



Cavanaugh Macdonald
CONSULTING, LLC

The experience and dedication you deserve



ACTUARIAL REVIEW REPORT FOR
SOUTH CAROLINA
PUBLIC EMPLOYEE BENEFIT AUTHORITY

Prepared June 21, 2023





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

June 21, 2023

Board of Trustees
South Carolina Public Employee Benefit Authority
202 Arbor Lake Drive
Columbia, South Carolina 29223

Dear Members of the Board:

Cavanaugh Macdonald Consulting, LLC has performed an independent review of the June 30, 2022 actuarial valuations of the South Carolina Retirement Systems. As an independent reviewing or auditing actuary, we have been asked to express an opinion regarding the reasonableness and accuracy of the actuarial assumptions, actuarial cost methods, and valuation results.

Our opinion on the valuation results was based on a replication valuation of the June 30, 2022 actuarial valuations and review of the valuation reports and related documents. The retained actuary for the South Carolina Public Employee Benefit Authority (PEBA) is Gabriel, Roeder, Smith & Company (GRS). We would like to thank GRS for their cooperation and assistance in providing the required information to us.

We find the actuarial valuation results to be generally reasonable and accurate based on the assumptions used. We have offered several suggestions for items to consider regarding the assumptions and reports. The valuation was performed by qualified actuaries 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.

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.



June 21, 2023
Board of Trustees
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If you need anything else, please do not hesitate to give us a call.

Sincerely,

A handwritten signature in blue ink that reads 'Alisa Bennett'.

Alisa Bennett, FSA, FCA, MAAA, EA
President

A handwritten signature in blue ink that reads 'Edward J. Koebel'.

Edward J. Koebel, FCA, MAAA, EA
Chief Executive Officer

A handwritten signature in blue ink that reads 'Micki R. Taylor'.

Micki Taylor, ASA, FCA, MAAA, EA
Consulting 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 Gabriel, Roeder, Smith & Company (GRS) for the South Carolina Public Employee Benefit Authority (PEBA). The work to be reviewed included the June 30, 2022 valuations for the five defined benefit retirement plans under PEBA's pension system and the 2020 Actuarial Experience Study.

We requested full participant data of the pertinent employee groups from PEBA along with reports, plan descriptions and applicable statutes pertaining to the plans. We also requested from GRS participant data as reconciled for the valuation, selected intermediate results or subtotals, and a complete description of assumptions, methods and valuation procedures. During the process, we requested a number of clarifying questions or additional information and GRS was very responsive.

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 PEBA's 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 of the work reviewed.

The Scope of Work from the RFP requested that the audit include the following reviews for all five plans the PEBA oversees; South Carolina Retirement System (SCRS), Police Officers Retirement System (PORS), Judges and Solicitors Retirement System (JSRS), General Assembly Retirement System (GARS), and the South Carolina National Guard Supplemental Retirement Plan (SCNG):

- A review of the current actuarial assumptions, procedures, and methodology for reasonableness and compliance with the state statutes, funding standards, and generally accepted actuarial standards. The assumptions evaluated should include both demographic and economic assumptions, such as mortality, retirement, separation rates, levels of pay adjustments, investment return assumption, and disability factors.
- A review of the appropriateness and internal consistency of the actuarial assumptions.
- Verification of demographic data, including the degree to which data is sufficient to support the conclusions of the investigation.



1. EXECUTIVE SUMMARY

- Independent verification and analysis of the actuarial valuation results, including a determination of the actuarial accrued liability, normal cost, funded status, expected employee and employer contributions, and the effects of any recent legislation.

CONCLUSIONS

As described in our report, we have determined that the actuarial methods, assumptions, processes, and reports are consistent with the applicable Actuarial Standards of Practice. Throughout the report, we have noted a few areas where we believe there are opportunities for improvement. We believe it appropriate that these recommendations be considered when the next experience study is carried out and/or when the 2023 valuations are prepared.

Additional details on our audit findings can be found in the remaining sections of this report. In Section 2 of our report, we analyze the set of actuarial assumptions recommended by GRS. The actuarial assumptions are a critical component of the valuation process and, thus, were reviewed as part of the audit.

In Section 3 of our report, we review the actuarial methods that are used to develop the actuarial contribution rate. In our opinion, these actuarial methods and policies used by GRS are reasonable and appropriate for systematically funding PEBA.

In Section 4 of our report, we compare the data provided by PEBA with the data used by GRS. We find that the data is consistent and appropriate and contains the needed information to perform a valuation.

In Section 5 of our report, we independently calculated the liabilities of PEBA. We attempted to match the total Present Value of Benefits for PEBA in total and at finer levels. We compared the normal cost rate by plan in order to confirm the cost calculations performed by GRS. While we matched fairly closely in aggregate, when we reviewed sample test life results, a few differences were found that could not be reconciled by both actuarial firms. However, we think these differences may be due to differences in timing, such as beginning of year or middle of year decrements, differences in actuarial software, or placing elements of liability in different “buckets” at the finer levels. In our opinion, the calculations being performed by GRS seem to be accurate, appropriate, and consistent with recognized actuarial practice.



1. EXECUTIVE SUMMARY

In Section 6, we provide our analysis on the valuation reports produced by GRS. We found them to be generally in compliance with the ASOPs.

Because of the complexity of actuarial work, we would not expect to match GRS's results exactly, nor would we necessarily expect our opinions regarding the selection of assumptions and methods to be the same as the opinions of GRS.

The remainder of this report provides the basis for our findings for each of the tasks, including our recommendations.



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 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.*"

In order to assess the reasonableness of the assumptions, we reviewed the 2020 Experience Study that GRS prepared for PEBA and issued December 2, 2020. We did not audit this experience study, but we did consider the reasonableness of the results and the appropriateness of the recommendations.



2. ACTUARIAL ASSUMPTIONS

ECONOMIC ASSUMPTIONS

Actuarial Standards of Practice (ASOPs) are issued by the Actuarial Standards Board to provide guidance to actuaries with respect to certain aspects of performing their work. As mentioned earlier, ASOP 27 is the actuarial standard that addresses the selection of or recommendations regarding economic assumptions for measuring pension obligations (liabilities) under defined benefit plans.

Price Inflation: Price inflation impacts the assumptions for investment return along with wage and payroll growth. The underlying price inflation component in all of these must be consistent in accordance with the guidance provided in ASOP 27.

In their report, GRS considered several sources of inflation estimates and then recommended no change in the inflation assumption of 2.25%. This assumption was set based on an experience period prior to the beginning of the COVID-19 pandemic and, although we have experienced rather high inflation over the last year and a half due to the recovery from the pandemic, current economic forecasts suggest annual inflation rates closer to 2.40% over the short-term and long-term, respectively. So, we believe the assumption recommended by GRS to be reasonable and within actuarial standards and we assume it will be evaluated again in the next experience study.

Investment Return Assumption: The investment return assumption should represent the long-term compound rate of return expected on the plan assets, considering the asset allocation, the real rate of return on each asset class, and the underlying inflation rate, all net of expenses paid from the Trust.

The long-term relationship between price inflation and investment return has long been recognized by economists. The basic principle is that the investor demands a more or less level “real return” – the excess of actual investment return over price inflation. If inflation rates are expected to be high, investment return rates are also expected to be high, while low inflation rates will result in lower expected investment returns, at least in the long run.

The period considered for pension funding represents a very long time horizon. In reviewing this assumption, the actuary should consider asset allocation policy, historical returns, and expectations of future returns. Frequently, asset advisors focus on no more than the next 5 to 10 years since they are most concerned with how to invest the funds currently to maximize returns. While actuaries are projecting benefits to be paid for the next 50 to 100 years, the short term is also relevant, especially for funds with negative cash flows. This difference in perspective can significantly influence how investment advisors and actuaries derive an investment return assumption.



