Minnesota State Retirement System

Judges Retirement Fund

Actuarial Valuation Report as of July 1, 2020

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December 1, 2020

Minnesota State Retirement System
Judges Retirement Fund
St. Paul, Minnesota

Dear Board of Directors:

The results of the July 1, 2020 annual actuarial valuation of the Judges Retirement Fund are presented in this report. This report was prepared at the request of the Board and is intended for use by the Board and staff and those designated or approved by the Board. This report may be provided to parties other than the Board and staff only in its entirety. GRS is not responsible for the consequences of any unauthorized use of this report by persons other than the intended users as described above.

The purpose of the valuation is to measure the Fund's funding progress and to determine the required contribution rate for the fiscal year beginning July 1, 2020 according to prescribed assumptions. Note that the impact of GASB Statements No. 67 and No. 68 is provided in a separate report.

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 this report. 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 for the State Employees Retirement Fund 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 actuarial standards for the July 1, 2021 valuation. For informational purposes, results based on a 6.5% discount rate are shown on page 5.

The valuation assumed 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. Therefore, we did not make such a determination.

The contribution rate in this report is determined using the actuarial assumptions and methods disclosed in the Actuarial Basis section of this report. This report includes risk metrics on pages 6 through 9, but does not include a more robust assessment of the risks of future experience differing materially from the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment. We encourage a review and assessment of investment and other significant risks that may have a material effect on the plan's financial condition.

The findings in this report are based on data and other information through June 30, 2020. 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 judgment has the capability to provide results that are consistent with the purposes of the valuation. 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 experience and economic expectations, at least in the short term. We will continue to monitor these developments and their impact.

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. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of such future measurements.

This report should not be relied on 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.

The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

Brian B. Murphy and Bonita J. Wurst 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. In addition, Mr. Murphy meets the requirements of "approved actuary" under Minnesota Statutes Section 356.215, Subdivision 1, Paragraph (c).

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 presents the actuarial position of the Judges Retirement Fund as of the valuation date according to prescribed assumptions, 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.

We are available to answer any questions or provide further details.

Respectfully submitted,

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

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

BBM/BJW:rmn

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 statutory assumption of the plan earning 7.50%), 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 in approximately 43 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 actuarial 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 market value of assets were used instead of the actuarial 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.

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Summary of Valuation Results

Contributions

The following table summarizes important contribution information as described in the Development of Costs section.

Total Contributions	Actuarial Valuation as of July 1, 2020	Actuarial Valuation as of July 1, 2019
Statutory Contributions - Chapter 490* (% of Payroll)	41.70%	42.32%
Required Contributions - Chapter 356 (% of Payroll)	42.17%	42.97%
Sufficiency / (Deficiency)	(0.47)%	(0.65)%

* *Statutory contributions reflect the fact that member contributions for Judges at the maximum benefit level are directed to the Unclassified Employees Retirement Plan. If these contributions were not directed to the Unclassified Employees Retirement Plan, the statutory contribution rate would be 41.87% instead of 41.70% as of July 1, 2020 and 42.52% instead of 42.32% as of July 1, 2019.*

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 fund. Required contributions are defined in statutes and the LCPR Standards 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).

Judges first appointed or elected after June 30, 2013 have a lower benefit multiplier and a later Normal Retirement Date, resulting in a new tier of lower cost benefits. These members contribute 7.0% of payroll (vs. 9.0% for judges first appointed or elected before July 1, 2013). The Statutory Contribution decreased as a result of more judges that are in the latest tier and making lower contributions. The Required Contribution also decreased due to more judges now receiving the new tier of lower cost benefits. The net effect was an improvement in the contribution deficiency, from a deficiency of 0.65% of payroll to a deficiency of 0.47% of payroll. On a market value of assets basis, contributions are deficient by 0.67% of payroll.

Based on the actuarial value of assets, statutory contribution rates, and actuarial assumptions described in this report, statutory contributions are expected to bring the plan to full funding in approximately 43 years.

The Plan Assets section provides detail on the plan assets used for the valuation including a development of the Actuarial Value of Assets (AVA). The Market Value of Assets (MVA) earned approximately 4.2% for the plan year ending June 30, 2020. The AVA earned approximately 7.2% for the plan year ending June 30, 2020 as compared to the assumed rate of 7.50%.

Participant reconciliation and statistics are detailed in the Membership Data section. The Actuarial Basis section includes a summary of plan provisions and actuarial methods and assumptions used for the calculations in this report.

Accounting and financial reporting information prepared according to GASB Statements No. 67 and No. 68 was provided to MSRS in a separate report dated November 30, 2020.

Summary of Valuation Results

A summary of principal valuation results from the current valuation and the prior valuation follows. Any changes in plan provisions, actuarial assumptions or valuation methods and procedures between the two valuations are described after the summary.

	Actuarial Valuation as of	
	July 1, 2020	**July 1, 2019**
Total Contributions (*% of Payroll*)		
Statutory - Chapter 490*	41.70%	42.32%
Required - Chapter 356	42.17%	42.97%
Sufficiency / (Deficiency)	(0.47)%	(0.65)%
Funding Ratios (*dollars in thousands*)		
Assets		
- Current assets (AVA)	$ 218,311	$ 208,012
- Current assets (MVA)	$ 216,737	$ 212,262
Accrued Benefit Funding Ratio		
- Current benefit obligations	$ 388,788	$ 377,894
- Funding ratio (AVA)	56.15%	55.05%
- Funding ratio (MVA)	55.75%	56.17%
Accrued Liability Funding Ratio		
- Actuarial accrued liability	$ 402,660	$ 391,146
- Funding ratio (AVA)	54.22%	53.18%
- Funding ratio (MVA)	53.83%	54.27%
Projected Benefit Funding Ratio		
- Current and expected future assets**	$ 470,719	$ 456,200
- Current and expected future benefit obligations	$ 474,536	$ 461,304
- Projected benefit funding ratio (AVA)**	99.20%	98.89%
Participant Data		
Active Members		
- Number	322	315
- Actual covered payroll [GASB] *(000s)*	$ 52,298	$ 50,164
- Annual valuation earnings *(000s)*	$ 51,875	$ 49,518
- Projected annual earnings *(000s)*	$ 53,171	$ 50,756
- Average projected annual earnings	$ 165,127	$ 161,130
- Average age	55.8	55.8
- Average service	8.9	8.8
Service Retirements	298	293
Survivors	76	74
Disability Retirements	16	16
Deferred Retirements	17	19
Terminated other Non-Vested	0	1
Total	**729**	**718**

* *Statutory contributions reflect the fact that member contributions for Judges at the maximum benefit level are directed to the Unclassified Employees Retirement Plan. If these contributions were not directed to the Unclassified Employees Retirement Plan, the statutory contribution rate would be 41.87% instead of 41.70% as of July 1, 2020 and 42.52% instead of 42.32% as of July 1, 2019.*

** *Per the LCPR Standards for Actuarial Work, calculated assuming the current percent of pay contribution toward the unfunded liability continues for the entire amortization period. Based on a blended Tier 1 and Tier 2 member contribution rate and normal cost.*

Summary of Valuation Results

Effects of Changes

The following changes in actuarial assumptions were recognized as of July 1, 2020:

- The assumed benefit increase was changed from 1.75% per year through 2039, 2.00% per year from 2040 to 2056 and 2.50% thereafter to 1.75% per year through 2041, 2.00% per year from 2042 to 2058 and 2.50% thereafter.

The impact of this change was to decrease the accrued liability by $0.4 million and decrease the required contribution by 0.08% of pay as follows:

	Before Changes	Reflecting Assumption Changes
Normal Cost Rate, % of Pay	19.23%	19.19%
Amortization of UAAL*, Level % of Pay to 2048	22.80%	22.76%
Expenses (% of Pay)	0.22%	0.22%
Total Required Contribution, % of Pay	42.25%	42.17%
Accrued Liability Funding Ratio	54.2%	54.2%
Projected Benefit Funding Ratio	99.1%	99.2%
UAAL* (in millions)	$184.7	$184.3

**Unfunded Actuarial Accrued Liability.*

Summary of Valuation Results

Valuation of Future Annual Post-Retirement Benefit Increases

Benefit recipients receive a future annual compounding 1.75% post-retirement benefit increase. If the accrued liability funding ratio (determined on a market value of assets basis), reaches or exceeds 70% (based on a 2.00% post-retirement benefit increase assumption) for two consecutive years, the benefit increase will revert to 2.00%. Similarly, if the accrued liability funding ratio (determined on a market value of assets basis) reaches or exceeds 90% (based on a 2.50% post-retirement benefit increase assumption) for two consecutive years, the benefit increase will revert to 2.50%.

Minnesota Statutes were revised in 2014 to establish a process for establishing a post-retirement benefit increase assumption for each valuation. If the plan has not yet reached the accrued liability funding ratio threshold required to pay a 2.00% or 2.50% benefit increase, a projection must be performed to determine the expected attainment of the threshold, and the expected change to a 2.00% or 2.50% benefit increase rate must be reflected in the liability calculations.

