



Cavanaugh Macdonald
CONSULTING, LLC

The experience and dedication you deserve

**FULL REPLICATION ACTUARIAL AUDIT
OF THE
JUNE 30, 2022 ACTUARIAL VALUATION REPORT
OF THE
SOUTH DAKOTA RETIREMENT SYSTEM**

Prepared November 9, 2022





Cavanaugh Macdonald

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November 9, 2022

Board of Trustees
South Dakota Retirement System
Post Office Box 1098
Pierre, SD 57501-1098

Dear Board of Trustees:

At your request, Cavanaugh Macdonald Consulting, LLC has performed an independent review of the June 30, 2022 actuarial valuation for the South Dakota Retirement System. Earlier this year, we reviewed and provided our opinion on the findings and recommendations in the quinquennial Experience Analysis performed and presented to the Board. The results of the demographic assumptions analysis were presented at the April 5, 2022 Board meeting and the results of the economic assumptions analysis were presented at the June 1, 2022 meeting. As a result of the Experience Analysis, several changes to the set of actuarial assumptions have been adopted by the Board, and are first reflected in the June 30, 2022 valuation. We previously provided our in-depth analysis and commentary on the recommended assumption changes in the Experience Analysis, so they are only briefly discussed in this report.

As an independent, reviewing or auditing actuary, we have been asked to:

- Assess the available data for the preparation of the valuation, the degree to which such data is sufficient to support the valuation conclusions, and the use and appropriateness of any assumptions made regarding the data.
- Comment on actuarial assumptions, funding methods, and procedures used in the valuation.
- Independently replicate the detailed valuation results using the actuarial assumptions, funding methods, and procedures used in the actuarial valuation.
- Reconcile discrepancies between the results determined by the internal Senior Actuary and the results determined by Cavanaugh Macdonald. SDRS intends that, to the extent possible, discrepancies be communicated and resolved with the internal Senior Actuary prior to the completion of the valuation so that adjustments and recommendations may be considered for inclusion in the final valuation report.
- Review the internal Senior Actuary's report for compliance with applicable Actuarial Standards of Practice and Governmental Accounting Standards Board Statements No. 67 and 68.



Our analysis of the actuarial assumptions and methods was based largely on the most recent experience study covering the time period from June 30, 2016 through June 30, 2021 and implemented effective with the June 30, 2022 actuarial valuation. Our opinion on the valuation results was based on a replication valuation of the June 30, 2022 actuarial valuations. We would like to thank Doug Fiddler, the SDRS Senior Actuary, for his cooperation and assistance in providing the required information to us in a timely manner. **We find the actuarial valuation results to be reasonable and accurate based on the actuarial assumptions and methods used. The valuation was performed by a qualified actuary and was performed in accordance with the principles and practices prescribed by the Actuarial Standards Board.** This report documents the detailed results of our review.

In order to prepare the results in this letter, we have utilized actuarial models that were developed to measure liabilities and develop actuarial costs. These models include tools that we have produced and tested, along with commercially available valuation software that we have reviewed to confirm the appropriateness and accuracy of the output. In utilizing these models, we develop and use input parameters and assumptions about future contingent events along with recognized actuarial approaches to develop the needed results. 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 future measurements. While we find the actuarial assumptions to be reasonable, the Board of Trustees has the final decision regarding the appropriateness of the assumptions.

If you need anything else, please do not hesitate to give us a call. The undersigned are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report.

Sincerely,

A handwritten signature in blue ink, appearing to read 'LL'.

Larry Langer, ASA, FCA, MAAA, EA
Principal and Consulting Actuary

A handwritten signature in blue ink, appearing to read 'Patrice Beckham'.

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

A handwritten signature in blue ink, appearing to read 'Aaron Chochon'.