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The investment return assumption is a prescribed assumption under Section 9-16-335 of the South Carolina State Code and the GRS experience study report makes a recommendation for this assumption. A core part of the GRS analysis was to review the investment return assumption on four different measures when making their recommendation:

1. Actual Investment Performance
2. Comparison to Other Retirement Systems
3. Forecasts Based on 2020 Capital Market Assumptions from Meketa Investment Group
4. Comparison of Meketa's Expectation to Other Investment Consultants

We agree with GRS that while selecting an investment return assumption, the appropriate approach should be to put more weight on the forward-looking capital market assumptions. We find the short-term (10-year) and long-term (20-year) expected geometric return expectations of 6.57% and 7.44%, respectively, to be reasonable based on similar experience we performed for our clients at this same time.

Based on the above range of nominal returns and further analysis on the investment return assumption from other investment consultant's capital market assumptions, we find the investment return assumption proposed by GRS of 7.00%, including a 2.25% price inflation assumption and a 4.75% real return assumption, to be reasonable. This prescribed assumption rate was set by an outside party under Section 9-16-335 of the South Carolina State Code and used by the PEBA Board. We also note that GRS recommended that the General Assembly modify the statute to provide the PEBA Board the authority to establish and maintain the investment return assumption or to have the General Assembly review this assumption on a more frequent basis than every four years. It is our experience that most systems allow the Board to set this assumption.

General Wage Increases: The general wage growth or wage inflation assumption consists of price inflation and real wage growth (also called productivity). As the price of goods and services increase, we expect wages to increase as well. Productivity is a measure of how much wages increase across the whole labor pool in excess of the rate of price inflation. Both of these items tend to be a function of the general economy rather than Fund specific. GRS recommended continuation of a 3.00% assumption for SCRS and 3.50% for PORs, which implies a real wage growth of 0.75% and 1.25% for SCRS and PORs, respectively. Typically this assumption would be the same for all plans because it is a broad economic assumption and differences would be seen in the merit component, but based on our experience with economic assumptions and public employment, we find this to be a reasonable assumption. This assumption was set based on an experience period prior to the beginning of the COVID-19 pandemic and, although we have experienced recent wage increases higher than expected, many of these could be described as catch up increases following wage freezes during COVID. It is unclear what long term impacts may



2. ACTUARIAL ASSUMPTIONS

occur due to inflation and labor shortages, so we assume this assumption will be evaluated again in the next experience study.

Payroll Growth Assumption: The UAAL is amortized as a level percentage of payroll over the amortization period for most groups. As a result, a payroll growth assumption is necessary to develop the UAAL contribution rate. In the Experience Study, GRS recommended a decrease in the payroll growth assumption from 3.00% to 2.70% for SCRS and PORS and continuation of the 3.00% assumption for JSRS. However, the JSRS actuarial valuation report shows 2.70% for this assumption. The funding period for JSRS rounds to the same number in the June 30, 2022 using either assumption, so we are not sure which is intended. We recommend this be reviewed in the 2023 valuation. The assumption is that payroll growth is less than the general wage inflation assumption, but more than price inflation. This is reasonable because as members retire or terminate, they are replaced by new members with lower salaries on average. This is especially pronounced in the current environment in which a lot of Baby Boomers are retiring. Using a lower payroll growth assumption also provides for a small degree of conservatism. We find the assumption reasonable.

Individual Salary Scale: There are two factors that generally affect salary increases and are typically reflected in the individual salary scale. First is wage inflation or the total wage growth assumption. The other component, frequently identified as merit scale, reflects the portion of salary increases provided at the individual level, including promotion, increased skills, longevity pay, and other similar items. The combination of these components is reflected in the total individual salary scale.

GRS has developed merit scales for SCRS and PORS, reflecting that different groups of members experience different patterns of pay increases. The assumptions are all service based for the first twenty years or so, and then just wage inflation thereafter. We note that the exhibit of pay increases by service indicates a definite declining trend from hire through 20 years of service and fairly flat thereafter. We generally prefer to have the merit scale grade to 0% at some point, and GRS has assumed that as well in their recommended tables. Therefore, we find the individual salary scales to be reasonable.



2. ACTUARIAL ASSUMPTIONS

DEMOGRAPHIC ASSUMPTIONS

The major demographic assumptions are the assumed rates of retirement, withdrawal (with or without a vested benefit), disability, and mortality (death before or after retirement). There are also various minor assumptions that sometimes are developed with a significant component of professional judgment since useful data is not always readily available.

In the following paragraphs, we make specific comments on the demographic assumptions.

Rates of Mortality: Generally, the most important demographic assumption in the pension valuation is mortality because it projects how long benefit payments are expected to be made. The longer retirees live and receive benefits, the larger the liability of PEBA, thus increasing the contributions required to fund PEBA. In addition, if members live longer than expected based on the assumption, the true cost of future benefit obligations will be understated, and contributions will increase as the unfavorable experience unfolds.

GRS analyzes the mortality experience for male and female retirees and combined SCRS and PORS together to determine credibility and setting a base mortality table assumption. In anticipating future mortality improvement, GRS recommended using 80% of the ultimate mortality improvement rates (UMP) generational mortality improvement scale published by the Society of Actuaries (SOA). Their rationale is that GRS has observed that mortality improvement in South Carolina has lagged that of the United States as a whole, and so they propose a mortality improvement scale that is 80% of the SOA published tables. While this may be reasonable, it is also possible that because South Carolina has higher mortality than most of the United States there is more room for improvement and that future mortality improvements could equal or exceed rather than lag the rates in the SOA table. We would suggest considering whether it might be appropriate to use more than 80% of the rates and provide some margin for adverse deviation should South Carolina begin to catch up with the rest of the nation.

In proposing a retiree mortality table, GRS provides a fairly standard analysis which shows for quinquennial age groups the number of deaths and exposures, the observed death rate on a count and benefit-weighted basis, the corresponding table rates in the current and proposed mortality tables, the number of deaths expected under the current and proposed tables, and the ratio of the observed to expected number of deaths. (This ratio of the actual to expected deaths is called the A/E ratio for short.) The final column with a range from 100% to 102% A/E ratio indicates that the proposed mortality table would predict at most 2% more male deaths than expected. When using a mortality improvement projection scale, it is considered very appropriate to select a table that predicts mortality at close to, or slightly higher than, the observed experience.



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For many years, most pension mortality tables developed by the SOA have been developed based not on the number of observed deaths in the data, but upon the amount of benefits that ended due to death compared with the amount of benefits in payment. This “benefit-weighted” approach provides the actuary with a table that reflects a nearly universal observation: those with larger benefits tend to live longer than those with lower benefits. The complete reason for this is often debated, but the reality of the pattern is accepted and is reflected in mortality tables to better reflect expected benefit payments over time. (There are mortality tables based on headcount rather than amounts for use in cases such as post-retirement medical benefits where the annuity amount is not important.)

In their analysis on pages 90 through 94 of the Experience Study, GRS has a column that shows the observed death rates on a benefits basis – specifically the 2nd column. Comparing this to the current and proposed mortality table in the 7th and 8th columns indicates, on a benefits basis, the A/E ratios of between 100% and 102% were observed for all the groups studied. (These figures can be found in the 9th and 10th columns of their tables). An A/E ratio of less than 100% means that fewer deaths have occurred than expected and liabilities may be understated. In our opinion, a proposed table should have an A/E ratio of between 95% and 105% and an A/E ratio of less than 90% is inappropriate.

Reviewing the data at each quinquennial age group, one would find some outliers from this range but for the most prevalent age ranges (60 – 94), the proposed mortality table recommended by GRS resulted in A/E ratios that fit into our preferred range.

On page 31 of the Experience Study report, the recommended non-disabled mortality rates are shown as below:

State and Local Government Retirees:

Males: 2020 PRSC for Males multiplied by 97%

Females: 2020 PRSC for Females multiplied by 107%

Public School Employees:

Males: 2020 PRSC for Males multiplied by 95%

Females: 2020 PRSC for Females multiplied by 94%

Retirees in PORS:

Males: 2020 PRSC for Males multiplied by 127%

Females: 2020 PRSC for Females multiplied by 107%



2. ACTUARIAL ASSUMPTIONS

However, we did not see any backup data or analysis to explain these adjustments. We recommend providing this information, especially due to the magnitude of the male PORS adjustment, and we recommend including this information in the subsequent experience studies.

