of Contributions and Funding Status – Correctional Employees Retirement Fund

Dear Erin:

Attached are 30-year projections of estimated funded status, required contributions, and statutory contributions under three asset return scenarios for the Correctional 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 Correctional 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 3.25% 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 4,523 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 34.1
- Average salary at hire is $48,900
- Approximately 45% female, 55% 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.

The State of Minnesota will provide supplemental contributions of 2.95% of payroll in the fiscal year ending June 30, 2021, and 4.45% of payroll thereafter until the plan reaches 100% funding (on a Market Value basis). The supplemental employer contributions are projected to be eliminated in fiscal years ending 2031 and 2040 in the 9.0% and 7.5% investment return scenarios, respectively.

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 Correctional 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 7.50% 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 3 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 7, 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 Correctional 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
Enclosure

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.

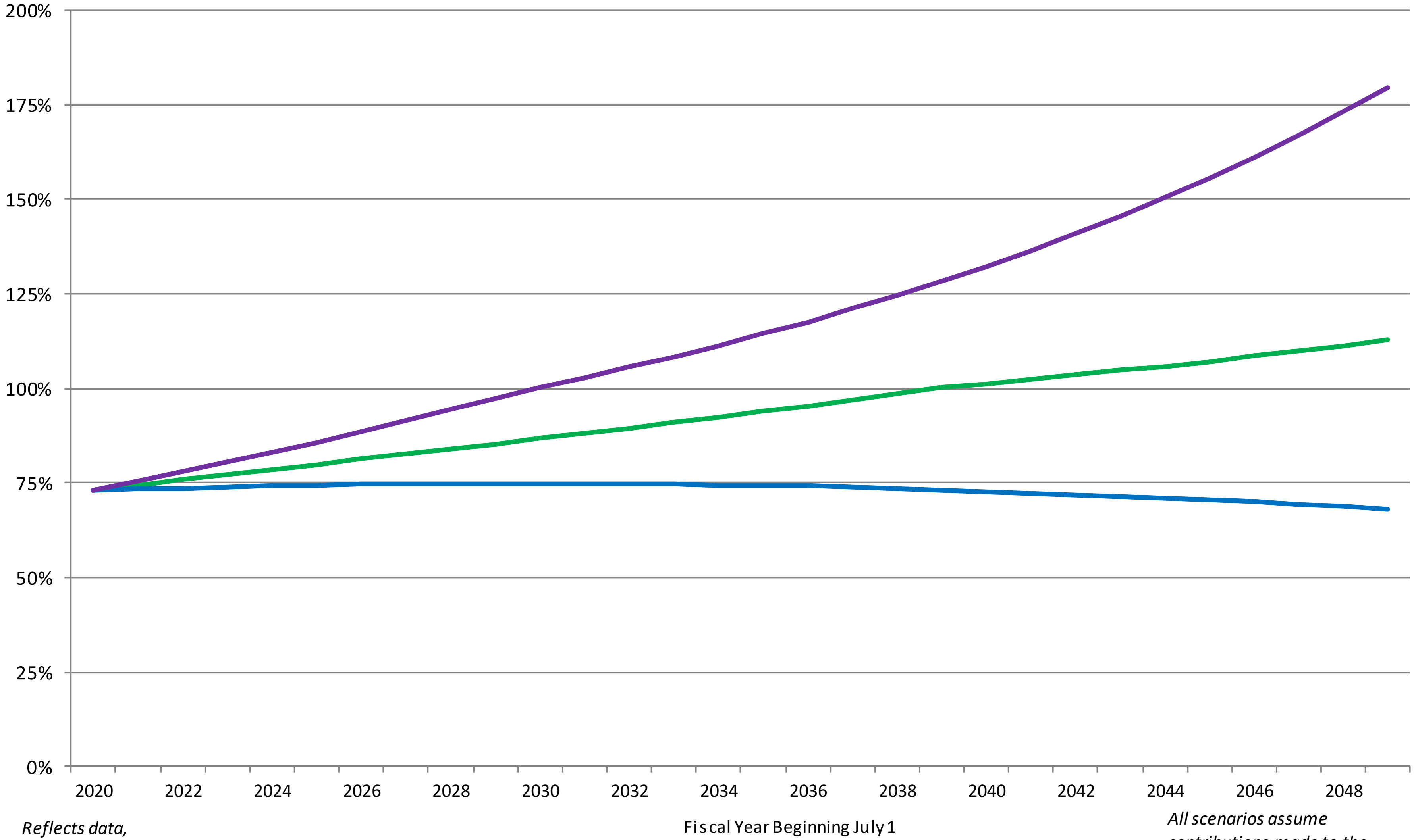
Limitations of Project Scope

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.