Aaron Chochon, ASA, EA, FCA, MAAA
Associate Actuary



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1. EXECUTIVE SUMMARY

As an independent auditing actuary, Cavanaugh Macdonald Consulting, LLC (CMC) has been tasked to provide a general overview and express an opinion of the reasonableness and soundness of the work performed by the South Dakota Retirement System's Senior Actuary, Mr. Doug Fiddler. The work to be reviewed includes the June 30, 2022 actuarial valuation, as well as the actuarial assumptions and methods used to produce the results.

We requested the raw data file that contains census data for members of the SDRS. We also requested the "valuation data", as reconciled for the 2022 valuation, as well as complete descriptions of assumptions, methods and valuation procedures.

It is our belief that an audit should not focus on finding differences between actuarial processes and procedures utilized by two different actuaries, but rather to verify there are no material errors and to find improvements to the process and procedures utilized by the System's Senior Actuary. In performing this audit, we attempt to limit discussions concerning differing opinions and focus more on the accuracy of calculations, the completeness and reliability of reporting, and the compliance with generally acceptable actuarial practices and standards of practice in all the work reviewed.

Pursuant to the RFP issued by the SDRS, a full replication audit was performed for the June 30, 2019 actuarial valuation. Limited scope reviews were contemplated for the four subsequent valuations performed by the staff actuary. Because the June 30, 2022 valuation implemented new actuarial assumptions adopted by the Board of Trustees following the preparation of an experience analysis, SDRS staff and Cavanaugh Macdonald agreed that a full replication audit would be prudent for the June 30, 2022 valuation.

The scope of the full replication audit project is as follows:

The Contractor shall prepare an independent replication of the June 30, 2022 actuarial valuation of SDRS. The Contractor will consult with SDRS staff throughout the process. SDRS staff will supply both raw and finalized data to the Contractor as of the valuation date. Such replication shall include the following at a minimum:

- A. Assessment of the available data for the preparation of the valuation, the degree to which such data is sufficient to support the valuation conclusions, and the use and appropriateness of any assumptions made regarding the data.
- B. Commentary on actuarial assumptions, funding methods, and procedures used in the valuation.
- C. Independent replication of the detailed valuation results using the actuarial assumptions, funding methods, and procedures used by the internal Senior Actuary.
- D. Reconciliation of discrepancies between the results determined by the internal Senior Actuary and the results determined by the Contractor. SDRS intends that, to the extent possible, discrepancies be communicated and resolved with the internal Senior Actuary



1. EXECUTIVE SUMMARY

prior to the completion of the valuation so that adjustments and recommendations may be considered for inclusion in the final valuation report.

- E. Review of the valuation report for compliance with applicable Actuarial Standards of Practice and Governmental Accounting Standards Board Statements No. 67 and 68.

Conclusions

Because of the complexity of actuarial work, we would not expect to match the internal Senior Actuary's results exactly, nor would we necessarily expect our opinions regarding the selection of assumptions and methods to be exactly the same as the opinions of Mr. Fiddler. The important point is that any differences of opinion are not material to the valuation results. However, our review has confirmed that we do not have any significant differences of opinions that would be material to the valuation results.

Our opinion on the valuation results was based on a replication valuation of the June 30, 2022 actuarial valuation. **We find the actuarial valuation results to be reasonable and accurate based on the actuarial assumptions and methods used. The valuation was performed by a qualified actuary and was performed in accordance with the principles and practices prescribed by the Actuarial Standards Board.**



2. ACTUARIAL ASSUMPTIONS

BACKGROUND ON ACTUARIAL ASSUMPTIONS

The actuarial assumptions form the basis of any actuarial valuation or cost study. Since it is not possible to know in advance how each member's career will evolve in terms of salary growth, future service and cause of termination, the actuary must develop assumptions in an attempt to estimate future patterns. These assumptions enable the actuary to value the amount of benefits earned and to reasonably estimate when and how long these benefits will be paid. Similarly, the actuary must make an assumption about future investment earnings of the trust fund. In developing the assumptions, the actuary examines the past experience and considers future expectations to make the best estimate of the anticipated experience under the plan.