Rates of Retirement: GRS has developed retirement rates for each Plan by employee type and gender. These rates of retirement are service based, varying in some cases by eligibility for reduced versus unreduced retirement or bands of service earned. There are also adjustments made in some cases for higher rates to be assumed in the first year of eligibility.

GRS compared the actual retirements with the expected retirements on a liability-weighted basis. Based on this, they typically moved part way from the current rates toward the observed rates. However, we do note that in three instances they did propose rates of retirement that moved the A/E ratio further from 100% from the current rates (e.g. Reduced Public School Males, Unreduced General Males, and Unreduced General Females).

They placed more emphasis on the last two years of experience for SCRS after the Teachers' Employee Retention Incentive Program (TERI) was completely phased out so this could explain some of these anomalies, as they stated on page 40 of their report. Overall, we find this approach appropriate and believe the selected rates are reasonable.

For the other three groups (JSRS, GARS, and the SCNG), we find the proposed rates of retirement to be reasonable.

Rates of Termination: Like retirement, GRS has developed termination rates that vary by employee type and gender. For SCRS, the rates are based on a select-and-ultimate approach where the termination rates are service based for the member's first ten years of employment (11 years for teachers), and then based on the member's years from retirement eligibility and service, ultimately.

For the select period, GRS compared the actual withdrawals with the expected withdrawals over the experience period, assessing the liability-weighted actual versus expected results. They stated that for this assumption, it is more conservative to have an A/E ratio above 100%, which we agree. So, based on this statement, they proposed increased termination rates for three groups of SCRS members (all but Male Public School Employees), moving part way from the current rates towards the observed rates and maintaining an A/E ratio ranging from 107% to 111%. We find this approach appropriate and believe the selected rates are reasonable.

For the ultimate period, GRS proposed increased rates of termination for most service from retirement amounts and for the most part, this was deemed reasonable and warranted. They tended



2. ACTUARIAL ASSUMPTIONS

to smooth out their proposed rates, starting with higher rates for the further number of years from retirement and then smaller rates when members are fairly close to retirement. This lowered the A/E ratios in half for three of the four groups and we find this to be a reasonable approach. However, GRS only decreased the A/E ratio for Male Public School Employees from 122% to 116%, and we believe there was some actual experience that warranted some further adjustments in the rates for this group. There may have been a reason why they did this but it was not provided for in their report.

For PORS, GRS has based rates on a service-only structure and we agree with this methodology. The A/E ratio for this group in aggregate was 111% and actual experience showed more terminations than expected at all ages. While GRS did not recommend any changes to these rates during this experience study, we believe they should review this assumption carefully during the next study to see if this trend continues.

Rates of Disability: In most retirement systems, disability retirements are relatively rare, making it difficult to set rates. The rates used by GRS are age-based with separate tables for employment groups. Separate rates are considered for males and females. Tables are age-based, which is virtually universal.

We do not have any concerns with the proposed incidence of disability rates based on our review.

MISCELLANEOUS ASSUMPTIONS

There are some miscellaneous assumptions used in the valuation that are discussed in one paragraph on page 41 of the Experience Study report. GRS makes a brief statement that they reviewed all of these miscellaneous assumptions and deem them to be realistic or conservative. We do, however, recommend that the following assumptions be listed and reviewed in more detail as part of the next experience study report:

Refund of Member Contributions: In the valuation process, this assumption is applied to active members who terminate employment. It anticipates a possible election of a refund of accumulated employee contributions by the member and the forfeiture of any vested monthly benefit at retirement eligibility. GRS assumes rates of refund for those vested based on age, so they should provide this backup data within the experience study report.

Unused Annual Leave: GRS applies a load for the effect of unused annual leave on Average Final Compensation on their active liabilities for Class 2 SCRS and PORS members. First, we recommend that GRS provide the details of this analysis as this is a fairly significant increase to



2. ACTUARIAL ASSUMPTIONS

liabilities and is more than an ancillary assumption. Second, we recommend GRS disclose that this also applies to normal cost calculations in their valuation report. Third, GRS indicated that this load applies to all decrements and we would recommend the load not be applied to refunds of contributions. Finally, we recommend clarifying in the valuation reports that this load is only applied to Class 2 members similar to how they describe the load for sick leave.

Sick Leave Load: GRS applies an increase of 3 months service to Class 2 members for SCRS and PORS. This is a relatively small load, but we would suggest that the derivation or support of this load be included in the Experience Study.



2. ACTUARIAL ASSUMPTIONS

EXPERIENCE STUDY REPORT

In our opinion, the Experience Study report indicates that the assumptions are being set in keeping with the applicable Actuarial Standards of Practice, notably ASOP 27 and ASOP 35. We note that some experience study reports contain moderate to extensive narrative regarding the selection of assumptions. This is a matter of preference that should be resolved between the actuary and the client.

As noted above, we believe the report should include additional disclosure regarding the mortality assumption and the various miscellaneous assumptions along with any support from the data.



3. ACTUARIAL METHODS

BACKGROUND ON ACTUARIAL METHODS

Actuarial methods are used to provide for systematic funding of a retirement plan. There are four broad considerations when establishing a funding policy for a pension plan:

- ***Sufficiency***: The funding target should be the value of benefits accrued to date so that benefits can be paid when due.
- ***Intergenerational equity***: Taxpayers and members should pay for workers' pensions while those workers are providing their services. The goal is to fund for the worker's benefits over the worker's career.
- ***Stability of contributions***: Generally governmental entities prefer predictable funding patterns. While stable contributions are easy to budget for, stability should not be achieved at the expense of the first two considerations.
- ***Accountability and transparency***: Each component of the funding policy should be clear on the intent and effect.

Generally, a funding policy is composed of the following actuarial methods:

- Actuarial Cost Method
- Asset Valuation Method
- Amortization of Unfunded Actuarial Accrued Liability Method

We discuss each component of the actuarial methods for PEBA and how these components satisfy the four broad considerations when establishing a funding policy below.



3. ACTUARIAL METHODS

ACTUARIAL COST METHOD

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 benefits and expenses the greater “I” is, the smaller “C” is. This is the underlying reason for advance funding a pension plan, and historically investment income pays for 75% to 80% of the benefit dollars received by plan members. In other words, for every dollar paid to a member only 20 to 25 cents comes from contributions.

Of course, the challenge with the formula is that in order to know exactly how much to contribute, we would have to allow the plan to operate until all retirees were deceased and all benefits have been paid out. 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.

In order to determine the contributions needed, 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. 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.). The PEBA assumptions were covered in the previous section.

By combining the assumptions for future events, the actuary generates an expected benefit payment stream; i.e., 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.



3. ACTUARIAL METHODS

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 PEBA and benefit security considerations.

In addition to referencing applicable Actuarial Standards of Practice, we reference the paper developed by the Conference of Consulting Actuaries Public Plans Community (CCA PPC) entitled "Actuarial Funding Policies and Practices for Public Pension Plans." We will refer to this as the CCA PPC Paper.

The actuarial cost method for PEBA is described on page 47 of the SCRS Valuation Report and is shown below for reference:

The contribution rate is set by statute for both employees and employers. The funding period is determined, as described below, using the Entry Age Normal. The Entry Age Normal actuarial cost method allocates the System's actuarial present value of future benefits to various periods based upon service. The portion of the present value of future benefits allocated to years of service prior to the valuation date is the actuarial accrued liability, and the portion allocated to years following the valuation date is the present value of future normal costs. The normal cost is determined for each active member as the level percent of payroll necessary to fully fund the expected benefits to be earned over the career of each individual active member. The normal cost is partially funded with active member contributions with the remainder funded by employer contributions.

An unfunded accrued liability exists in the amount equal to the excess of accrued liability over valuation assets. The amortization period of the System is the number of years required to fully amortize the unfunded accrued liability with the expected amount of employer contributions in excess of the employers' portion of the normal cost.