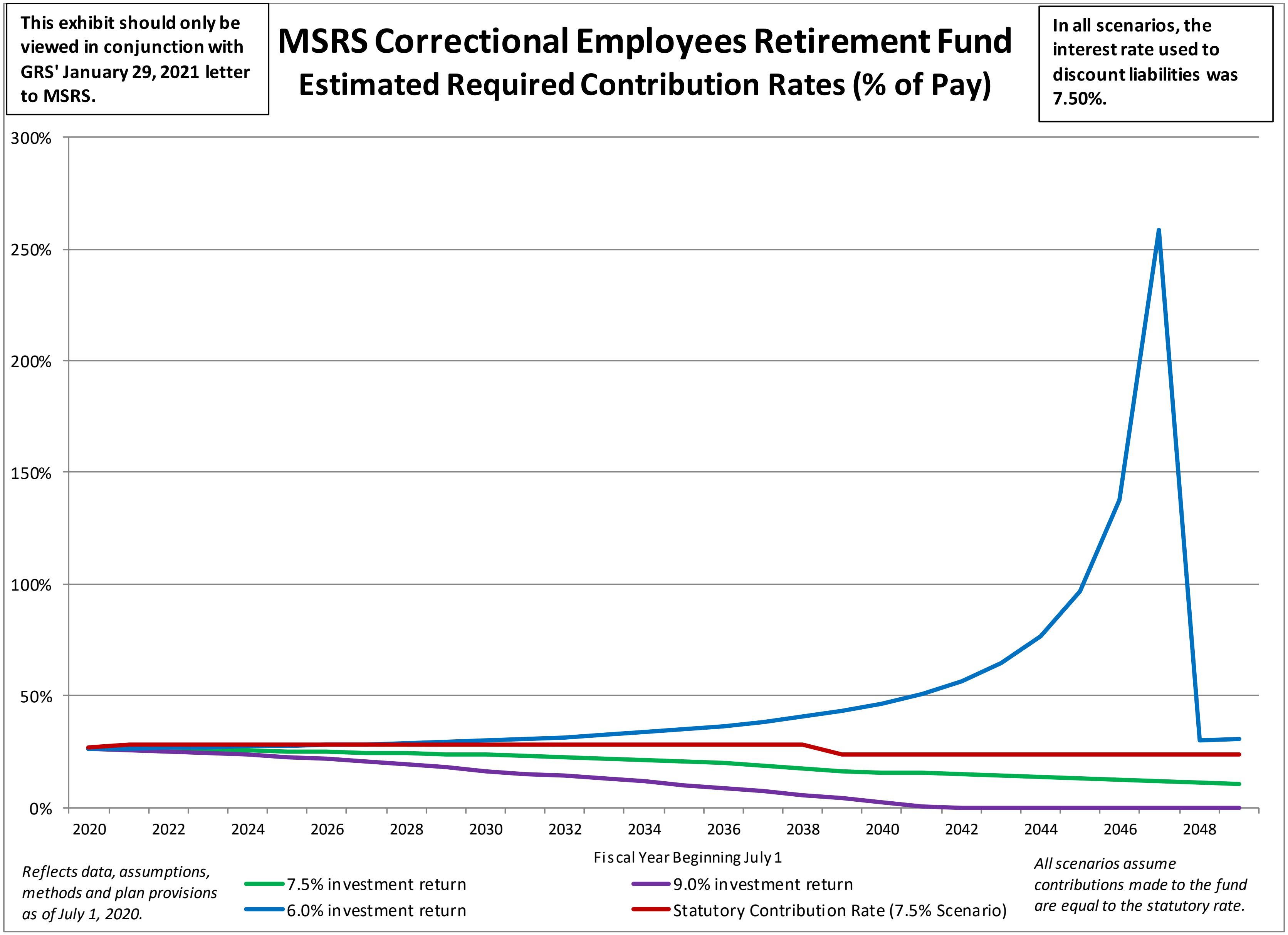
MSRS Correctional Employees Retirement Fund
Estimated Funded Ratio

In all scenarios, the interest rate used to discount liabilities was 7.5%.