To determine an assumption regarding a future change in the post-retirement benefit increase, we performed a projection of liabilities and market value of assets based on the following methods and assumptions:

- Future investment returns of 7.50%;
- Open group; stable active population (new member profile based on average new members hired in recent years);
- The post-retirement benefit increase rate is assumed to be 1.75% per year until the accrued liability funding ratio threshold (determined on a market value of assets basis) required to pay a 2.00% post-retirement benefit increase is reached and is assumed to be 2.00% per year until the threshold required to pay a 2.50% post-retirement benefit increase is reached; and
- Current statutory contribution levels (i.e., not including potential contribution increases).

Based on these assumptions and methods, the projection indicates this plan is expected to attain the accrued liability funding ratio threshold to pay the 2.00% benefit increase in the year 2041 and the plan would begin paying 2.00% benefit increases on January 1, 2042. Similarly, the projection indicates this plan is expected to attain the accrued liability funding ratio threshold to pay the 2.50% benefit increase in the year 2058 and the plan would begin paying 2.50% benefit increases on January 1, 2059. This assumption is reflected in our calculations. This is only an assumption; actual timing will depend on actual experience.

Summary of Valuation Results

Sensitivity Tests

During the 2017 legislative session, the Legislative Commission on Pensions and Retirement (LCPR) enacted a new sensitivity disclosure requirement for MSRS' valuations. Per the LCPR's requirement, we have calculated the liabilities associated with the following scenarios:

1) 6.5% interest rate assumption
2) 8.5% interest rate assumption
3) 1.75% post-retirement benefit increase for all future years
4) 2.5% post-retirement benefit increase for all future years

In each case, all other assumptions were unchanged from those used to develop the final valuation results in this report. Note that we believe the 8.5% interest rate assumption would not comply with Actuarial Standards of Practice.

$ in millions	Final Valuation Assumptions	Final Valuation Assumptions with 6.5% interest	Final Valuation Assumptions with 8.5% interest	Final Valuation Assumptions with 1.75% COLA for all future years	Final Valuation Assumptions with 2.5% COLA for all future years
Normal Cost Rate, % of Pay	19.19%	23.23%	15.95%	19.01%	20.38%
Amortization of Unfunded Accrued Liability, Level % of Pay to 2048	22.76%	25.02%	20.39%	22.65%	25.91%
Expenses (% of Pay)	0.22%	0.22%	0.22%	0.22%	0.22%
Total Required Contribution, % of Pay	42.17%	48.47%	36.56%	41.88%	46.51%
Contribution Sufficiency/(Deficiency), % of Pay	(0.47)%	(6.77)%	5.14 %	(0.18)%	(4.81)%
Accrued Liability Funding Ratio	54.2%	49.2%	59.4%	54.3%	51.0%
Present Value of Projected Benefits	$474.5	$536.5	$423.8	$472.7	$504.2
Present Value of Future Normal Costs	$71.8	$93.2	$56.0	$70.9	$76.1
Actuarial Accrued Liability	$402.7	$443.3	$367.8	$401.8	$428.1
Unfunded Accrued Liability	$184.3	$225.1	$149.5	$183.5	$209.8

Summary of Valuation Results

Risks Associated with Measuring the Accrued Liability and Actuarially Determined Contribution

The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

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 due to changing conditions; 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. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

1. **Investment Risk** – actual investment returns may differ from the expected returns;
2. **Asset/Liability Mismatch** – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. **Contribution Risk** – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. **Salary and Payroll Risk** – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. **Longevity Risk** – members may live longer or shorter than expected and receive pensions for a period of time other than assumed; and
6. **Other Demographic Risks** – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example, if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

Summary of Valuation Results

The Required Contribution rate shown on page 1 may be considered as a minimum contribution rate that complies with Minnesota Statutes and the requirements of the Standards for Actuarial Work published by the LCPR. The timely receipt of the actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

Plan Maturity Measures

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures and values for the Judges Retirement Fund for the last two years include the following. Additional maturity measures are shown on the following pages.

	2020	2019
Ratio of market value of assets to total payroll	4.14	4.23
Ratio of actuarial accrued liability to total payroll	7.70	7.80
Ratio of actives to retirees and beneficiaries	0.83	0.82
Ratio of net cash flow to market value of assets	-2.1%	-1.9%
Approximate modified duration* of:		
▪ Total projected benefits:	11.88	11.91
▪ Actuarial accrued liability:	9.39	9.42
▪ Retiree liability:	7.68	7.74

* *Based on 7.5% interest*

Ratio of Market Value of Assets to Payroll

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 5.0 times the payroll, a return on assets 5% different than assumed would equal 25% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

Ratio of Actuarial Accrued Liability to Payroll

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

The ratio of liability to payroll may also be used as a measure of sensitivity of contribution rates to liability gains and losses. For example, if the actuarial accrued liability is 5.0 times the payroll, a change in liability 2% other than assumed would equal 10% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

Summary of Valuation Results

Ratio of Actives to Retirees and Beneficiaries

A young plan with many active members and few retirees will have a high ratio of actives to retirees. A mature open plan may have close to the same number of actives as retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

Ratio of Net Cash Flow to Market Value of Assets

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means benefits and expenses exceed contributions and existing funds may be used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

Duration of Actuarial Liability

The duration may be used to approximate the sensitivity of the liability to a small change in the assumed rate of return. For example, a duration of 10 indicates that the liability would change by approximately 10% if the assumed rate of return were changed by 1% (i.e., from 7.5% to 6.5%).

Additional Risk Assessment

Additional risk assessment is outside the scope of the annual actuarial valuation but could aid stakeholders in an understanding of the risks to which the System is exposed. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability.

Summary of Valuation Results

Risk Measures (Dollars in Thousands)

Valuation Date (July 1)	(1) Accrued Liabilities (AAL)	(2) Market Value of Assets	(3) Market Value Unfunded AAL (1) - (2)	(4) Actual Covered Payroll	(5) Market Value Funded Ratio (2) / (1)	(6) Retiree Liabilities	(7) RetLiab/ AAL (6) / (1)	(8) AAL/ Payroll (1) / (4)	(9) Assets/ Payroll (2) / (4)
2010	$ 240,579	$ 126,201	$ 114,378	$ 39,291	52.5%	$ 135,184	56.2%	612.3%	321.2%
2011	$ 248,630	$ 148,504	$ 100,126	$ 40,473	59.7%	$ 141,762	57.0%	614.3%	366.9%
2012	$ 281,576	$ 144,086	$ 137,490	$ 38,644	51.2%	$ 169,262	60.1%	728.6%	372.9%
2013	$ 284,513	$ 155,398	$ 129,115	$ 39,888	54.6%	$ 180,641	63.5%	713.3%	389.6%
2014	$ 298,233	$ 175,556	$ 122,677	$ 41,893	58.9%	$ 190,570	63.9%	711.9%	419.1%
2015	$ 315,633	$ 174,580	$ 141,053	$ 43,449	55.3%	$ 205,115	65.0%	726.4%	401.8%
2016	$ 331,334	$ 165,905	$ 165,429	$ 45,418	50.1%	$ 211,594	63.9%	729.5%	365.3%
2017	$ 348,976	$ 185,141	$ 163,835	$ 47,813	53.1%	$ 219,587	62.9%	729.9%	387.2%
2018	$ 377,925	$ 201,755	$ 176,170	$ 49,009	53.4%	$ 246,060	65.1%	771.1%	411.7%
2019	$ 391,146	$ 212,262	$ 178,884	$ 50,164	54.3%	$ 263,979	67.5%	779.7%	423.1%
2020	$ 402,660	$ 216,737	$ 185,923	$ 52,298	53.8%	$ 270,913	67.3%	769.9%	414.4%

Valuation Date (July 1)	(10) Portfolio StdDev	(11) Std Dev % of Pay (9) x (10)	(12) Unfunded / Payroll (3) / (4)	(13) Non-Investment Cash Flow (NICF)	(14) NICF/ Assets (13) / (2)	(15) SBI Market Rate of Return	(16) SBI 5-year Average	(17) SBI 10-year Trailing Average
2010			291.1%	$ (5,828)	-4.6%	15.2%	3.4%	N/A
2011			247.4%	$ (6,341)	-4.3%	23.3%	5.3%	N/A
2012			355.8%	$ (7,759)	-5.4%	2.4%	2.3%	N/A
2013			323.7%	$ (8,631)	-5.6%	14.2%	6.2%	N/A
2014			292.8%	$ (7,853)	-4.5%	18.6%	14.5%	N/A
2015	14.1%	56.7%	324.6%	$ (8,548)	-4.9%	4.4%	12.3%	N/A
2016	14.1%	51.5%	364.2%	$ (8,489)	-5.1%	-0.1%	7.7%	N/A
2017	14.1%	54.6%	342.7%	$ (5,493)	-3.0%	15.1%	10.2%	7.9%
2018	14.1%	58.0%	359.5%	$ (2,651)	-1.3%	10.3%	12.4%	7.9%
2019	14.3%	60.5%	356.6%	$ (3,984)	-1.9%	7.2%	7.3%	10.8%
2020	14.3%	59.3%	355.5%	$ (4,480)	-2.1%	4.2%	7.2%	9.7%

Notes pertaining to numbered columns:

(5) The Funded ratio is the most widely known measure of a plan's financial strength, but the trend in the funded ratio is much more important than the absolute ratio. The funded ratio should trend to 100%. As it approaches 100%, it is important to re-evaluate the level of investment risk in the portfolio and potentially to re-evaluate the assumed rate of return.