3. ACTUARIAL METHODS

The calculation of the amortization period takes into account scheduled increases to contribution rates applicable to future years and payroll growth. Also, the calculation of the actuarial determined contribution rate and amortization period reflects additional contributions the System receives with respect to ORP participants and return to work retirees. These contributions are assumed to grow at the same payroll growth rate as for active employees. It is assumed that amortization payments are made monthly at the end of the month.

The actuarial cost method used by GRS in the valuation is the individual variant of the entry age normal cost method. This actuarial cost method is used by the majority of public funds in the United States. This cost method determines the normal cost as a level percentage of pay *for each individual* which, if paid from entry into the plan to the last assumed retirement age, will accumulate to an amount sufficient to pay the expected benefit. Entry age normal tends to result in reasonably stable contribution rates, a feature that has helped make it the most commonly used cost method for public plans. The use of the entry age normal cost method satisfies the sufficiency and intergenerational equity components discussed above by developing contributions for taxpayers and members for workers' pensions while those workers are providing their services. The goal is to fund for the worker's benefits over the worker's career by paying for the cost of benefits accrued. An additional cost is determined by amortizing the unfunded actuarial accrued liability (discussed later in this section).

In our opinion, the actuarial cost method employed by the PEBA and GRS is appropriate and will systematically fund the prospective pension benefits on an actuarially sound basis if all of the actuarial assumptions are reasonably accurate and the actuarial required contributions are made.



3. ACTUARIAL METHODS

ASSET VALUATION METHOD

Since the purpose of actuarial funding is to build up an asset pool (remember the importance of “I” in “ $C + I = B + E$ ”) actuaries need to value the current asset pool on each valuation date. The market value could be used, but it would tend to create too much volatility from valuation date to valuation date, and a single day’s measurement is not necessarily indicative of the true underlying value of the investments held by the plan. Thus, most actuaries use an asset valuation method which smooths out these fluctuations in pursuit of achieving more stable funding measures and (when relevant) developing more level contributions. A good asset valuation method places values on a plan’s assets which are related to current market value, but which will also produce a smooth pattern of costs. This is a question of balancing fit (measured against market value) and smoothness.

The goal of the actuarial asset valuation method is thus to smooth or reduce investment market fluctuations. This is particularly important during periods of volatile capital markets in which abrupt changes in asset values, when factored into the funding valuation, produce sudden unnecessary changes in contribution levels. In this case, “unnecessary” implies that the change in asset values is not necessarily a true revaluing of the assets involved, but rather a fluctuation reflecting a current economic climate or a short-term reaction to specific news.

In our opinion, desirable characteristics of an actuarial asset valuation method include the following:

- The method should be simple to operate. It should be readily calculable from financial statements.
- The method should be easy to explain to all interested parties.
- The theoretical underpinnings should be solid and not produce a long-term lag to the fair value of assets. The value produced should account for market values.
- The method should smooth the effect of market fluctuations.
- Investment decisions should not be affected by the actuarial asset valuation method, and vice versa.
- The value produced should be realistic; the price tag placed on assets should be sensible and should not cause other variables to be adjusted to account for unrealistic asset values.



3. ACTUARIAL METHODS

The use of an asset valuation method satisfies the stability of contributions component by providing for contribution stability which is not achieved at the expense of the sufficiency and intergenerational equity components of a sound funding policy.

The Asset Valuation Method for PEBA is described on page 47 of the SCRS Valuation Report and is shown below for reference:

The actuarial value of assets is equal to the market value, adjusted for the five-year phase in of the actual investment return in excess of (or less than) the expected investment return on a market value of asset basis. The actual return is calculated net of investment expenses, and the expected investment return is equal to the assumed investment return rate multiplied by the prior year's market value of assets, adjusted for contributions, benefits paid, and refunds.

We find the description of the method is reasonable and accurate to the calculation shown on page 21 of the SCRS Valuation Report.

Compliance with ASOP 44: Actuarial Standard of Practice Number 44, “Selection and Use of Asset Valuation Methods for Pension Valuations,” provides guidance to the actuary when selecting an asset valuation method for purposes of a defined benefit pension plan actuarial valuation. When considering the use of an asset valuation method other than market value, ASOP 44 states the actuary should select an asset valuation method that is designed to produce actuarial values of assets that bear a reasonable relationship to the corresponding market values. Further guidance states that the asset valuation method must satisfy both of the following criteria:

(a) The asset values fall within a reasonable range around the corresponding market value.

AND

(b) Any differences between the actuarial value of assets and the market value of assets are recognized within a reasonable period of time.

In lieu of satisfying both (a) and (b) above, an asset valuation method meets ASOP 44 requirements if, in the actuary’s professional judgment, the asset valuation method either:

- (i) Produces values within a sufficiently narrow range around market value OR
- (ii) Recognizes differences from market value in a sufficiently short period.



3. ACTUARIAL METHODS

Several of the terms in the criteria of ASOP 44 such as “reasonable” and “sufficiently narrow” are not well defined. As a result, actuaries can differ in their opinion on these matters. As we consider the current asset valuation method used by GRS for the PEBA valuation in light of ASOP 44, we believe it satisfies these requirements.

The current asset valuation method is reasonable and complies with actuarial standards.



3. ACTUARIAL METHODS

UNFUNDED ACTUARIAL ACCRUED LIABILITY (UAAL) AMORTIZATION METHOD

The UAAL amortization method determines the length of time and the structure of the increase or decrease in contributions required to systematically fund the UAAL. The UAAL amortization method is comprised of the following components:

- ***Amortization period:*** The period over which the UAAL is paid off.
- ***Closed or open amortization:*** Under a closed amortization the amortization period decreases by one each year and the associated UAAL is “paid off”; under an open amortization, referred to as rolling period above, the UAAL is amortized over the same amortization period and the associated UAAL is not “paid off”.
- ***Single base or amortization layers:*** Under a single base all UAAL is amortized as one component; under amortization layers the UAAL is broken down into several layers, with new layers added each valuation.
- ***Level dollar or level percent of payroll:*** Under level dollar the payments are calculated so the payment is the same dollar amount in the future; under level percent of payroll the payments are projected to increase each year.

The model amortization policy practice from the CCA PPC Paper can be found on page 26 and includes the following parameters:

- ***Amortization period:*** The amount varies by source
 - ***Active Plan Amendment*** – lesser of active demographics or 15 years
 - ***Inactive Plan Amendments*** – lesser of inactive demographics or 10 years
 - ***Experience Gain/loss*** – 15 to 20 years
 - ***Assumption or Method Changes*** – 15 to 25 years
 - ***Early retirement Incentive*** – 5 years or less
- ***Closed or open amortization:*** closed amortization
- ***Single base or amortization layers:*** amortization layers
- ***Level dollar or level percent of payroll:*** level percent of payroll



3. ACTUARIAL METHODS

For PEBA, the UAAL amortization method used for the calculated contribution rates for SCRS, PORS, and JSRS is set by State statute and can be found in the letter of the valuation reports as follows:

The employer contribution rate is established in accordance with Section 9-1-1085 of the South Carolina Code, which first came into existence by the Retirement System Funding and Administration Act of 2017 and last amended by Act 135 and a subsequent budget proviso.

Additionally, the Statute specifies that the maximum amortization period is 25 years as of July 1, 2022 and the maximum amortization period will decrease by one year in each of the next five years until reaching a maximum 20-year funding period on July 1, 2027. The employer contribution rate determined by an actuarial valuation must be sufficient to maintain an amortization period that does not exceed 20 years each year thereafter. Finally, the Board is not permitted to decrease the employer and member contribution rates until the funded ratio of the plan is at least 85%.

Comparing the CCA PPC model policy to the PEBA policy reveals some differences:

Parameter	CCA PPC Paper	PEBA
Amortization Period	Varies by Cause	Maximum 25-year period
Closed or Open Amortization	Closed	Blend
Single Base or Amortization Layer	Amortization layer	Single base
Level Dollar or Level Percent of Payroll	Level percent of payroll	Level percent of payroll*

* Level dollar for GARS and SCNG

Since the contribution rate is set in statute for SCRS, PORS, and JSRS, the amortization period for those plans fluctuates from year to year based on experience. We like that the Statute includes a maximum amortization period to ensure sustainability for each System. However, we would recommend that PEBA institute a calculation of an Actuarial Determined Contribution (ADC) for each plan to compare to the employer contribution rate established in Statute. This will ensure that the System is projected to have an improved funded ratio and reach its goal of 100% funded in a faster manner. This is likely to be addressed with the implementation of ASOP 4.