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.
MSRS Correctional Employees Retirement Fund
Estimated Required Contribution Rates (% of Pay)
In all scenarios, the interest rate used to discount liabilities was 7.50%.
300%
250%
200%
150%
100%
50%
0%
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
Fiscal Year Beginning July 1
Reflects data, assumptions, methods and plan provisions as of July 1, 2020.
7.5% investment return
6.0% investment return
9.0% investment return
Statutory Contribution Rate (7.5% Scenario)
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.

Correctional 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	26.95%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%
Required - Chapter 356 (MVA)	26.37%	26.26%	26.05%	25.81%	25.56%	25.30%	25.02%	24.72%	24.39%	24.03%
Sufficiency / (Deficiency)	0.58%	2.19%	2.40%	2.64%	2.89%	3.15%	3.43%	3.73%	4.06%	4.42%
Contributions										
Statutory - Chapter 352	77,158	83,848	86,452	89,246	92,070	94,845	97,840	100,984	104,170	107,438
Required - Chapter 356 (MVA)	75,480	77,394	79,145	80,962	82,722	84,352	86,037	87,729	89,306	90,759
Sufficiency / (Deficiency)	1,678	6,454	7,307	8,284	9,348	10,493	11,803	13,255	14,864	16,679
Funding Ratios										
Current Assets (MVA)	1,223,537	1,306,172	1,397,123	1,492,650	1,593,025	1,698,610	1,809,421	1,925,739	2,047,737	2,175,647
Actuarial Accrued Liability (AAL)	1,670,854	1,755,988	1,843,967	1,934,964	2,029,039	2,126,438	2,227,087	2,330,977	2,438,092	2,548,503
Unfunded AAL	447,317	449,816	446,844	442,314	436,014	427,828	417,666	405,238	390,355	372,856
Funding Ratio	73.2%	74.4%	75.8%	77.1%	78.5%	79.9%	81.2%	82.6%	84.0%	85.4%
Benefit Payments	85,013	89,634	94,372	99,366	104,392	109,730	115,393	121,434	127,703	134,404
Ratio of Assets to Benefit Payments	14.39	14.57	14.80	15.02	15.26	15.48	15.68	15.86	16.04	16.19

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.

Correctional 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	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	24.00%
Required - Chapter 356 (MVA)	23.64%	23.20%	22.71%	22.16%	21.52%	20.80%	19.95%	18.94%	17.72%	16.32%
Sufficiency / (Deficiency)	4.81%	5.25%	5.74%	6.29%	6.93%	7.65%	8.50%	9.51%	10.73%	7.68%
Contributions										
Statutory - Chapter 352	110,758	114,230	117,766	121,427	125,209	128,994	132,974	137,152	141,466	123,027
Required - Chapter 356 (MVA)	92,036	93,161	94,019	94,568	94,723	94,294	93,232	91,299	88,124	83,682
Sufficiency / (Deficiency)	18,722	21,069	23,747	26,859	30,486	34,700	39,742	45,853	53,342	39,345
Funding Ratios										
Current Assets (MVA)	2,309,551	2,449,380	2,595,718	2,748,608	2,908,458	3,075,453	3,249,365	3,430,220	3,618,644	3,815,482
Actuarial Accrued Liability (AAL)	2,662,047	2,778,439	2,897,958	3,020,401	3,145,847	3,274,146	3,404,800	3,537,387	3,672,063	3,809,210
Unfunded AAL	352,496	329,059	302,240	271,793	237,389	198,693	155,435	107,167	53,419	(6,272)
Funding Ratio	86.8%	88.2%	89.6%	91.0%	92.5%	93.9%	95.4%	97.0%	98.5%	100.2%
Benefit Payments	141,654	148,921	156,678	164,640	173,048	182,194	192,007	201,916	211,691	221,985
Ratio of Assets to Benefit Payments	16.30	16.45	16.57	16.69	16.81	16.88	16.92	16.99	17.09	17.19