There are two general types of actuarial assumptions:

- Economic assumptions – these include the valuation interest rate (expected return on plan assets), assumed rates of salary increase, price inflation, wage inflation, and increases in total payroll. The selection of economic assumptions should conform to ASOP No. 27 “*Selection of Economic Assumptions for Measuring Pension Obligations*”.
- Demographic assumptions – these include the assumed rates of retirement, mortality, termination, and disability. The selection of demographic assumptions should conform to ASOP No. 35 “*Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*”.

The discussion on the actuarial assumptions on the following pages is based on the data and recommendations in the Experience Analysis covering the study period from June 30, 2016 to June 30, 2021.

Actuarial Assumptions

Discount rate/investment return:	6.50%, net of investment expenses.
Inflation:	2.50%
Wage inflation:	3.15%
Salary merit/seniority:	Service based, decreasing from 4.4% to 0.0% over 25 years.
Retirement:	Age 55 to 80 for non-Public Safety and age 45 to 70 for Public Safety. Rates are generally lower for reduced retirement.
Disability:	Rates for non-Judicial members shown through age 65 and vary by class and employment type. None for Judicial members.



2. ACTUARIAL ASSUMPTIONS

Mortality:	Pub-2010 amount-weighted base mortality tables, which vary by class and employment type, projected generationally with MP-2020. Adjustments were made to the retired member base mortality tables based on credible experience.
Termination:	Five-year select and ultimate for non-Judicial members. Rates for non-Judicial members shown through age 55 and vary by employment type. None for Judicial members.
Marital Status:	80% of non-retired members assumed to be married with male members two years older than spouses and female members two years younger than spouses.
Family Composition:	Members are assumed to have two eligible dependent children while the member is between the ages of 29 and 48.
Future Social Security Increases:	Future Social Security COLA adjustments assumed to be 2.50% per year; future social security taxable wage base increases assumed to be 3.15% per year.
Interest on Member Contributions:	2.25% per annum
Administrative Expenses:	2.0% of projected annual member and employer contributions.
Election of Portable Retirement Option Benefits:	Percentage of election based on credited service at termination, which decreases from 100% at 0-2 years of service to 0% at 30 or more years of service.
Terminated Vested Member Benefit Commencement:	Age 58 for Class A Foundation Members with 20 or more years of Credited Service at termination. Age 48 for Class B Public Safety Foundation Members with 15 or more years of Credited Service at termination. Three years prior to Normal Retirement Age for all others.
COLA:	2.25% (baseline) 2.10% (restricted maximum based of June 30, 2022, valuation)



2. ACTUARIAL ASSUMPTIONS

Actuarial Assumptions - Review

Actuarial assumptions used in the valuation are based on an experience study covering the time period from June 30, 2016 through June 30, 2021. In general, we believe there are no inherent conflicts in the assumptions now in use with the requirements imposed by applicable Actuarial Standards of Practice.

With respect to the most critical assumptions used in this valuation, we have the following comments:

Investment return/discount rate: ASOP No. 27 requires the selection of a reasonable assumption that may include consideration of a margin for “adverse deviation”.

We note the investment return assumption of 6.50% is below the median return of 7.00% used by most public-sector pension plans. However, this assumption is heavily impacted by the asset allocation for the portfolio and the perspective of each Board of Trustees. It is also worth noting that the 6.50% assumed return is lower than the 20-year historical plan experience of 8.15% shown in Table 5.3 on page 24 of the June 30, 2022 Actuarial Valuation report. We have reviewed the development of the assumption in the June 1, 2022 presentation to the Board entitled “Experience Analysis: Economic Assumptions” and we find it to be complete and supportive of the use of the current set of economic assumptions. We believe the current rate of 6.50% is reasonable.

Inflation: We believe the inflation assumption of 2.50% is reasonable and in line with the levels of inflation assumed by other public-sector pension plans.