4. DATA REVIEW

DATA ANALYSIS

We requested and received the participant data files that PEBA provided to GRS for the June 30, 2022 valuations. There were over 715,000 records in the active member file, including around 430,000 inactive or retired records, leaving approximately 285,000 active records. There were over 182,000 records in the retired file. GRS also supplied us with their processed data files that were used for the valuations. Based on a comparison of the client data and the GRS data, GRS assigned status based on several fields found in the client data. We find their final headcounts to be reasonable based on the data we had to review; we understand edits are sometimes needed after combining the active and retired files and after comparing them to the prior year data. Other than some steps to determine status, it appears GRS performs virtually no data manipulation on the PEBA files, except to correct any missing or inconsistent data. The fact that GRS can use the PEBA files essentially unedited is an indication of the quality of the supplied data. We commend PEBA for developing such an effective process.

We also considered the data elements provided by PEBA to determine if the data contained sufficient detail for being able to adequately assess the liabilities of the retirement system. While a few of the plans had differences in annual or deferred benefits, we did not identify any issues that were of concern to us.



4. DATA REVIEW

SCRS Key Data Comparison as of July 1, 2022

	GRS	CMC	Difference
Actives			
Number	200,989	200,989	0
Average Age	45.5	45.5	0.0
Average Service	10.3	10.3	(0.0)
Total annualized prior year salaries	9,964,502,082	9,964,502,082	0
Total projected payroll	10,429,574,000	10,469,494,719	39,920,719
Contributions with Interest	9,318,169,203	9,318,169,203	(0)
Vested Inactives			
Number	23,054	23,054	0
Total Deferred Benefits	184,545,915	191,567,168	7,021,253
Nonvested Inactives			
Number	193,457	193,457	0
Contributions with Interest	463,484,499	463,484,497	(2)
Service Retirements			
Number	127,950	127,950	0
Total Annual Benefits	2,920,977,880	2,920,977,860	(20)
Average Age	71.9	71.9	0.0
Disableds			
Number	11,245	11,245	0
Total Annual Benefits	166,425,630	166,426,050	420
Average Age	67.8	67.8	0.0
Beneficiaries			
Number	11,661	11,661	0
Total Annual Benefits	154,253,990	154,254,009	19
Average Age	67.9	67.9	0



4. DATA REVIEW

PORS Key Data Comparison as of July 1, 2022

	GRS	CMC	Difference
Actives			
Number	26,606	26,606	0
Average Age	39.6	39.6	0.0
Average Service	10.1	10.2	0.1
Total annualized prior year salaries	1,433,864,149	1,433,864,149	0
Total projected payroll	1,513,764,000	1,516,949,909	3,185,909
Contributions with Interest	1,214,045,244	1,214,045,244	0
Vested Inactives			
Number	2,792	2,792	0
Total Deferred Benefits	27,650,448	27,634,131	(16,317)
Nonvested Inactives			
Number	18,403	18,403	0
Contributions with Interest	71,206,588	71,206,588	0
Service Retirements			
Number	16,397	16,397	0
Total Annual Benefits	376,650,798	376,650,782	(16)
Average Age	66.5	66.5	0.0
Disableds			
Number	2,797	2,797	0
Total Annual Benefits	61,599,698	61,599,721	23
Average Age	57.9	57.9	0.0
Beneficiaries			
Number	1,646	1,646	0
Total Annual Benefits	22,026,912	22,026,903	(9)
Average Age	67.3	67.3	(0)



4. DATA REVIEW

JSRS Key Data Comparison as of July 1, 2022

	GRS	CMC	Difference
Actives*			
Number	160	160	0
Average Age	57.9	57.9	0.0
Average Service	15.4	15.4	0.0
Total annualized prior year salaries	27,357,948	27,357,996	48
Total projected payroll	32,037,472	31,925,130	(112,342)
Contributions with Interest	35,494,860	35,494,860	0
Vested Inactives			
Number	2	2	0
Total Deferred Benefits	151,073	151,073	0
Nonvested Inactives			
Number	4	4	0
Contributions with Interest	177,248	177,248	0
Service Retirements			
Number	161	161	0
Total Annual Benefits	24,094,767	24,094,759	(8)
Average Age	73.7	73.7	0.0
Disableds			
Number	0	0	0
Total Annual Benefits	0	0	0
Average Age	N/A	N/A	N/A
Beneficiaries			
Number	63	63	0
Total Annual Benefits	2,323,636	2,323,636	0
Average Age	69.1	69.1	0

*Counts include 15 retired-in-place members and 4 unfilled positions. Total annualized prior year salaries exclude these additional members; the amount for GRS is estimated based on the average compensation shown in Table 15 of the JSRS valuation report.



4. DATA REVIEW

GARS Key Data Comparison as of July 1, 2022

	GRS	CMC	Difference
Actives			
Number	53	53	0
Average Age	60.4	60.4	0.0
Average Service	19.9	19.9	0.0
Total annualized prior year salaries	1,203,800	1,203,800	0
Total projected payroll	1,203,800	1,203,800	0
Contributions with Interest	4,157,900	4,157,900	0
Special Contributors			
Number	19	19	0
Contributions with Interest	1,038,282	1,038,282	0
Vested Inactives			
Number	14	14	0
Total Deferred Benefits	312,609	312,609	0
Nonvested Inactives			
Number	15	15	0
Contributions with Interest	193,381	193,381	0
Service Retirements			
Number	258	258	0
Total Annual Benefits	5,213,705	5,213,691	(14)
Average Age	75.8	75.8	0.0
Disableds			
Number	0	0	0
Total Annual Benefits	0	0	0
Average Age	0.0	0.0	0.0
Beneficiaries			
Number	79	79	0
Total Annual Benefits	1,017,367	1,017,367	0
Average Age	73.9	73.9	0



4. DATA REVIEW

SCNG Key Data Comparison as of July 1, 2022

	GRS	CMC	Difference
Actives			
Number	12,047	12,047	0
Average Age	32.6	32.6	0.0
Average Service	10.8	10.8	0.0
Total annualized prior year salaries	N/A	N/A	N/A
Total projected payroll	N/A	N/A	N/A
Contributions with Interest	N/A	N/A	N/A
Vested Inactives			
Number	1,511	1,511	0
Total Deferred Benefits	1,225,920	1,225,920	0
Nonvested Inactives			
Number	0	0	0
Contributions with Interest	0	0	0
Service Retirements			
Number	5,097	5,097	0
Total Annual Benefits	4,617,720	4,617,720	0
Average Age	72.1	72.1	0.0
Disableds			
Number	0	0	0
Total Annual Benefits	0	0	0
Average Age	N/A	N/A	N/A
Beneficiaries			
Number	0	0	0
Total Annual Benefits	0	0	0
Average Age	N/A	N/A	N/A



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 make those complex calculations. Differences may also arise from the actuarial software used to make 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 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 liability.

We first ran all 5 plans in aggregate and found the overall results to fall within reasonable ranges as explained in the paragraph above. Next, we examined a representative group of individual employees in greater detail, not only comparing the liability measurements, but also reviewing the timing of payroll increases, retirements and mortality timing. The following pages show the results of our analysis in aggregate and for the representative group of individual employees in greater detail, with discrepancies over 5% highlighted. Since we matched so closely in aggregate results and since we do not find the individual deviations to be systemic, we do not find them surprising or of particular concern.

Based on the results of our review, overall, we find the actuarial liabilities and normal cost measures to be reasonable in aggregate. Since all of the plans except GARS and SCNG have fixed statutory rates, we matched the expected funding period and were able to match within rounding.



