



Actuarial Audit of Public Employees Retirement System of Ohio

Prepared for Ohio Retirement Study Council

December 5, 2025

Submitted by:

Milliman

Scott Porter, FSA, EA, MAAA
Principal & Consulting Actuary

801 Cassatt Road
Suite 111
Berwyn, PA 19312
Tel +1 610 975 8070

milliman.com



Solutions for a world at risk™



801 Cassatt Road
Suite 111
Berwyn, PA 19312

Tel +1 610 687 5644

milliman.com

December 5, 2025

Bethany Rhodes
Ohio Retirement Study Council
30 East Broad Street, 2nd Floor
Columbus, Ohio 43215

Re: Request for Proposal–Actuarial Audit of Public Employees Retirement System of Ohio

On behalf of Milliman, we are pleased to present this proposal to provide actuarial audit services to Ohio Retirement Study Council (ORSC). This proposal follows the format set forth in the RFP and describes our firm, approach, our people, and proposed fees.

Milliman is willing to perform the services described in the RFP and confirms the availability of our staff and resources to perform all services and provide all deliverables as described in the RFP.

The submission of this proposal in response to the RFP is conditioned on the mutual agreement of contract terms. Milliman shall not be bound by any contract terms or obligated to perform the services described in this proposal until a mutually acceptable written agreement is signed by the parties.

Please do not hesitate to get in touch with me if you have any questions or would like to discuss any aspect of this proposal. Thank you for the opportunity to present Milliman's capabilities. We look forward to working with you.

Sincerely,

A handwritten signature in black ink that reads "Scott Porter".

Scott Porter, FSA, EA, MAAA
Principal & Consulting Actuary
Tel: 610 975 8070
Email: scott.porter@milliman.com

Table of Contents

INTRODUCTION	4
PROPOSAL SUMMARY	5
CAPABILITIES AND EXPERIENCE	8
STAFF QUALIFICATIONS	11
REFERENCES	16
METHODOLOGY, WORK PRODUCT, AND TIMELINE	17
ADDITIONAL INFORMATION	25
GLOSSARY	25
COST INFORMATION	27
APPENDICES	29
APPENDIX A – SERVICE TEAM BIOGRAPHIES	
APPENDIX B – SAMPLE AUDIT REPORT	

INTRODUCTION

Thank you for considering Milliman's proposal for actuarial auditing services and ongoing support. We appreciate the opportunity to demonstrate how our expertise can benefit the Ohio Retirement Study Council ("ORSC").

What sets Milliman apart:

1. **Established Legacy:** Milliman has been performing actuarial audits for 30 years and has been performing valuations, experience studies, and pension consulting services to public defined benefit plans since our foundation more than 75 years ago. Milliman has completed 25 actuarial audits over the past five years, including for the Ohio Public Employees Retirement System ("OPERS"). The firm provides full service actuarial consulting to more than 300 public pension clients and over 1,000 OPEB plans. Milliman brings a wealth of knowledge to the table.
2. **Industry Leadership:** We are the retained system actuary, or the most recently appointed pension actuarial auditor, for six of the US's seven largest public pension systems, as identified by *Pensions & Investments*.
3. **Enthusiastic References:** The best indicator of how well we will serve you is how we serve our current clients. Milliman builds our business primarily on the strength of enthusiastic client references and we think references are one of the strongest and most important parts of our service proposals.

Why Milliman is the right strategic partner for ORSC:

Clear Communication: Our team works very hard to demystify technical work in our written and oral communications. Just as importantly, we communicate in a way that is respectful of the widely varying perspectives of stakeholders.

Strategic Approach: Milliman has a long history working with ORSC in assessing the strategic goals and policies for the financing and sustainability of the various retirement systems it oversees. This actuarial audit provides a great opportunity for OPERS and ORSC to assess the consistency and reasonability of its strategic policies. Milliman will draw from our past experiences with both ORSC and OPERS as well as experiences working with the largest and most complex retirement systems in the country and provide fresh perspectives to OPERS and ORSC. We have found that discussions about the strategic goals of the retirement system can provide some of the most meaningful take-aways from the actuarial audit process.

Strength of Service Team and Depth of Our Bench: The complexity of OPERS and the importance to the people of your community demands a strong and responsive service team. With more than 5,000 employees, Milliman has the resources to meet and exceed all staffing demands required of our partnership with ORSC.

Although there are many qualified actuarial firms, we feel that no firm can match the combination of Milliman's experience, high technical ability, and client service. **In a world overloaded with information, our clients rely on us to help find the right information and turn it into actionable knowledge to solve their toughest problems.** We are committed to bringing depth, clarity, and context to the issues and challenges that our clients face every day. Our clients rely on us to be industry experts, trusted advisors, and creative problem-solvers.

Milliman's Values

Milliman's advice, products and client service adhere to the highest standards of quality.

Milliman's people demonstrate integrity in all that we do. We are committed to honesty and professionalism in our interaction with our clients and colleagues.

Milliman is committed to embracing diversity and providing all of our people opportunities to achieve their full potential.

On the basis of these values, Milliman has become one of the largest independent providers of comprehensive employee benefits consulting and administration services in the world.

PROPOSAL SUMMARY

Each proposal shall provide a narrative summary of the proposal being submitted. This summary should identify all of the services and work products that are being offered in the proposal and should demonstrate the firm's understanding of the project.

The overall goal of any actuarial audit is to provide a holistic and independent review of the policies, methods, actuarial assumptions, and actuarial calculations to ensure that the primary objective of the retirement system—meeting the promised benefits to members—is achieved.

It is our understanding that the work to be performed under this RFP includes an actuarial audit of the Ohio Public Employees Retirement System (OPERS). This audit is intended to provide the Ohio Retirement Study Council (ORSC), the Legislature, and the OPERS Board with a comprehensive and independent assessment of the actuarial soundness of OPERS and its related benefit programs.

The actuarial audit will be based on the December 31, 2024 actuarial valuation report for the Defined Benefit Allowances (Traditional, Combined, and Member Directed Plans), the OPERS 5-Year Experience Study (January 1, 2016–December 31, 2020), and the December 31, 2024 Annual Actuarial Valuation and Projections of Retiree Health Benefits, including GASB Statement 74 disclosures.

Our actuarial audit will address the following areas, as required by the scope of services:

- Independent calculation of OPERS' actuarial accrued liability, actuarial value of assets and resulting unfunded actuarial accrued liability as of December 31, 2024
- Assessment of the reasonableness of actuarial assumptions and methods
- Suggestions for improvement in the data provided by OPERS to the retained actuary

We will perform a thorough analytical review of the actuarial valuations, including a parallel valuation of pension and retiree health care benefits as of December 31, 2024, using the validated member census data and the same actuarial assumptions as the OPERS consulting actuary. Our review will include recalculation and verification of liabilities for specific test cases and an assessment of the overall reasonableness of liabilities, assets, and contribution rates for the covered plans and programs. We will also evaluate the consulting actuary's adherence to Actuarial Standards of Practice (ASOPs) and applicable statutory requirements.

Throughout the engagement, we will maintain open communication with the ORSC, providing monthly status updates and notification of key activities. Our team will be responsive to the guidance of the ORSC and the OPERS Board, and will ensure that all deliveries, including the final report, are prepared in the specified format and are accessible to a legislative and trustee audience. The final report will include a description of the work performed, an executive summary, findings, and recommendations clearly organized for the intended recipients. We will provide both digital and bound copies of the final report to the ORSC and OPERS and present our findings in person to both entities as required.

In addition to the summary, please provide all of the following general information:

- The firm's primary contact for ORSC staff use and, if different, for PERS staff use during the audit, including the contact's address, telephone and e-mail address;

The principal contact for this RFP is:

Scott Porter, FSA, EA, MAAA
Principal and Consulting Actuary
Milliman, Inc.
801 Cassatt Road
Suite 111
Berwyn, PA 19312
Tel: 610 975 8070
✉ scott.porter@milliman.com

- General ownership structure of the organization, including subsidiary and affiliated companies, and joint venture relationships;

Founded in 1947, Milliman is a privately held consulting firm recognized for delivering comprehensive actuarial and advisory services in employee benefits, retirement and investment consulting, healthcare, and insurance. With 75+ years of experience, Milliman ranks among the world's largest independent actuarial firms, employing more than 5,000 professionals across 70 offices globally and generating annual revenue of \$1.6+ billion.

Milliman is independently owned and managed by our principals, who are distinguished by their technical and business acumen, and by their achievements in their respective fields. Our body of professionals includes actuaries, technologists, clinicians, economists, climate and data scientists, benefits and compensation experts, and many others.

We are not affiliated with any public accounting or brokerage firms. The consultants of the firm are not permitted to own stock in any insurance or reinsurance company, and client organizations. Due to these policies, Milliman provides analyses and opinions that are totally independent and objective.

Milliman, Inc. has around 60 affiliated entities in the Milliman group. Each shareholder of Milliman, Inc. owns less than one percent of the company.

Milliman is a corporation, with most of its corporate staff located in Seattle, WA.

Milliman's board of directors includes the chairman, CEO, practice directors from the four primary business lines, and five at-large members who are also principals of the firm.

- Information regarding any material change in the firm's structure or ownership within the last eighteen months, or any material change in ownership, staff, or structure currently under review or being contemplated by the firm;

While Milliman's growth has primarily been driven by internal investment, strategic acquisitions have enhanced and expanded our consulting capabilities, product offerings, and technology platforms. The firm remains privately held, with no anticipated changes to its ownership or organizational structure in the foreseeable future.

- If available, a third-party assessment or report concerning client satisfaction and measures of the firm's strengths and weaknesses;

Milliman's SOC-2 Type II report and reports are considered highly confidential and sensitive to Milliman's business operations. Milliman requires a signed Nondisclosure Agreement to be entered with ORSC before we are able to share copies of this information. A copy can be provided during a upon request.

- Any material litigation which has been threatened against the firm or to which the firm is currently a party;

With over 70 offices throughout the world, Milliman is subject to litigation from time to time in the normal course of its business activities. Such suits can arise in a variety of contexts. No material litigation currently pending against Milliman will interfere with or jeopardize Milliman's ability to provide any of the services included in this proposal.

- A list and brief description of litigation brought against the firm by existing or former clients over the last five years; and

During the preceding five years, there has been no litigation or other legal proceeding involving the principals, practices or offices of Milliman that will be providing the services under this proposal. It is not Milliman's practice to provide information about claims or litigation unrelated to the office or practice involved in a proposal.

- A list of any professional relationships involving the ORSC, the five Ohio public retirement systems, the State of Ohio, or its political subdivisions for the past five years, together with a statement explaining why such relationships do not constitute a conflict of interest relative to performing the proposed review. In the event that the firm has had any professional relationships involving the ORSC, the five Ohio public retirement systems, the State of Ohio, or its political subdivisions for the past five years, the firm shall provide a statement explaining why such relationships do not constitute a conflict of interest relative to performing the proposed review, or, if necessary, an explanation of the actions that will be taken to ensure an independent review.

Effective January 22, 2021, Milliman was hired by Ohio Public Employees Retirement System ("OPERS") to conduct an actuarial audit of its system. On August 1, 2022, Milliman was also hired by Ohio School Employees Retirement System ("OSERS") to conduct an actuarial audit of its system. While Milliman had previously conducted an actuarial audit of OPERS, we do not believe it constitutes a conflict to perform a similar function for ORSC as Milliman was hired to perform a single task and has had no further relationship with OPERS since the expiration of that contract.

Milliman is independent of the governmental entity/plan and is unaware of any potential conflicts of interest. Milliman's policy on potential conflicts of interest is structured to provide full disclosure to our clients so they can determine if their interests are being satisfactorily served if a conflict exists. Part of the Milliman Code of Ethics is to provide independent advice and avoid conflicts of interest. Before starting work (or proposing work in the case of an RFP), a detailed conflict check is sent via email to all consultants. If an actual or perceived conflict of interest exists, the assignment will usually be declined. If appropriate, the assignment may still be accepted, but the conflict will be disclosed.

No conflicts were disclosed during this process regarding this RFP.

CAPABILITIES AND EXPERIENCE

Each proposal shall describe the firm's capabilities and recent experience (at least during the last five years) in performing actuarial valuations, audits, or studies of public employee retirement systems. The response should include information on the types and sizes of public employee retirement systems for which past work has been performed, including whether the systems were defined benefit or defined contribution plans, the types and number of participating employers, number of participants, and other relevant indicators of plan type, size, and comparability to PERS. You should include other information you believe may be relevant in demonstrating your capabilities in performing the actuarial audit, including other professional experience and data processing capabilities.

For Milliman, governmental actuarial services are a priority, as the firm's largest clients are in the public sector. Milliman has performed actuarial studies or valuations for over two-thirds of the state retirement systems.

Milliman's experience performing actuarial services for large public employee retirement systems dates back to our engagement with the Washington State Employees Retirement System in 1947. Our expertise covers all aspects of public employee retirement plans, including actuarial valuations, experience studies, and development of plan costs; recommendation of plan design changes; working with system staff on administrative disclosure, communication, record keeping and testifying before legislatures and governing boards.

Three recent examples of Milliman's consulting and advisory to elected public bodies include the work we have done for the State of Washington, the Commonwealth of Pennsylvania, and the Commonwealth of Kentucky. These three engagements are described below:

WASHINGTON STATE RETIREMENT SYSTEMS

Milliman serves as the retained audit actuary for the Washington State Retirement Systems and has performed this function every two years since 2014. The Pension Funding Council (a legislative committee responsible for setting economic assumptions and the related pension contribution rates for ten of the state's pension plans) and the Law Enforcement Officers' and Fire Fighters' (LEOFF) Plan 2 board are our clients.

We work directly with Office of the State Actuary (OSA). The OSA is an independent and non-partisan legislative agency that works primarily on the funding and benefit issues of the state's public retirement systems. The OSA performs actuarial valuation and experience studies of the Washington State Retirement Systems, but it is not part of the Department of Retirement Systems. OSA staff includes 5 credential actuaries and 5 actuarial analysts, as well as several policy analysts and other support staff.

OSA performs the actuarial valuations with Milliman's review and feedback based on detailed sample lives provided by OSA from their valuation system. For the experience study, OSA provides Milliman preliminary proposed assumptions to review. Milliman and OSA discuss the assumptions, and OSA can make adjustments based on Milliman's feedback before issuing its final report.

PENNSYLVANIA INDEPENDENT FISCAL OFFICE

The Independent Fiscal Office has the responsibility to provide actuarial notes for legislation that proposes changes to public employee pensions in the Commonwealth of Pennsylvania. Milliman has been assisting the IFO (and its predecessor the Pennsylvania Employer Retirement Commission) since 1986 related to changes to the Public School Employees Retirement System and the State Employees Retirement System. Milliman also assists the IFO in its stress test analysis impact analysis on PSERS

and SERS. Each of these systems recently enacted legislation to provide incoming members the choice of a defined benefit / defined contribution plan combination or solely a defined contribution plan. The DB / DC combination plans also provide the employee an option to choose an enhanced DB benefit.

KENTUCKY RETIREMENT SYSTEMS

In 2022, Milliman was hired by the Kentucky Legislative Research Commission to perform actuarial audits of the various state-administered retirement systems in the Commonwealth on behalf of the Public Pension Oversight Board. Actuarial audits were conducted for the following plans:

- Kentucky Employees Retirement System
- State Police Retirement System
- County Employees Retirement System
- Teachers Retirement System
- Judicial Form Retirement System

There were three different actuarial firms providing the valuation services that were included in the audit and GRS was one of those firms.

The actuarial audits included review of both pension and insurance valuations and were similar in scope to the services requested by ORSC including, data validity, review of actuarial methods and procedures, review actuarial assumptions, and review of actuarial reports. They also included full replication valuations of both pension and healthcare insurance plans.

In addition to our experience working with elected public bodies, below are representative lists of our current public sector clients which speaks to our ability to provide actuarial services to complex public retirement systems.

Milliman's Retained Actuarial Consulting Clients

Milliman currently serves as the retained actuary for over 1,000 public pension and retiree healthcare clients of all sizes, from California to Florida and from Texas to Alaska. This includes serving as the retained actuary for seven public retirement system clients with at least 100,000 members. The years these clients have retained us shows our dedication to client service.

Retained Clients for Actuarial Services	Initial Contract	Total Membership	Assets
California State Teachers' Retirement System	1985	965,000	\$309 billion
Florida Retirement System	1986	1,200,000	\$199 billion
Oregon Public Employees Retirement System	2012	381,000	\$86 billion
Los Angeles County Employees Retirement Association	1999	184,000	\$73 billion
Texas County & District Retirement System	1999	320,000	\$43 billion
Puerto Rico Government Employees Retirement System	2007	240,000	\$30 billion*
Public Employee Retirement System of Idaho	1970	160,000	\$17 billion

* For plans operating on a pay-as-you-go basis, the liability amount is shown in the table above as a proxy for the plan size.

Milliman's Actuarial Audit Experience

Milliman has completed over 50 actuarial audits in the past 10 years. Additionally, we are one of the nation's largest providers of actuarial services to the public sector, so we are often also the actuary being audited. As a result, you will be working with a consulting team that is familiar with the actuarial audit process from both sides and understands what is required to perform a thorough actuarial audit.

Below is a representative list of the actuarial audits Milliman has completed in the last five years for large public pension clients. Asterisks indicate systems where members of the ORSC project team have served in a lead, supporting or peer review role.

Firmwide Audit Clients	Total Membership	Year of Audit(s)
Virginia Retirement Systems*	855,000	2026 (ongoing)
Nevada Public Employees Retirement System*	220,000	2025
New Mexico Educational Retirement Board	170,000	2025
New Hampshire Retirement System*	115,000	2025
Montana Teachers Retirement System*	40,000	2025
New York City Employees' Retirement System*	430,000	2025
New York City Teachers' Retirement System*	235,000	2025
New York City Board of Education Retirement System*	58,000	2025
New York City Police Pension Fund*	89,000	2025
New York City Fire Pension Fund*	28,000	2025
Texas Teachers Retirement System*	1,950,000	2024, 2020
State of Washington Pension Funding Council and LEOFF 2 Retirement Board*	350,000	2024, 2022, 2020
Missouri Public School and Education Employee Retirement System*	130,000	2024
Montana Public Employee Retirement Administration*	85,000	2024
New York State Teachers Retirement System	434,950	2023
Retirement Systems of Alabama*	260,000	2023, 2021
Kentucky State-Administered Retirement Systems*	480,000	2022
Ohio School Employees Retirement System*	230,000	2022
Ohio Public Employees Retirement System*	1,200,000	2021

Note that we currently provide ongoing actuarial audit services to the State of Washington Pension Funding Council and Law Enforcement Officers' and Fire Fighters' Retirement System Plan 2 Board. In addition, we provide actuarial review services for the Pennsylvania Independent Fiscal Office, which oversees legislative changes to the Pennsylvania Public School Employees Retirement System and the State Employees Retirement System. Previously we have also provided actuarial services to other oversight organizations for New York State, New York City and State of Ohio. Finally, we were hired in November 2025 by the Joint Legislative Audit and Review Commission to perform an actuarial audit of the Virginia Retirement System to be conducted in 2026.