Wage inflation: We believe the wage inflation assumption is reasonable and within the range of assumptions used by other public-sector pension plans. The wage inflation assumption of 3.15% is 65 basis points higher than the inflation assumption of 2.50%.

Salary merit/seniority: The salary increase assumption can be separated into a general wage inflation and merit/seniority increase assumptions. The merit/seniority salary increase assumption is a service-based assumption, with smaller increases, as a percentage of pay, for longer-service employees. In our experience, salary increases are typically closely correlated with service and most public plans use a service-based merit salary assumption. We concur with this methodology, and the merit/seniority rates appear



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reasonable when compared to those used by other public retirement systems.

Retirement:

We concur with separating of the retirement assumptions by occupational categories, and the rates themselves appear to be consistent with those used by other public sector retirement systems. The retirement assumption used in the SDRS valuation reflects lower retirement rates for those who are eligible for reduced retirement benefits which is a pattern commonly observed in other systems. The Normal Retirement Age (NRA) is age 65 with three years of service for non-Public Safety Foundation members. Because the Foundation member group includes those who were hired on or before June 30, 2017, these members constitute nearly all of the observed retirement experience up to this point. Therefore, our analysis is focused on this group. This group's highest pre-NRA retirement rates are 28.5% (for eligibility for reduced early retirement benefits) and 40% (for eligibility for unreduced benefits). All active members are assumed to retire immediately by age 80, 25 years after initial retirement eligibility

Similar to non-Public Safety group, the Foundation group accounts for all retirement experience up to this point for Public Safety members. Normal Retirement Age for this group is age 55 with three years of service. The highest pre-NRA retirement rates are 16.5% (for eligibility for reduced early retirement benefits) and 33.0% (for eligibility for unreduced benefits). All active members are assumed to retire immediately by age 70, 25 years after initial retirement eligibility.

These assumptions appear to be reasonable based on the findings of the most recent experience study.

Disability:

The assumed disability rates appear to be reasonable, based on those used by other public-sector retirement systems we have worked with.

Mortality:

For the first time, in 2019 the Society of Actuaries published a set of mortality tables based solely on public plan data: the Pub-2010 Mortality Tables. Separate tables were created for Teachers, Public Safety and General Employees. These tables have become a key resource for the selection of mortality assumptions for public plans. In our opinion, recommending



2. ACTUARIAL ASSUMPTIONS

and adopting the respective Pub-2010 mortality rates for each employment type, along with reflecting generational mortality using scale MP-2020, is reasonable and meets the requirements of ASOP No. 35.

Termination:

We agree with the application of assumed termination rates by years of service in the first five years of employment and by both service and age for members in later years. The termination rates incorporated in the valuation appear to be in line with those used by other public-sector plans in our experience.

Interest on member contributions:

Interest is credited at a rate less than or equal to the minimum of 90% of the average 91-day US Treasury rate for the preceding calendar year and the assumed rate of investment return. In our opinion, the contribution interest assumption is reasonable.

Terminated member commencement:

The reduction for early retirement is 3% per year for Foundation Members and 5% per year for Generational Members. This appears to reflect a degree of subsidization by the plan for Foundation Members but to be actuarially neutral for Generational Members. We agree members may likely elect a benefit prior to Normal Retirement eligibility given this subsidy for Foundation Members. In our opinion, the stated assumptions are reasonable.

COLA:

The COLA is defined in levels based on the SDRS Fair Value Funded Ratio (FVFR):

- 1) FVFR at least 100% when future COLAs are equal to the baseline COLA assumption:
 - % increase in most recent 3rd calendar quarter CPI-W over the prior year (min 0.5%, max 3.5%)
- 2) FVFR less than 100% when future COLAs are equal to the baseline COLA assumption:
 - Same as above, but restricted maximum COLA is based on a future COLA assumption that results in a FVFR of at least 100%

The baseline assumption is that COLAs will be granted



2. ACTUARIAL ASSUMPTIONS

at the rate of 2.25% per year, which is reasonable.