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

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Correctional 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	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%
Required - Chapter 356 (MVA)	15.86%	15.38%	14.88%	14.35%	13.81%	13.24%	12.65%	12.04%	11.40%	10.73%
Sufficiency / (Deficiency)	8.14%	8.62%	9.12%	9.65%	10.19%	10.76%	11.35%	11.96%	12.60%	13.27%
Contributions										
Statutory - Chapter 352	126,852	130,912	135,156	139,496	143,954	148,587	153,396	158,420	163,558	168,883
Required - Chapter 356 (MVA)	83,837	83,892	83,785	83,429	82,819	81,974	80,861	79,461	77,669	75,512
Sufficiency / (Deficiency)	43,015	47,020	51,371	56,067	61,135	66,613	72,535	78,959	85,889	93,371
Funding Ratios										
Current Assets (MVA)	3,997,219	4,185,748	4,382,061	4,587,170	4,801,823	5,026,586	5,262,018	5,508,788	5,768,107	6,040,934
Actuarial Accrued Liability (AAL)	3,948,542	4,090,237	4,234,841	4,382,937	4,534,857	4,690,715	4,850,547	5,014,453	5,183,000	5,356,541
Unfunded AAL	(48,677)	(95,511)	(147,220)	(204,233)	(266,966)	(335,871)	(411,471)	(494,335)	(585,107)	(684,393)
Funding Ratio	101.2%	102.3%	103.5%	104.7%	105.9%	107.2%	108.5%	109.9%	111.3%	112.8%
Benefit Payments	232,348	242,480	252,377	262,287	272,455	282,988	293,823	304,521	315,315	326,531
Ratio of Assets to Benefit Payments	17.20	17.26	17.36	17.49	17.62	17.76	17.91	18.09	18.29	18.50

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.

Correctional 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	26.95%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%
Required - Chapter 356 (MVA)	26.37%	26.64%	26.86%	27.09%	27.37%	27.69%	28.06%	28.48%	28.96%	29.51%
Sufficiency / (Deficiency)	0.58%	1.81%	1.59%	1.36%	1.08%	0.76%	0.39%	(0.03)%	(0.51)%	(1.06)%
Contributions										
Statutory - Chapter 352	77,158	83,848	86,452	89,246	92,070	94,845	97,840	100,984	104,170	107,438
Required - Chapter 356 (MVA)	75,480	78,527	81,608	84,983	88,566	92,324	96,493	101,083	106,044	111,454
Sufficiency / (Deficiency)	1,678	5,321	4,844	4,263	3,504	2,521	1,347	(99)	(1,874)	(4,016)
Funding Ratios										
Current Assets (MVA)	1,223,537	1,287,885	1,358,197	1,430,499	1,504,838	1,581,337	1,659,752	1,740,089	1,822,224	1,906,073
Actuarial Accrued Liability (AAL)	1,670,854	1,755,988	1,843,967	1,934,964	2,029,039	2,126,438	2,227,087	2,330,977	2,438,092	2,548,503
Unfunded AAL	447,317	468,103	485,770	504,465	524,201	545,101	567,335	590,888	615,868	642,430
Funding Ratio	73.2%	73.3%	73.7%	73.9%	74.2%	74.4%	74.5%	74.7%	74.7%	74.8%
Benefit Payments	85,013	89,634	94,372	99,366	104,392	109,730	115,393	121,434	127,703	134,404
Ratio of Assets to Benefit Payments	14.39	14.37	14.39	14.40	14.42	14.41	14.38	14.33	14.27	14.18