Milliman is involved in all aspects of public employee retirement systems, including development of contribution rates, recommendation of benefit design changes, working with system staff on administrative matters (disclosure, communication and recordkeeping) and actuarial audits. Our consultants have experience testifying before governing bodies: legislatures, city councils, and other governing boards. Our extensive involvement in all levels of public plans means we understand the complications of changes from different points of view, participants, administrators, legislature, taxpayers, etc.

STAFF QUALIFICATIONS

Each proposal shall, at a minimum, describe the qualifications of all management and lead professional personnel who will participate in the audit. Each personnel description shall include: (1) a resume; (2) a summary of experience each has had in performing actuarial valuations, audits, or studies of public employee retirement systems; and (3) a management plan identifying the responsibilities each will have on the audit.

Each resume should include information on the current and past positions held with the firm, educational background, actuarial and other relevant credentials, and other relevant information to demonstrate the person's qualification.

Each proposal shall also include a description of the firm's procedures in the event that a key person assigned to this engagement leaves the firm during the engagement.

The experience summaries should include information on the types and sizes of public employee retirement systems for which the designated staff have completed actuarial work, including whether the systems were defined benefit or defined contribution plans, the types and number of participating employers, number of participants, and other relevant indicators of plan type, size, and comparability to PERS. It is permissible to reference, rather than repeat, duplicative information provided elsewhere in the proposal. The experience summaries should describe the work performed and detail the roles and responsibilities that the individual staff had on the projects.

The management plan should specify the roles and responsibilities that each of the management and professional staff will have on the actuarial audit and include an estimated portion of the audit's time that will be spent by each on the audit.

Actuaries included on the project team should meet the following criteria:

- Be members of the American Academy of Actuaries;
- Be enrolled actuaries with experience in governmental plans;
- Be, at a minimum, associates with at least five years of experience in public practice, although preference will be given to actuaries that are Fellows of the Society of Actuaries; and
- Have performed an actuarial valuation, audit, or study of a public employee retirement system within the last two years.

In the event that the firm or any personnel listed in the proposal has had any professional relationships involving the ORSC, the five Ohio public retirement systems, the State of Ohio, or its political subdivisions for the past five years, the firm shall provide a statement explaining why such relationships do not

constitute a conflict of interest relative to performing the proposed review, or, if necessary, an explanation of the actions that will be taken to ensure an independent review.

The strengths of the team are constituted by talent, initiative, teamwork and diversity. Our people truly place customer service as paramount. This is demonstrated by the unusually quick turnaround of client requests, going above and beyond to meet deadlines and being a business partner and advisor to our clients in all that we do. Partnering with our clients to develop awareness of their business needs and constraints is a hallmark of Milliman client relationships. Teamwork leads to innovation through the creative use of multiple talents, all collaborating for the benefit of client solutions.

We have a broad range of high-caliber professionals with diverse backgrounds and specialties that are melded into unique, effective and longstanding solutions for our clients. In situations where special areas of expertise are necessary, additional Milliman consultants with the appropriate backgrounds will be engaged to assist as needed.

Listed below are the senior members of the team that we have identified for OPERS. These service team leaders all have significant public plan expertise. They possess deep knowledge of the employee benefit marketplace, have extensive actuarial and technical backgrounds, and have many years of client-facing experience. Most of all, they have proven track records for understanding their clients' needs and objectives and successfully attaining those objectives. Senior team members are available to OPERS on a continuous basis.

Biographies are provided in Appendix A. Various consultants, analysts and other professionals may support these individuals.

Scott Porter, FSA, EA, MAAA, Principal & Consulting Actuary

Role on the Team: Scott will lead the relationship and serve as lead consultant. He will be responsible for ensuring that OPERS receives the highest level of service, strong consulting support and critical market intelligence. This includes responsibility for ensuring that all services are being delivered in accordance with our firm-wide quality assurance guidelines. Scott will attend meetings and is available on a continuous basis.

Experience & Qualifications: Scott is a Fellow of the Society of Actuaries, a Member of the American Academy of Actuaries, Enrolled Actuary and a Principal of Milliman. With 30 years of defined benefit pension experience, Scott is an expert in public pension and retiree medical plans, and regularly consults with clients on issues involving valuations, projections, day to day consulting and interpretation of pension related issues, legislative compliance, and the design and redesign of benefit plans.

During the past five years, Scott had led actuarial audits for the five New York City Retirement systems, the five Kentucky State-administered retirement systems (pension and insurance), Retirement Systems of Alabama (twice), Ohio School Employees Retirement System as well as Ohio Public Employees Retirement System. The audit for OPERS was conducted in 2020. Milliman has had no further relationship since the audit was completed. Scott also consults to the Independent Fiscal Office on the two large statewide systems of Pennsylvania and is part of the project team that was recently hired to conduct an audit of the Virginia Retirement System.

Ryan Falls, FSA, EA, MAAA, Principal & Consulting Actuary

Role on the Team: Ryan will partner with Scott, provide peer review services and serve as backup lead consultant for this engagement.

Experience & Qualifications: Ryan is a Fellow of the Society of Actuaries, a Member of the American Academy of Actuaries, and an Enrolled Actuary. While Ryan has recently joined Milliman, he has over 25 years of experience working with public sector retirement systems and has extensive experience performing actuarial audits. Ryan has conducted actuarial audits for many notable organizations, including Teachers Retirement System of Texas, Montana Public Employee Retirement Administration, Nebraska Public Employees Retirement System, the Virginia Retirement System, the Oregon Public Employees Retirement System, and the Montana Teachers Retirement System. Ryan is currently working on an actuarial audit of Nevada Public Employees Retirement System is the lead consultant of the project team that was recently hired to conduct an audit of the Virginia Retirement System.

Immediately prior to joining Milliman, Ryan was the lead actuary for the Arizona State Retirement System, the Teachers Retirement System of Oklahoma, the New Mexico Educational Retirement Board, the New Mexico Public Employees Retirement Association, and the Employees Retirement System of Texas.

Kathy Warren, FSA, EA, MAAA, Principal & Consulting Actuary

Role on the Team: Kathy will serve as the pension valuation manager. She will provide the primary review of the pension work on the liability replications, sample life review, development of results, and data validity review.

Kathy is a Fellow of the Society of Actuaries, a Member of the American Academy of Actuaries, Enrolled Actuary and a Principal of Milliman. Kathy has over 30 years of experience working with public sector retirement systems. Kathy is lead consultant to the Pennsylvania Independent Fiscal Office, which reviews potential legislation impacting the State Employees' Retirement System (SERS) and the Public School Employees' Retirement System (PSERS) and consults to the Puerto Rico Retirement Systems and the New York Metropolitan Transportation Authority Retirement Plans. She had been involved with several actuarial audits including the Kentucky State-Administered Retirement Systems.

Rick Gordon, FSA, EA, MAAA, Principal & Consulting Actuary

Role on the Team: Rick will serve as OPEB valuation manager. He will provide the primary review of the retiree healthcare work on the liability replications, sample life review, development of results, and data validity review.

Experience & Qualifications: Rick is a Fellow of the Society of Actuaries, an Enrolled Actuary, a Member of the American Academy of Actuaries and a Principal of Milliman. Rick has more than 27 years of experience working with defined benefit pension and postretirement health and welfare plans. He has completed many projects for public pension and postretirement welfare plans, including the Puerto Rico Teachers Retirement System, New York Metropolitan Transportation Authority Retirement Plans, Nassau County, and California State Teachers' Retirement System. He has been involved with several actuarial audits including the New York City Retirement Systems and Ohio State Teachers Retirement System.

Rick is co-author of Milliman's annual Public Pension Funding Study, which explores and provides analysis of the funded status of the 100 largest U.S. public sector pension plans. He also co-author's Milliman Public Pension Funding Index, which tracks the funding status of the same 100 public pension plans on a monthly basis.

Nicholas Collier, ASA, EA, MAAA, Principal & Consulting Actuary

Role on the Team: Nick will provide peer review services and additional expertise as needed.

Experience & Qualifications: Nick is an Associate of the Society of Actuaries, a Member of the American Academy of Actuaries, Enrolled Actuary and a Principal of Milliman. Nick has over 30 years of experience working with public sector retirement systems and has extensive experience performing actuarial audits, having worked on approximately 30 audits over the last 20 years. Nick is the lead consultant to the California State Teachers' Retirement System, Texas County & District Retirement System, Los Angeles County Employees Retirement Association and the Seattle City Employees' Retirement System. Over the past five years, he has conducted actuarial audits for the Retirement Systems of Alabama, Teacher Retirement System of Texas, Washington State Retirement Systems, Ohio School Employees Retirement System and the Ohio Public Employees Retirement System.

Health Valuation Team Members for OPEB Valuation

Marcella Giorgou, FSA, EA, MAAA, Principal & Consulting Actuary

Role on the Team: Marcella will be the lead health consultant. Marcella is a health actuary and will be responsible for all health-related analysis and inputs into the retiree healthcare or OPEB valuation.

Experience & Qualifications: Marcella is a Fellow of the Society of Actuaries, an Enrolled Actuary, a Member of the American Academy of Actuaries and a Principal of Milliman. Marcella provides health and welfare benefits consulting services focusing on the design and delivery of benefits and include plan design review, assistance in collective bargaining negotiations, renewal calculations and Medicare Part D attestations. She has provided healthcare review services on various actuarial audits including Kentucky State-Administered Retirement Systems, Retirement Systems of Alabama and the Ohio School Employees Retirement System.

Reza Vahid, FSA, CFA, MAAA, Principal & Consulting Actuary

Role on the Team: Reza will provide peer review services and assist Marcella in the development of healthcare assumptions for the retiree healthcare plan.

Experience & Qualifications: Reza has more than 20 years of experience serving OPEB clients. He is a Consulting Actuary of Milliman, a Fellow of the Society of Actuaries (FSA), a CFA Charterholder, and a member of the American Academy of Actuaries. He provides health and welfare services including plan design analysis, assistance in collective bargaining negotiations and development of healthcare-related assumptions for postretirement benefit valuations.

Additional Resources

Alan Perry, FSA, MAAA, CFA, Principal & Consulting Actuary, Capital Markets Assumption Expert

Role on the Team: Alan is chair of Milliman's Capital Market Assumptions Committee and will assist in reviewing the recommended investment return assumption.

Experience & Qualifications: Alan is a Fellow of the Society of Actuaries, a Member of the American Academy of Actuaries, a Chartered Financial Analyst, and a Principal of Milliman. Alan provides assistance to Milliman consultants and clients on developing investment return assumptions, asset allocation studies and investment strategies. He has also consulted to the Ohio Tuition Trust Authority for the past 30 years.

Nina Lantz, FSA, EA, MAAA, Director, Employee Benefits Research Group

Role on the Team: Nina provides oversight to Milliman's clients compliance and regulatory needs.

Experience & Qualifications: Nina serves Milliman's Employee Benefits practice by providing analysis of legislation, regulations, accounting standards, and formal and informal agency guidance for implications on employee benefits. She manages the training of consultants on developing employee benefits and technical issues and assists in producing Milliman publications and technical resources.

Estimated portion of the audit's time that will be spent by each on the audit:

Name	Credentials	Estimated Portion
Scott Porter	FSA, EA, MAAA	25%
Ryan Falls	FSA, EA, MAAA	15%
Kathy Warren	FSA, EA, MAAA	10%
Rick Gordon	FSA, EA, MAAA	5%
Nicholas Collier	ASA, EA, MAAA	3%
Marcella Giorgou	FSA, EA, MAAA	3%
Reza Vahid	FSA, CFA, MAAA	2%
Alan Perry	FSA, MAAA, CFA	2%
Nina Lantz	FSA, EA, MAAA	As needed
Analysts	Varied	35%
Total		100%

Backup Procedures

Milliman is committed to serving the public sector and continuing to grow our presence in the marketplace. Our proposed project lead, Scott Porter, has been an industry leader for over a decade, serving as the lead consulting actuary, as well as servicing as the lead actuarial auditor, for some of the largest public retirement systems in the country and frequently speaking at industry conferences on the importance of pension plan sustainability.

Additionally, Milliman has an excellent history of continuity in its professional staff. In fact, over the last five years, our turnover rate has been 10% among all consultants and less than 4% among Principals where the majority of the turnover is due to retirement. These percentages have not varied much throughout Milliman's history, demonstrating excellent stability in our professional staff.

Milliman ensures team knowledge is accessible with an electronic filing system that preserves all work products. We have a qualified team providing top consulting and administration services tailored to client needs. Our selected team for this partnership brings expertise in handling complex client requirements and offers a strategic outlook, business acumen, and effective communication skills to help NHRS achieve its goals.

Milliman demonstrated the ability to ensure continuity with the recent retirement of Mark Olleman. Mark was an industry-leading consulting actuary for many decades as well as a leader within Milliman. Mark was very clear with his team about his upcoming intentions to retire and the Milliman team was very thoughtful about communicating with the clients and transitioning team responsibilities.

REFERENCES

Each proposal must include a list of at least three organizations, but no more than five, that may be used as references for the firm's work on actuarial audits or studies. References may be contacted to determine the quality of the work performed, personnel assigned to the project, and contract adherence. The following should be included for the references listed:

- Date of the actuarial audit work;
- Name, email address, and address of client;
- Name, email address, and telephone number of an individual in the client organization who is familiar with the work; and
- Description of the work performed.

INDEPENDENT FISCAL OFFICE

(Oversight to Pennsylvania Public Schools' Retirement System and State Employees' Retirement System)

Project Dates	Since 1986 including its predecessor Pennsylvania Employer Retirement Commission
Client Contact	Matthew Knittel, Director mknittel@ifo.state.pa.us 717-230-8293 400 Market Street Harrisburg, PA 17105
Services Provided	Providing actuarial notes related to changes to the Public School Employees Retirement System and the State Employees Retirement System.

KENTUCKY JOINT PUBLIC PENSION OVERSIGHT BOARD COMMITTEE

Project Dates	2022 – 2023
Client Contact	Brad Gross, Committee Staff Administrator brad.gross@lrc.ky.gov 502-564-8100 Capitol Building, Room 300, 700 Capital Ave. Frankfort, KY 40601
Services Provided	Actuarial audit of pension and insurance plans for Kentucky State-Administered Retirement Systems

SCHOOL EMPLOYEES RETIREMENT SYSTEM OF OHIO

Project Dates	2022
Client Contact	Marni Hall, CPA, Chief Financial Officer mhall@ohsers.org 614-222-5890 300 East Borad Street, Suite 100 Columbus, OH 43215
Services Provided	Actuarial audit of pension and retiree healthcare plan

TEACHER RETIREMENT SYSTEM OF TEXAS

Project Dates	2024
Client Contact	Janice Ehlert, Senior Policy Advisor 1000 Red River Street Austin, TX 78701 janice.ehlert@trs.texas.gov 800-223 8778
Services Provided	Actuarial audit of pension plan

METHODOLOGY, WORK PRODUCT, AND TIMELINE

Each proposal shall describe the proposed methodology for each element of the components listed under Scope of Audit. The description should include specific techniques that will be used, including anticipated sampling techniques and sizes, and proposed sources of data and information. You may propose alternative ways of addressing the elements of the audit's scope.

In describing the proposed methodology, also identify the type and level of assistance that you anticipate will be needed from the staff of PERS and the consulting actuary, including: assistance to understand the operations and records of PERS; assistance to understand the actuarial assumptions, method, and procedures; and assistance to access, obtain, and analyze information needed for the audit. The description of the proposed methodology shall also identify meetings, interviews, programming support, space needs, etc., that you anticipate requiring from PERS and the consulting actuary.

Each proposal shall also include one or more examples of work product(s) from actuarial valuations or audits that may help to illustrate the proposed methodology and final work product.

Each proposal shall provide an estimated date that the final report will be submitted and the projected timeline or the anticipated work requirements and milestone dates to reach that date.

Overall Goals

The overall goal of any actuarial audit is to provide a holistic review of the various policies, methods, actuarial assumptions, and actuarial calculations to ensure that the primary objective of any retirement system – to ensure the benefits promised by OPERS are met.

It is our understanding that the work to be performed under this RFP includes an actuarial audit of the December 31, 2024 pension and retiree healthcare valuations. The audit is mandated by the statutes governing the ORSC found in Chapter 171 of the Ohio Revised Code.

Our actuarial audit will address the following areas:

- Assess the validity, completeness and appropriateness of the valuation data used by the actuary for OPERS' structure and funding objectives
- Assess the appropriateness of the actuarial methods and procedures are reasonable and consistent with actuarial standards of practice appropriate for OPERS structure and funding objectives and are applied as stated by the consulting actuary.

- Assess the reasonableness of the selection of the actuarial assumptions, including both demographic and economic assumptions, based on OPERS experience and are appropriate for OPERS structure and funding objectives. In addition, review the actuarial gain loss analysis included in the valuation reports.
- Perform a parallel valuation based on the validated member census data and the same actuarial assumptions to assess the reasonableness of the liabilities, funded status, and contribution rates determined by the consulting actuary for both the pension and retiree healthcare valuations.
- Review the retiree healthcare benefits to determine whether OPERS is appropriately and consistently determining retiree contributions to health care for consistency with OPERS' health care policies.

We will perform a thorough analytical review of the actuarial valuations, including recalculation and verification of liabilities, overall reasonableness of liabilities, assets, and contribution rates for the pension and retiree healthcare plans. Our review will utilize the same census data, plan provisions, and actuarial assumptions as the retained actuary to ensure a precise and meaningful assessment. We will also evaluate the retained actuary's adherence to Actuarial Standards of Practice (ASOPs) and the Ohio Revised Code. If we recommend assumption adjustments, we will detail our rationale for the recommendation and describe the general effect on OPERS funding condition.

Throughout the engagement, we will maintain open communication with ORSC staff, providing status updates and advance notification of all interviews and document reviews. Our team will be responsive to ORSC's guidance and will ensure that all deliverables are prepared in the format specified by ORSC and are accessible to a legislative audience.

STRATEGIC APPROACH

The technical replication of the actuarial valuations is likely the most important aspect of the actuarial audit for OPERS and ORSC. Milliman's successful replication of the liability calculations and the actuarial valuation results gives the ORSC and OPERS confidence that the valuation results provided by the consulting actuary are reasonable for decision making and reporting.

Milliman will also take time to assess the strategic goals and policies for the financing and sustainability of the OPERS. This actuarial audit provides a good opportunity to take a step back and assess the consistency and reasonability of the OPERS strategic policies for both pension and retiree healthcare benefits. Milliman will draw from our experiences working with many of the largest and most complex retirement systems in the country and provide fresh perspectives for ORSC. We have found that discussions about the strategic goals of the retirement plans can provide some of the most meaningful takeaways for legislative oversight groups and the retirement system Boards.