The results of the June 30, 2022 actuarial valuation indicate a 2023 COLA based on the restricted maximum COLA of 2.10%, and the liabilities and normal costs in the valuation are determined on the assumption that future COLAs are equal to 2.10%.

Generational Members have a different level of benefits and subsidies which could result in different patterns of termination and retirement. As the Generational Members become a larger portion of the active membership, it will be important to establish a separate set of demographic assumptions for this group. While enough actual member experience may not be available in the next experience study in 2027, each assumption should be considered and discussed even if the recommendations are based on professional judgment and future expectations. For example, since Generational Members' retirement eligibility criteria differ from those applicable to Foundation Members, the actuary has used professional judgment to adjust the retirement rates of Generational Members pending the accumulation of sufficient experience among Generational Members to serve as a basis for this assumption.



3. ACTUARIAL METHODS

SDRS is funded by fixed, statutory Member and Employer Contributions that total 12.407% of covered compensation in the June 30, 2022 actuarial valuation. As stated in the valuation report, the purpose of the valuation is:

- (1) to determine if the funded status of SDRS is at least 100% assuming future COLAs are equal to the baseline COLA assumption of 2.25% and if not, to determine the restricted maximum COLA that results in a funded status of 100%,
- (2) to determine the 2023 COLA for SDRS,
- (3) to determine the funded status of SDRS as of June 30, 2022,
- (4) to confirm that such fixed, statutory contributions are the Actuarially Determined Contributions (ADC),
- (5) to determine if corrective actions must be recommended,
- (6) to provide accounting information under GASB 67 and 68, and
- (7) to identify, assess, and disclose risks to future SDRS funding.

The annual valuation provides the basis for making such determinations based on the actuarial methods described in the report. On this basis, the 2022 Actuarial Valuation of SDRS determines a restricted 2023 COLA of no greater than 2.10%, results in a Fair Value Funded Ratio of 100.0%, confirms that the statutory rates of contribution are the ADC and that no corrective actions or recommendations are required.

Actuarial Methods - Review

For all pension plans, whether defined benefit or defined contribution, the basic retirement funding equation is:

$$C + I = B + E$$

Where:

- C = employer and member contributions
- I = investment income
- B = benefits paid
- E = expenses paid from the fund, if any.

As can be seen from the formula, for a given level of contributions and expenses the greater “I” is, the greater “B” can be. This is the underlying reason for advance funding a pension plan, and historically investment income pays for 65% to 70% of the benefit dollars received by plan members. In other words, for every dollar paid to a member only 30 to 35 cents comes from contributions.



3. ACTUARIAL METHODS

Of course, the problem with the formula is that in order to figure out exactly how much benefits can be paid, the plan would have to be closed to new members and allowed to operate until all retirees were deceased. At that point, the benefits and expenses actually paid out, and the investment income actually earned would be known and, using the equation above, the true cost could be determined. Since the vast majority of plans are ongoing and have no intention of closing, and since even with a closed plan it takes a very long time before all benefits are finally paid out, plan sponsors hire actuaries to estimate the cost of their plans and to determine the amount of benefits that can be paid given a level of contributions.

In order to determine the benefits that can be paid for a current level of contributions, the actuary's first step is to estimate on a given date (the valuation date) the value of all benefits (and expenses) that will be paid to the existing active and retired membership over their remaining lifetimes based on the plan's current benefit structure based on the baseline COLA assumption. This estimation requires the use of assumptions regarding both future events (termination, disability, retirement, death, etc.) and future economic conditions (return on assets, inflation, salary growth, etc.).

By combining the assumptions for future events and the salary growth assumption, the actuary generates an expected benefit payment stream. In other words, a string of annual payments expected to be made to the current active and retired members from the valuation date until all members are no longer living. Then the actuary applies the investment return assumption to discount each year's payments to the valuation date, creating the present value of all future benefits or the total liability of the plan.