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

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Correctional 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	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%
Required - Chapter 356 (MVA)	30.15%	30.87%	31.70%	32.65%	33.76%	35.07%	36.60%	38.42%	40.60%	43.30%
Sufficiency / (Deficiency)	(1.70)%	(2.42)%	(3.25)%	(4.20)%	(5.31)%	(6.62)%	(8.15)%	(9.97)%	(12.15)%	(14.85)%
Contributions										
Statutory - Chapter 352	110,758	114,230	117,766	121,427	125,209	128,994	132,974	137,152	141,466	145,839
Required - Chapter 356 (MVA)	117,367	123,938	131,217	139,370	148,582	159,014	171,089	185,208	201,896	221,948
Sufficiency / (Deficiency)	(6,609)	(9,708)	(13,451)	(17,943)	(23,373)	(30,020)	(38,115)	(48,056)	(60,430)	(76,109)
Funding Ratios										
Current Assets (MVA)	1,991,380	2,077,717	2,165,284	2,253,714	2,342,976	2,432,785	2,522,415	2,611,367	2,699,704	2,787,665
Actuarial Accrued Liability (AAL)	2,662,047	2,778,439	2,897,958	3,020,401	3,145,847	3,274,146	3,404,800	3,537,387	3,672,063	3,809,210
Unfunded AAL	670,667	700,722	732,674	766,687	802,871	841,361	882,385	926,020	972,359	1,021,545
Funding Ratio	74.8%	74.8%	74.7%	74.6%	74.5%	74.3%	74.1%	73.8%	73.5%	73.2%
Benefit Payments	141,654	148,921	156,678	164,640	173,048	182,194	192,007	201,916	211,691	221,985
Ratio of Assets to Benefit Payments	14.06	13.95	13.82	13.69	13.54	13.35	13.14	12.93	12.75	12.56

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

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Correctional 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	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%
Required - Chapter 356 (MVA)	46.67%	50.99%	56.74%	64.80%	76.92%	97.10%	137.47%	258.48%	30.34%	30.88%
Sufficiency / (Deficiency)	(18.22)%	(22.54)%	(28.29)%	(36.35)%	(48.47)%	(68.65)%	(109.02)%	(230.03)%	(1.89)%	(2.43)%
Contributions										
Statutory - Chapter 352	150,372	155,186	160,216	165,361	170,645	176,137	181,838	187,794	193,884	200,197
Required - Chapter 356 (MVA)	246,686	278,133	319,515	376,654	461,360	601,186	878,625	1,706,178	206,756	217,293
Sufficiency / (Deficiency)	(96,314)	(122,947)	(159,299)	(211,293)	(290,715)	(425,049)	(696,787)	(1,518,384)	(12,872)	(17,096)
Funding Ratios										
Current Assets (MVA)	2,874,751	2,961,004	3,046,898	3,132,872	3,219,035	3,305,274	3,391,429	3,477,398	3,563,569	3,649,993
Actuarial Accrued Liability (AAL)	3,948,542	4,090,237	4,234,841	4,382,937	4,534,857	4,690,715	4,850,547	5,014,453	5,183,000	5,356,541
Unfunded AAL	1,073,791	1,129,233	1,187,943	1,250,065	1,315,822	1,385,441	1,459,118	1,537,055	1,619,431	1,706,548
Funding Ratio	72.8%	72.4%	71.9%	71.5%	71.0%	70.5%	69.9%	69.3%	68.8%	68.1%
Benefit Payments	232,348	242,480	252,377	262,287	272,455	282,988	293,823	304,521	315,315	326,531
Ratio of Assets to Benefit Payments	12.37	12.21	12.07	11.94	11.81	11.68	11.54	11.42	11.30	11.18

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.

Correctional 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	26.95%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%	28.45%
Required - Chapter 356 (MVA)	26.37%	25.88%	25.22%	24.49%	23.68%	22.77%	21.76%	20.62%	19.34%	17.90%
Sufficiency / (Deficiency)	0.58%	2.57%	3.23%	3.96%	4.77%	5.68%	6.69%	7.83%	9.11%	10.55%
Contributions										
Statutory - Chapter 352	77,158	83,848	86,452	89,246	92,070	94,845	97,840	100,984	104,170	107,438
Required - Chapter 356 (MVA)	75,480	76,262	76,648	76,827	76,627	75,920	74,820	73,198	70,830	67,585
Sufficiency / (Deficiency)	1,678	7,586	9,804	12,419	15,443	18,925	23,020	27,786	33,340	39,853
Funding Ratios										
Current Assets (MVA)	1,223,537	1,324,459	1,436,598	1,556,568	1,685,001	1,822,659	1,969,994	2,127,765	2,296,668	2,477,513
Actuarial Accrued Liability (AAL)	1,670,854	1,755,988	1,843,967	1,934,964	2,029,039	2,126,438	2,227,087	2,330,977	2,438,092	2,548,503
Unfunded AAL	447,317	431,529	407,369	378,396	344,038	303,779	257,093	203,212	141,424	70,990
Funding Ratio	73.2%	75.4%	77.9%	80.4%	83.0%	85.7%	88.5%	91.3%	94.2%	97.2%
Benefit Payments	85,013	89,634	94,372	99,366	104,392	109,730	115,393	121,434	127,703	134,404
Ratio of Assets to Benefit Payments	14.39	14.78	15.22	15.66	16.14	16.61	17.07	17.52	17.98	18.43