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of June 30, 2022 Principal Results for SCRS In Aggregate (\$ in thousands)

	GRS	CavMac	Difference
Present Value of Future Benefits			
Actives	\$ 29,798,355	\$ 29,776,427	-0.1%
Inactive (Vested and Non Vested)	1,625,439	1,676,532	3.1%
Annuitants	<u>34,071,915</u>	<u>34,024,329</u>	-0.1%
Total	\$ 65,495,709	\$ 65,477,288	0.0%
Actuarial Accrued Liability	\$ 56,924,028	\$ 57,059,049	0.2%
Actuarial Value of Assets	<u>32,250,013</u>	<u>32,250,013</u>	
Unfunded Accrued Liability	\$ 24,674,015	\$ 24,809,036	
Normal Cost as % of Pay	10.74%	11.01%	2.5%
Projected Payroll for Active Members	\$ 10,429,574	\$ 10,469,495	0.4%
Projected Payroll for All Members, including working retirees and members in ORP	\$ 12,646,572	\$ 12,686,493	
Amortization	16.64%	16.37%	
Expenses	0.18%	0.18%	
Funding Period (years)	17	17	
Total Required Contribution	27.56%	27.56%	
Employee Rate	<u>9.00%</u>	<u>9.00%</u>	
Required Employer Contribution	18.56%	18.56%	



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Valuation Results for SCRS Active Employees

System	Class	Age	Salary	System Svc	Total Svc	Sex	GRS				CMC				% Difference - CMC to GRS			
							PVFB	AL	NC	PVFS	PVFB	AL	NC	PVFS	PVFB	AL	NC	PVFS
SCRS General	2	48	39,795	15.333	15.333	F	144,331	101,146	4,331	405,766	143,698	98,339	4,305	408,247	-0.44%	-2.77%	-0.60%	0.61%
SCRS General	3	68	48,337	5.571	5.571	F	69,033	47,896	5,596	181,541	71,529	38,913	9,034	159,729	3.62%	-18.76%	61.44%	-12.01%
SCRS General	2	54	529,238	19.910	19.910	M	1,995,570	1,597,658	50,372	4,271,186	2,012,589	1,595,023	51,345	4,206,822	0.85%	-0.16%	1.93%	-1.51%
SCRS General	3	33	125,949	9.633	9.633	F	211,827	100,716	9,815	1,440,378	215,110	107,872	9,118	1,409,732	1.55%	7.11%	-7.10%	-2.13%
SCRS General	2	42	49,155	6.635	22.574	M	134,125	110,033	2,960	408,805	134,765	116,415	2,108	418,003	0.48%	5.80%	-28.78%	2.25%
SCRS General	3	18	15,597	0.083	0.083	M	11,229	384	1,123	150,274	10,960	0	1,006	134,440	-2.40%	-100.00%	-10.42%	-10.54%
SCRS Teachers	2	48	68,485	18.000	18.000	F	292,581	217,680	7,873	664,693	293,081	216,452	7,924	652,725	0.17%	-0.56%	0.65%	-1.80%
SCRS Teachers	3	34	45,757	10.000	10.000	F	102,723	49,303	4,121	590,383	104,464	48,673	4,167	589,461	1.69%	-1.28%	1.12%	-0.16%
SCRS Teachers	2	51	3,849	8.172	30.064	M	12,130	10,839	244	19,923	10,936	10,341	105	19,250	-9.84%	-4.59%	-56.97%	-3.38%
SCRS Teachers	2	59	71,143	13.821	13.821	F	231,683	187,301	10,349	300,165	239,455	187,780	11,118	327,356	3.35%	0.26%	7.43%	9.06%
SCRS Teachers	3	67	95,077	3.333	3.333	M	99,408	48,349	10,732	425,616	102,109	39,363	13,593	401,276	2.72%	-18.59%	26.66%	-5.72%
SCRS Teachers	3	22	23,785	0.316	0.316	F	22,613	387	2,233	243,785	23,584	0	2,173	249,288	4.29%	-100.00%	-2.69%	2.26%



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Valuation Results for SCRS Inactive Employees

System	Status	Age	Employee Contribution				% Difference -		
			Balance	Benefit Amount*	Payment Form	Sex	GRS PVFB	CMC PVFB	CMC to GRS
SCRS	VT	32	32,181.03	527.40	Deferred Life Annuity	F	32,181	32,181	0.00%
SCRS	VT	51	468,494.85	7,863.92	Deferred Life Annuity	M	468,766	468,495	-0.06%
SCRS	VT	57	141,546.42	1,789.13	Deferred Life Annuity	M	142,293	145,599	2.32%
SCRS	VT	69	598.68	13.21	Deferred Life Annuity	M	3,650	3,765	3.15%
SCRS	VT	59	226.99	2.73	Deferred Life Annuity	M	648	676	4.32%
SCRS	VT	33	35,236.98	0.00	Deferred Life Annuity	F	35,237	35,237	0.00%
SCRS	VT	52	41,228.89	698.61	Deferred Life Annuity	F	41,229	42,196	2.35%
SCRS	VT	43	8,895.60	422.76	Deferred Life Annuity	M	74,281	77,828	4.78%
SCRS	Retired	65	92,212.40	2,285.64	50% J&S /Revert	F	418,859	414,655	-1.00%
SCRS	Retired	74	116,626.87	3,541.49	100% J&S /Revert	M	497,582	491,053	-1.31%
SCRS	QDRO	64	144,622.56	2,426.91	100% J&S /Revert	F	294,617	290,912	-1.26%
SCRS	Retired	69	72,643.36	1,735.36	Social Security	M	299,167	301,297	0.71%
SCRS	Retired	66	144,622.56	2,602.72	100% J&S /Revert	M	428,491	424,664	-0.89%
SCRS	Disabled	57	56,311.42	1,617.78	Maximum	F	215,457	214,999	-0.21%
SCRS	Retired	74	52,737.46	1,997.76	10 year Refund	F	232,785	227,558	-2.25%
SCRS	Retired	57	129,754.87	1,477.55	100% J&S /Revert	F	261,467	259,516	-0.75%
SCRS	Disabled	80	10,598.85	484.93	50% J&S	M	42,702	43,678	2.29%
SCRS	Beneficiary	63	2,445.96	1,151.67	100% J&S	F	177,991	176,938	-0.59%

* Monthly; estimated for VTs



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Principal Valuation Results for PORS In Aggregate (\$ in thousands)

	GRS	CavMac	Difference
Present Value of Future Benefits			
Actives	\$ 5,203,211	\$ 5,156,266	-0.9%
Inactive (Vested and Non Vested)	299,817	293,153	-2.2%
Annuitants	<u>5,293,122</u>	<u>5,300,732</u>	0.1%
Total	\$ 10,796,150	\$ 10,750,151	-0.4%
Actuarial Accrued Liability	\$ 9,092,631	\$ 9,117,026	0.3%
Actuarial Value of Assets	<u>5,947,764</u>	<u>5,947,764</u>	
Unfunded Accrued Liability	\$ 3,144,867	\$ 3,169,262	
Normal Cost as % of Pay	15.12%	15.39%	1.8%
Projected Payroll for Active Members	\$ 1,513,764	\$ 1,516,950	0.2%
Projected Payroll for All Members, including working retirees and members in ORP	\$ 1,626,826	\$ 1,630,012	
Amortization	15.69%	15.42%	
Expenses	0.18%	0.18%	
Funding Period (years)	16	17	
Total Required Contribution	30.99%	30.99%	
Employee Rate	<u>9.75%</u>	<u>9.75%</u>	
Required Employer Contribution	21.24%	21.24%	



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Valuation Results for PORS Active Employees