COMMUNICATION PLAN

Part of what makes our client relationships so successful lies in the fact that Milliman anticipates the communication needs of diverse audiences. The ability to communicate effectively and with integrity is paramount. It is important to provide unbiased information and communicate the relevant liability measurements to various stakeholders. This information is essential for all decision makers.

Our team works very hard to demystify technical work in our written and oral communications. Just as importantly, we communicate in a way that is respectful of the widely varying perspectives of stakeholders. When communicating directly to ORSC and OPERS, the actuary must do so in an independent, unbiased manner that is cognizant and respectful of varying perspectives and knowledge

levels for both stakeholders and staff members. While challenging to accomplish, this type of thoughtful communication maintains the actuary's credibility across the stakeholder landscape. In turn, this assists ORSC and OPERS since stakeholders will be more open to operating from the same set of actuarial facts, even as they continue to hold their own differing opinions.

TEAM APPROACH

Milliman has proposed a broad team to perform the required task of the actuarial audit. Our team includes industry leading experts from many different consulting disciplines to provide the insights necessary for each of the plans to complete the actuarial audit. Our team is discussed further in the following responses.

ACTUARIAL AUDIT PROCESS

We will follow the detailed actuarial audit process noted below:

STEP 1: BACKGROUND

Gather information necessary to perform actuarial audit.

Methods: We will perform the following steps:

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Gather reports:</p> <ul style="list-style-type: none"> ▪ Recent valuation reports ▪ Experience study reports ▪ ACFRs ▪ Member Handbooks ▪ Applicable law and recent legislation ▪ Existing funding agreement and policies | <p>Preliminary discussions with ORSC and OPERS.</p> <ul style="list-style-type: none"> ▪ Confirm timeline ▪ Determine if any additional data is needed ▪ Establish protocol for communications with ORSC and OPERS ▪ Review benefit provisions for all systems ▪ Discuss any specific staff concerns |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

STEP 2: DATA

Assess the accuracy and appropriateness of the data used in the valuation.

Methods: We will perform the following steps:

Compare data elements with various benefit provisions to assure that all material benefit provisions are being considered:

Review data for missing, incomplete, or questionable information, including:

- Verify that active and retiree data files contain all of the necessary information and is consistent with the provisions of the plans and their funding policies
- Low Salary and Salary in excess of IRC 401(a)(17) limits
- Services Retirees with age less than eligibility age
- Questionable birth dates
- Compare data provided by the systems (including any adjustments, if necessary) with the data used by the ORSC in the valuation. We will compare key elements such as:
 - Average Salary, Average Service, Average Benefit Amount, Average Age
- Compare results with those reported in the ACFR and by OPERS in its valuations. We may request additional information from OPERS if we feel it is appropriate.
- Verify that the assets used in the valuation are consistent with the financial statements.

STEP 3: ACTUARIAL ASSUMPTIONS

We will review all assumptions recommended in the most recent experience study and used in the valuation to confirm the results are reasonable and consistent with actuarial standards.

Methods: We will perform the following steps:

- Review the general reasonableness of data, including a comparison of the data used in experience study with the data reconciliations and gain loss analysis noted in the actuarial valuations
- Evaluate the reasonableness of experience study results; if any material differences are encountered, we will reconcile with the consulting actuary
- Assess the reasonableness of the recommended assumptions

For the demographic assumptions, we will review the assumptions for reasonableness and verify that all provisions and benefits are accurately reflected and considered in its development. Based on this comparison, we will identify assumptions that may require additional analysis.

For the economic assumptions, we would perform a similar analysis to what we would do if we were the consulting actuary. To perform this analysis, we have developed a forward looking projection model, combining our investment expertise with actuarial expertise and using current capital market assumptions. We compare both the Milliman market assumptions and those of the client's investment consultants with those used in the OPERS valuations and employ a stochastic model to determine the probabilities of the long-term return rate for the current portfolio.

For the healthcare assumptions, we will review the current assumptions for reasonableness. A key distinction between pension and OPEB (Other Postemployment Benefits) valuations is the need to project future healthcare costs. Milliman, a leading healthcare consulting firm, applies its deep expertise to ensure that the actuarial assumptions used in OPEB valuations accurately reflect OPERS's benefit obligations. Milliman's Health Cost Guidelines™ (HCGs), developed through extensive healthcare experience, serve as a premier industry reference for establishing health claim cost and aging assumptions in OPEB valuations. These Guidelines—created collaboratively by Milliman health actuaries—are based on medical claims data from approximately 57 million lives.

The HCGs provide a flexible yet consistent framework for estimating claim costs across various health benefit plans. They are especially valuable for developing per capita claims costs in postemployment health benefit valuations. For healthcare trend assumptions, Milliman utilizes a modified version of the Getzen Trend Model, originally developed and maintained by the Society of Actuaries. This model forms the foundation for trend projections in OPEB valuations, with tailored adjustments to better reflect employer-sponsored plans.

STEP 4: ACTUARIAL LIABILITIES

Confirm that the key valuation results are reasonable by performing parallel valuations for both the pension and retiree healthcare benefits. We will also request individual sample lives to assist in the replication valuations.

Methods: We will perform the following steps:

Check Individual Calculations: In this step, we will verify that all provisions of each plan are reflected in the valuation and that all assumptions and methods are correctly applied. This step can be useful for identifying small or offsetting discrepancies in calculations.

When we request sample test lives from the consulting actuary for OPERS, we will select specific individuals from each of the plans to provide verification of benefit plan provisions from all pension and non-pension plans. We will also seek a cross-section of the population with respect age, sex, and length of service characteristics.

Perform parallel valuations: We will independently program OPERS plan provisions, actuarial assumptions and methods combined with the member data used in the December 31, 2024 actuarial valuation to independently determine liabilities, normal costs, funded status, and contribution rates for comparison with the results in the actuarial valuation reports.

Review projected cash flows for comparison with recent experience for each system.

Review the gain/loss analysis performed for OPERS to determine reasonableness and trends.

Compare Results: We will then compare our results on an individual-basis and plan wide basis with those calculated by the consulting actuary for OPERS.

Reconcile Differences: If there are any material differences, we will work with the consulting actuary to reconcile them.

STEP 5: FUNDING

Opine on whether the OPERS financial objectives are being met by the actuarial techniques being used to calculate the actuarial determined contribution rates.

Methods: We will give an opinion on whether the development of the actuarial determined contributions are meeting the criteria of the applicable law and funding policies of the plans, Actuarial Standards of Practice, and the Governmental Accounting Standards Board. There may also be additional objectives, such as stable contribution rates and other considerations. We will meet with the staff to discuss these. The following key factors to meeting the funding objectives will be discussed:

Funded Ratio: We will look at how each plan's assets compare to their liabilities and how this ratio is anticipated to change over time.

Actuarially Determined Contribution Rate: We will comment on whether the actuarially determined contribution rates are calculated correctly, are sufficient to fund each plan over a reasonable period and how they are anticipated to change over time.

Healthcare Contributions: We will review the retiree contribution determinations for consistency with OPERS' healthcare policies.

Funding approach: We will discuss the current funding situation and offer comments for consideration of any potential alternative approaches.

Actuarial cost method: OPERS plans are currently using the Entry Age Normal (EAN) actuarial cost method for purposes of reporting the funded status of each plan. The Entry Age Normal actuarial cost method is used by the majority of public sector systems. We will discuss the pros and cons of the different actuarial cost methods.

Asset valuation method: Some asset methods smooth volatility by deferring the recognition of gains and losses. This reduces the volatility in the contribution rates. Most of the OPERS plans use a smoothed asset value and a few plans use a modified version.

Funding Method: We will evaluate key components of the funding method to see whether it is meeting goals.

STEP 6: ACTUARIAL REPORTS

We will review that all reports provided by the consulting actuary are in compliance with relevant Actuarial Standards of Practice (ASOPs) and are appropriate for the audience.

Methods: We review actuarial reports for accuracy and completeness, focusing on the following:

Applicable ASOPs include:

- ASOP 4 – Measuring Pension Obligations
- ASOP 6 – Measuring Retiree Group Benefits Obligations
- ASOP 23 – Data Quality
- ASOP 27 – Selection of Assumptions for Measuring Pension Obligations
- ASOP 41 – Actuarial Communications
- ASOP 44 – Selection and Use of Asset Valuation Methods for Pension Valuations

Important aspects of the reports:

- **Content:** Does the report comply with the relevant Actuarial Standards of Practice standards?
- **Completeness:** Are all disclosures required by statute present, complete, and accurate?
- **Format:** Does the format of the report allow the reader to easily find the necessary information?
- **Clarity:** Is the valuation report written in such a way that it can be understood by its audience (Board member, employer, etc.)?
- **Scope:** Does the report cover all significant aspects of the valuation? For example, is there a section

- ASOP 51 – Assessment and Disclosure of Pension Plan Risk
 - ASOP 56 – Modeling
- discussing the significant changes between the current and prior valuations? Does the report contain sufficient clarity that another qualified actuary could make an objective appraisal of the reasonableness of the results presented in the report?

STEP 7: REPORT OF FINDINGS

We will comment on the potential impact of any material differences found in the valuation and review of the methodology. We will comment on the current actuarial reports in the following areas, including any areas where we think enhancements can be made.

- We will report our findings in the following sections:
 - Executive Summary
 - Data Verification
 - Actuarial Assumptions
 - Parallel Valuation Results
 - Review of Funding Calculations
 - Content of Valuation Reports
- We will provide an initial draft for ORSC review
- We will incorporate feedback from ORSC and issue a second draft for OPERS and the OPERS consulting actuary to review.
- We will issue a final report, including comments received on the draft report, to ORSC for acceptance.
- We will brief ORSC on the results of the actuarial audit and be available to provide additional briefings, if necessary.

Project Timeline

We prefer to establish a clear understanding of expectations from our clients, agreeing to timelines in advance, with key milestones and deliverables. This allows the entire team to understand expectations, and to provide opportunities to communicate in advance if there are timing concerns. In our experience, clear and regular communication is one of the key elements to client satisfaction, as well as consistent execution and high-quality work. We regularly solicit feedback on how we are performing, and all team members recognize the importance of soliciting and acting upon feedback from their client contacts. Our commitment is to meet the upfront agreed-upon deliverables, subject to receiving information and data as requested, and we expect to be measured against that standard. It is important for our clients to understand that our peer review requirements do not allow us to short cut review time and impact quality.

The following is a representative timeline based on the deliverables outlined in the RFP. The final project timeline will be discussed at the kickoff meeting at the beginning of the audit process.

Proposed Schedule

Contracting	
Selection of Actuarial Auditor	TBD
Contract executed	TBD
Background	
Kick off discussion with ORSC and OPERS	1 st week of January 2026
Review statutes, policies and reports	1 st and 2 nd weeks of January
Data	
Request processed census data and sample individual calculations from consulting actuary	2 nd week in January

Request original census data from OPERS	2 nd week in January
Receive original valuation data files and other information that was provided by OPERS to the consulting actuary	3 rd week of January
Receive requested information from consulting actuary (except sample calcs)	3 rd week of January
Process census data provided by OPERS for use in valuation	4 th week of January – 2 nd week of February
Review processed valuation data received from the consulting actuary and reconcile it to data provided by OPERS	4 th week of January – 2 nd week of February
Actuarial Assumptions	
Review of actuarial assumptions and methodology	Month of February
Discuss any methodology questions with the consulting actuary	1 st week of March
Actuarial Liabilities	
Receive detailed results by decrement and group from consulting actuary	2 nd week of February
Customize Milliman valuation system for OPERS plan benefits	2 nd week of February – 2 nd week of March
Receive requested sample individual calculations from consulting actuary	3 rd week in February
Perform replication valuations with Milliman's actuarial valuation system	4 th week of February - 4 th week of March
Reconcile differences on individual liability calculations	4 th week of March - 1 st week of April
Funding	
Replicate key valuation results, including: actuarial value of assets and actuarially determined contributions	Month of April
Reports	
Review OPERS actuarial valuation reports for clear, appropriate communication and compliance with ASOPs	Month of April
Report of Findings	
Milliman drafts actuarial audit report	1 st and 2 nd weeks in May
Actuarial audit report peer reviewed internally at Milliman	2 nd week in May
Provide an initial draft report to the ORSC for review	3 rd week in May
Release a second draft report to OPERS and the consulting actuary for their review and comments	4 th week in May
Issue a final report to the ORSC for final acceptance, incorporating appropriate comments from OPERS and the consulting actuary, and prepare copies of the briefing packet	2 nd week in June
Provide briefing on the results of the actuarial audit to ORSC	Mid-June – mid-July as scheduling permits
Provide briefing on the results of the actuarial audit to the OPERS Board	Mid-June – mid-August as scheduling permits

QUALITY CONTROL

Milliman has a formalized peer review process to provide assurance that the highest quality standards are being maintained.

Milliman's internal pre-release peer review standards and procedures are unsurpassed in our profession to avoid issues arising. Prior to issuance, work products for a high-visibility system like OPERS are peer reviewed by a senior consultant who is not involved with the audit until the peer review of the preliminary report. That review involves both verification of the technical results and review of the work product's verbiage and structure for clarity, understandability, and tone.

Additional Processes

For a plan as complex and large as OPERS with over \$100 billion in assets, the following lists additional items OPERS may want to consider.

Census Data and Benefit Calculation Review

The member data used by the actuary is one of the basic foundations of an actuarial valuation. It forms the basis for actuarially projecting the benefits provided by the plan and determining the plan's liability.

Our standard actuarial audit process already includes a comparison of the original census data prepared by OPERS for the actuarial valuation and the final census data used by the retained actuary for the actuarial valuation.

We can expand the scope of the actuarial audit to also compare the valuation data for a sampling of members to independent sources such as actual benefit calculations to ensure that data codes have been interpreted properly for valuation purposes. We will examine the data used in a recent sampling of benefit calculations and compare it to the census data that was used for prior valuations to ensure that the data is consistent across both valuations and administration. In many instances this can be very useful in understanding the prevalence of prior or purchase service and the consistency of salary provided for the valuation versus that used in the development of final average compensation.

Similarly, we will compare benefit elections made by sample recent retirees to the benefit data used in subsequent valuations. This can be useful to ensure that all benefit contingencies are valued correctly, i.e. what benefits are paid upon the retiree's death or changes that occur when one is approved for a disability retirement.

Finally, we will review benefit calculations for terminating and retired members to ensure that benefits are being determined in compliance with plan provisions and applicable law.

In our experience, this review becomes one of the most enlightening parts of an actuarial audit. Fees can be provided upon request once the full scope is fully defined.

Transfers

In our experience we have seen that a significant number of members transfer service each year between the five Ohio retirement systems. If OPERS is not actively coordinating with other systems and providing data on all transferred service (and any purchased service) to the actuary, we could review benefit calculations for members who recently transferred into OPERS in order to provide an illustration on the potential impact on the valuation liability.

ADDITIONAL INFORMATION

It is permissible to include additional information that will be helpful to gain an understanding of the proposal. This may include diagrams, excerpts from reports, or other explanatory documentation that would clarify or substantiate the proposal.

Any material included here should be specifically referenced elsewhere in the proposal.

We have proposed a robust project team that has significant experience with large complex retirement systems, including previously with OPERS, that we believe will be beneficial to OPERS. Members of the team have significant experience performing actuarial audits, actuarial valuations, valuation projections, testifying to boards and legislative bodies and with complex funding policies, plan provisions and data extracts. Our experiences include being the retained system actuary, auditing actuary, actuary for review commissions or legislative bodies, and as consulting actuary to administrations. We believe these experiences will be vital to provide independent commentary on the actuarial valuation process, procedures, methods and results of OPERS.

GLOSSARY

Each proposal shall provide a glossary of all abbreviations, acronyms, and technical terms used to describe the services or products proposed. This glossary should be provided even if the terms are described or defined when first used in the proposal response.

TITLE	TERM	DEFINITION
ASA	Associate of the Society of Actuaries	Actuarial designation. Actuarial candidates who pass the first segment of requirements earn the Associate of the Society of Actuaries (ASA) credential. An Associate of the Society of Actuaries has demonstrated knowledge of the fundamental concepts and techniques for modeling and managing risk. The Associate has also learned the basic methods of applying those concepts and techniques to common problems involving uncertain future events, especially those with financial implications. The Associate has also completed a professionalism course covering the professional code of conduct and the importance of adherence to recognized standards of practice. Associates who have been members of the SOA for five or more years may also vote in Society of Actuaries elections.
ASOP	Actuarial Standard of Practice	
EA	Enrolled Actuary	An enrolled actuary (EA) is an actuary who has been licensed by a Joint Board of the Department of the Treasury and the Department of Labor to perform a variety of actuarial tasks required of pension plans in the United States by the Employee Retirement Income Security Act of 1974 (ERISA).
FSA	Fellow of the Society of Actuaries	Actuarial Designation that means the Fellow has demonstrated a knowledge of the business environments within which financial decisions concerning pensions, life

insurance, health insurance, general insurance and investments are made including the application of mathematical concepts and other techniques to the various areas of actuarial practice. The Fellow has further demonstrated an in-depth knowledge of the application of appropriate techniques to a specific area of actuarial practice. Fellows may vote in Society of Actuaries elections.

GASB	Governmental Accounting Standards Board	<p>The Governmental Accounting Standards Board (GASB) is the independent organization that establishes and improves standards of accounting and financial reporting for U.S. state and local governments. Established in 1984 by agreement of the Financial Accounting Foundation (FAF) and 10 national associations of state and local government officials, the GASB is recognized by governments, the accounting industry, and the capital markets as the official source of generally accepted accounting principles (GAAP) for state and local governments.</p> <p>The GASB issues standards and other communications that result in decision-useful information for users of government financial reports including, for example, owners of municipal bonds, members of citizen groups, legislators and legislative staff, and oversight bodies. Those standards also help government officials demonstrate to their constituents their accountability over public resources. Additionally, the GASB works to educate the public, including financial statement preparers, auditors, and users, about its standards and the information those standards require governments to present in their financial reports.</p>
MAAA	Member of the American Academy of Actuaries	<p>Actuarial Designation.</p> <p>Membership requirements: One or more of the following: Associateship in the Casualty Actuarial Society, associateship in the Society of Actuaries, M.S.P.A. or F.S.P.A. in the American Society of Pension Professionals and Actuaries, membership in the Conference of Consulting Actuaries, enrolled actuary status under Title 3, Section C of the Employee Retirement Income Security Act of 1974, fellowship in the Canadian Institute of Actuaries, fellowship in the Institute & Faculty of Actuaries in the United Kingdom, membership in the Colegio Nacional de Actuarios in Mexico, fellowship in the Institute of Actuaries of Australia. Any other actuarial educational credentials must be approved by the Membership Committee and the Executive Committee.</p>
OPEB	Other Postemployment Benefits	<p>Other Postemployment Benefits (OPEB) are benefits (other than pensions) that U.S. state and local governments provide to their retired employees. These benefits principally involve health care benefits, but also may include life insurance, disability, legal and other services.</p>
SOC 2	Service Organization Control	<p>Report issued by external auditor on compliance of controls at an organization providing ongoing services such as</p>

outsourcing or fund management in accordance with
SSAE16.