(6) and (7). The ratio of Retiree liabilities to total accrued liabilities gives an indication of the maturity of the system. As the ratio increases, cash flow needs increase, and the liquidity needs of the portfolio change. A ratio on the order of 50% indicates a maturing system.

(8) and (9). The ratios of liabilities and assets to payroll gives an indication of both maturity and volatility. Many systems have ratios between 500% and 700%. Ratios significantly above that range may indicate difficulty in supporting the benefit level as a level % of payroll.

(10) and (11). The portfolio standard deviation measures the volatility of investment return. When multiplied by the ratio of assets to payroll it gives the effect of a one standard deviation asset move as a percent of payroll. This figure helps users understand the difficulty of dealing with investment volatility and the challenges volatility brings to sustainability.

(12) The ratio of unfunded liability to payroll gives an indication of the plan sponsor's ability to actually pay off the unfunded liability. A ratio above approximately 300% or 400% may indicate difficulty in discharging the unfunded liability within a reasonable time frame.

(13) and (14). The ratio of non-investment cash flow to assets is an important measure of sustainability. Negative ratios are common and expected for a maturing system. In the longer term, this ratio should be on the order of approximately -4%. A ratio that is significantly more negative than that for an extended period could be a leading indicator of potential exhaustion of assets.

(15) (16) and (17). Investment return is probably the largest single risk that most systems face. The year by year return and the 5-year and 10-year geometric average give an indicator of past performance. Of course, past performance is not a guarantee of future results, may not ever be reflective of potential future results and historical averages are very sensitive to the time period chosen. The performance data for the Combined Funds (pooled investments of major Minnesota Public Retirement Systems) is presented in these columns. The source of this data is the Minnesota State Board of Investment.

Information prior to 2012 provided by prior actuary. See prior reports for additional detail.

Supplemental Information

The remainder of the report includes information supporting the results presented in the previous sections.

- **Plan assets** presents information about the plan's assets as reported by the Minnesota State Retirement System. The assets represent the portion of total fund liabilities that has been funded.
- **Membership data** presents and describes the membership data used in the valuation.
- **Development of costs** shows the liabilities for plan benefits and the derivation of the contribution amount.
- **Actuarial basis** describes the plan provisions, as well as the methods and assumptions used to value the plan. The valuation is based on the premise that the plan is ongoing.
- **Additional schedules** includes a summary of funding progress and contributions over the long term.
- **Glossary** defines the terms used in this report.

Plan Assets

Statement of Fiduciary Net Position *(Dollars in Thousands)*

Assets	Market Value June 30, 2020	Market Value June 30, 2019
Cash, equivalents, short-term securities	$ 10,096	$ 6,674
Fixed income	43,931	21,579
Equity	162,372	183,835
Other*	15,165	15,730
Total cash, investments, and other assets	**$ 231,564**	**$ 227,818**
Amounts Receivable	500	304
Total Assets	**$ 232,064**	**$ 228,122**
Amounts Payable*	(15,327)	(15,860)
Net Position Restricted for Pensions	**$ 216,737**	**$ 212,262**

** Includes $15,165 in Securities Lending Collateral as of June 30, 2020 and $15,730 as of June 30, 2019.*

Plan Assets

Reconciliation of Plan Assets *(Dollars in Thousands)*

The following exhibit shows the revenue, expenses and resulting assets of the Fund as reported by the Minnesota State Retirement System for the prior two fiscal years.

Change in Assets	**Market Value**	
Year Ending	**June 30, 2020**	**June 30, 2019**
1. Fund balance at market value at beginning of year	**$ 212,262**	**$ 201,755**
2. Contributions		
a. Member	4,168	4,049
b. Employer	11,767	11,287
c. Other sources	6,000	6,000
d. Total contributions	$ 21,935	$ 21,336
3. Investment income		
a. Investment income/(loss)	9,155	14,694
b. Investment expenses	(200)	(203)
c. Net investment income/(loss)	$ 8,955	$ 14,491
4. Other	-	-
5. Total income: *(2.d.) + (3.c.) + (4.)*	**$ 30,890**	**$ 35,827**
6. Benefits Paid		
a. Annuity benefits	(26,272)	(25,233)
b. Refunds	(30)	-
c. Total benefits paid	$ (26,302)	$ (25,233)
7. Expenses		
a. Other	-	-
b. Administrative	(113)	(87)
c. Total expenses	$ (113)	$ (87)
8. Total disbursements: *(6.c.) + (7.c.)*	**$ (26,415)**	**$ (25,320)**
9. Fund balance at market value at end of year: *(1.) + (5.) + (8.)*	**$ 216,737**	**$ 212,262**
10. State Board of Investment calculated return on investments	4.2%	7.2%

Plan Assets

Actuarial Asset Value *(Dollars in Thousands)*

	June 30, 2020	June 30, 2019
1. Market value of assets available for benefits	**$ 216,737**	**$ 212,262**
2. Determination of average balance		
a. Total assets available at beginning of year	212,262	201,755
b. Total assets available at end of year	216,737	212,262
c. Net investment income for fiscal year	8,955	14,491
d. Average balance *[a. + b. - c.] / 2*	210,022	199,763
3. Expected return *[7.5% x 2.d.]*	15,752	14,982
4. Actual return	8,955	14,491
5. Current year asset gain/(loss) *[4. - 3.]*	(6,797)	(491)
6. Unrecognized asset returns		

	Original Amount	Unrecognized Amount %	Unrecognized Amount Dollar	Unrecognized Amount %	Unrecognized Amount Dollar
a. Year ended June 30, 2020	$ (6,797)	80%	$ (5,438)	N/A	N/A
b. Year ended June 30, 2019	(491)	60%	(295)	80%	$ (393)
c. Year ended June 30, 2018	4,560	40%	1,824	60%	2,736
d. Year ended June 30, 2017	11,676	20%	2,335	40%	4,670
e. Year ended June 30, 2016	(13,813)		N/A	20%	(2,763)
f. Unrecognized return adjustment			**$ (1,574)**		**$ 4,250**

7. **Actuarial value at end of year** *(1. - 6.f.)*	**$ 218,311**	**$ 208,012**
8. Approximate return on actuarial value of assets during fiscal year	7.1%	7.2%
9. Ratio of actuarial value of assets to market value of assets	1.01	0.98

Membership Data

Distribution of Active Members (Total)*

	Years of Service as of June 30, 2020									
Age	**<3****	**3 - 4****	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25 - 29**	**30 - 34**	**35+**	**Total**
< 25										
Avg. Earnings										
25 - 29										
Avg. Earnings										
30 - 34										
Avg. Earnings										
35 - 39	5									**5**
Avg. Earnings	$151,800									**$151,800**
40 - 44	16	6	4							**26**
Avg. Earnings	$154,267	$161,108	$162,683							**$157,141**
45 - 49	18	6	14	2						**40**
Avg. Earnings	$156,712	$161,108	$161,108	$161,108						**$159,130**
50 - 54	22	9	20	15	1					**67**
Avg. Earnings	$159,920	$161,108	$161,192	$164,285	$161,108					**$161,454**
55 - 59	10	12	18	20	7					**67**
Avg. Earnings	$150,556	$161,984	$161,692	$164,132	$161,108					**$160,749**
60 - 64	1	2	22	17	17	8	5			**72**
Avg. Earnings	$161,108	$166,366	$162,542	$162,305	$164,056	$166,058	$163,211			**$163,367**
65 - 69	2	1	13	10	11	7				**44**
Avg. Earnings	$148,149	$161,108	$162,726	$163,294	$162,064	$166,436				**$162,580**
70+ ***									1	**1**
Avg. Earnings									$161,108	**$161,108**
Total	**74**	**36**	**91**	**64**	**36**	**15**	**5**		**1**	**322**
Avg. Earnings	**$155,801**	**$161,692**	**$161,889**	**$163,457**	**$162,792**	**$166,235**	**$163,211**		**$161,108**	**$161,101**

* *Includes 6 Tier 1 Judges who have reached the maximum benefit formula (member contributions are directed to the Unclassified Employees Retirement Plan).*

** *This exhibit does not reflect service earned in other MSRS Plans or service earned under a Combined Service Annuity arrangement. It should not be relied upon as an indicator of non-vested status.*

*** *All active Judges are under age 70 as of the valuation date based on actual age (unrounded).*

In each cell, the top number is the count of active participants for the age/service combination and the bottom number is average valuation earnings for the fiscal year ending on the valuation date.