System	Class	Age	Salary	System Svc	Total Svc	Sex	GRS				CMC				% Difference - CMC to GRS			
							PVFB	AL	NC	PVFS	PVFB	AL	NC	PVFS	PVFB	AL	NC	PVFS
PORS	2	40	51,260	15.041	16.516	F	269,777	198,819	7,962	466,908	268,975	205,460	7,116	443,675	-0.30%	3.34%	-10.63%	-4.98%
PORS	2	47	77,804	12.083	15.583	M	320,506	220,381	12,409	638,125	322,058	243,566	9,074	649,055	0.48%	10.52%	-26.88%	1.71%
PORS	2	51	56,420	21.891	30.063	M	355,226	321,825	7,291	247,111	359,411	338,006	4,454	229,650	1.18%	5.03%	-38.91%	-7.07%
PORS	3	37	27,388	2.25	6.75	F	63,790	23,706	3,807	290,020	61,178	31,112	2,812	270,386	-4.09%	31.24%	-26.14%	-6.77%
PORS	3	30	47,633	4.667	7.583	F	128,513	52,949	6,614	549,112	124,782	65,306	5,126	515,768	-2.90%	23.34%	-22.50%	-6.07%
PORS	3	53	50,641	2.917	2.917	M	76,596	27,356	8,291	299,096	78,431	28,310	7,874	290,226	2.40%	3.49%	-5.03%	-2.97%



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Valuation Results for PORS Inactive Employees

System	Status	Age	Benefit		Sex	GRS PVFB	CMC PVFB	% Difference - CMC to GRS
			Amount	Payment Form				
PORS	VT	49	1,422	Maximum	M	149,832	149,744	-0.06%
PORS	VT	69	494	Maximum	F	66,302	65,899	-0.61%
PORS	VT	41	137	Maximum	F	39,046	39,045	0.00%
PORS	VT	41	846	Maximum	M	50,121	52,204	4.16%
PORS	Disabled	68	2,296	Maximum	M	252,215	243,889	-3.30%
PORS	Disabled	41	1,724	100% J&S /Revert	M	336,770	337,693	0.27%
PORS	QDRO	62	622	Maximum	F	95,637	95,795	0.16%
PORS	Disabled	62	1,707	50% J&S /Revert	M	273,841	272,232	-0.59%
PORS	Retired	71	565	100% J&S	F	82,385	82,331	-0.07%
PORS	Retired	69	32	50% J&S	M	4,806	4,811	0.10%
PORS	Disabled	81	267	100% J&S	M	33,466	32,265	-3.59%
PORS	Retired	74	923	Maximum	M	88,890	89,238	0.39%
PORS	Retired	71	3,785	Social Security	F	474,852	475,281	0.09%
PORS	Retired	53	3,004	100% J&S /Revert	M	543,988	546,978	0.55%
PORS	Disabled	63	1,347	50% J&S	M	186,321	183,733	-1.39%
PORS	Beneficiary	70	2,563	100% J&S	F	331,272	330,146	-0.34%
PORS	Retired	68	727	50% J&S /Revert	M	115,372	116,514	0.99%
PORS	Beneficiary, AD	68	732	Life Annuity	M	87,196	87,087	-0.13%



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Principal Valuation Results for JSRS In Aggregate (\$ in thousands)

	GRS	CavMac	Difference
Present Value of Future Benefits			
Actives	\$ 218,875	\$ 214,770	-1.9%
Inactive (Vested and Non Vested)	1,185	1,202	1.4%
Annuitants	<u>296,820</u>	<u>296,849</u>	0.0%
Total	\$ 516,880	\$ 512,821	-0.8%
Actuarial Accrued Liability	\$ 449,607	\$ 446,234	-0.8%
Actuarial Value of Assets	<u>207,551</u>	<u>207,551</u>	
Unfunded Accrued Liability	\$ 242,056	\$ 238,683	
Normal Cost as % of Pay	30.56%	30.72%	0.5%
Projected Payroll for All Members, including working retirees and unfilled positions	\$ 32,037	\$ 31,925	
Amortization	42.20%	42.04%	
Expenses	0.18%	0.18%	
Funding Period (years)	21	21	
Total Required Contribution	72.94%	72.94%	
Employee Rate	<u>10.00%</u>	<u>10.00%</u>	
Required Employer Contribution	62.94%	62.94%	



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Valuation Results for JSRS Active Employees

System	Type	Age	Salary	System Svc	Total Svc	Sex	GRS				CMC				% Difference - CMC to GRS			
							PVFB	AL	NC	PVFS	PVFB	AL	NC	PVFS	PVFB	AL	NC	PVFS
JSRS	Judge	68	202,655	31.264	31.264	M	2,475,932	2,453,895	22,796	102,617	2,365,448	2,324,885	43,917	185,370	-4.46%	-5.26%	92.65%	80.64%
JSRS	Judge	46	202,655	3.250	3.250	M	882,810	197,748	46,601	3,065,375	867,218	153,331	52,376	2,952,428	-1.77%	-22.46%	12.39%	-3.68%
JSRS	Judge	63	213,321	0.250	0.250	M	1,240,225	268	164,997	1,643,618	1,240,919	0	171,964	1,528,869	0.06%	-100.00%	4.22%	-6.98%
JSRS	Judge	61	197,321	18.422	18.422	F	1,570,416	1,251,421	50,943	1,268,842	1,508,935	1,181,915	49,934	1,344,323	-3.91%	-5.55%	-1.98%	5.95%
JSRS	Solicitor	52	202,655	9.455	9.455	M	1,118,647	513,797	50,082	2,516,307	1,103,626	512,776	52,869	2,412,819	-1.34%	-0.20%	5.56%	-4.11%
JSRS	Solicitor	66	202,655	1.417	1.417	M	1,331,302	363,363	176,227	1,140,145	1,335,053	220,497	214,074	1,033,575	0.28%	-39.32%	21.48%	-9.35%



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Valuation Results for JSRS Inactive Employees

System	Status	Age	Benefit Amount	Payment Form	Sex	GRS	CMC	%
						PVFB	PVFB	Difference - CMC to GRS
JSRS	Beneficiary	75	5,200	Life Annuity	F	673,323	672,238	-0.16%
JSRS	Retired	72	13,377	33-1/3% J&S	F	2,476,712	2,496,201	0.79%
JSRS	Retired	69	9,816	33-1/3% J&S	M	1,763,353	1,765,247	0.11%
JSRS	Retired	58	12,266	33-1/3% J&S	M	2,486,976	2,481,025	-0.24%
JSRS	Retired	80	15,198	33-1/3% J&S	M	1,515,729	1,548,439	2.16%



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Principal Valuation Results for GARS In Aggregate

	GRS	CavMac	Difference
Present Value of Future Benefits			
Actives	\$ 13,809	\$ 13,947	1.0%
Inactive (Vested and Non Vested)	3,259	3,253	-0.2%
Annuitants	<u>53,995</u>	<u>53,988</u>	0.0%
Total	\$ <u>71,063</u>	\$ <u>71,188</u>	0.2%
Actuarial Accrued Liability	\$ 69,876	\$ 69,874	0.0%
Actuarial Value of Assets	<u>42,869</u>	<u>42,869</u>	
Unfunded Accrued Liability	\$ <u>27,007</u>	\$ <u>27,005</u>	
Normal Cost	\$ 263	\$ 275	4.6%
Amortization	6,152	6,155	
Expenses	2	2	
Funding Period (years)	5	5	
Total Required Contribution	\$ 6,417	\$ 6,432	
Employee	<u>132</u>	<u>132</u>	
Required Employer Contribution	\$ <u>6,285</u>	\$ <u>6,300</u>	

Note: The Normal Cost of \$263 is calculated from Table 3 in the 2022 GARS valuation report as $21.88\% \times \$1,204 = \263 , and the Expenses of \$2 is calculated from the same table as $.18\% \times \$1,204 = \2 . Adding these together gives the total normal cost of \$265 shown in Table 1 of the 2022 GARS valuation report. The Required Employer Contribution of \$6,285 is also shown in Table 1 of the 2022 GARS valuation report.