The difference between the total liability and the current assets of the plan represents the present value of future contributions (PVFC) that have to be made by either members or the employers. Usually, the members and employers cannot contribute the entire difference in one year, but rather desire a relatively smooth contribution pattern over time that also meets any external constraints. In order to budget for the PVFC, the actuary applies an actuarial cost method. There are several acceptable cost methods, but it's important to recognize that they are nothing more than budgeting tools.

Different actuarial cost methods can provide for faster funding earlier in a plan's existence, more level funding over time, or more flexibility in funding. The choice of an actuarial cost method will determine the pattern or pace of the funding and, therefore, should be linked to the long-term financing objectives of the system and benefit security considerations.

The Entry Age Normal actuarial cost method, which is used in the SDRS valuation, satisfies the requirements of Actuarial Standard of Practice (ASOP) No. 4 and is an appropriate method to use for the calculation of System's Actuarial Accrued Liability and Normal Costs. Furthermore:

- Normal Cost is calculated as a level percentage of each member's pay over the member's career.
- The majority of public plans use such cost method for funding.



3. ACTUARIAL METHODS

- GASB Statement Nos. 67 and 68 require the use of the individual version of such cost method for financial accounting and disclosure. For the ADC, the aggregate version is used.
- Use of the same cost method for funding enhances consistency between funding and accounting valuations.

The Conference of Consulting Actuaries Public Plans Community (CCA PPC) White Paper entitled “Actuarial Funding Policies and Practices for Public Pension Plans” (dated October 2014) categorizes such cost method as the model actuarial cost method.

In our opinion, the actuarial cost method employed for the SDRS valuation is appropriate and will systematically fund the prospective pension benefits on an actuarially sound basis, if all actuarial assumptions are met in the future.

ASSET VALUATION METHOD

The SDRS actuarial valuation uses the fair market value of assets. We believe this is appropriate given SDRS’ Funding Policy objectives to manage SDRS benefits based on the fixed, statutory member and employer contribution rates. Those objectives include a funded ratio, on the market value of assets, that is at least 100%, and actuarially determined benefits that are variable and supported by the fixed, statutory contributions. To this end, the cost-of-living adjustment (COLA) granted each year is adjusted to maintain a funded ratio of 100%, subject to certain minimum and maximum limits.

Given the Board’s Funding Policy, we believe the use of market value for an asset valuation method is reasonable. Because Actuarial Standard of Practice Number 44 only applies to the use of asset valuation methods other than pure market value, it does not apply to the SDRS valuation.

AMORTIZATION OF UNFUNDED ACTUARIAL ACCRUED LIABILITY METHOD

Based on the Board’s Funding Policy which maintains a funded ratio of 100%, there is no unfunded actuarial accrued liability and an amortization policy is not needed. We would note that if the Fair Value Funded Ratio is less than 100%, corrective action recommendations would be required so any unfunded actuarial accrued liability would be temporary.



4. DATA REVIEW

The System's actuary supplied CMC with the census data used to generate the June 30, 2022 valuation results, as well as the "raw" census data that he received from SDRS staff. As part of our audit of the June 30, 2022 valuation, we analyzed these data for internal consistency and completeness. Our review involved a lengthy series of data checks, involving dozens of data items. While disclosing all the detailed analysis included in our various data reviews would not be particularly helpful, the list below illustrates some of the highlights of our data review.

1. We were able to match the key membership statistics disclosed in the June 30, 2022 valuation report, including member count by status, average age, average salary and projected payroll.
2. Overall, the benefit amount for those in pay status was generally 3.50% higher than last year which is consistent with the expected increase reflected in the June 30, 2021 valuation results.
3. Overall, members in the June 30, 2022 active data who were not in the June 30, 2021 data (i.e. new entrants) looked reasonable.
4. Changes to standard data items such as age, service and salary amounts were reasonable.
5. When comparing the raw data files to the final census data use to generate the valuation results, we were able to match within reasonable margins to status counts, salaries, service, and benefit amounts.

In summary, we found no notable issues during our review of the June 30, 2022 valuation data.