COST INFORMATION

The pricing summary should include a breakdown of costs per element listed under Scope of Audit, including: personnel costs (including hourly rates and estimated hours for professional and clerical staff assigned to the audit); travel and lodging; data processing costs; materials, and any other potential costs. The cost estimates in the pricing summary must include all necessary charges to complete the audit and must be a “not to exceed” figure.

The overall fee associated with the replication and review services described in Section II are summarized in the following table.

OPERS Actuarial Audit

<u>Work Description / Level of Professional</u>	<u>Hourly Billing Rate</u>	<u>Estimated Hours</u>	<u>Estimated Price</u>
Principal & Consulting Actuary	\$550	95	\$52,250
Senior Actuary	\$425	100	\$42,500
Actuary	\$300	75	\$22,500
Senior Analyst	\$225	85	\$19,125
Junior Analyst	\$150	125	\$18,750
Peer Review	\$550	25	\$13,750
Travel & Lodging		-	\$4,000
Preliminary Bid Price		505	\$172,875
Bid Price Not to Exceed Fee			\$168,000

As requested, the following tables provides a breakdown of the audit fee by key deliverable: Pension Replication and associated tasks, Experience Study and Retiree Healthcare Replication and associated tasks.

OPERS Actuarial Audit – Pension Replication

<u>Work Description / Level of Professional</u>	<u>Hourly Billing Rate</u>	<u>Estimated Hours</u>	<u>Estimated Price</u>
Principal and Consulting Actuary	\$550	53	\$29,150
Senior Actuary	\$425	55	\$23,375
Actuary	\$300	40	\$12,000
Senior Analyst	\$225	45	\$10,125
Junior Analyst	\$150	80	\$12,000
Peer Review	\$550	11	\$6,050
Total Bid Price		284	\$92,700

OPERS Actuarial Audit – Experience Study Review

<u>Work Description / Level of Professional</u>	<u>Hourly Billing Rate</u>	<u>Estimated Hours</u>	<u>Estimated Price</u>
Principal and Consulting Actuary	\$550	12	\$6,600
Senior Actuary	\$425	10	\$4,250
Actuary	\$300	10	\$3,000
Senior Analyst	\$225	15	\$3,375
Junior Analyst	\$150	-	-
Peer Review	\$550	4	\$2,200
Total Bid Price		51	\$19,425

OPERS Actuarial Audit – Retiree Healthcare Replication

<u>Work Description / Level of Professional</u>	<u>Hourly Billing Rate</u>	<u>Estimated Hours</u>	<u>Estimated Price</u>
Principal and Consulting Actuary	\$550	30	\$16,500
Senior Actuary	\$425	35	\$14,875
Actuary	\$300	25	\$7,500
Senior Analyst	\$225	25	\$5,625
Junior Analyst	\$150	45	\$6,750
Peer Review	\$550	10	\$5,500
Total Bid Price		170	\$56,750

Our billing procedures would be to submit actual time charges on a monthly basis (toward the end of the following month). Charges for those services included in the fixed fee contract price will be capped if and when the total price reaches 90% of the fixed fee until the services are completed. At such time, the remainder of the fixed fee will be billed.

Appendices

Appendix A – Service Team Biographies

SCOTT PORTER

FSA, EA, MAAA

Principal, Consulting Actuary

scott.porter@milliman.com

+1 610 975 8070



Current Responsibility

Scott Porter is a consulting actuary with the Philadelphia office of Milliman. He joined the firm in 1992.

Professional Work Experience

Scott serves both public and private sector clients with their defined benefit pension and retiree medical plans. Client assignments include actuarial valuations, cost studies, actuarial audits, accounting valuations under 67, 68, 74, and 75, and FASB codifications ASC Topic 715, and government filings.

He has developed cost-projection models for private and public sector clients to determine future funding levels and the cost of proposed plan changes, as well as for GASB 67 and 74 depletion date calculations. He has assisted clients in collective bargaining and in implementing plan changes; he has also testified to legislative bodies.

Scott has consulted to several governmental entities with unique funding strategies, including rate collars, phase-in strategies, pension obligation bonds, and dedicated revenue, such as from lottery enterprise and sales tax, to assist with funding and financial reporting of pension plans. He also has experience in performing actuarial audits for pension plans, including analysis of data, actuarial methods, and assumptions.

Scott is chair of Milliman's Public Sector Strategic Planning Group; a contributing member to Milliman's Pension and Health Experts Group; and a contributing member to the Society of Actuaries' Retirement Plan Experience Committee Public Plan Mortality.

Professional Designations

- Fellow, Society of Actuaries
- Enrolled Actuary, ERISA
- Member, American Academy of Actuaries

Education

BBA (magna cum laude), concentration in Actuarial Science, Temple University

R. RYAN FALLS

FSA, FCA, EA, MAAA

Principal & Consulting Actuary

ryan.falls@milliman.com

214-289-7869



Current Responsibility

Ryan Falls is a principal and consulting actuary in Milliman's Dallas, Texas, office. Ryan joined Milliman's public sector consulting team in April 2023.

Professional Work Experience

Ryan has 25 years of actuarial and benefits consulting experience, focusing on the needs of major public employee retirement systems and private sector employers. Throughout his career, Ryan has provided consulting services to statewide and municipal retirement systems across the country. As an actuary and senior consultant, Ryan performs actuarial valuations for public pension and retiree health care plans; conducts plan design analyses, including the design and implementation of cash balance and other hybrid plan designs; and performs asset liability modeling and actuarial audits.

Ryan is an expert in consulting on plan design and sustainability. His background includes studying many large plan designs to understand the impacts on plan costs, employee retention, administrative functions, and applicable stakeholders. Ryan has repeatedly seen first-hand the monumental effort required by retirement systems, stakeholders, and politicians to reform public pension plans. As a result, Ryan firmly believes that true reform and plan sustainability must include adaptable features such as actuarially determined contributions and adjustable benefit provisions.

Immediately prior to joining Milliman, Ryan was the lead actuary for the Arizona State Retirement System, the Teachers Retirement System of Oklahoma, the New Mexico Educational Retirement Board, the New Mexico Public Employees Retirement Association, and the Employees Retirement System of Texas. Ryan has also conducted 13 actuarial audits over the past five years for many notable organizations, including the Nebraska Public Employees Retirement System, the Oregon Public Employees Retirement System, the Missouri Public School and Education Employee Retirement System, and the Teacher Retirement System of Texas.

Professional Designations

- Fellow, Society of Actuaries
- Fellow, Conference of Consulting Actuaries

- Enrolled Actuary
- Member, American Academy of Actuaries

Education

Bachelor of Science, Applied Mathematical Science, Texas A&M University

Presentations and Publications

Ryan regularly serves as a speaker at national conferences for organizations such as the National Council on Teacher Retirement (NCTR), National Conference on Public Employee Retirement Systems (NCPERS), International Foundation of Employee Benefit Plans (IFEBC), and National Association of Public Pension Attorneys (NAPPA).

Affiliations

Ryan is an active member of the NCTR Corporate Advisory Committee. As a committee member, Ryan provides advice and counsel for NCTR's governance process.

KATHY WARREN

EA, FSA, MAAA

Principal & Consulting Actuary

katherine.warren@milliman.com

+1 610 975 8074



Current Responsibility

Kathy Warren is a principal and consulting actuary with the Philadelphia office of Milliman. She joined the firm in 1991.

Professional Work Experience

Kathy serves both public and private sector clients regarding their defined benefit pension plans and post-retirement welfare plans. Client assignments include actuarial valuations for minimum funding and employer accounting under ERISA, FASB, and GASB standards; cost studies and legislative impacts (including multi-year projections); and government filings. Kathy has experience in developing cost projection models for private and public sector clients to determine future funding levels and the cost of proposed plan changes. She also assists with participant communication by providing individual benefit statements and benefit calculations.

Professional Designations

- Fellow, Society of Actuaries
- Enrolled Actuary, ERISA
- Member, American Academy of Actuaries

Education

BA (summa cum laude), Mathematics, University of Pennsylvania

Presentations and Publications

Kathy currently serves on the Editorial Committee of Milliman's Benefit Perspectives and chairs Milliman's committee for the firm's valuation system. She has also assisted the Joint Board for the Enrollment of Actuaries and the Society of Actuaries in developing the Enrolled Actuaries examinations.

RICK GORDON

FSA, EA, MAAA

Principal & Consulting Actuary

rick.gordon@milliman.com

+1 610 975 8968



Current Responsibility

Rick Gordon is a principal and consulting actuary with Milliman's Employee Benefits Consulting Practice. He joined the firm in 2001.

Professional Work Experience

Rick has over 25 years of pension and employee benefits consulting experience. He serves both public and private sector clients regarding their defined benefit pension and retiree medical plans. Rick performs all aspects of actuarial consulting, including actuarial valuations, experience studies, plan design cost studies, FASB valuations for developing expense and year-end disclosure for FASB ASC Topic 715, and government filings. Assignments also include GASB valuations under 67, 68, 74, and 75. He has developed stochastic asset-liability projection models for private and public sector clients to assess volatility of future funding levels and the cost of proposed plan changes. Rick also has experience in performing audits for pension plans, including analysis of data, actuarial procedures, and assumptions. Additionally, he consults for various state-run college prepaid tuition programs. Rick is a member of Milliman's GASB 67/68 Task Force and is also co-author for Milliman's Public Pension Funding Study, which provides an independent analysis of the country's 100 largest public pension plans.

Professional Designations

- Fellow, Society of Actuaries
- Enrolled Actuary, ERISA
- Member, American Academy of Actuaries

Education

BS, Mathematics, Elizabethtown College, Elizabethtown, Pennsylvania

Presentations and Publications

- Co-author of Milliman's annual Public Pension Funding Study - milliman.com/ppfs.

- Co-author of Milliman's annual Public Pension Funding Index - milliman.com/ppfi.
- GASB 67/68: Relationship Between Valuation Date, Measurement Date, and Reporting Date (PERIScope, March 2014).
- Discount Rates: Pension Case Study (International Actuarial Association monograph, 2011).

NICK COLLIER

ASA, EA, MAAA, FCA

Principal, Consulting Actuary

nick.collier@milliman.com

+1 206 504 5508



Current Responsibility

Nick Collier is a principal and consulting actuary with the Seattle office of Milliman. He joined the firm in 1987.

Professional Work Experience

Nick's area of expertise is the employee benefits field, serving a wide range of public and multiemployer clients. He has assisted clients with many aspects of defined benefit plans, including actuarial valuations, experience studies, asset-liability modeling, cost projections, and postretirement benefits valuation. Additionally, Nick has extensive experience performing actuarial audits.

Nick's projects have included:

- Creating stochastic asset-liability projections
- Designing a retirement benefit online calculator
- Analyzing the use of reserves in funding policy
- Conducting high-level internal quality control reviews

For each client, Nick is, at a minimum, involved with the actuarial valuation, experience analysis, cost studies, and projections. Each of these systems has more than 10,000 members and assets greater than \$1 billion. Three of these systems have cash balance features as part of the retirement system. Additionally, Nick has performed more than 30 actuarial audits on large public sector retirement systems.

- Associate, Society of Actuaries
- Member, American Academy of Actuaries
- Enrolled Actuary, ERISA
- Fellow, Conference of Consulting Actuaries

Education

BA (cum laude), Mathematics and Economics, Claremont McKenna College

Presentations and Publications

- "COVID 19 – An Actuarial Perspective on Experience, Assumptions, and Policies," March 8, 2021. Presentation at CALAPRS General Assembly.
- "6 Years Post-PEPRA – Are We Getting the Savings as Promised?" March 8, 2020. Presentation at CALAPRS General Assembly.
- "Volatility Adjusted Discount Rates," presented at the 2010 Conference of Consulting Actuaries meeting.

Professional Designations

1301 Fifth Avenue, Suite 3800
Seattle, WA 98101
United States

milliman.com



MARCELLA GIORGOU

EA, FSA, MAAA

Principal & Consulting Actuary

marcella.giorgou@milliman.com

+1 646 473 3311



Current Responsibility

Marcella Giorgou is a principal and consulting actuary in the New York office of Milliman. She joined the firm in 2004.

Professional Work Experience

Marcella provides health and welfare benefits consulting services. These services focus on the design and delivery of benefits and include plan design review and analysis, assistance in collective bargaining negotiations, compliance support, renewal negotiations, reserve calculations, Medicare Part D attestations, and financial projections.

Marcella also has experience providing actuarial support services to corporate, multiemployer, and not-for-profit post-retirement benefit plans. Her experience includes accounting valuations of pension and post-retirement medical plans.

Professional Designations

- Enrolled Actuary
- Fellow, Society of Actuaries
- Member, American Academy of Actuaries

Education

BS, Actuarial Science and Finance, New York University's Stern School of Business

REZA VAHID

FSA, CFA, MAAA

Principal & Consulting Actuary

reza.vahid@milliman.com



Current Responsibility

Reza Vahid is a principal and consulting actuary in the New York office of Milliman. He joined the firm in 2014.

Professional Work Experience

Reza has over 20 years of employee benefits consulting experience and is the lead or co-lead consultant on several Taft-Hartley health and welfare clients. He also provides actuarial and employee benefit support services to corporate, governmental, and not-for-profit employee benefit plans. His experience includes developing budgeting and cost projections, performing contribution rate strategy, strategic planning, benefit design, and cost control, and performing funding and accounting valuations for other postretirement benefit plans. Reza also assists clients with plan design analysis, collective bargaining negotiations, other postretirement benefit valuation assumptions development, reserve calculations, and contribution and expense projections.

Professional Designations

- Fellow, Society of Actuaries
- CFA Charterholder
- Member, American Academy of Actuaries

Education

- BA, Neuroscience, Columbia University
- Phillips Exeter Academy

Presentations and Publications

[Multiemployer health and welfare fund statistics: 2023 report \(milliman.com\)](#)

[Multiemployer health and welfare fund statistics: 2022 report \(milliman.com\)](#)

[Coronavirus Aid, Relief, and Economic Security Act \(milliman.com\)](#)

Affiliations

Member, International Foundation of Employee Benefit Plans (IFEBP)

ALAN PERRY

FSA, MAAA, CFA

Principal, Consulting Actuary

alan.perry@milliman.com

+1 610 975 8046



Current Responsibility

Alan Perry is a principal and consulting actuary with the Philadelphia office of Milliman. He joined the firm in 1990.

Professional Work Experience

Alan's experience covers retirement plans, college prepaid tuition and savings plans, endowments, foundations, and insurance organizations. He specializes in the development of capital markets assumptions and investment policy. Alan performs asset/liability studies, including stochastic modeling, to help plan sponsors develop investment and funding strategies and manage financial risk. He also performs valuations of employee stock options.

Professional Designations

- Fellow, Society of Actuaries
- Member, American Academy of Actuaries
- Chartered Financial Analyst

Affiliations

- Member, American Academy of Actuaries' Task Force on Employee Stock Options
- Member, Financial Analysts of Philadelphia

Education

- BBA, Economics, Wharton School, University of Pennsylvania
- MS, Actuarial Science, Temple University

Presentations and Publications

Alan serves on Milliman's Investment Oversight Committee and is the Chair of Milliman's Capital Markets Committee. He is a frequent speaker on pension and investment topics, including the following:

- National Association of State Treasurers
- International Foundation of Employee Benefit Plans
- Government Finance Officers Association

Alan is also the co-author of the annual Milliman Pension Funding Study that analyzes the funding progress of the 100 largest U.S. corporate defined benefit plans.

NINA LANTZ

FSA, EA, MAAA

Principal and Director, Employee Benefits Research

nina.lantz@milliman.com

+1 503 227 0634



Current Responsibility

Nina Lantz is a principal and director of Employee Benefits Research at Milliman. She is based in Portland, Oregon. She joined the firm in 1993.

Nina supports Milliman's Employee Benefits Practice by keeping consultants informed on late-breaking legislation, regulations, accounting standards, and formal and informal agency guidance as it impacts employee benefits. She oversees the training of consultants on emerging technical matters and assists in producing Milliman publications and technical resources.

Professional Work Experience

During her career, Nina has worked on a variety of corporate and public defined benefit plans, with a particular emphasis on multiemployer defined benefit plans. She has provided actuarial and consulting services to clients, supporting them in funding and administering their retirement plans, and developing strategies to help them navigate the challenges related to changing legislation and regulation, industry fluctuations, and market volatility.

Professional Designations

- Fellow, Society of Actuaries
- Enrolled Actuary, ERISA
- Member, American Academy of Actuaries

Education

BS, Mathematics, Oregon State University

Affiliations

Member, International Foundation of Employee Benefit Plans

Appendix B – Sample Audit Report



School Employees Retirement System of Ohio

Actuarial Audit of June 30, 2021 Actuarial Valuations

Prepared by:

Nick J. Collier, ASA, EA, MAAA
Principal & Consulting Actuary

Scott F. Porter, FSA, EA, MAAA
Principal & Consulting Actuary

Milliman, Inc.
1550 Liberty Ridge Drive
Suite 200
Wayne, PA 19087
Tel +1 610-687-5644
milliman.com



1550 Liberty Ridge Drive
Suite 200
Wayne, PA 19087-5572
USA
Tel +1 610 687 5644
milliman.com

CONFIDENTIAL

December 7, 2022

Richard Stensrud
Executive Director
School Employees Retirement System of Ohio
300 E. Broad St., Suite 100
Columbus, Ohio 43215-3746

Re: Actuarial Audit of June 30, 2021 Actuarial Valuations

Dear Mr. Stensrud:

We are pleased to present the enclosed report summarizing our findings and recommendations resulting from our independent review of the actuarial methods, procedures, actuarial assumptions and membership data and the resulting actuarially computed normal costs and liabilities as shown in the June 30, 2021 reports on the Actuarial Valuation of Defined Benefit Allowances and Projections of Retiree Health Benefits for the School Employees Retirement System of Ohio (SERS).

This report presents an executive summary followed by separate sections discussing in detail our findings, analyses and recommendations. While some issues are discussed at greater length than others, this report is intended to provide a complete and independent third party review of SERS and its operations from an actuarial perspective. All comments and recommendations are intended to be constructive. Our purpose was to identify areas of possible improvement in the system, its operation and/or the actuarial procedures.