Membership Data

Distribution of Active Members (Tier 1)*

	Years of Service as of June 30, 2020									
Age	**<3****	**3 - 4****	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25 - 29**	**30 - 34**	**35+**	**Total**
< 25										
Avg. Earnings										
25 - 29										
Avg. Earnings										
30 - 34										
Avg. Earnings										
35 - 39										
Avg. Earnings										
40 - 44										
Avg. Earnings										
45 - 49			8	2						**10**
Avg. Earnings			$161,108	$161,108						**$161,108**
50 - 54			10	15	1					**26**
Avg. Earnings			$161,108	$164,285	$161,108					**$162,941**
55 - 59			11	20	7					**38**
Avg. Earnings			$161,108	$164,132	$161,108					**$162,699**
60 - 64			11	17	17	8	5			**58**
Avg. Earnings			$163,020	$162,305	$164,056	$166,058	$163,211			**$163,550**
65 - 69			12	10	11	7				**40**
Avg. Earnings			$162,860	$163,294	$162,064	$166,436				**$163,376**
70+ ***									1	**1**
Avg. Earnings									$161,108	**$161,108**
Total			**52**	**64**	**36**	**15**	**5**		**1**	**173**
Avg. Earnings			**$161,917**	**$163,457**	**$162,792**	**$166,235**	**$163,211**		**$161,108**	**$163,076**

* *Includes 6 Tier 1 Judges who have reached the maximum benefit formula (member contributions are directed to the Unclassified Employees Retirement Plan).*

** *This exhibit does not reflect service earned in other MSRS plans or service earned in a Combined Service Annuity arrangement. It should not be relied upon as an indicator of non-vested status.*

*** *All active Judges are under age 70 as of the valuation date based on actual age (unrounded).*

In each cell, the top number is the count of active participants for the age/service combination and the bottom number is average valuation earnings for the fiscal year ending on the valuation date.

Membership Data

Distribution of Active Members (Tier 2)

	Years of Service as of June 30, 2020									
Age	**<3***	**3 - 4***	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25 - 29**	**30 - 34**	**35+**	**Total**
< 25										
Avg. Earnings										
25 - 29										
Avg. Earnings										
30 - 34										
Avg. Earnings										
35 - 39	5									**5**
Avg. Earnings	$151,800									**$ 151,800**
40 - 44	16	6	4							**26**
Avg. Earnings	$154,267	$161,108	$ 162,683							**$ 157,141**
45 - 49	18	6	6							**30**
Avg. Earnings	$156,712	$161,108	$ 161,108							**$ 158,470**
50 - 54	22	9	10							**41**
Avg. Earnings	$159,920	$161,108	$ 161,277							**$ 160,512**
55 - 59	10	12	7							**29**
Avg. Earnings	$150,556	$161,984	$ 162,610							**$ 158,194**
60 - 64	1	2	11							**14**
Avg. Earnings	$161,108	$166,366	$ 162,064							**$ 162,610**
65 - 69	2	1	1							**4**
Avg. Earnings	$148,149	$161,108	$ 161,108							**$ 154,628**
70+										
Avg. Earnings										
Total	**74**	**36**	**39**							**149**
Avg. Earnings	**$155,801**	**$161,692**	**$ 161,852**							**$ 158,808**

* *This exhibit does not reflect service earned in other MSRS plans or service earned in a Combined Service Annuity arrangement. It should not be relied upon as an indicator of non-vested status.*

In each cell, the top number is the count of active participants for the age/service combination and the bottom number is average valuation earnings for the fiscal year ending on the valuation date.

Membership Data

Distribution of Service Retirements

	Years Retired as of June 30, 2020							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<50								
Avg. Benefit								
50 - 54								
Avg. Benefit								
55 - 59								
Avg. Benefit								
60 - 64	1	3						**4**
Avg. Benefit	$64,373	$44,769						**$49,670**
65 - 69	12	35	7					**54**
Avg. Benefit	$68,637	$69,743	$50,802					**$67,042**
70 - 74	3	43	56	8				**110**
Avg. Benefit	$53,643	$68,862	$71,664	$70,360				**$69,982**
75 - 79		1	35	26	4			**66**
Avg. Benefit		$116,553	$72,247	$75,953	$53,878			**$73,265**
80 - 84				17	11	2		**30**
Avg. Benefit				$73,102	$62,757	$66,565		**$68,873**
85 - 89				1	7	7		**15**
Avg. Benefit				$61,837	$70,618	$88,055		**$78,170**
90+					1	8	10	**19**
Avg. Benefit					$49,285	$63,073	$95,698	**$79,518**
Total	**16**	**82**	**98**	**52**	**23**	**17**	**10**	**298**
Avg. Benefit	**$65,559**	**$68,938**	**$70,382**	**$73,889**	**$63,020**	**$73,770**	**$95,698**	**$70,812**

In each cell, the top number is the count of retired participants for the age/years retired combination and the bottom number is the average annual benefit amount.

Membership Data

Distribution of Survivors

	Years Since Death as of June 30, 2020							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<45								
Avg. Benefit								
45 - 49								
Avg. Benefit								
50 - 54								
Avg. Benefit								
55 - 59	1							**1**
Avg. Benefit	$ 55,625							**$ 55,625**
60 - 64								
Avg. Benefit								
65 - 69	3	1	1	3	2	2	1	**13**
Avg. Benefit	$ 64,081	$ 36,111	$ 28,220	$ 58,195	$ 40,777	$ 54,359	$ 63,181	**$ 52,662**
70 - 74		3	2	3	3			**11**
Avg. Benefit		$ 43,470	$ 57,147	$ 56,714	$ 35,410			**$ 47,371**
75 - 79	2	2		4		2	2	**12**
Avg. Benefit	$ 33,678	$ 63,248		$ 49,645		$ 69,104	$ 77,034	**$ 57,059**
80 - 84	1	4	7	4		1	1	**18**
Avg. Benefit	$ 45,536	$ 60,397	$ 51,978	$ 49,537		$ 63,024	$ 52,974	**$ 53,618**
85 - 89			1	3	1	2	1	**8**
Avg. Benefit			$ 69,842	$ 61,449	$ 55,425	$ 50,720	$ 45,349	**$ 57,050**
90+		1	3	2	3	2	2	**13**
Avg. Benefit		$ 94,272	$ 54,811	$ 52,975	$ 50,039	$ 87,074	$ 70,058	**$ 63,772**
Total	**7**	**11**	**14**	**19**	**9**	**9**	**7**	**76**
Avg. Benefit	**$ 51,537**	**$ 57,171**	**$ 52,902**	**$ 54,303**	**$ 43,703**	**$ 65,060**	**$ 65,098**	**$ 55,218**

In each cell, the top number is the count of survivors for the age/years since death combination and the bottom number is the average annual benefit amount.

Membership Data

Distribution of Disability Retirements

	Years Disabled as of June 30, 2020							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
< 45								
Avg. Benefit								
45 - 49								
Avg. Benefit								
50 - 54								
Avg. Benefit								
55 - 59								
Avg. Benefit								
60 - 64								
Avg. Benefit								
65 - 69				1	1			**2**
Avg. Benefit				$58,938	$52,751			**$55,844**
70 - 74				3	1			**4**
Avg. Benefit				$57,448	$72,026			**$61,093**
75+				3	5	2		**10**
Avg. Benefit				$78,348	$67,507	$96,971		**$76,652**
Total				**7**	**7**	**2**		**16**
Avg. Benefit				**$66,618**	**$66,045**	**$96,971**		**$70,161**

In each cell, the top number is the count of disabled participants for the age/years since disability combination and the bottom number is the average annual benefit amount.

Membership Data

Reconciliation of Members

		Terminated		Recipients			
	Actives*	Deferred Retirement	Other Non-Vested	Service Retirement	Disability Retirement	Survivor	Total
Members on 7/1/2019	**315**	**19**	**1**	**293**	**16**	**74**	**718**
New members	21	0	0	0	0	0	**21**
Return to active	0	0	0	0	0	0	**0**
Terminated non-vested	0	0	0	0	0	0	**0**
Service retirements	(12)	(3)	0	15	0	0	**0**
Terminated deferred	(1)	1	0	0	0	0	**0**
Terminated refund/transfer	0	0	(1)	0	0	0	**(1)**
Deaths	(1)	0	0	(11)	0	(5)	**(17)**
New beneficiary	0	0	0	0	0	7	**7**
Disabled	0	0	0	0	0	0	**0**
Unexpected status changes	0	0	0	1	0	0	**1**
Net change	7	(2)	(1)	5	0	2	**11**
Members on 6/30/2020	**322**	**17**	**0**	**298**	**16**	**76**	**729**

Summary of Membership

Active Member Statistics*	**Total**
Number	322
Average age	55.8
Average service	8.9
Average salary	$ 161,101

Terminated Member Statistics	**Deferred Retirement**	**Other Non-Vested**	**Total**
Number	17	0	17
Average age	58.9	0.0	58.9
Average service	10.1	0.0	10.1
Average annual benefit at Normal Retirement Date	$ 42,462	N/A	$ 42,462
Average refund value	$ 177,317	N/A	$ 177,317

Retiree & Survivor Member Statistics	**Service Retirees**	**Disabled Retirees**	**Survivors**	**Total**
Number	298	16	76	390
Average age	75.2	76.7	79.6	76.1
Average annual benefit	$ 70,812	$ 70,161	$ 55,218	$ 67,746

** Includes active Judges who have reached the maximum benefit formula (employee contributions are directed to the Unclassified Employees Retirement Plan).*

Development of Costs

Actuarial Valuation Balance Sheet *(Dollars in Thousands)*

The actuarial balance sheet is based on the principle that the long-term projected benefit obligations of the plan should be ideally equal to the long-term resources available to fund those obligations. A Projected Benefit Funding Ratio less than 100% indicates that contributions are insufficient. The resources available to meet projected obligations for current members consist of current fund assets plus the present value of anticipated future contributions intended to fund benefits for current members. In the exhibit below, B.2 is the estimated present value of contributions to fund the normal cost rate for current members until their respective termination dates. Item B.1 is the present value of the total 41.70% statutory contribution net of normal cost and anticipated plan expenses during the period from the valuation date to the statutory unfunded amortization date.