5. ACTUARIAL VALUATION RESULTS REVIEW

REASONABLENESS OF THE ACTUARIAL VALUATION RESULTS

This section of our review discusses the reasonableness and accuracy of the valuation liabilities and costs.

Generally accepted actuarial standards and practices provide actuaries with the basic mathematics and the framework for calculating the actuarial results. When it comes to applying those actuarial standards to complex calculations, differences may exist due to individual opinion on the best way to perform those complex calculations. Differences may also arise from the actuarial software used to perform these calculations, especially in the allocation of liabilities between past and future service for active members. Although these factors may lead to differences in the calculated results, these differences should not be material. Generally, differences in the present value of benefits of 1% to 2% or less and differences in the actuarial liabilities of 3% to 5% or less are considered reasonable. The normal cost rate should generally be within 5% as well, but it is also important that it be consistent with the relationship of the present value of benefits and the actuarial accrued liability.

As part of the actuarial audit, CMC used the data provided by the System's actuary to reproduce the valuation liabilities used for the calculations in the June 30, 2022 valuation. We have presented a summary of our results at the end of this section. While the results are generally a very close match, we also looked at a finer level of detail than is displayed. This allowed us to identify differences that would not otherwise be apparent from the summarized results. However, the reasonable match of the summarized results emphasizes that the differences discussed in the remainder of this section are indeed minor. ***Based on the results of our review, overall, we find the actuarial calculations in the June 30, 2022 actuarial valuation to be reasonable.***

During the 2019 Actuarial Valuation report audit, CMC and the System's actuary discussed five differences in methodology and approach that were identified during the replication process. None of these are materially significant. As a result of our discussions, four of the five recommendations have been adopted by the System's actuary. The one exception was the continued use of the Aggregate Entry Age Normal cost method, rather than moving to the Individual Entry Age Normal method. During our discussions with the Senior Actuary, it was explained that the Aggregate Entry Age Normal cost method provides for more stable costs from year to year. Stable normal cost measurements are especially important to SDRS because contribution rates are fixed and benefit provisions are directly impacted if the fixed contribution rates are less than the calculated minimum actuarial requirement. We suggest that the aggregate and individual methods continue to be monitored, and consideration be given to using the individual method for all purposes to be consistent. That being said, the aggregate method is acceptable, if it is determined to be more stable for ADC purposes.



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of June 30, 2022 Liability Measures (Assumes 2.10% COLA in the future)

	<u>SDRS</u>	<u>CMC</u>	<u>CMC/SDRS</u>
Present Value of Benefits			
- Active Members	7,489,474,313	7,530,467,420	1.005
- Inactives	<u>8,999,041,699</u>	<u>8,996,905,828</u>	1.000
- Total	16,488,516,012	16,527,373,248	1.002
Actuarial Accrued Liability			
- Active Members	5,117,619,676	5,132,178,143	1.003
- Inactives	<u>8,999,041,699</u>	<u>8,996,905,828</u>	1.000
- Total	14,116,661,375	14,129,083,971	1.001
Normal Cost Amount	275,090,199	277,350,167	1.008
Present Value of Future Normal Costs	2,371,854,637	2,398,289,277	1.011
Present Value of Future Active Member Compensation	20,548,147,981	20,673,137,330	1.006
Normal Cost Rate, Beginning of Year	11.543%	11.601%	
Normal Cost Rate, Adjusted for Mid-Year Payment	11.912%	11.972%	

As observed above, these differences are well within the tolerances noted on the previous page. In particular, all results were well within the most stringent threshold of less than 1% to 2% reserved for the present value of benefits.



6. VALUATION REPORT REVIEW

CONTENT OF THE ACTUARIAL REPORTS

The American Academy of Actuaries has issued a number of Actuarial Standards of Practice which deal with measuring pension obligations and communicating the results (ASOP No. 4, 23, 27, 35, 41, 44, 51 and 56). Those standards list specific elements to be included, either directly or by reference to other documents, in pension actuarial communications. Some of the elements would not be pertinent in all communications, but since an actuarial valuation report is the most complete picture of the actuarial status of the plan, all of the elements listed should be covered in the report, even if only briefly.