We would like to thank the staffs of SERS and CavMac for their cooperation. Their prompt and courteous responses to our questions and requests for information were of valuable assistance to us and greatly appreciated.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by SERS staff and CavMac. This information includes, but is not limited

Actuarial Audit of June 30, 2021 Actuarial Valuations
School Employees Retirement System of Ohio

This work product was prepared solely for SERS for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

to, statutory provisions, employee data, and financial information. Since the audit results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our calculations may need to be revised. The audit results were developed using models intended for actuarial valuations that use standard actuarial techniques.

A valuation report is only an estimate of the Plan's financial condition as of a single date. It can neither predict the Plan's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of Plan benefits, only the timing of Plan contributions. Future actuarial measurements may differ significantly from the current measurements presented in this analysis due to actual plan experience deviating from the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as potential additional contribution requirements due to changes in the System's funded status), and changes in plan provisions, actuarial assumptions, and applicable law. An assessment of the potential range and cost effect of such differences is beyond the scope of this analysis.

Milliman's work product was prepared exclusively for SERS for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning SERS' operations, and uses SERS' data, which Milliman has not audited. It is not for the use or benefit of any third party for any purpose. Any third party recipient of Milliman's work product who desires professional guidance should not rely upon Milliman's work product but should engage qualified professionals for advice appropriate to its own specific needs.

The consultants who worked on this assignment are retirement actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Actuarial Standards of Practice promulgated by the Actuarial Standards Board and the applicable Code of Professional Conduct, amplifying Opinions, and supporting Recommendations of the American Academy of Actuaries.

We 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 herein.

Mr. Richard Stensrud
December 7, 2022
Page 2

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

We look forward to having the opportunity to present this report and respond to questions regarding our review and recommendations.

Respectfully submitted,



Nick Collier, ASA, EA, MAAA



Scott Porter, FSA, EA, MAAA

NJC:SFP:78OHS01-10
SERS 2021 Audit Report.doc

TABLE OF CONTENTS

Executive Summary and Recommendations	1
Section I - Data Validity	11
<i>Comparison of June 30, 2021 Membership Data</i>	13
<i>Benefit Calculation Review</i>	14
<i>Benefit Calculation Review – Retiree Data</i>	15
<i>Benefit Calculation Review – Active Data</i>	18
<i>Valuation Data Review</i>	20
Section II - Actuarial Valuation Methods and Procedures	24
<i>Asset Valuation Method</i>	25
<i>Actuarial Cost Method</i>	25
<i>Funding Policy</i>	26
Section III - Actuarial Valuation Assumptions	30
<i>Selection of Actuarial Assumptions</i>	31
<i>Economic Assumptions</i>	31
<i>Demographic Assumptions</i>	36
<i>Retiree Healthcare Assumptions</i>	43
Section IV - Actuarial Valuation Report	48
<i>Actuarial Standards of Practice</i>	49
<i>Summary of Plan Provisions</i>	51
<i>Summary of Actuarial Assumptions</i>	51
Section V - Sample Life Review	53
<i>Basic Pension Benefits – Retirees & Survivors</i>	55
<i>Basic Pension Benefits - Actives</i>	59
<i>Healthcare Benefits – Retirees & Survivors</i>	62
<i>Healthcare Benefits - Actives</i>	63

Executive Summary and Recommendations

This report summarizes the results of an actuarial review of the School Employees Retirement System of Ohio (“SERS”) based on the June 30, 2021 actuarial valuations for basic benefits and healthcare benefits as well as the 2015 – 2020 Experience Study. The purposes of this review are to determine:

- The validity, completeness, and appropriateness of the demographic and financial information used by CavMac to meet SERS’ funding objectives for both the basic benefits and healthcare benefits.
- The reasonableness of the consulting actuary’s conclusions and the conformance of CavMac’s work with generally accepted actuarial standards of practice.
- The reasonableness of CavMac’s conclusions when reviewing retiree healthcare premiums and funding.

This analysis was conducted under a Level II limited-scope audit, which uses a review of sample cases (sample lives) provided by CavMac to determine if all of the benefits offered by SERS are reflected in the actuarial programs. Sample life refers to the development of liabilities for specific individuals in the valuation model. The sample life information provided by CavMac was a high-level summary of the liabilities for each of the samples. While we have no material concern with the overall determination of the liabilities for each of the plans based on the sample lives that we reviewed, we did not perform a full replication to determine if any programming differences would yield a materially different result.

Overall Assessment

Our overall assessment as a result of our review of CavMac’s actuarial work for SERS is that all major actuarial functions are being appropriately addressed. CavMac has employed generally accepted actuarial practices and principles in studying plan experience, selecting assumptions, determining liabilities and contribution rates, and presenting the results of their work.

Review of Another Actuary’s Work

In a system as large and complex as SERS, there are many operational aspects that have a bearing on the actuarial analysis of the plan. The reader should recognize that many of the issues that we reviewed and which we will discuss in this report are subject to opinion and professional preference. No two actuaries (or actuarial firms) are likely to use precisely the same methods and assumptions (and, therefore, arrive at precisely the same conclusions) when presented with the exact same circumstances and set of historical facts. In completing our review, we have attempted to focus on those aspects of the plan and its actuarial functions that could be meaningfully improved. In presenting our findings in this report, we have tried to limit discussion of aspects which reflect our

professional preferences, but which would have minimal effect on the results and conclusions presented by the actuary.

By its nature, a review of another professional's work product will tend to focus on those aspects where the reviewer believes some modification in current procedures would be desirable. Hence, a report such as this will devote the majority of the presentation to commentary that, even though intended to be constructive, may give the reader the impression that only issues were found. ***Therefore, we would like to state clearly up front that we found the actuarial procedures and practices to be of a high quality and in compliance with all major aspects of the applicable actuarial standards.*** While we will discuss several areas where we believe some modifications in current data collection procedures, actuarial assumptions or methods would be beneficial, that discussion should be considered within the context of an overall favorable report concerning CavMac's work.

Audit Conclusions

Set forth below is a summary of the conclusions of the audit split into the various components considered in our review. In each subsection, we have provided commentary including any recommended changes we have or items that we think should be considered in the future. These comments should be viewed in the context of an overall favorable review of the actuarial work. We do not believe that if any of changes were implemented that they would significantly affect the results of the valuations.

Membership Data

We performed tests on both the raw data supplied by SERS staff and the processed data used by CavMac in the actuarial valuations. As part of our review, we reviewed twenty (20) benefit calculations reflecting members who retired in the year before or year after the valuation date allowing us to review the raw data for consistency with information used in the actual benefit calculation. Based on this review, we feel the individual member data used is appropriate and complete. Please note that we have combined our comments on the membership data with our comments on our review of the sample lives below. Please refer to the subsection below as well as *Section I – Data Validity* of this audit report for more details.

Actuarial Value of Assets

We have reviewed the calculations of the actuarial value of assets used in the June 30, 2021 actuarial valuation for the basic pension benefits. We found the calculations to be accurate and the methodology to be appropriate and in compliance with actuarial standards of practice. Please refer to *Section II – Actuarial Valuation Methods and Procedures* of this audit report for more details.

Actuarial Cost Method

We have reviewed the version of the Entry Age Normal cost method employed by CavMac and have found the methodology to be appropriate and in compliance with actuarial standards of practice. Please refer to *Section II – Actuarial Valuation Methods and Procedures* of this audit report for more details.

Funding Policy

SERS employs a fixed contribution rate where a portion of the contribution is allocated to healthcare benefits based on the funded percentage of the basic benefits. Under statute, if the maximum employer contribution rate of 14% of payroll does not fund the basic benefits over a period of 30 years or less, the Board is required to take action to reduce the period to no more than 30 years. To help place the current contribution rate in context for stakeholders, CavMac determines an actuarially determined contribution rate. The actuarially determined contribution rate is based on amortizing the unfunded liability over a closed period that declines by one year with each valuation. As of the June 30, 2021 valuation, the period is 23 years. We believe the calculation of the actuarially determined contribution is reasonable and provides valuable information to stakeholders.

The valuation report does not report the effective amortization period for comparison to the 30-year statutory minimum requirement. We suggest consideration be given to either adding this metric to the valuation report or simply making a statement that the 30-amortization requirement is or is not met (the requirement was satisfied in the most recent valuation).

For healthcare benefits, SERS' funding goal is to maintain solvency for at least a 20-year period. Based on projections included in the June 30, 2021 actuarial valuation, the trust is to remain solvent for a 37 year period until 2058. In addition to any portion allocated based on the maximum employer contribution rate of 14%, SERS also collects a surcharge of 1.5% of payroll from employers. To provide some context for determining the adequacy of the 1.5% surcharge, CavMac determines a minimum contribution rate based on an open 30-year amortization period. While we believe this does assist in providing stakeholders with some context on the adequacy of the surcharge rate, we would suggest greater focus be incorporated into the health care fund balance projections by including an exhibit in the report displaying the projected benefits out of the fund and incorporate reasons for changes in the solvency period into the report commentary.

Please note that the normal cost rate shown in the actuarial valuation report did not incorporate the mid-year interest adjustment similar to the other contribution rates. This would have increased the overall contribution rate from 2.46% of payroll to 2.50% of payroll.

Please refer to *Section II – Actuarial Valuation Methods and Procedures* of this audit report for more details.

Sample Life Review

A Level II audit requires a review of detailed sample lives provided by the actuary. Sample life refers to the development of liabilities for specific individuals in the valuation model. As requested by Milliman, CavMac provided 15 sample lives for various categories of individuals representing a cross section of members by hire age, grandfathered status, status, form of payment, etc. to review the projected benefits produced by the actuarial model for both the pension and healthcare actuarial valuations as of June 30, 2021.

CavMac provided a high-level summary of the present values calculated by decrement, i.e., the portion of the liability attributable to the future retirement, termination, disablement or death of the member. We independently programmed the primary features of the benefits provided by SERS to determine if the liabilities calculated by CavMac for the individuals are reasonable and are likely to lead to a reasonable aggregate result of the liabilities of the entire system.

While we have no material concern with the overall determination of the liabilities for each of the plans based on the sample lives that we reviewed, we did not perform a full replication to determine if any programming differences found would yield a materially different result. Please refer to *Section V – Sample Life Review* of this audit report for more details.

The following summarizes our findings for both the basic benefits and healthcare benefits. One particular area that our review focused on was the benefits provided upon disability, how the data is provided to the actuary for members receiving disability benefits, and how those benefits are valued in both the basic benefits and healthcare benefits actuarial valuations. We have combined all of our comments on disability benefits into a single subsection below.

Disability Benefits

We recommend both CavMac and SERS review the benefits valued and data provided on members who retired due to disability in both the basic benefits and healthcare valuations. The following summarizes our findings and recommendations:

- We recommend that SERS create a separate benefit type code of “C” for Converted Disability when a member converts a New Disability Plan benefit to a service retirement benefit at age 65 so these members can continue to be valued as disabled. After the date of conversion, these members are valued as service retirees and the health mortality table is applied. By utilizing the disability mortality table, the liability would decrease.

- When a disabled member dies, beneficiaries of that member are entitled to survivor benefits. Survivor benefits are available to Old Disability Plan members for lifetime and for New Disability Plan members until date of conversion (age 65). We recommend that these benefits be included in the actuarial valuation programming for active members and current disability retirees. We also suggest that SERS include a spouse date of birth and other dependent information on the retiree data, to the extent available, so that these benefits can be valued more accurately. Adding these benefits will increase the liability of the plans.
- When a New Disability Plan member converts to a service retirement benefit, the date of commencement reported is updated to the date of conversion. Since COLAs are deferred until the 4th anniversary of date of commencement (if commence on or after April 1, 2018), we suggest that SERS include the first date a COLA would apply so that the change in the date of commencement does not result in CavMac assuming a COLA is deferred until a future date rather than immediately applicable. While we do not believe this is resulting in any issue currently, it could potentially prevent the liability from being understated in future valuations.
- For New Disability Plan members, SERS provides the date of conversion and estimated benefit at this conversion date on the data. However, this information was not included in the valuation data provided to us by CavMac, and consequently we believe CavMac is assuming the current disability benefit would be paid for the member's lifetime. We recommend that CavMac review its data procedures and incorporate the estimated converted benefit into its coding for current retirees and active members. We estimated that the converted benefit is less than the disability benefit and would result in a lower liability.
- SERS indicates which retirees are receiving the Medicare Part B subsidy, which may include disabled members who are under age 65. Our understanding is that CavMac assumes the Medicare Part B benefit begins at age 65 regardless of the indicator on the data. We recommend that CavMac value the Medicare Part B subsidy for disabled members indicated by SERS and incorporate an assumption for disabled members who are within 24 – 30 months of their commencement date. Medicare includes a 25 month elimination period.

While the healthcare valuation includes an assumption for future disability members who are eligible for Medicare (see our comments in the next paragraph), we are unsure if this assumption is utilized in the valuation of Medicare Part B subsidy. Therefore, we also recommend that an assumption be included in the active programming for the potential of Medicare Part B subsidy benefits provided prior to age 65. Incorporating this benefit into the valuation program would result in an increase in the liability.

- For healthcare benefits, retirees contribute a portion of the premium based on years of service. For New Disability Plan members, the years of service used to determine the contribution premium percentage includes the period of disability at the date of conversion. We believe CavMac is assuming the contribution premium percentage remains the same based on years of service at the time of disability. We recommend that CavMac review its actuarial programs to reflect a possible lower contribution premium percentage at the date of conversion for current New Disability Plan retirees and for active employees. Incorporating this change will result in an increase in the liability for healthcare benefits.
- In the healthcare valuation report, CavMac assumes that 15% of future disabled retirees will become eligible for Medicare. In our review of the retiree data, we found the percentage receiving the Medicare Part B subsidy to be about 40%. We suggest that SERS and CavMac review the percentage of members on disability who qualify for Medicare.
- Since records for New Disability Plan members are being communicated as service retirements rather than disability retirements after the date of conversion, their mortality experience is being analyzed as healthy mortality as opposed to disability mortality in the experience study in developing the appropriate adjustments to the selected mortality tables. We would expect these members to have higher rates of mortality than other service retirements which could lead to lower life expectancies assumed for the entire service retirement population. We recommend that these members be identified and combined with the disability retirements in the next experience study.

Basic Benefits

The following are a summary of comments related to other basic benefits.

- **Accumulated Contributions:** For members who elect the maximum single life annuity, a beneficiary may still be entitled to a death benefit equal to their accumulated contribution balance less the amount of payments received in retirement. For New Plan Disability members, the accumulated contribution balance is reduced by benefits received after the date of conversion. While SERS includes this information in the data, the data provided by CavMac did not incorporate it as they indicated the balance is assumed to have been exhausted by date of death.

For future retirees, it is our understanding that CavMac assumes that this death benefit is equal in value to approximately a 1-year certain. Based on the information in the benefit calculations, we estimated that the average period for which a death benefit would be applicable is 40 months or 3.3 years. We recommend that CavMac incorporate this benefit for current retirees and increase

its assumption for future retirees reflecting benefit difference for grandfathered versus non-grandfathered members. Modifying this assumption would result in an increase in the liability.

- **Multiple Plan Beneficiaries:** CavMac values retirees who elected a joint and survivor annuity with multiple plan beneficiaries as had elected a 100% joint and survivor annuity for ease of coding. The data provided by SERS indicates the amounts payable to each beneficiary and the cumulative joint and survivor percentage could be determined. While there are few members who elect this option, we would recommend that CavMac review their data procedures and value the actual cumulative joint and survivor percentage. We would also suggest using the date of birth for the youngest beneficiary. Making these modifications would result in a very small decrease in the liability.
- **Medicare Part B:** The Medicare Part B subsidy of \$45.50 is paid to each recipient of a service retirement benefit, disability recipient or a survivor who had at least 10 years of service and has elected healthcare coverage. For members who elect a joint and survivor annuity, the benefit continues to be paid to the spouse upon death of the retiree. For the pension benefits, the election of a joint and survivor annuity would have the same present value as the value of a single life annuity due to the actuarial equivalent factors that are provided. For the Medicare Part B continuation, this provision effectively provides the retiree with a subsidized 100% joint and survivor annuity for any member who elected a joint and survivor annuity. We recommend that CavMac review the percentage of members who this may apply to and incorporate in future actuarial valuations.

Healthcare Benefits

The following are a summary of comments related to other healthcare benefits.

- **Contribution Premium Percentage:** The percentage of the premium paid by SERS and the retiree is based on years of service at retirement. At 35 years, the percentage decreases by 1% for each additional year of service if the member retired on or after August 1, 2008 such that at 50 years the premium is fully subsidized by SERS. In addition, the retiree is not charged the \$35 surcharge. In reviewing the edited retiree data, the contribution premium percentage is 20% rather than 0%. In addition, CavMac is valuing the surcharge for these members. We recommend that CavMac review its data procedures and programs to verify the proper contribution premium percentage is determined. Adjusting the contribution premium percentage for these members will result in an increase in the liability.
- **Participation Assumption:** Upon retirement, members have two chances to elect healthcare coverage from SERS (members may also elect coverage if any other

healthcare coverage is involuntarily terminated). The first opportunity is upon retirement and the second opportunity is upon becoming eligible for Medicare. Based on analysis conducted in the experience study, there is a percentage of members who first elect healthcare coverage from SERS upon becoming eligible for Medicare. However, no liability is included for current retirees who have not elected healthcare coverage upon retirement but may do so upon becoming eligible for Medicare. We recommend that CavMac and SERS identify current retirees and determine a liability for members who may elect coverage upon becoming eligible for Medicare. By including these retirees in the healthcare valuation, this will result in an increase in the liability.

Actuarial Assumptions

We have reviewed the actuarial assumptions used in the June 30, 2021 valuations as recommended in the 2015 – 2020 experience study and have found the assumptions to be appropriate and in compliance with actuarial standards of practice. In some instances, we suggest additional disclosure for the assumption be noted in the experience study and/or valuation report. For these comments, please refer to *Section IV – Actuarial Valuation Report*. For comments related to the actuarial assumptions, please refer to *Section III – Actuarial Assumptions*. A summary is provided below:

- Due to a significant change in capital market assumptions and inflation since the 2021 valuation, there may be a desire to reflect off-cycle (i.e. between experience studies) changes to specific economic assumptions, such as the investment return assumption, COLA assumption and salary inflation. While we believe these types of assumptions should be reviewed annually, at least internally, we are not recommending any changes to assumptions at this time due to the volatility in the markets. As time progresses, it may make sense to consider whether changes should be made prior to the next experience study.
- We performed an analysis on the investment return assumption as of June 30, 2021 using Milliman capital market assumptions. Our analysis shows a 30-year expected median return of 6.86%, which is very similar to the Wilshire analysis noted in the experience study report of 6.81%. After applying the decrease due to administrative expenses of 0.22%, our calculation of 6.64% is somewhat below the current assumption. It should be noted that although our estimated expected return is less than the current 7.0% assumption, the difference is not enough that we would say it is unreasonable. Also, our analysis is based on our understanding of SERS' assets which is not as extensive as Wilshire's. Furthermore, with changes in capital market assumptions since the 2021 valuation that are resulting in higher return expectations, we would not recommend any change in the investment return assumption at this time.