The contributions made in excess of amounts required for current benefit payments are accumulated as a reserve to help meet benefit payments in later years. It is this reserve system which permits the establishment of a level rate of contribution each year.

				June 30, 2020
A. Actuarial Value of Assets				$ 218,311
B. Expected Future Assets				
1. Present value of expected future statutory supplemental contributions*				180,532
2. Present value of future normal cost contributions				71,876
3. Total expected future assets: *(1.) + (2.)*				$ 252,408
C. Total Current and Expected Future Assets				470,719
D. Current Benefit Obligations**				
1. Benefit recipients	**Non-Vested**	**Vested**	**Total**	
a. Service retirements	$ -	$ 225,830	$ 225,830	
b. Disability retirements	-	11,297	11,297	
c. Survivors	-	33,786	33,786	
2. Deferred retirements	-	5,840	5,840	
3. Former members without vested rights***	-	-	-	
4. Active members	3,656	108,379	112,035	
5. Total current benefit obligations	$ 3,656	$ 385,132	$ 388,788	
E. Expected Future Benefit Obligations				85,748
F. Total Current and Expected Future Benefit Obligations****				474,536
G. Unfunded Current Benefit Obligations: *(D.5.) - (A.)*				170,477
H. Unfunded Current and Future Benefit Obligations: *(F.) - (C.)*				3,817
I. Accrued Benefit Funding Ratio: *(A.)/(D.5.)*				56.15%
J. Projected Benefit Funding Ratio: *(C.)/(F.)*				99.20%

* *Per the LCPR Standards for Actuarial Work, calculated assuming the current percent of pay contribution toward the unfunded liability continues for the entire amortization period. Based on a blended Tier 1 and Tier 2 member contribution rate and normal cost.*

** *Present value of credited projected benefits (projected compensation, current service).*

*** *Former members who have not satisfied vesting requirements and have not collected a refund of member contributions as of the valuation date.*

**** *Present value of projected benefits (projected compensation, projected service).*

Development of Costs

Determination of Unfunded Actuarial Accrued Liability and Supplemental Contribution Rate (*Dollars in Thousands)*

	Actuarial Present Value of Projected Benefits	Actuarial Present Value of Future Normal Costs	Actuarial Accrued Liability
A. Determination of Actuarial Accrued Liability (AAL)			
1. Active members			
a. Retirement annuities	$ 189,215	$ 66,713	$ 122,502
b. Disability benefits	4,271	2,663	1,608
c. Survivor's benefits	4,075	2,399	1,676
d. Deferred retirements	-	-	-
e. Refunds*	222	101	121
f. Total	$ 197,783	$ 71,876	$ 125,907
2. Deferred retirements	5,840	-	5,840
3. Former members without vested rights	-	-	-
4. Benefit recipients	270,913	-	270,913
5. Total	$ 474,536	$ 71,876	$ 402,660
B. Determination of Unfunded Actuarial Accrued Liability (UAAL)			
1. Actuarial accrued liability			$ 402,660
2. Current assets (AVA)			218,311
3. Unfunded actuarial accrued liability			$ 184,349
C. Determination of Supplemental Contribution Rate**			
1. Present value of future payrolls through the amortization date of June 30, 2048			$ 809,922
2. Supplemental contribution rate: *(B.3.) / (C.1.)*			22.76% ***

* *Includes non-vested refunds and non-married survivor benefits only.*

** *The amortization of the Unfunded Actuarial Accrued Liability (UAAL) using the current amortization method results in initial payments less than the "interest only" payment on the UAAL. Payments less than the interest only amount will result in the UAAL increasing for an initial period of time.*

*** *The amortization factor as of July 1, 2020 is 15.23239.*

Development of Costs

Changes in Unfunded Actuarial Accrued Liability (UAAL)
(Dollars in Thousands)

	Year Ending June 30, 2020		
	Actuarial Accrued Liability	Current Assets	Unfunded Actuarial Accrued Liability
A. At beginning of year	$ 391,146	$ 208,012	$ 183,134
B. Changes due to interest requirements and current rate of funding			
1. Normal cost and expenses	10,010	-	10,010
2. Benefit payments	(26,302)	(26,302)	-
3. Contributions	-	21,935	(21,935)
4. Interest on A., B.1., B.2., and B.3.	28,725	15,437	13,288
5. Total *(B.1. + B.2. + B.3. + B.4.)*	$ 12,433	$ 11,070	$ 1,363
C. Expected unfunded actuarial accrued liability at end of year *(A. + B.5.)*	$ 403,579	$ 219,082	$ 184,497
D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected			
1. Age and service retirements			163
2. Disability retirements			(133)
3. Death-in-service benefits			(38)
4. Withdrawals			(949)
5. Salary increases			44
6. Investment income			771
7. Mortality of annuitants			508
8. Other items			(194)
9. Total			$ 172
E. Unfunded actuarial accrued liability at end of year before plan amendments and changes in actuarial assumptions *(C. + D.9.)*			$ 184,669
F. Change in unfunded actuarial accrued liability due to changes in plan provisions			-
G. Change in unfunded actuarial accrued liability due to changes in actuarial assumptions			(320)
H. Change in unfunded actuarial accrued liability due to changes in actuarial methods			-
I. Unfunded actuarial accrued liability at end of year *(E. + F. + G. + H.)**			$ 184,349

** The unfunded actuarial accrued liability on a market value of assets basis is $185,923.*

Development of Costs

Determination of Contribution Sufficiency/(Deficiency) *(Dollars in Thousands)*

The required contribution is defined in Minnesota Statutes as the sum of normal cost, a supplemental contribution to amortize the UAAL, and an allowance for expenses. The dollar amounts shown are for illustrative purposes and equal percent of payroll multiplied by projected annual payroll.

	Percent of Payroll		Dollar Amount
A. Statutory contributions - Chapter 490			
1. Employee contributions*	7.92%	$	4,210
2. Employer contributions	22.50%		11,963
3. State contributions****	11.28%		6,000
4. Total	41.70%	$	22,173
B. Required contributions - Chapter 356			
1. Normal cost			
a. Retirement benefits	17.82%	$	9,475
b. Disability benefits	0.68%		362
c. Survivors	0.66%		351
d. Deferred retirement benefits	0.00%		-
e. Refunds**	0.03%		16
f. Total	19.19%	$	10,204
2. Supplemental contribution amortization of Unfunded Actuarial Accrued Liability by June 30, 2048	22.76%	$	12,102
3. Allowance for expenses	0.22%		117
4. Total	42.17% ***	$	22,423
C. Contribution Sufficiency/(Deficiency) *(A.3. - B.4.)*	(0.47)%	$	(250)

Note: Projected annual payroll for fiscal year beginning on the valuation date: $53,171 (determined by increasing reported pay for each member by one full year's assumed pay increase according to the actuarial salary scale, as prescribed by the LCPR Standards for Actuarial Work).

* *For Tier I Judges who have reached the maximum benefit amount, member contributions equal to 9% of pay are directed to the Unclassified Employees Retirement Plan. The member contribution amount of $4,210 shown above is equal to 9% of a Tier 1 payroll amount of $27,915 (which excludes the payroll for Tier 1 Judges at the maximum level) and 7.00% of a Tier 2 payroll amount of $24,254 for Tier 2 Judges.*

** *Includes non-vested refunds and non-married survivor benefits only.*

*** *The required contribution on a market value of assets basis is 42.37% of payroll.*

**** *$6,000,000 per year until the plan is fully funded or July 1, 2048, if earlier.*

Actuarial Basis

Actuarial Methods

All actuarial methods are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement, or the MSRS Board of Directors. Different methodologies may also be reasonable and results based on other methodologies would be different.