Disclosure of Actuarial Assumptions and Methods

During the replication process, CMC requested additional information from the System's actuary regarding the actuarial assumptions and methods used to generate liabilities. Overall, the assumptions and methods we inquired about were minor and have very little impact on the valuation results. We recommend that the following assumptions also be disclosed in the valuation report:

- Benefit payment form election
- Benefit commencement date for deferred beneficiaries
- Mortality assumption for the Cement Plant Retirement Plan and Dept of Labor

Risk Assessment and Disclosure

ASOP No. 51 provides guidance to actuaries with respect to the assessment and disclosure of risk with respect to future actuarial measurements, which may vary significantly from current measurements. Examples of future measurements noted are pension liabilities, actuarially determined contributions and funded status. The standard applies to actuaries when performing a funding valuation and is effective for any actuarial work product with a measurement date on or after November 1, 2018.

In our opinion, the risk discussion included in the June 30, 2022 actuarial report complies with ASOP No. 51. The identification of risk to be assessed appears reasonable and appropriate. The initial risk assessment indicates investment risk is the most significant risk to SDRS funding and benefit levels. Other less significant risks identified were longevity risk, inflation risk, salary increase risk, other demographic risk, covered payroll risk and contribution risk. For each of these less significant risks, scenarios were generally described where departures from expectations would result in a certain general outcome. ASOP No. 51 does not require that the assessment of a risk be based on numerical calculations, but the SDRS actuary does a good job of addressing the risks by including some quantitative analysis.

The report included further assessment of investment risk. While many methods of risk assessment are allowed, the choice of scenario testing for investment risk appears reasonable and appropriate. The scenario testing appropriately showed the impact on funding results over a five-



6. VALUATION REPORT REVIEW

year period if actual returns were significantly less than or greater than the assumed investment return of 6.5%. The analysis showed that investment risk most significantly impacts a member's level of benefits since automatic benefit adjustments occur in both the low return and high return scenarios. In addition, severe or prolonged low return scenarios may trigger a requirement for corrective action recommendations and extreme or prolonged high return scenarios may permit consideration of benefit improvements in accordance with the Board's policies. As such, the report includes one-, two- and three-year projections of the amount of investment return needed (and the likelihood of such return) to meet certain objectives such as avoiding corrective action or providing a full COLA. The assessment of investment risk as a major risk to the System is appropriate and compliant with ASOP No. 51, in our opinion.

ASOP No. 51 also indicates that the actuary should consider disclosing certain plan maturity measures that the actuary believes are significant to understanding risks to the plan and provide commentary to help the reader understand the significance of the measurement in the assessment of risk. For this requirement, the actuary included historical ratios of assets and liabilities to active member payroll, historical percentages of retired and terminated member counts to total member counts, historical percentages of retired and terminated member liability to total member liability and historical cash flow measurements as a percentage of assets. The actuary generally described the significance of each plan maturity measurement, but we believe some additional commentary to help the user understand their significance might improve this section of the report. For example, while it is clear both the number and portion of liability attributable to retirees has increased over the last 15 years, there is no explanation as to how this creates risk for the System.

Overall, we believe the information provided in the June 30, 2022 valuation report is very comprehensive and does a good job of communicating the most significant risks to SDRS.

Modeling Disclosure

ASOP No. 56 was adopted by the Actuarial Standards Board in December, 2019 and was first effective for work performed on or after October 1, 2020. The purpose of this standard is to provide guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. A "model" in this context was defined to include annual actuarial valuation reports. In our opinion, the language on page 2 of the report satisfies the disclosure requirements of ASOP No. 56.

We believe the content and disclosures included in the SDRS valuation report are in compliance with current Actuarial Standards of Practice (ASOPs).