- In the 2020 experience study, CavMac reviewed the experience of current survivors and beneficiaries and recommended use of the contingent survivor mortality table as the basis for these beneficiaries. Mortality among contingent survivors is found to be higher after their spouse has died. However, it is our understanding that CavMac is applying the contingent survivor mortality to spouses of retirees who are alive where the mortality may be expected to be lower. This may result in lower actuarial equivalent reductions for members who elect a joint and survivor annuity and lower liability for spouses in the healthcare valuation than if the healthy annuitant mortality is used. We recommend that CavMac review its use of this table in these situations. Limiting the application of this table to apply only to survivors currently in payment would result in a higher liability for the basic benefits and healthcare valuations.
- While we agree with using benefit-weighting in determining the post-retirement mortality assumption for the pension valuation, we recommend consideration be given to using headcount-weighting for the healthcare valuation. Use of headcount-weighted mortality rates would most likely result in a lower liability for the healthcare valuation.
- For determining the rates of disability applicable to current active members, we suggest CavMac eliminate members not yet eligible for benefits (less than 5 years of service) or members where the service retirement benefit exceeds the disability benefit when reviewing the actual experience. Furthermore, in our experience there may be a delay in determining when a member qualifies for disability benefits, and we suggest this delay be incorporated into the experience analysis.
- For the healthcare valuation, we recommend CavMac review its procedures for developing age-based per capita costs and healthcare trends to reflect differences between coverages, specifically the Medicare Advantage plan and the prescription drug plan, as well as reviewing its long-term trend for consistency between pre-Medicare and Medicare and long-term economic factors, including considering health costs share of GDP.

Valuation Reports

In *Section IV – Actuarial Valuation Report*, we provide commentary on the applicable actuarial standards of practice as well as the summary of plan provisions and actuarial assumptions contained in the reports. While we note some items for improvement or additional disclosure, we find that CavMac is meeting the applicable actuarial standards.

Section I – Data Validity

Background

The member data used by the actuary is one of the basic foundations of an actuarial valuation. It forms the basis for actuarially projecting the benefits provided to members by SERS. Thus, an important step in an actuarial audit is reviewing the validity of the member data.

As part of our review process, we performed independent edits on the raw data and then compared our results with the valuation data used by CavMac. We found our results to be consistent. Our results did not match exactly in some cases; however, this is understandable since CavMac, as the retained actuary, has more extensive data-editing procedures. Overall, each data key component matched within an acceptable level, and we believe the individual member data used by CavMac was appropriate for valuation purposes.

A summary of the data in aggregate is shown in the following exhibits for the pension and healthcare benefits. A couple of comments:

- We have separated retirees by the type of retirement or survivor. In the totals, benefits for Re-Employed retirees are included but not their count as these records also have a service retiree record. The data in the system contains two records for these individuals.
- Please note that the valuation salary reported in the valuation reflects anticipated salary increases for the upcoming year as well as annualizing salaries reported for new hires. Based on similar calculations, we match closely. We suggest that CavMac include a comment or footnote that the valuation salary reflects anticipated increases for the upcoming year.

**Comparison of June 30, 2021 Valuation Data
Pension Valuation**

Ohio School Employees Retirement System	CavMac Valuation Report	Milliman's Review of Valuation Data	Ratio of Milliman / CavMac
Total Retirees, Beneficiaries and Survivors			
Total number	80,721	80,722	100.00%
Annual pension benefits	\$1,254,934,762	\$1,254,956,475	100.00%
Average age	74.4	74.4	100.00%
Service Retirees			
Total number	66,265	66,266	100.00%
Annual pension benefits	\$1,070,518,506	\$1,070,532,237	100.00%
Average age	74.6	74.6	100.00%
Re-Employed Retirees			
Total number	912	912	100.00%
Annual pension benefits	\$3,344,726	\$3,344,726	100.00%
Average age	77.1	77.1	100.00%
Disability Retirees			
Total number	4,868	4,868	100.00%
Annual pension benefits	\$87,390,489	\$87,379,575	99.99%
Average age	66.7	66.7	100.00%
Beneficiaries			
Total number	5,392	5,392	100.00%
Annual pension benefits	\$53,845,057	\$53,874,053	100.05%
Average age	80.1	80.1	100.00%
Survivors			
Total number	4,196	4,196	100.00%
Annual pension benefits	\$39,835,984	\$39,825,884	99.97%
Average age	72.6	72.6	100.00%
Active Members			
Total number	146,646	146,644	100.00%
Average age	47.7	47.7	100.00%
Average service	8.1	8.1	100.00%
Total salary	\$3,622,097,199	\$3,611,022,883	99.69%
Average salary	\$24,700	\$24,624	99.70%
Inactive			
Vested	5,972	5,972	100.00%
Annual pension benefits	\$38,777,532	\$38,718,057	99.85%
Average age	56.2	56.2	100.00%

**Comparison of June 30, 2021 Valuation Data
Healthcare Valuation**

Ohio School Employees Retirement System	CavMac Valuation Report	Milliman's Review of Valuation Data	Ratio of Milliman / CavMac
Service Retirees			
Total number	30,898	30,898	100.00%
Average age	76.0	76.0	100.00%
Disability Retirees			
Total number	2,580	2,580	100.00%
Average age	69.5	69.5	100.00%
Spouses			
Total number	7,143	7,141	99.97%
Average age	78.1	78.1	100.00%
Non-spouse Dependents			
Total number	276	278	100.72%
Average age	31.0	31.4	101.29%
Active Members			
Total number	146,646	146,651	100.00%
Average age	47.7	47.7	100.00%
Average service	8.1	8.1	100.00%
Total salary	\$3,622,097,199	\$3,611,022,883	99.69%
Average salary	\$24,700	\$24,623	99.69%
Inactive			
Vested	5,972	6,117	97.63%
Average age	56.2	56.4	100.36%

Benefit Calculation Review - Background

Our data review process included an extra layer of data verification by comparing valuation data and benefit calculation data. The purpose of the valuation is to determine the liability for benefits to be paid in the future. Therefore, verifying the consistency between the data used for valuation purposes and the data used for benefit calculation purposes is a critical and integral component of the audit process.

To perform this task, we requested the data SERS provided to CavMac for the June 30, 2021 valuation and additional information from SERS regarding members who retired after June 30, 2021. After reviewing this data, we then requested twenty (20) individual benefit calculations from SERS that were randomly selected to encompass all employee categories and the majority of the benefits SERS members receive. These benefits include service retirement benefits, disability benefits, survivor benefits, and lump sum options in the plan. Ten (10) of the requested calculations were intended for members whose benefits commenced subsequent to June 30, 2021 (they were reported as active

members on the valuation date) and ten (10) of the requested calculations were for members whose benefits commenced prior to June 30, 2021 (they were reported as retired members on the valuation date). Please note that three records selected who we believe had retired actually represented a disability conversion or a rehired retiree, and thus the verification of active salary data was not possible. This information was the basis for our review.

The purpose of reviewing actual benefit calculations is two-fold. First, we reviewed the benefit calculations for reasonableness, consistency and compliance with the Legislative Code governing SERS as well as the SERS Member Handbook. Second, we reviewed the data used in the benefit calculations for consistency with the valuation data provided to the plan actuary for the June 30, 2021 valuation.

Plan Provisions

Before we discuss our findings regarding the data, we have a few comments regarding the member handbook and other materials contained on the SERS website communicating the system benefits.

SERS is a complex system providing various different retirement plans and health care benefits containing varying eligibility requirements dependent on the type of member and membership group. Although we understand that the benefit offerings to members could be overwhelming, the website is well-organized and contains numerous links and information booklets to describe the specific benefits an individual may be reviewing. While certain details in the member handbook could be clarified or expanded, much of this information is contained on the website. One item where we believe clarification could be helpful is regarding disability benefits:

For disability benefits paid under the new plan, we would suggest including a section on benefits paid at the date of conversion such as benefit formula, service used in the benefit formula, and options to members upon commencement as well as the impact on eligibility for retiree healthcare benefits and the percentage of the premium subsidy to be received.

Benefit Calculation Review – Retiree Data

The following table describes the items reviewed for members who were reported with the retiree data in the June 30, 2021 actuarial valuation.

Benefit Calculation Review: Retiree Data		Milliman
1.	Benefits were generally computed accurately in the calculation based on the information contained in the calculation and were reasonable and consistent with the Handbook	✓
2.	Basic data information (date of birth, gender, date of commencement) was provided accurately in the retiree data to the actuary	✓

Benefit Calculation Review: Retiree Data		Milliman
3.	Benefit amounts (current benefit, original benefit, employee contributions) were provided accurately in the retiree data	✓
4.	Form of payment information was provided accurately	✓
5.	Information on beneficiaries (spouse date of birth, survivor type) was provided accurately	✓
6.	For members receiving a disability benefit, the benefit type, benefit amount, date of conversion and benefit at date of conversion were provided accurately (see discussion below)	✓
7.	Information on beneficiaries for members receiving a disability benefit (see discussion below)	X
8.	Information on former disability members who have converted to a service retirement benefit (record type, commencement date) (see discussion below)	X
9.	For survivors, benefit and other information was provided accurately	✓
10.	Service credit, final average compensation and employee contribution balance were consistent with amounts computed in the benefit calculation (see discussion on employee contribution refunds)	✓

In our experience, this degree of matching indicates that high quality retiree data is being provided to the actuary by the System. We did notice a few items in our review where the data provided to the actuary did not exactly match the final benefit calculation provided to us. For example, there was one situation where the benefit and contributions were not finalized at the time the actuary data was produced (we also found two situations in the preliminary 2022 retiree data provided for members who retired subsequent to the June 30, 2021 valuation date). One suggestion we have been providing to clients is to provide an indicator on the data whether the information on the data reflects an estimated calculation or final calculation, although based on our review, we do not believe there is a significant lag in completing calculations.

Old Disability Plan

SERS offers two different types of disability benefits based on when a member is hired. If hired prior to July 29, 1992 and did not elect the New Disability Plan, then the member is eligible for the Old Disability Plan.

Under the Old Disability Plan, the benefit is paid for the lifetime of the member assuming they remain eligible for disability during their period of service. Upon the death of the member, eligible beneficiaries are able to receive survivor benefits under any of the Schedules depending on years of service. The form of payment provided for these members is a single life annuity and no potential survivor information is provided. We do note that dependent information is provided in the healthcare data. As such, CavMac is not valuing the potential for survivor benefits to be paid to Disability Old Plan members.

Recommendation: We would suggest that SERS include a spouse date of birth and other dependent information on the data to the extent available. Based on available data, CavMac may need to make certain assumptions on if a beneficiary is eligible to receive a benefit, the number of qualified beneficiaries eligible at the time of death and how long beneficiaries would be eligible to receive the survivor benefit. Such an assumption may vary by age of the retiree. We do believe that the years of service used to calculate the Schedule III survivor benefit is currently included in the data.

New Disability Plan – During Period of Disability

Under the New Disability Plan, the benefit is paid until age 65 if the member became disabled at age 60 or earlier. For members who become disabled after age 60, the benefit ceases at ages varying from 66 to 70. The date that the member's disability ceases is referred to as the conversion date. At the date of conversion, the member can retire and receive a service retirement benefit. During the period of disability, members are eligible for cost-of-living adjustments (COLA) and upon death, survivor benefits similar to those available to Old Disability Plan members. Similar to Old Disability Plan members, the form of payment provided is single life annuity for all members and no potential survivor information is provided.

We do note that the member's current benefit including COLA adjustments during the period of disability up until the valuation date is included on the data.

We also note that expected conversion date and projected benefit at date of conversion are also included in the data although we do not believe they are used in the actuarial programming. We discuss these items in Section V of this report.

Recommendation: Similar to Old Disability Plan members, we would suggest that SERS include a spouse date of birth and other dependent information on the data to the extent available with CavMac making similar assumptions as noted above. Although any assumptions made by CavMac should only apply until the date of conversion.

New Disability Plan – After Conversion

Once a New Disability Plan member reaches their date of conversion, the benefit is re-determined in accordance with the applicable benefit formula and the member makes an election under the available forms of payment. COLA benefits received are also adjusted based on the converted retirement benefit versus the disability retirement benefit.

On the data, several fields are then updated:

- Benefit Type – is updated from disability to service
- Commencement Date – is updated from date of disability to conversion date
- Benefit amounts – all fields are updated to reflect converted retirement benefit

- Form of Payment – updated to reflect election made by the member
- Beneficiary information – updated to reflect the election made by the member
- Accumulated Contributions – unchanged from accumulated amount as of date of disability
- Service – updated to reflect period of disability

Based on the updated fields, CavMac is treating the converted New Disability Plan member as a service retirement. This can have two implications:

- The applicable mortality table used in developing the valuation liability is the healthy annuitant table.
- In the experience study, the tabulation of exposures and actual deaths would reflect converted disability members as healthy retirees rather than disability retirees.

By treating these members as healthy retirees, the liability for these members would reflect a longer life expectancy than anticipated by the disability mortality table. Furthermore, by including them as healthy retirees in the experience study, the average rate of mortality for healthy retirees would most likely provide the impression that it is higher for this group relative to a base table which could lead to underestimating the life expectancy for other “true” healthy retirees.

For members with a commencement date on or after April 1, 2018, the COLA is deferred until the 4th anniversary of commencement. Since the commencement date is updated to the conversion date, the actuarial programming may be deferring COLAs to a future date although the applicable date of commencement to receive COLA adjustments is the original date of disability.

Recommendation: We suggest SERS create a separate benefit type code of “C” for Converted Disability. This would then allow CavMac to treat these members as disability plan members for valuation and experience study purposes. We would also suggest that SERS include the first date a COLA would apply so that the change in the date of commencement does not result in CavMac assuming a COLA is deferred until a future date rather than immediately applicable. Although, if a benefit type code of C is provided, we believe it would be reasonable for CavMac to assume the COLA would apply immediately since the period of disability would almost always be longer than the COLA deferral period.

Benefit Calculation Review – Active Data

The following table describes the items reviewed for members who were reported with the active data in the June 30, 2021 actuarial valuation and retired subsequent to the valuation date.

Benefit Calculation Review: Active Data**Milliman**

1.	Benefits were generally computed accurately in the calculation based on the information contained in the calculation and were reasonable and consistent with the Handbook	✓
2.	Basic data information (date of birth, gender, date of hire) was provided accurately in the active data to the actuary	✓
3.	Total service credit was generally consistent with the active data (see discussion on other service credit)	✓
4.	Annual salary and final average salary were generally consistent with the active data (see discussion when final average salary is not based on last three years)	✓
5.	Employee contribution balance was generally consistent with the active data	✓

In our experience, this degree of matching indicates that high quality active data is being provided to the actuary by the System.

However, we did identify the following items in our review related to the active data. Some of these may be record keeping items with no impact on the calculation of benefits or liability and some of them may be considered to have an immaterial effect on the calculation of liability. Nevertheless, we have included all items that we identified for SERS to review and determine if any actions should be taken.

Other Service Credit

Members may receive service credit for employment with other governmental employers, including other Ohio statewide systems, such as STRS and OPERS. We found three instances for members who retired subsequent to the valuation date where the service credit in the actual calculations reflected service or earnings from STRS or OPERS. There was also 1 instance for a member who retired prior to the valuation date. The total service credited from these other systems ranged from 0.11 years up to 6 years of service. Note that one member did not receive any additional service credit but was credited with additional earnings from STRS. We are unsure if SERS receives service information from STRS or OPERS prior to retirement to provide to the actuary or if this service is not known until retirement. Either way, the value of the additional benefit due to this service or earnings is not reflected in the actuarial valuation until retirement.

Recommendation: We recommend SERS reviews its procedures for collecting and providing other system service to the actuary in the active data. We suggest a more detailed study be performed to understand the impact that this additional service and earnings can have on the actuarial valuation to determine if any additional loads should be incorporated into the process.

Final average salary

In our review of the calculation, we noticed numerous instances where the member's final average salary used in the calculation was based on earnings from an earlier time period. In other words, a member's final average earnings were based on earnings from 2014–2016 rather than from 2019 – 2021. In the valuation data, SERS provides a member's current year and prior year earnings on the active valuation data. In addition, CavMac incorporates earnings from prior valuation periods since 2013 onto the edited actuary data. It is our understanding that CavMac is utilizing this prior earnings information in the development of the projected final average earnings within the actuarial programming. We agree with this approach and recommend it continue.

Valuation Data Review

In preparing an actuarial valuation, the actuary will review the “raw” data provided by the plan sponsor and will “edit” the data as needed to complete missing data and/or to remove discrepancies. We requested and received a copy of the edited data from CavMac. Based on our understanding of the data provided to the actuary, we reviewed the edited data to review the reasonableness of interpretations, estimates and adjustments made in the data editing process.

A general review of the valuation data should include the following:

General Annual Data Review

1.	Compare data with prior year's data to ensure all records from prior year are accounted for	✓
2.	Prepare data reconciliation from prior year to current year and identify status changes, such as new members, terminations, retirements, deaths, etc. during the year (see discussion below)	X
3.	Compare data reconciliation with prior year reconciliation to identify trends and anomalies	X
4.	Interpreting the data fields appropriately	✓
5.	Determining the applicable records to be included in the actuarial valuation based on the various status codes	✓

Overall, we found CavMac's procedures to be reasonable and appropriate for the scope of the project and consistent with Actuarial Standard of Practice 23 - *Data Quality*. The following represent a few minor comments regarding the general data procedures employed by CavMac.

Data Reconciliation

We understand that a system as complex as SERS requires significant amount of data editing and review to understand movement in membership from one year to the next. However, identifying this movement in data is important in understanding the reason for actuarial gains and losses and continual review of actuarial assumptions, etc. Furthermore, it may be helpful in understanding when members change status such as disability to service retirement upon benefit conversion and members electing healthcare coverage upon becoming eligible for Medicare.

Recommendation: We recommend CavMac incorporate a data reconciliation in the actuarial valuation report for basic benefits and healthcare benefits. We believe this exercise may assist in understanding how disabled plan members are potentially provided as a service retirement in a subsequent valuation and the number of retirees who did not elect healthcare coverage at retirement but do so upon becoming eligible for Medicare.

Data Review – Overall Data

For a system as complex as SERS, a significant part of the valuation is ensuring that the data provided to the actuary is accurate and provides all information necessary to value all the benefits that could be payable upon future contingent events. In the prior section, our comments focused on data items verified against member's specific calculations. In this section, we provide commentary on the reasonableness of the data files provided to the actuary.

Data Review - Retiree Data

The following table describes the items reviewed for members who were reported with the retiree data in the June 30, 2021 actuarial valuation.