Actuarial Cost Method

Actuarial Accrued Liability and required contributions in this report are computed using the Entry Age Normal Cost Method. This method is prescribed by Minnesota Statute. An actuarial cost method is a set of techniques used by the actuary to develop contribution levels under a retirement plan. The actuarial cost method used in this valuation for all purposes is the Entry Age Actuarial Cost Method. Under this method, a normal cost is developed by amortizing the actuarial value of benefits expected to be received by each active participant (as a level percentage of pay) over the total working lifetime of that participant, from hire to termination. Age as of the valuation date was calculated based on the dates of birth provided by the Fund. Entry age for valuation purposes was calculated as the age on the valuation date minus the provided years of service on the valuation date.

To the extent that current assets and future normal costs do not support participants' expected future benefits, an Unfunded Actuarial Accrued Liability ("UAAL") develops. The UAAL is amortized over the statutory amortization period using level percent of payroll assuming payroll increases. The total contribution developed under this method is the sum of normal cost, expenses, and the payment toward the UAAL.

Valuation of Future Post-Retirement Benefit Increases

If the plan has reached the accrued liability funding ratio threshold (determined on a market value of assets basis) required to pay a 2.00% or 2.50% benefit increase, Minnesota Statutes require the 2.00% or 2.50% benefit increase rate to be reflected in the liability calculations. If the plan has not yet reached the accrued liability funding ratio threshold required to pay a 2.00% or 2.50% benefit increase, Minnesota Statutes require a projection to be performed to determine the expected attainment of the accrued liability funding ratio thresholds, and the expected payment of 2.00% or 2.50% benefit increases must be reflected in the liability calculations.

Funding Objective

The fundamental financing objective of the Fund is to establish contribution rates which, when expressed as a percentage of active member payroll, will remain approximately level from generation to generation and meet the required deadline for full funding.

Actuarial Basis

Actuarial Methods (Concluded)

Asset Valuation Method

The assets are valued based on a five-year moving average of expected and market values (five-year average actuarial value) determined as follows:

- At the end of each plan year, an average asset value is calculated as the average of the market asset value at the beginning and end of the fiscal year net of investment income for the fiscal year;
- The investment gain or (loss) is taken as the excess of actual investment income over the expected investment income based on the average asset value as calculated above;
- The investment gain or (loss) so determined is recognized over five years at 20% per year; and
- The asset value is the sum of the market asset value plus the scheduled recognition of investment gains or (losses) during the current and the preceding four fiscal years.

Payment on the Unfunded Actuarial Accrued Liability

Payment equals a level percentage of payroll each year to the statutory amortization date of June 30, 2048 assuming payroll increases of 2.50% per annum. If there is a negative Unfunded Actuarial Accrued Liability, the surplus amount is amortized over 30 years as a level percentage of payroll. If the unfunded liability increases due to changes in benefits, assumptions, or methods, the statutory amortization date may be extended.

As required by the Standards for Actuarial Work, projected payroll is 1) determined by increasing reported payroll for each member by one full year's assumed pay increase according to the actuarial salary scale and 2) multiplied by 0.962 in the determination of the present value of future payroll to account for timing differences. This statutory method produces a required contribution that is similar to, but slightly below, the contribution that would be produced by more common actuarial methods.

Changes in Methods since Prior Valuation

There have been no changes in actuarial methods since the prior valuation.

Actuarial Basis

Summary of Actuarial Assumptions

The following assumptions were used in valuing the liabilities and benefits under the plan. All actuarial assumptions are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement (LCPR), or the MSRS Board of Directors. These parties are responsible for selecting the assumptions used for this valuation. The assumptions prescribed are based on the last experience study, dated July 26, 2016, and a review of inflation and investment return assumptions, dated September 11, 2017. An experience study for the 2015-2019 period was issued on June 30, 2020. This report recommended changes to economic and demographic assumptions, expected to be effective at a future date.

Investment return	7.50% per annum.
Benefit increases after retirement	1.75% per annum through 2041, 2.00% per annum from 2042 to 2058, and 2.50% per annum thereafter.
Salary increases	2.50% per year.
Payroll growth	2.50% per year.
Inflation	2.50% per year.
Mortality rates	
Healthy pre-retirement	RP-2014 employee generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
Healthy post-retirement	RP-2014 annuitant generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
Disabled	RP-2014 annuitant generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
Notes	The RP-2014 employee mortality table as published by the Society of Actuaries (SOA) contains mortality rates for ages 18 to 80 and the annuitant mortality table contains mortality rates for ages 50 to 120. We have extended the annuitant mortality table as needed for members younger than age 50 who are receiving a benefit by deriving rates based on the employee table and the juvenile table. Similarly, we have extended the employee table as needed for members older than age 80 by deriving rates based on the annuitant table.
Retirement	Members retiring from active status are assumed to retire according to the age related rates shown in the rate table. Members who have attained the highest assumed retirement age are assumed to retire in one year.
Withdrawal	None.
Disability	Age-related rates based on experience; see table of sample rates.
Administrative expenses	Prior year administrative expenses expressed as percentage of prior year projected payroll.

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Refund of contributions	Account balances for deferred members accumulate interest until normal retirement date and are discounted back to the valuation date.
Commencement of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 65.
Percentage married	Marital status as indicated by data.
Age of spouse	Females are assumed to be three years younger than their male spouses.
Form of payment	Members are assumed to elect a life annuity.
Allowance for Combined Service Annuity	None.
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.
Decrement operation	Decrements are assumed to occur mid-fiscal year.
Service credit accruals	It is assumed that members accrue one year of service credit per year.
Pay increases	Pay increases are assumed to happen at the beginning of the fiscal year. This is equivalent to assuming that reported earnings are pensionable earnings for the year ending on the valuation date.
Unknown data for certain members	To prepare this report, GRS has used and relied on participant data supplied by the Fund. Although GRS has reviewed the data in accordance with Actuarial Standards of Practice No. 23, GRS has not verified or audited any of the data or information provided. There were no members reported with missing or invalid birth dates. In cases where submitted data was missing or incomplete, the following assumptions were applied: <u>Data for active members</u>: There were 6 members who have reached the 24-year service cap. We assumed these members earned the greater of the salary reported under the Unclassified Employees Retirement Plan or $161,108 for the July 1, 2019 to June 30, 2020 plan year. There were no members reported with missing service. There were no members reported with a missing or invalid gender.

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Unknown data for certain members (Concluded)	Data for terminated members: There were no members reported without a benefit and no members reported with a missing or invalid gender. Data for members receiving benefits: There were no members reported without a benefit. There were two members reported with a missing gender. We assumed male gender for retirees and female gender for survivors. There were no retirees reported with a bounceback survivor option and a survivor date of death. There were 3 retirees reported with a bounceback annuity and an unreasonable reduction factor. A factor of 0.80, 0.85 and 0.90 was assumed for the 100%, 75% and 50% joint and survivor annuity, respectively. There were no survivors reported on the data file with an expired benefit. There were retired members reported with a survivor option and an invalid or missing survivor gender (39 members) and/or survivor date of birth (31 members). We used the valuation assumptions if the survivor gender or date of birth was missing or invalid.
Changes in actuarial assumptions	The assumed benefit increase was changed from 1.75% per year through 2039, 2.00% per year from 2040 to 2056 and 2.50% thereafter to 1.75% per year through 2041, 2.00% per year from 2042 to 2058 and 2.50% thereafter.

Actuarial Basis

Summary of Actuarial Assumptions (Concluded)

Age in 2020	Percentage of Members Dying each Year*					
	Healthy Post-Retirement Mortality**		Healthy Pre-Retirement Mortality**		Disability Mortality**	
	Male	Female	Male	Female	Male	Female
20	0.02%	0.01%	0.02%	0.01%	0.02%	0.01%
25	0.03	0.02	0.03	0.01	0.03	0.02
30	0.05	0.04	0.03	0.02	0.05	0.04
35	0.07	0.08	0.03	0.03	0.07	0.08
40	0.11	0.11	0.04	0.03	0.11	0.11
45	0.16	0.14	0.06	0.05	0.16	0.14
50	0.24	0.19	0.10	0.08	0.24	0.19
55	0.36	0.27	0.18	0.14	0.36	0.27
60	0.50	0.39	0.31	0.20	0.50	0.39
65	0.72	0.62	0.55	0.30	0.72	0.62
70	1.17	0.99	0.97	0.51	1.17	0.99
75	2.03	1.67	1.74	0.90	2.03	1.67
80	3.61	2.97	3.12	1.61	3.61	2.97
85	6.65	5.44	6.50	4.31	6.65	5.44
90	12.20	9.94	12.34	9.62	12.20	9.94

* *Generally, mortality rates are expected to increase as age increases. These standard mortality rates have been adjusted slightly to prevent decreasing mortality rates. The adjustment has no material effect on results.*

** *Rates are adjusted for mortality improvements using Scale MP-2015 from a base year of 2006.*

	Percentage of Eligible Members Retiring each Year			
	Disability Retirement			
Age	Male	Female	Age	Retirement
20	0.00%	0.00%	60	0%
25	0.00	0.00	61	0
30	0.00	0.00	62	8
35	0.00	0.00	63	8
40	0.01	0.01	64	5
45	0.03	0.03	65	20
50	0.05	0.05	66	23
55	0.12	0.12	67	23
60	0.31	0.31	68	20
65	0.00	0.00	69	20
70	0.00	0.00	70	100

Actuarial Basis

Summary of Plan Provisions

Following is a summary of the major plan provisions used in the valuation of this report. MSRS is solely responsible for the validity, accuracy and comprehensiveness of this information. If any of the plan provisions shown below are not accurate and complete, the valuation results may differ significantly from those shown in this report and may require a revision of this report.