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Valuation Results for GARS Active Employees

System	Type	Age	Salary	System Svc	Total Svc	Sex	GRS				CMC				% Difference - CMC to GRS			
							PVFB	AL	NC	PVFS	PVFB	AL	NC	PVFS	PVFB	AL	NC	PVFS
GARS	Gen Assembly	63	22,400	31.030	31.030	M	353,758	351,753	2,074	11,012	370,150	370,150	0	0	4.63%	5.23%	-100.00%	-100.00%
GARS	Gen Assembly	54	22,400	18.580	18.580	F	181,496	153,087	4,053	156,603	183,686	155,884	3,977	150,601	1.21%	1.83%	-1.89%	-3.83%
GARS	Gen Assembly	80	22,400	24.690	24.690	M	169,034	165,675	3,474	11,012	185,169	185,169	0	0	9.55%	11.77%	-100.00%	-100.00%
GARS	Gen Assembly	43	22,400	10.250	10.250	F	105,362	60,703	4,319	231,384	103,363	59,315	4,064	234,237	-1.90%	-2.29%	-5.90%	1.23%
GARS	Spec Contrib	34	22,400	12.000	12.000	M	45,638	33,081	1,797	156,484	48,420	34,798	1,818	162,160	6.10%	5.19%	1.17%	3.63%
GARS	Spec Contrib	51	22,400	22.000	22.000	M	155,868	154,383	1,536	11,012	148,021	148,021	0	0	-5.03%	-4.12%	-100.00%	-100.00%



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Valuation Results for GARS Inactive Employees

System	Status	Age	Employee Contribution		Payment Form	Sex	% Difference -		
			Balance	Benefit Amount*			GRS PVFB	CMC PVFB	CMC to GRS
GARS	VT	55	83,712.36	2,005.11	Deferred Life Annuity	M	201,120	195,270	-2.91%
GARS	Beneficiary	80	15,331.71	815.12	50% J&S / Revert	F	67,103	67,725	0.93%
GARS	Retired	69	107,169.98	2,547.40	50% J&S / Revert	M	331,549	330,020	-0.46%
GARS	Retired	67	99,943.97	2,249.33	Maximum	M	270,537	271,787	0.46%

* Monthly; estimated for VTs



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Principal Valuation Results for SCNG In Aggregate (\$ in thousands)

	GRS	CavMac	Difference
Present Value of Future Benefits			
Actives	\$ 29,332	\$ 29,545	0.7%
Inactive (Vested and Non Vested)	9,733	9,745	0.1%
Annuitants	<u>36,714</u>	<u>36,694</u>	-0.1%
Total	\$ <u>75,779</u>	\$ <u>75,984</u>	0.3%
Actuarial Accrued Liability	\$ 68,801	\$ 68,822	0.0%
Actuarial Value of Assets	<u>40,221</u>	<u>40,221</u>	
Unfunded Accrued Liability	\$ 28,580	\$ 28,601	
Normal Cost	\$ 782	\$ 708	-9.5%
Amortization	3,039	3,056	
Expenses	15	15	
Funding Period (years)	14	14	
Total Required Contribution	\$ 3,836	\$ 3,779	
Employee	<u>0</u>	<u>0</u>	
Required Employer Contribution	\$ <u>3,836</u>	\$ <u>3,779</u>	



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Valuation Results for SCNG Active Employees

System	Age	Salary	Nat. Guard Svc	Military Svc	Sex	GRS				CMC				% Difference - CMC to GRS			
						PVFB	AL	NC	PVFS	PVFB	AL	NC	PVFS	PVFB	AL	NC	PVFS
SCNG	35		9.000	17.000	M	2,250	1,845	53	305,252	2,193	1,767	52	-2.53%	-4.23%	-1.89%	-100.00%	
SCNG	54		5.000	18.000	M	5,582	4,665	132	277,697	5,445	4,620	112	-2.45%	-0.96%	-15.15%	-100.00%	
SCNG	43		3.000	23.000	M	3,759	3,318	58	302,923	3,604	3,184	52	-4.12%	-4.04%	-10.34%	-100.00%	
SCNG	30		8.000	10.000	M	1,434	867	59	383,837	1,439	856	57	0.35%	-1.27%	-3.39%	-100.00%	
SCNG	45		11.000	13.000	M	3,610	2,653	120	317,350	3,600	2,619	115	-0.28%	-1.28%	-4.17%	-100.00%	
SCNG	62		15.000	20.000	M	6,343	6,343	0	19,665	6,368	6,368	0	0.39%	0.39%	0.00%	-100.00%	



5. ACTUARIAL VALUATION RESULTS REVIEW

Comparison of the June 30, 2022 Valuation Results for SCNG Inactive Employees

System	Status	Age	Benefit		Sex	GRS PVFB	CMC PVFB	%
			Amount	Payment Form				Difference - CMC to GRS
SCNG	Retired	79	1,020.00	Life Annuity	M	6,170	6,084	-1.39%
SCNG	Retired	75	600.00	Life Annuity	M	4,327	4,320	-0.16%
SCNG	Retired	61	1,200.00	Life Annuity	F	14,169	14,192	0.16%
SCNG	VT	60	1,200.00	Life Annuity	M	12,871	13,225	2.75%
SCNG	VT	50	840.00	Life Annuity	M	4,490	4,580	2.00%
SCNG	VT	53	540.00	Life Annuity	M	3,507	3,620	3.22%



6. VALUATION REPORT REVIEW

CONTENT OF THE ACTUARIAL REPORTS

Actuarial Standards of Practice are issued by the Actuarial Standards Board and are binding on credentialed actuaries practicing in the United States. These standards generally identify what the actuary should consider, document and disclose when performing an actuarial assignment. The American Academy of Actuaries has issued 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.

Assumptions should be deemed reasonable for each valuation and significant events that occur after the most recent experience study should be taken into account, we recommend GRS make some statement regarding the COVID-19 pandemic and whether any changes are incorporated into the current valuation since the data for the experience study preceded the pandemic.

In September 2017, Actuarial Standard of Practice Number 51, *Assessment and Disclosure of Risk in Measuring Pension Obligations*, (ASOP 51) was issued as final with application to measurement dates on or after November 1, 2018. A typical retirement plan faces many different risks, but the greatest risk is the inability to make benefit payments when due. If plan assets are depleted, benefits may not be paid which could create legal risk or the plan could become “pay as you go.” The term “risk” is most commonly associated with an outcome with undesirable results. However, in the actuarial world, risk can be translated as uncertainty. The actuarial valuation process uses many actuarial assumptions to project how future contributions and investment returns will meet the cash flow needs for future benefit payments. Of course, we know that actual experience will not unfold exactly as anticipated by the assumptions and that uncertainty, whether favorable or unfavorable, creates risk. ASOP 51 defines risk as the potential of actual future measurements to deviate from expected results due to actual experience that differs from the actuarial assumptions.

The various risk factors for a given plan can have a significant impact – positive or negative – on the actuarial projection of liability and contribution rates.



6. VALUATION REPORT REVIEW

There are a number of risks inherent in the funding of a defined benefit plan. These include:

- economic risks, such as investment return and price inflation;
- demographic risks such as mortality, payroll growth, aging population including the impact of baby boomers, and retirement ages;
- contribution risk, i.e., the potential for contribution rates to be too high for the plan sponsor/employer to pay; and
- external risks such as the regulatory and political environment.

We recommend that the ASOP 51 section of the reports be customized to each plan and address the particular risks of each plan. For example, a plan with a fixed contribution rate may run the risk that the contribution rate is not sufficient to meet the funding goals of the plan. Also, even though the investment return assumption is a prescribed assumption under Section 9-16-335 of the South Carolina State Code, sensitivity to this assumption may be a useful metric to include in the ASOP 51 risk disclosure section.

In addition, there are minor items that should be reviewed in the reports. The PORS report, on page 46, item 8, reads “Members with a vested benefit are assumed to elect a refund or a deferred benefit commencing at age 65, whichever is more valuable at the valuation date.” Based on discussions with GRS, we believe this should be age 55. The SCRS report is silent on the age a member with a vested benefit is assumed to commence receiving a deferred benefit. We believe this should be specified.

The June 30, 2022 Actuarial Valuation Reports for PEBA generally provide sufficient information for another actuary to understand what was done and to assess the reasonableness of the results. We compared the contents of the reports to over 30 specific items detailed for pension actuarial work in ASOPs 4, 41, and 51.

In our review of the content of the report, we found it to be in compliance with the applicable ASOPs but would recommend that consideration be given to including some additional commentary and analysis around specific risks faced by each plan.