Valuation Data Review: Retiree Data		Milliman
1.	Member's status is reasonable and consistent with other data fields in file	✓
2.	Basic data information (date of birth, gender, date of commencement) was reasonable	✓
3.	Relationship between the current monthly allowance including COLA and the base amount at retirement was reasonable; verified annuity for benefit associated with a rehired retiree did not increase with COLA	✓
4.	For members electing a joint and survivor benefit, the beneficiary information provided was reasonable	✓
5.	The member's accumulated contributions information is included on the data (see discussion below)	X
6.	For members receiving a New Disability Plan benefit, the benefit amount and date of conversion were reasonable, including the service credit and final	X

Valuation Data Review: Retiree Data**Milliman**

	average compensation information to estimate the benefit at date of conversion (see discussion below)	
7.	For beneficiaries receiving the survivor portion of the retirement benefit, the benefit amount reflects the survivor percentage appropriately	✓
8.	Basic Healthcare data information (health plan information, Medicare eligibility, etc.) was reasonable	✓
9.	Basic Healthcare dependent data information (dependent type, date of birth, health plan information, Medicare eligibility, etc.) was reasonable	✓
10.	For Healthcare, percentage of premium to be paid by member is reasonable based on years of service provided	✓

While we believe that the System is providing the information accurate to the actuary, we did identify the following items in our review that were not incorporated in the edited data used by the actuary.

Accumulated Contributions

For members who elect the maximum single life annuity, a beneficiary may still be entitled to a death benefit equal to their accumulated contribution balance less the amount of payments received in retirement. For New Plan Disability members, the accumulated contribution balance is only reduced by benefits received after the date of conversion. While SERS is including this information, the data provided by CavMac did not incorporate this information as they indicated the balance is assumed to have been exhausted by date of death. For future retirees, it is our understanding that CavMac assumes that this death benefit is equal in value to approximately a 1-year certain.

Based on the information in the benefit calculations, we estimated that the average period for which a death benefit would be applicable is 40 months or 3.3 years by dividing the balance at retirement by the applicable retirement benefit. By individual, the range varies from 23 months (nearly 2 years) to 72 months (6 years).

Recommendation: Based on this analysis, we recommend that CavMac incorporate this benefit for current retirees. This feature also has a little more value than prior years since the COLAs are now deferred 3 years for employees who retire on or after April 1, 2018. In addition, the balance is only applied at date of conversion for New Plan Disability members.

We also recommend that CavMac increase its assumption for future retirees. We also note that members retiring after August 1, 2017 who do not qualify for the grandfathered benefits would either receive a lower benefit or decide to work longer than similar situated grandfathered members. Therefore, for these members, the number of years that this

death benefit may be applicable would most likely be higher for non-grandfathered members than grandfathered members.

Disability Data

For New Disability Plan members, SERS provides the date of conversion and estimated benefit at this conversion date on the data. However, this information was not included in the valuation data provided to us by CavMac, and consequently we believe CavMac is assuming the current disability benefit would be paid for the member's lifetime.

Based on members who had their benefits converted between July 1, 2021 and June 30, 2022, we estimate that the average converted benefit is 87% of the disability benefit meaning that the liability held is higher than if the converted benefited was reflected.

Data Review - Active Data

The following table describes the items reviewed for members who were reported with the active data in the June 30, 2021 actuarial valuation.

Valuation Data Review: Active Data		Milliman
1.	Basic data information (date of birth, gender), including adjustments for missing data, was reasonable	✓
2.	Salary information was reasonable including CavMac's adjustments to annualize salary for members hired within the last year	✓
3.	Employee contribution balance was generally consistent with service and compensation information	✓

Based on our review, we believe that CavMac is correctly reflecting the data provided by SERS into the actuarial valuation process.

Section II – Actuarial Valuation Methods and Procedures

In this section, we discuss the various actuarial methods used in the actuarial valuation to measure the plan's liabilities and funded status. Since the contribution rate paid by employers and its members is specified in statute, one of the purposes of the actuarial valuation is to determine if the contribution rate is adequate to fund the promised benefits. SERS also calculates a non-binding actuarially determined contribution rate calculated to pay off the unfunded liability over a closed period of 23 years in the June 30, 2021 pension actuarial valuation and an open period of 30 years in the June 30, 2021 healthcare valuation. In this section, we provide commentary on the reasonableness of the various methods employed in the actuarial valuations in determining these rates.

Asset Valuation Method

For the pension valuation, the asset valuation method recognizes the difference between the actual and expected investment income on the market value of assets based on the valuation return assumption over a period of four years. Additionally, the actuarial value of assets is limited to a 20% corridor, i.e., no less than 80% nor more than 120% of market value. The purpose of the asset valuation method is to reduce the impact that market volatility has on valuation results. We agree with the use of the asset valuation method and that four years is a reasonable period. Additionally, we find that this method is reasonable and consistent with the guidance provided in Actuarial Standard of Practice 44 - *Selection and Use of Asset Valuation Methods for Pension Valuations*.

We also reviewed the numerical calculation of the actuarial valuation of assets and found it to be accurate.

On the healthcare valuation, there is no separate asset valuation method as the market value of assets is used to determine the actuarially determined contribution rate. Since there is no specific actuarial funding goal, we believe the use of market value is appropriate.

Actuarial Cost Method

Both the pension and retiree healthcare valuations use the Entry Age Normal actuarial cost method to determine the cost of benefits accrued during the upcoming year (known as the normal cost) plus the value of benefits accrued for all years of past service (known as the accrued liability) as of the valuation date.

The purpose of any cost method is to allocate the cost of future benefits to specific time periods. Most public plans follow one of a group of generally accepted funding methods, which allocate the cost over the members' working years. In this way, benefits are financed during the time in which services are provided.

The Entry Age Normal actuarial cost method is the most common cost method used by public plans. The 2022 Public Fund Survey from the National Association of State

Retirement Administrators shows that about 90% of the retirement systems surveyed are using the Entry Age Normal cost method.

The focus of the Entry Age Normal cost method is the level allocation of costs over the member’s working lifetime. For a public plan, this means current taxpayers pay their fair share of the pensions of the public employees who are currently providing services. Current taxpayers are not expected to pay for services received by a past generation, nor are they expected to pay for the services that will be received by a future generation. The cost method does not anticipate increases or decreases in allocated costs.

We find that the actuarial cost method used in both the pension and retiree healthcare valuations is reasonable and consistent with the guidance provided in Actuarial Standard of Practice 4 - *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions* and Actuarial Standard of Practice 6 – *Measuring Retiree Group Benefits Obligations and Determining retiree Group Benefits Program Periodic Costs or Actuarially Determined Contributions*.

For GASB Statements Nos. 67, 68, 74 and 75, the Entry Age Normal actuarial cost method is the only permissible cost method for financial reporting purposes.

Funding Policy

As set in statute, SERS receives contributions from employers at 14% of payroll and employees at 10% of payroll for a total rate of 24% of payroll. The portion of employer contributions allocated to fund the basic pension benefits depends on the funded ratio of the pension plan with the remainder being allocated to the Health Care Fund in accordance with the following table. In addition, there is a surcharge of 1.5% of payroll received from employers for the Health Care Fund.

Funded Ratio	Basic Benefit Rate	Health Care Fund
Less than 70%	14.00%	0.00%
70% to 80%	At least 13.50%	0.50% or less
80% to 90%	At least 13.25%	0.75% or less
90% or Greater	Amount needed to fund basic benefits	Remainder of 14.00%

Although there is the possibility of some adjustment in the allocation of the contribution rate, SERS is basically funded on a fixed-rate basis. The Conference of Consulting Actuaries Public Plans Committee issued a white paper (“CCA White Paper”) on model actuarial funding policies which include guidelines for amortizing the unfunded liability,

but it only addresses situations where the contribution rates are set on an actuarial basis. The Committee is currently working on a paper specific to pension plans that have fixed contribution rates. The one comment made in the paper is retirement systems with fixed contribution rates should develop an actuarially determined contribution rate for comparison to the fixed rate. For SERS, a contribution rate is determined in both the pension and healthcare valuations. For the pension valuation, the actuarially determined rate is calculated to pay off the unfunded liability over a declining period of 23 years in the June 30, 2021 actuarial valuation.

In the healthcare valuation, the contribution rate is based on an open amortization period of 30 years, but the funding objectives for these benefits are slightly different. After satisfying the funding objectives for the basic benefits, the goal is to achieve a 20-year solvency period.

Actuarially Determined Employer Contribution Rate – Basic Benefits

We independently calculated the actuarially determined employer contribution rate and found the 12.50% of payroll rate determined by CavMac to be accurate based on the assets, liabilities, and payroll reported in the June 30, 2021 actuarial valuation. If 12.50% of payroll, combined with employee contributions, were the only contributions received by SERS, the funded ratio would be projected to be 100% in 2044 (23 years from the 2021 valuation date) if all assumptions are met. Since the current employer contribution rate of 14% exceeds 12.50%, the projected date would be earlier assuming the employer rate continues to be allocated 100% to basic benefits, although future experience will impact this date.

Actuarially Determined Employer Contribution Rate – Healthcare

We independently calculated the actuarially determined employer contribution rate and found the 2.46% of payroll rate determined by CavMac to be slightly different than our calculation based on the assets, liabilities, and payroll reported in the June 30, 2021 actuarial valuation. Please note that we calculated a total rate of 2.50%, which reflects a normal cost rate of 1.26% versus the reported rate of 1.22%. We believe the difference is that CavMac calculated the rate based on the normal cost dollars at the beginning of year rather than using the dollars adjusted to mid-year, which would have been consistent with the calculation of the unfunded liability rate and the calculation of the pension contribution rates.

Currently the only funding received by the healthcare trust is the 1.5% surcharge, which exceeds our calculation of the normal cost rate by 0.24%. If this was the only contribution rate, the amortization period is infinite. However, the funding goal on the healthcare trust

is not necessarily to meet an actuarial funding goal, but rather to maintain solvency for at least a 20-year period.

Contribution Adequacy

Under statute, if the maximum contribution rate does not fund the basic benefits over a period of 30 years or less, the Board is required to take action to reduce the period to no more than 30 years. As of the June 30, 2021 actuarial valuation, the effective amortization period based on the current employer contribution rate of 14% is less than 20 years; however, it is possible that future experience could cause the amortization period to exceed 30 years at some point in the future. Allocating the maximum contribution rate of 14% to fund basic benefits reduces the likelihood of this occurring.

The actuarially determined contribution rate is based on amortizing the unfunded liability over a period that declines by one year with each valuation. As of the June 30, 2021 valuation, the period is 23 years which is longer than actuarial guidance (CCA White Paper model practices) would suggest for systems where the contribution rates are calculated on an actuarial basis. A long amortization period (if the contribution rate were based on that period) results in negative amortization, where the unfunded liability is projected to grow from year to year. However, under the fixed maximum SERS contribution rate, which is greater than the actuarially determined rate, negative amortization is not currently occurring, and the unfunded liability is projected to decrease in the year following the June 30, 2022 actuarial valuation (if all assumptions are met). We believe that moving toward a shorter amortization period for use in the calculation of the actuarially determined contribution rate is appropriate in determining the portion of the contribution allocated to pension and healthcare and provides valuable information to stakeholders.

There will always be a competition between providing strong funding to the system and having reasonable contribution rates. We believe that SERS's funding policy strikes a reasonable balance between the two.

Recommendation: The valuation report does not report the effective amortization period for comparison to the 30-year statutory minimum requirement. We suggest consideration be given to either adding this metric to the valuation report or simply making a statement that the 30-amortization requirement is or is not met (the requirement was satisfied in the most recent valuation).

For the healthcare valuation, there are many changes that can be made to the underlying health benefits to assist with meeting the funding goal of maintaining solvency for at least a 20-year period. These items include modifying the premiums, copays, deductibles, etc. on the underlying health plans. Based on projections included in the June 30, 2021 actuarial valuation, the trust is to remain solvent for 37 year period until 2058, which was an increase from the prior valuation of three years. However, in the actuarial valuations

from 2017 – 2019, the fund balance was anticipated to be exhausted prior to the 20 year stated period.

While we agree that displaying a minimum contribution rate based on a 30-year amortization period provides some context for determining the adequacy of the 1.5% surcharge, we would suggest greater focus be incorporated into the health care fund balance projections.

Recommendation: We suggest an exhibit be included in the report displaying the projected benefits out of the fund and reasons for changes in the solvency period from one year to the next be incorporated into the report commentary.

Normal Cost Rates by Group

Unreduced retirement eligibility varies for members who had completed 25 years of service as of August 1, 2017 or have not. Members who have met the criteria would have a higher normal cost rate, all else being equal, and would be replaced by members with the later retirement conditions.

Recommendation: We recommend that the normal cost rates be reported for each group to understand the relative difference in the Plan provisions.

Section III – Actuarial Valuation Assumptions

Selection of Actuarial Assumptions

The purpose of the actuarial valuation is to analyze the resources needed to meet the current and future obligations of the System. To provide the best estimate of the long-term funded status of the System, the actuarial valuation should be predicated on methods and assumptions that will estimate the future obligations of the System in a reasonable manner.

An actuarial valuation uses various methods and two different types of assumptions: economic and demographic. Economic assumptions are related to the general economy and its long-term impact on the System, or to the operation of the System itself. Demographic assumptions are based on the emergence of the specific experience of the System's members.

Choosing actuarial assumptions is highly subjective. It is unlikely that any two actuaries, given the same set of experience statistics, would arrive at exactly the same set of actuarial assumptions for any system as complex as SERS. Even allowing for the minor variations that occur because of the variability of the underlying statistics and possible data anomalies, differences among actuarial approaches will occur in analyzing trends. Some actuaries prefer to match the results of recent experience very closely in setting future assumptions, while other actuaries will use recent experience as a guide but tend to change existing assumptions gradually over time. Valid arguments can be made for either approach.

We will comment on the demographic and the economic assumptions recommended in the Experience Study for the Five-Year Period Ending June 30, 2020 and used in the June 30, 2021 annual basic benefits valuation and the retiree health care valuation. We will provide commentary and make suggestions to be considered for future experience studies.

Economic Assumptions

Overview

In our opinion, the packages of economic assumptions used in the June 30, 2021 valuations of annual basic benefits and retiree health care are reasonable.

Inflation

Inflation, as referred to here, means price inflation. The inflation assumption has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment return and wage growth. It has a direct impact on the valuation results to the extent it affects the COLA increase assumption.

There is expected to be a long-term relationship between inflation and the investment return assumption. The basic principle is that the investors demand a “real return” – the excess of actual investment returns over inflation. If inflation rates are expected to be high, investors will demand expected investment returns that are also expected to be high enough to exceed inflation, while lower inflation rates will result in lower demanded expected investment returns, at least in the long run.

As CavMac discussed in their experience study report, since the U.S. Treasury started issuing inflation-indexed bonds (TIPS), it is possible to determine the approximate rate of inflation anticipated by the financial markets by comparing the yields on inflation-indexed bonds with traditional fixed government bonds. As of December 31, 2020, the end date of the experience study, the yield for both the 20-year and 30-year inflation-indexed Treasury bonds implied inflation was about 2.0% per year. Recently (end of November 2022), the implied inflation has increased to 2.5% and 2.3% for 20- and 30-year periods respectively.

Another source for a long-term inflation forecast is the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. Consistent with timing of the experience study, in the 2020 Trustees Report, the projected ultimate average annual increase in the CPI under the intermediate cost assumptions was 2.40%. This is unchanged in the 2022 Trustees report.

Although assumptions should not be set based on what other systems are doing, it is informative to see how SERS compares. According to the National Association of State Retirement Administrators (NASRA) Public Fund Survey (a survey of approximately 200 large municipal and statewide systems), the median inflation assumption for statewide systems was 2.50% as of 2020 and 2022. Please note that inflation has increased dramatically since the 2021 valuation, but long-term inflation is not anticipated to be significantly different than the 2.4% assumption although it is expected to be higher in the very near-term. For use in the June 30, 2021 actuarial valuation, we believe that a 2.40% price inflation assumption was reasonable.

COLA Assumption

The rate of the annual Cost-of-Living Adjustment (COLA) is the annual rate of increase in the Consumer Price Index, but not less than 0% and capped at 2.5%. The assumption was lowered from 2.5% to 2.0% at the time of the experience study to reflect the lower inflation assumption. Note that the COLA assumption only applies once a retiree becomes eligible for the COLA which is on their anniversary of their retirement date if they retire prior to April 1, 2018 or on their 4th anniversary of their retirement date if they retire on or after April 1, 2018.

In developing the recommended annual COLA assumption, CavMac stochastically modeled the distribution of expected COLAs using the 2.40% assumed rate of inflation

and an annual standard deviation in rates of inflation of 1.75%. Their calculated average rate of COLA over a 30- year period was 1.85%, and they recommended using 2.00% to maintain a margin above the modeled average COLA. We confirmed their calculation of 1.85% was accurate and agree that the current 2.00% annual COLA assumption is reasonable. Due to short-term higher levels of inflation, some actuaries may wish to reflect a higher short-term assumption. However, with the 2.5% cap on COLA adjustments, we do not believe it is necessary for SERS.

Wage Inflation

As noted in the CavMac experience study report, wage inflation consists of two components, 1) a portion due to pure price inflation (i.e., increases due to changes in the CPI), and 2) increases in average salary levels in excess of pure price inflation (i.e., increases due to changes in productivity levels, supply and demand in the labor market and other macroeconomic factors) referred to as real wage growth. CavMac cites the 2020 Social Security Trustees Report which has a wage inflation assumption exceeding the price inflation assumption by 0.52% to 1.76%. CavMac indicated they favored the lower end with a recommendation of 0.85%, which was adopted for use in the valuation. We believe the resulting 3.25% (2.40% price inflation plus 0.85% real wage growth) wage growth assumption used in the June 30, 2021 valuation is reasonable.

Payroll Growth

The annual payroll growth assumption used in the amortization of the Unfunded Actuarial Accrued Liability, which is part of the calculation of the actuarially determined contribution, is equal to 1.75% in the June 30, 2021 actuarial valuation. Typically, the payroll growth is equal to the general wage growth assumption, although analysis for the individual system should be done. In the experience study, CavMac notes that recent experience has shown payroll increases have averaged less than 2%. CavMac's open-group projections are also forecasting future increases less than 2%, so they recommended the lower 1.75% assumption which was adopted. We believe this assumption is reasonable.

Salary Increases due to Merit & Promotion

CavMac studied merit and promotion pay increases by length of service. We agree that length of service is generally the best predictor of future merit increases. Based on CavMac's analysis, they recommended adjustments to the prior rates: reductions in assumed increases with service of 5 years of less and higher increases for members with 10 or more years of service. Overall, the recommended rates appear reasonable based on the reported experience. We do note that no merit increases are assumed after 17 years of service. Typically, we observe some merit or promotion increases throughout a member's career in our public sector clients, although we believe it is reasonable to assume that non-teacher school employees have different salary patterns than other public sector employees. For 18 years or later, the observed increase for SERS was a

non-zero increase (+0.23%), so we think this assumption should be monitored going forward. We suggest consideration be given to studying merit increase over a longer period (10 years or more) in future experience studies, as isolating merit increases from general wage increases can cause variations when viewed over a shorter period.