Plan year	July 1 through June 30.
Eligibility	A judge or justice of any court. If the member was active prior to January 1, 1974, benefits may be computed according to provisions of the prior plan.
Tier 1 / Tier 2 member	Tier 1 includes judges or justices first appointed or elected before July 1, 2013, and Tier 2 includes judges or justices first appointed or elected after June 30, 2013. A judge or justice with less than five years of service as of December 30, 2013, may make a one-time irrevocable election into Tier 2. For the purpose of this valuation, we have assumed no Tier 1 members elected Tier 2 benefits as of the valuation date.
Contributions	
Member	9.00% of salary for Tier 1 members, 7.00% of salary for Tier 2 members. Tier 1 member contributions after maximum benefit is reached are redirected to the Unclassified Employees Retirement Plan.
Employer	22.50% of salary. Member contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).
State contributions	$6,000,000 per year until the earlier of 1) the year after the plan reaches full funding on an actuarial value of assets basis, and 2) July 1, 2048.
Allowable service	Service as a judge. Credit may also be earned for uncredited judicial service if the appropriate employee contributions, with interest, are made.
Salary	Salary set by law.
Average salary	Average of the five highest years of salary of the last 10 years prior to termination of judicial service.

Actuarial Basis

Summary of Plan Provisions (Continued)

Retirement	
Normal retirement benefit	
Age/Service requirement	First appointed as a judge before July 1, 2013 (Tier 1): (a.) Age 65 and five years of Allowable Service (b.) Age 70 (mandatory retirement age) First appointed as a judge after June 30, 2013 (Tier 2): (a.) Age 66 and five years of Allowable Service (b.) Age 70 (mandatory retirement age) Judges appointed before July 1, 2013, with less than five years of allowable service on or before December 31, 2013, may make a one-time election for the Tier 2 benefit package.
Amount	First appointed as a judge before July 1, 2013 (Tier 1): 2.70% of Average Salary for each year of Allowable Service prior to July 1, 1980, and 3.20% of Average Salary for each year of Allowable Service after June 30, 1980. Maximum benefit equal to 76.80% of Average Salary. First appointed as a judge after June 30, 2013 (Tier 2): 2.50% of Average Salary for each year of Allowable Service. Tier 1 who elected into Tier 2: 3.20% of Average Salary for each year of Allowable Service prior to January 1, 2014, plus 2.50% of Average Salary for each year of Allowable Service after December 31, 2013.
Early retirement	
Age/Service requirement	Age 60 and five years of Allowable Service.
Amount	Normal Retirement Benefit based on Allowable Service and Average Salary at retirement date with reduction of 0.50% for each month the member is under Normal Retirement Age at time of retirement.
Form of payment	Life annuity. Actuarially equivalent options are: (a.) 50%,75% or 100% joint and survivor with no bounce back feature (b.) 50%, 75% or 100% with bounce back feature (c.) 15-year certain and life thereafter
Benefit increases	Since January 1, 2014, benefit recipients receive annual 1.75% benefit increases. If the accrued liability funding ratio reaches or exceeds 70% for two consecutive years (on a Market Value of Assets basis), the benefit increase will revert to 2.00%. If the accrued liability funding ratio reaches or exceeds 90% for two consecutive years (on a Market Value of Assets basis), the benefit increase will revert to 2.50%.

Actuarial Basis

Summary of Plan Provisions (Continued)

Benefit increases (Continued)	A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a full increase. Members receiving benefits for at least one month but less than 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a pro rata increase.
Disability	
Disability benefit	
Age/Service requirement	Permanent inability to perform the function of judge.
Amount	No benefit is paid by the Fund. Instead salary is continued for one year but not beyond age 70. Employee contributions continue and Allowable Service is earned. If disability continues after the first year (or at age 70 if earlier), the larger of 25.00% of Average Salary or the Normal Retirement Benefit, without reduction.
Retirement after disability	
Age/Service requirement	Member is still disabled after salary payments cease after one year or at age 70, if earlier.
Amount	No change in disability benefit amount from pre-retirement computed benefit amount.
Form of payment	Same as for retirement.
Benefit increases	Same as for retirement.
Death	
Survivor's benefit	
Age/service requirement	Active or disabled member dies before retirement or a former member eligible for a deferred annuity dies.
Amount	Larger of 25% of Average Salary or 60% of Normal Retirement Benefit earned at date of death. If member dies after age 60 with five or more years of service, spouse may receive the 100% joint and survivor benefit the member had earned as of date of death. Benefit paid to spouse for life. If no spouse, benefit is paid to surviving dependent children until child marries, dies, or attains age 18 (age 22 if full-time student).
Benefit increases	Same as for retirement.
Refund of contributions	
Age/service requirement	Member dies prior to retirement or former member eligible for a deferred annuity dies and survivors' benefits are not payable.
Amount	Member's contributions with 6.00% interest through June 30, 2011. Beginning July 1, 2011, a member's contributions increase at 4.00% interest. Beginning July 1, 2018, a member's contributions increase at 3.00% interest.

Actuarial Basis

Summary of Plan Provisions (Concluded)

Termination	
Refund of contributions	
Age/Service requirement	Termination of service as a judge.
Amount	Member's contributions with 6.00% interest through June 30, 2011. Beginning July 1, 2011, a member's contributions increase at 4.00% interest. Beginning July 1, 2018, a member's contributions increase at 3.00% interest. If a member is vested, a deferred annuity may be elected in lieu of a refund.
Deferred benefit	
Age/service requirement	Five years of Allowable Service.
Amount	Benefit computed under law in effect at termination. Amount is payable at normal or early retirement. If a member terminated employment prior to July 1, 1997 but was not eligible to commence their pension before July 1, 1997, an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%.
Form of payment	Same as for retirement.
Optional form conversion factors	Effective July 1, 2019 and phased in over a 24-month period, actuarially equivalent factors based on the RP-2014 mortality table for healthy annuitants for a member turning age 66 in 2021, reflecting projected mortality improvements using Scale MP-2017, white collar adjustment, blended 70% males, 5.65% post-retirement interest, and 7.50% pre-retirement interest. Reflecting statutory requirements, joint and survivor factors are based on an interest assumption of 6.50%.
Combined service annuity	Members are eligible for combined service benefits if they: (a.) Have sufficient allowable service in total that equals or exceeds the applicable service credit vesting requirement of the retirement plan with the longest applicable service credit vesting requirement; (b.) Have at least six months of allowable service credit in each plan worked under; and (c.) Are not in receipt of a benefit from another plan, or have applied for benefits with an effective date within one year. Members who meet the above requirements must have their benefit based on the following: (a.) Allowable service in all covered plans are combined in order to determine eligibility for early retirement; and (b.) Average salary is based on the high five consecutive years during their entire service in all covered plans.
Changes in plan provisions	There have been no changes in plan provisions since the prior valuation.

Additional Schedules

Schedule of Funding Progress[1] *(Dollars in Thousands)*

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded (Overfunded) AAL (UAAL) (b) - (a)	Funded Ratio (a)/(b)	Actual Covered Payroll (Previous FY) (c)	UAAL as a Percentage of Covered Payroll [(b)-(a)]/(c)
7-1-1991	$ 33,559	$ 78,429	$ 44,870	42.79%	$ 18,410	243.73 %
7-1-1992	37,768	83,969	46,201	44.98	22,765	202.95
7-1-1993	44,156	90,509	46,353	48.79	22,084	209.89
7-1-1994	50,428	98,313	47,885	51.29	22,264	215.08
7-1-1995	56,813	102,238	45,425	55.57	22,877	198.56
7-1-1996	64,851	108,150	43,299	59.96	22,421	193.12
7-1-1997	74,681	117,714	43,033	63.44	22,909	187.84
7-1-1998	86,578	130,727	44,149	66.23	24,965	176.84
7-1-1999	97,692	139,649	41,957	69.96	32,940	127.37
7-1-2000	111,113	153,660	42,547	72.31	26,315	161.68
7-1-2001	123,589	165,244	41,655	74.79	28,246	147.47
7-1-2002	131,379	171,921	40,542	76.42	31,078	130.45
7-1-2003	134,142	176,291	42,149	76.09	33,771	124.81
7-1-2004	138,948	190,338	51,390	73.00	34,683	148.17
7-1-2005	144,465	191,414	46,949	75.47	35,941	130.63
7-1-2006	151,850	202,301	50,451	75.06	36,529	138.11
7-1-2007	153,562	214,297	60,735	71.66	36,195	167.80
7-1-2008	147,542	231,623	84,081	63.70	38,296	219.56
7-1-2009	147,120	241,815	94,695	60.84	39,444	240.07
7-1-2010	144,728	240,579	95,851	60.16	39,291	243.95
7-1-2011	145,996	248,630	102,634	58.72	40,473	253.59
7-1-2012	144,898	281,576	136,678	51.46	38,644 [2]	353.69
7-1-2013	144,918	284,513	139,595	50.94	39,888 [2]	349.97
7-1-2014	157,528	298,233	140,705	52.82	41,893 [3]	335.86
7-1-2015	168,235	315,633	147,398	53.30	43,449 [3]	339.24
7-1-2016	172,525	331,334	158,809	52.07	45,418 [3]	349.66
7-1-2017	183,361	348,976	165,615	52.54	47,813 [3]	346.38
7-1-2018	197,852	377,925	180,073	52.35	49,009 [3]	367.43
7-1-2019	208,012	391,146	183,134	53.18	50,164 [3]	365.07
7-1-2020	218,311	402,660	184,349	54.22	52,298 [3]	352.50

[1] Information prior to 2012 provided by prior actuaries. See prior reports for additional detail.
[2] Assumed equal to actual employer contribution divided by 20.50%.
[3] Assumed equal to actual employer contribution divided by 22.50%.