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.

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Correctional 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	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%
Required - Chapter 356 (MVA)	16.30%	15.23%	14.10%	12.90%	11.63%	10.28%	8.86%	7.36%	5.77%	4.08%
Sufficiency / (Deficiency)	7.70%	8.77%	9.90%	11.10%	12.37%	13.72%	15.14%	16.64%	18.23%	19.92%
Contributions										
Statutory - Chapter 352	93,434	96,363	99,346	102,434	105,624	108,817	112,175	115,700	119,339	123,027
Required - Chapter 356 (MVA)	63,448	61,156	58,368	55,064	51,193	46,630	41,419	35,479	28,679	20,893
Sufficiency / (Deficiency)	29,986	35,207	40,978	47,370	54,431	62,187	70,756	80,221	90,660	102,134
Funding Ratios										
Current Assets (MVA)	2,671,008	2,859,667	3,060,729	3,274,855	3,503,114	3,746,419	4,005,355	4,280,800	4,574,314	4,887,779
Actuarial Accrued Liability (AAL)	2,662,047	2,778,439	2,897,958	3,020,401	3,145,847	3,274,146	3,404,800	3,537,387	3,672,063	3,809,210
Unfunded AAL	(8,961)	(81,228)	(162,771)	(254,454)	(357,267)	(472,273)	(600,555)	(743,413)	(902,251)	(1,078,569)
Funding Ratio	100.3%	102.9%	105.6%	108.4%	111.4%	114.4%	117.6%	121.0%	124.6%	128.3%
Benefit Payments	141,654	148,921	156,678	164,640	173,048	182,194	192,007	201,916	211,691	221,985
Ratio of Assets to Benefit Payments	18.86	19.20	19.54	19.89	20.24	20.56	20.86	21.20	21.61	22.02

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.

Correctional 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	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%
Required - Chapter 356 (MVA)	2.29%	0.41%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Sufficiency / (Deficiency)	21.71%	23.59%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%	24.00%
Contributions										
Statutory - Chapter 352	126,852	130,912	135,156	139,496	143,954	148,587	153,396	158,420	163,558	168,883
Required - Chapter 356 (MVA)	12,090	2,224	-	-	-	-	-	-	-	-
Sufficiency / (Deficiency)	114,762	128,688	135,156	139,496	143,954	148,587	153,396	158,420	163,558	168,883
Funding Ratios										
Current Assets (MVA)	5,222,501	5,580,460	5,964,232	6,376,575	6,820,146	7,297,607	7,811,807	8,365,918	8,963,899	9,609,714
Actuarial Accrued Liability (AAL)	3,948,542	4,090,237	4,234,841	4,382,937	4,534,857	4,690,715	4,850,547	5,014,453	5,183,000	5,356,541
Unfunded AAL	(1,273,959)	(1,490,223)	(1,729,391)	(1,993,638)	(2,285,289)	(2,606,892)	(2,961,260)	(3,351,465)	(3,780,899)	(4,253,173)
Funding Ratio	132.3%	136.4%	140.8%	145.5%	150.4%	155.6%	161.1%	166.8%	172.9%	179.4%
Benefit Payments	232,348	242,480	252,377	262,287	272,455	282,988	293,823	304,521	315,315	326,531
Ratio of Assets to Benefit Payments	22.48	23.01	23.63	24.31	25.03	25.79	26.59	27.47	28.43	29.43

Numbers may not add due to rounding.

The interest rate used to discount liabilities was 7.5%.