Additional Schedules

Schedule of Contributions from the Employer and Other Contributing Entities[1] *(Dollars in Thousands)*

Plan Year Ended June 30	Actuarially Required Contribution Rate (a)	Actual Covered Payroll (b)	Actual Member Contributions (c)	Annual Required Contributions [(a)x(b)] - (c) = (d)	Actual Employer Contributions[2] (e)	Percentage Contributed (e)/(d)
1991	23.59%	$ 18,410	$ 799	$ 3,544	$ -	0.00 %
1992	25.10	22,765	988	4,726	4,722	99.92
1993	26.59	22,084	1,409	4,463	4,845	108.56
1994	26.29	22,264	1,416	4,437	4,912	110.71
1995	28.27	22,877	1,455	5,012	5,162	102.99
1996	27.32	22,421	1,426	4,699	4,972	105.81
1997	27.01	22,909	1,457	4,731	6,632	140.18
1998	27.60	24,965	1,570	5,320	7,129	134.00
1999	27.32	32,940	2,069	6,930	7,051	101.75
2000	26.75	26,315	2,107	4,932	7,298	147.97
2001	24.58	28,246	2,162	4,781	7,793	163.00
2002	26.72	31,078	2,345	5,959	8,369	140.44
2003	26.82	33,771	2,574	6,483	6,923	106.79
2004	26.73	34,683	2,643	6,628	7,110	107.27
2005	29.42	35,941	2,662	7,912	7,225	91.32
2006	29.14	36,529	2,866	7,779	7,336	94.30
2007	30.73	36,195	2,792	8,331	7,572	90.88
2008	33.70	38,296	2,861	10,045	7,936	79.00
2009	30.33	39,444	2,978	8,985	8,219	91.47
2010	31.53	39,291	2,988	9,400	8,283 [3]	88.12
2011	31.66	40,473	3,010	9,804	8,297	84.63 [3]
2012	33.15	38,644 [4]	2,931	9,879	7,922	80.19
2013	41.52	39,888 [4]	3,037	13,524	8,177	60.46
2014	42.42	41,893 [5]	3,578	14,193	9,426	66.41
2015	41.26	43,449 [5]	3,629	14,298	9,776	68.37
2016	42.73	45,418 [5]	3,763	15,644	10,219	65.32
2017	43.34	47,813 [5]	3,932	16,790	13,758	81.94
2018	44.90	49,009 [5]	3,973	18,032	17,027	94.43
2019	42.94	50,164 [5]	4,049	17,491	17,287	98.83
2020	42.97	52,298 [5]	4,168	18,304	17,767	97.06
2021	42.17	N/A	N/A	N/A	N/A	N/A

[1] *Information prior to 2012 provided by prior actuary. See prior reports for additional detail.*
[2] *Includes contributions from other sources (if applicable).*
[3] *Provided by MSRS instead of prior actuary.*
[4] *Assumed equal to actual employer contribution divided by 20.50%.*
[5] *Assumed equal to actual employer contribution divided by 22.50%.*

Glossary of Terms

Accrued Benefit Funding Ratio	The ratio of assets to Current Benefit Obligations.
Accrued Liability Funding Ratio	The ratio of assets to Actuarial Accrued Liability.
Actuarial Accrued Liability (AAL)	The difference between the Actuarial Present Value of Future Benefits, and the Actuarial Present Value of Future Normal Costs.
Actuarial Assumptions	Assumptions about future plan experience that affect costs or liabilities, such as: mortality, withdrawal, disablement, and retirement; future increases in salary; future rates of investment earnings; future investment and administrative expenses; characteristics of members not specified in the data, such as marital status; characteristics of future members; future elections made by members; and other items.
Actuarial Cost Method	A procedure for allocating the Actuarial Present Value of Future Benefits between the Actuarial Present Value of future Normal Costs and the Actuarial Accrued Liability.
Actuarial Equivalent	Of equal Actuarial Present Value, determined as of a given date and based on a given set of Actuarial Assumptions.
Actuarial Present Value (APV)	The amount of funds required to provide a payment or series of payments in the future. It is determined by discounting the future payments with an assumed interest rate and with the assumed probability each payment will be made.
Actuarial Present Value of Projected Benefits	The Actuarial Present Value of amounts which are expected to be paid at various future times to active members, retired members, beneficiaries receiving benefits, and inactive, non-retired members entitled to either a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.
Actuarial Valuation	The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial Valuation for a governmental retirement system typically also includes calculations of items needed for developing and monitoring a retirement system's funding policy, such as the Funded Ratio and the Annual Required Contribution (ARC).
Actuarial Value of Assets	The value of the assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets or a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the actuarially required contribution (ARC).

Glossary of Terms (Continued)

Amortization Method	A method for determining the Amortization Payment. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. The stream of payments increases at the rate at which total covered payroll of all active members is assumed to increase.
Amortization Payment	That portion of the plan contribution or ARC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.
Amortization Period	The period used in calculating the Amortization Payment.
Annual Required Contribution (ARC)	The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation. The ARC consists of the Employer Normal Cost and Amortization Payment.
Augmentation	Annual increases to deferred benefits.
Closed Amortization Period	A specific number of years that is reduced by one each year, and declines to zero with the passage of time. For example, if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc.
Current Benefit Obligations	The present value of benefits earned to the valuation date, based on current service and including future salary increases to retirement (comparable to a Projected Unit Credit measurement).
Employer Normal Cost	The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.
Expected Assets	The present value of anticipated future contributions intended to fund benefits for current members.
Experience Gain/Loss	A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two actuarial valuations. To the extent that actual experience differs from that assumed, Unfunded Actuarial Accrued Liabilities emerge which may be larger or smaller than projected. Gains are due to favorable experience, e.g., the assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, losses are the result of unfavorable experience; i.e., actual results that produce Unfunded Actuarial Accrued Liabilities which are larger than projected.
GASB	Governmental Accounting Standards Board.

Glossary of Terms (Concluded)

GASB Statements No. 25 and No. 27	These are the governmental accounting standards that previously set the accounting and financial reporting rules for public retirement systems and the employers that sponsor or contribute to them. Statement No. 27 sets the accounting and financial reporting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 25 sets the rules for the systems themselves. These statements remain in effect only for pension plans that are not administered as trusts or equivalent arrangements. Please refer to the definition of GASB Statements No. 67 and No. 68 below.
GASB Statement No. 50	The accounting standard governing a state or local governmental employer's accounting for pensions. This statement remains in effect only for pension plans that are not administered as trusts. Please refer to the definition of GASB Statements No. 67 and No. 68.
GASB Statements No. 67 and No. 68	Statements No. 67 and No. 68, issued in June 2012, replace the requirements of Statements No. 25, No. 27 and No. 50, respectively, for pension plans administered as trusts. Statement No. 68, effective for the fiscal year beginning July 1, 2014, sets the accounting and financial reporting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67, effective for the fiscal year beginning July 1, 2013, sets the rules for the systems themselves. Accounting and financial reporting information prepared according to Statements No. 67 and No. 68 is provided in a separate report beginning with the June 30, 2014 actuarial valuation.
GASB Statement No. 82	Statement No. 82, issued in March 2016, is an amendment to Statements No. 67, No. 68, and No. 73, and is intended to improve consistency in the application of the accounting statements.
Normal Cost	The annual cost assigned, under the Actuarial Cost Method, to the current plan year.
Projected Benefit Funding Ratio	The ratio of the sum of Actuarial Value of Assets and Expected Assets to the Actuarial Present Value of Projected Benefits. A Ratio less than 100% indicates that contributions are insufficient.
Unfunded Actuarial Accrued Liability	The difference between the Actuarial Accrued Liability and Actuarial Value of Assets.
Valuation Date	The date as of which the Actuarial Present Value of Future Benefits are determined. The benefits expected to be paid in the future are discounted to this date.