Over the next few years, salary increases are expected to be higher due to the current inflation levels. This could potentially lead to actuarial losses as salary increases exceed that expected. Alternatively, some actuaries may wish to reflect higher salary increases in the near-term. While we do not feel such an assumption is necessary at this time, if such an assumption is considered we suggest the actuaries consider how the assumption would apply for time periods prior to the valuation date in context of determining the actuarial accrued liability and normal cost under the Entry Age Normal cost method as sometimes near-term assumptions can have unintended consequences depending on how it is applied.

Administrative Expenses

The investment return is assumed to be net of administrative and investment expenses. CavMac analyzed actual administrative expenses over the past 5 years and recommended a long-term administrative expense ratio of 0.22%. We believe this is a reasonable assumption.

Investment Return

The investment return assumption is one of the primary determinants in the calculation of the expected cost of SERS' benefits, providing a discount of the estimated future benefit payments to reflect the time value of money. This assumption has a direct impact on the calculations of actuarial accrued liabilities, normal cost rate, and the actuarially determined contribution rate. The discount rate is the rate used to discount future benefit payments into an actuarial present value. The traditional actuarial approach used for public sector funding sets the discount rate equal to, or approximately equal to, the expected investment return over a long time horizon.

To develop an analytical basis for assessing the investment return assumption, CavMac relied on forward looking long-term capital market assumptions developed by Wilshire (SERS' investment consultant) and also considered those of other investment consultants by doing separate analysis using the capital market assumptions in the *Survey of Capital Market Assumptions: 2020 Edition* published by Horizon Actuarial Services, LLC. Based on SERS' target allocation, these analyses showed median expected real returns (real return is the expected return in excess of inflation) of 4.38% for Wilshire with a 30-year time horizon and 5.26% for Horizon with a 20- to 30-year time horizon. CavMac took the average of these two estimates to come up with an expected real return of 4.82%.

Combining the inflation assumption of 2.40% and the 4.82% expected real return and netting the assuming administrative expenses of 0.22%, CavMac calculated an expected return of 7.00% ($2.40\% + 4.82\% - 0.22\%$) and recommended this for use as the investment assumption. Based on this recommendation, the assumption was decreased from 7.50% in the June 30, 2019 actuarial valuation to 7.00% for the June 30, 2020 actuarial valuation. The 7.00% assumption was also used for the June 30, 2021 actuarial valuation.

We find the analysis and recommend assumption reasonable and have the following additional comments.

- **Independent Milliman Analysis:** We performed additional analysis on the investment return assumption as of June 30, 2021 using Milliman capital market assumptions. Our analysis shows a 30-year expected median return of 6.86%, which is very similar to the Wilshire analysis noted in the report of 6.81%. After applying the decrease due to administrative expenses of 0.22%, our calculation of 6.64% is somewhat below the current assumption. It should be noted that although our estimated expected return is less than the current 7.0% assumption, the difference is not enough that we would say it is unreasonable. Also, our analysis is based on our understanding of SERS' assets which is not as extensive as Wilshire's.
- **Assumption Review Timing:** If warranted by the actuary's analysis, a detailed off-cycle review should be presented to the Board for consideration. This type of off-cycle review allows for smaller adjustments more often than larger adjustments that may take place after a 5-year period. While a system wants to avoid frequent changes in assumptions due to short-term fluctuations, if it waits until the end of a 5-year period, large changes in the assumption may be politically and/or economically more difficult to implement, and the assumptions have the potential to fall out of compliance with actuarial standards of practice.
- **Time Horizon:** CavMac analysis is based on a 30-year expected return (or 20 to 30 years in the case of the Horizon Survey). Traditionally, actuaries have focused on the long term. We do note that in a typical public sector plan, close to two-thirds of the present value of benefits for current members is paid out in the next 20 years. That means that returns in years 20 to 30 have a relatively small impact on the current liabilities of SERS, but CavMac is giving them equal weighting to returns in the next 10 years which have a much more significant impact on the liabilities for current members. We would suggest consideration be given to the impact of different time horizons or reflecting actual cash flows when the expected return is analyzed in the future.
- **Investment Expertise:** Given Wilshire has specific expertise with SERS investments and not all of SERS asset classes are reported in the Horizon Survey,

consideration should be given in the future to giving more weight to Wilshire's expected return. Timing of the Horizon Survey can also have an impact on differences with SERS' investment consultant. The Horizon Survey is typically published in August reflecting capital market assumptions as of January 1 whereas Wilshire's assumption may be more reflective of capital markets as of June 30. While most years this timing difference is not significant, there can be situations where they can be significantly different, such as 2022.

- **Recent Changes in Investment Environment:** Our commentary has focused on the assumption in relation to the time of the experience study and use in the June 30, 2021 valuation. However, driven by increasing fixed income yields and lower price-to-earnings ratios, capital market assumptions have increased significantly as of June 30, 2022, as compared to a year ago. Based on Milliman's capital market assumptions as of June 30, 2022, the 30-year median return would increase by nearly 70 basis points from Milliman's 2021 expected return. We would not suggest modifications to the investment return assumption at this time, but as noted above, we do recommend an off-cycle review be presented to the Board if it is determined by the actuary that that a change should be considered prior to the next experience study.

Demographic Assumptions

Overview

Actuarial Standard of Practice (ASOP) No. 35 governs the selection of demographic and other noneconomic assumptions for measuring pension obligations. ASOP 35 states that the actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations, and select assumptions based upon application of that professional judgment. The actuary should select reasonable demographic assumptions in light of the particular characteristics of the defined benefit plan that is the subject of the measurement. A reasonable assumption is one that is expected to appropriately model the contingency being measured and is not anticipated to produce significant cumulative actuarial gains or losses over the measurement period.

We found that the methodologies used to prepare the experience study were appropriate and that the assumptions developed comply with the guidance provided by ASOP 35. We have offered a few suggestions for considerations in future experience studies. The ultimate purpose of any actuarial experience study is to provide a basis for setting the actuarial assumptions for future valuations. We believe that the statistical analysis included in the CavMac experience study report and the resulting recommendations are reasonable.

Annuitant Mortality Assumption

Please note that our comments are based on the assumption in place as of June 30, 2021, and do not reflect any potential adjustments or comments due to the Covid-19 pandemic.

Mortality rates are used to project the length of time benefits will be paid to current and future retirees and beneficiaries. The selection of a mortality assumption affects plan liabilities because the estimated value of retiree benefits depends on how long the benefit payments are expected to continue. There are clear differences in the mortality rates by gender and non-disabled versus disabled retired members.

We reviewed CavMac results for the probability of death for healthy and disabled retired members and found them to be reasonable and generally consistent with the methods we usually recommend. We have the following observations, but we have no recommended changes; however, we believe the approach in setting the contingent mortality should be reviewed with the next experience study.

1. **Benefit Weighting:** We recommend mortality rates be studied on either benefits-weighted or liability-weighted basis. Analysis has shown that higher benefit/liability retirees tend to live longer than lower benefit/liability retirees. CavMac uses a benefit-weighted approach in their mortality analysis to account for this relationship; we agree with this approach.
2. **New Mortality Tables:** The Retirement Plans Experience Committee (RPEC) of the Society of Actuaries (“SOA”) issued the “Pub-2010” family of static base mortality tables in 2019. The 2010 in the title refers to the central year of collected study data. These are the first tables published by the RPEC based solely on public sector experience. The Pub-2010 tables, with customization to SERS retiree experience, were recommended in the experience study are being used in the valuation; we agree with the use of these tables.
3. **Contingent Survivor Mortality:** The analysis of contingent survivor mortality experience reflects the experience of survivors where the member has previously died, and the survivor is now receiving payments. That is, it excludes contingent beneficiaries where the retiree is receiving the payment and no pension benefit is currently being paid to the contingent beneficiary. We caution against using the experience of the in-payment survivors to set the assumption for the not-in-payment contingent beneficiaries, as studies have shown in-payment survivors have materially higher mortality rates. This is often referred to as the “grieving widow effect.” This could also impact the development of the actuarial equivalent factors for retirees electing a joint and survivor annuity. Assuming a shorter life span for a beneficiary will reduce the cost of these options and produce a larger relative benefit.

4. **Disability Mortality:** In reviewing the data used in the experience study, the age bands with the most weighted disability deaths are ages 60 - 70 whereas the age bands with the most weighted deaths for the service retirements are ages 80 - 89. We believe this is due to the fact that New Disability Plan members are converted to a service retirement and reflected in the healthy annuitant experience rather than in the disabled annuitant experience. For the next experience study, we suggest a review of the data to determine what service retirements were due to converted disability retirements and categorize them appropriately. We also caution on the use of adjustments and set forwards that increase the rates of mortality for a group that is only partially credible.
5. **Applicable Mortality for Healthcare Benefits:** For healthcare benefits, mortality would not typically reflect benefit weighting as the liability is not based on benefit amount. For healthcare benefits, we suggest consideration be given in the experience study to incorporating an analysis on the number of deaths as compared to the headcount-weighted version of the Pub-2010 mortality tables. We would anticipate that use of headcount-weighted tables would produce a lower liability in the healthcare valuation.

As with the basic benefits, we would caution against using the contingent survivor mortality for dependents of current retirees. This could have a greater impact on the liabilities of the healthcare valuation since benefits are provided to dependents while the retiree is alive.

6. **Pandemic Impact:** In the US, there was a significant increase in mortality rates in second quarter of 2020 through the first quarter of 2022, which were likely driven by the pandemic and may not be indicative of future experience. For purposes of the experience study, CavMac made no explicit adjustment for this. Since only the last quarter of the study overlapped with the higher mortality period, the impact on the results should have been relatively small. We do note that even including this experience, the actual experience during the study period was less than expected based on the prior assumption.

Pre-Retirement Mortality

CavMac notes that active mortality experience during the study period was not sufficient to be credible. Therefore, they recommended using a standard table, the Pub-2010 General Amount Weighted Below Median Employee mortality table. We believe this is a reasonable assumption.

Mortality Improvement Scale

It is difficult to predict how much future mortality will improve compared to mortality today. The SOA has created projections of mortality improvement in “MP” (Mortality Projection) tables that are updated annually. The valuation uses the 2020 version of the MP scale, as it was the most recent table as of the last experience study. The table projects small declines in the base mortality rates over time and is often referred to as the “generational” approach, as each generation is projected to live longer than the previous generation. We strongly support the use of generational mortality and believe the table being used is reasonable.

Withdrawal

We reviewed the rates of withdrawal (probability of leaving active employment for reasons other than service retirement, death or disability). The current assumption varies by length of service, with members early in their career (low levels of service) having higher probabilities of withdrawing than members later in their career (higher levels of service). We agree that service level is generally the most significant factor in projecting withdrawal rates.

Based on CavMac’s analysis, the withdrawal rates proposed in the experience study and used in the June 30, 2021 valuation are aligned with actual experience, and the assumptions appear reasonable.

According to the experience study, CavMac uses a liability-weighted approach in their analysis:

As a result, we liability weighted the experience to better reflect the impact of the current assumption on liability measures. The liability is approximated by using the member’s compensation and years of service to estimate the member’s benefit level. The exposure and actual occurrences are then multiplied by the benefit level to provide the liability-weighted experience.

However, the analysis presented in the report appears to be compensation weighted. That is, the actual occurrences appear to be multiplied by compensation, not benefit level. Because the analysis is separated by service level, we do not believe this difference materially affects the analysis. The two methods (liability weighted and compensation weighted) result in different aggregate results. For example, a liability-weighted approach would provide a higher weight to older members since they will be closer in age to commencing their benefit and liability-weighting in a healthcare valuation would be significantly different than a pension valuation with benefits based on compensation. Regardless, the recommendations of the withdrawal rates by service level closely represent the actual experience on this basis; our conclusion is that the withdrawal assumption is reasonable.

While we believe setting rates of withdrawal based on weighting the results by compensation is reasonable, we believe it would be useful for the report to include the results by number as well. This will help the readers understand the impact of compensation weighting.

The withdrawal assumptions are higher than a typical public sector retirement system, especially for longer-service members; however, this relationship is consistent with our observations of other school employee retirement systems where certificated teachers are not covered.

In addition to the probability a member withdraws from active employment, an assumption must be made as to whether that member will take a refund of their contributions upon withdrawal or keep their contributions with SERS and receive a deferred monthly allowance at a later date. No mention of any analysis on this assumption is included in the experience study, and no assumption for the probability of refund is disclosed in the valuation report. We would recommend that CavMac disclose this assumption in future valuation reports and consider including an analysis of this assumption in future experience studies.

Rates of Service Retirement

The valuation includes separate retirement assumptions depending on whether the member is eligible to retire prior to August 1, 2017 to reflect the different benefit and eligibility provisions before and after this date. The retirement assumption is further differentiated by whether the member is eligible for reduced or unreduced benefits and whether it is their first year of eligibility for an unreduced benefit.

First eligibility for unreduced retirement benefits is determined to be the first age that meets the conditions for normal retirement as shown in the following chart:

Normal Retirement Eligibility	
Grandfathered	Non-Grandfathered
Age 65 with 5 Years of Service	Age 67 with 10 Years of Service
30 Years of Service	Age 57 with 30 Years of Service

In the experience study, CavMac groups all members who meet the above retirement eligibility conditions together, with separate analysis by grandfather eligibility. In our experience, we find that members who attain the service condition for retirement, even if after the age condition for normal retirement, experience a greater rate of retirement than

members who just reach the age condition. For example, members age 65 and older who attain 30 years of service would retire at a greater rate than members age 65 and older with less than 30 years of service even though they are both eligible for an unreduced retirement.

We believe this could be one reason that experience for non-grandfathered participants is lower than grandfathered participants at ages 68 and older even though the benefits received would be the same by service. CavMac set the assumption for non-grandfathered participants at nearly half the rate of the grandfathered participants at these ages. We recommend that the next experience study review experience by service even after meeting the age requirement for normal retirement.

For early retirement, CavMac separates the experience for members with at least 25 years of service and less. Based on our experience, surprisingly the rates of early retirement for members with at least 25 years of service is much less than those with less than 25 years. The rates set by CavMac do reflect the actual experience of the group.

As experience for the non-grandfathered group is not yet fully observable, CavMac made adjustments based on professional judgement. We believe the rates used for this group are reasonable for these age / service conditions that are not fully observable.

Based on the analysis shown in the experience study, we noticed that there were significant changes made to the valuation assumptions. The following table displays the actual to expected ratios of the current assumption that was in effect in the 2020 valuation to the proposed assumption that was adopted for the 2021 and later valuations. An actual to expected ratio of 1.0 means that the experience matches that expected by the assumption. A ratio of more than 1.0 indicates that members are retiring at greater rates than expected and less than 1.0 indicates that members are retiring later than expected.

Retirement Experience for Grandfathered Members Reported in 2020 Experience Study Actual to Expected Ratio		
	Current (Pre-2021)	Proposed 2021+
First Eligibility for Normal Retirement	1.42	0.92
Subsequent to First Eligibility	1.17	0.93
Early Retirement	2.65	1.01

Based on the experience study, actual retirement experience was greater than that expected anywhere from 17% greater for normal retirement subsequent to first eligibility to 165% greater for early retirement. The proposed assumptions resulted in higher rates

of retirement to bring the actual expected ratios much closer to 1.0. While the proposed assumptions appear to be reasonable based on this 5-year period of experience, we do wonder if there were any events during this period that may have caused the actual experience to be that much higher than expected or if this was the result of weighting the assumption by compensation level for the first time.

Neither the valuation report nor the experience study appears to disclose an assumption for when deferred vested members commence. We recommend the assumption and rationale be added to future reports.

Disabilities among Active Members

The assumptions for rates of disability from active status vary by age and gender. In the experience study CavMac recommended rates that were greater than indicated by the experience to maintain a margin to account for the significant increase in costs when disabilities occur. This means that the valuation is anticipating a greater number of disabled members than expected. We believe this could be due to two possible reasons:

- **Disability Lag:** It has been our experience that there is often a lag between when a member leaves active employment and when they are approved for a disability retirement, so not all disability retirements may be included in the experience study. We would suggest that future studies attempt to adjust for the reporting lag.
- **Disability benefit is not requested:** There are situations where a member may become disabled, but may not apply for disability:
 - Members with less than 5 years of service are not eligible and therefore if these members terminate employment due to disability would most likely be categorized as a termination. As such, we would recommend not applying the rates of disability prior to the member reaching the eligibility requirement.
 - Once a member has accrued a retirement benefit in excess of 75% (34 years of service) for Old Disability Plan members and 60% for New Disability Plan members (28 years of service), the member is more likely to elect a service retirement pension rather than disability retirement. We would recommend that the rates of disability be studied excluding these members.
 - Once a member reaches a certain age, disability benefits are no longer eligible (age 65 for Old Disability Plan members and age 70 for New Disability Plan members). We would recommend that the rates of disability be studied excluding these members.

The rates of disability used in the actuarial valuation do decline once a member attains age 60, which most likely account for the situations noted above. However, actual rates of disability would not necessarily decline; just the election of a disability benefit would decline. If the above situations are accounted for, we would not expect the rates to decline.

Medicare Part B

The Medicare Part B subsidy of \$45.50 is paid to each recipient of a service retirement benefit, disability recipient or a survivor who had at least 10 years of service. For members who elect a joint and survivor annuity, the benefit continues to be paid to the spouse upon death of the retiree. For the pension benefits, the election of a joint and survivor annuity would have the same present value as the value of a single life annuity. For the Medicare Part B continuation, this provision effectively provides the retiree with a subsidized 100% joint and survivor annuity for any member who elected a joint and survivor annuity. We recommend that CavMac review the percentage of members who this may apply to and incorporate in future actuarial valuations.

Retiree Healthcare Assumptions

Many of the assumptions used in the valuation of basic benefits are also used in the valuation of health care benefits. Additional assumptions used in the June 30, 2021 retiree health valuation are discussed below. Actuarial Standards of Practice No. 6 (ASOP 6) provides guidance to actuaries measuring retiree group benefit obligations.

Age-Specific Claims Costs

Section 3.7.7 of ASOP 6, provides that the actuary use age-specific costs in the development of the per capita costs. The ASOP 6 practice note dated March 2021 notes that Medicare Advantage (MA) and Medicare Advantage Prescription Drug (PDP) Plans have a relatively flat age and gender curve after federal payments. Based on ASOP 6 and the ASOP 6 practice note, we recommend CavMac consider the following:

- Utilizing MA and PDP specific aging factors to develop per capita costs to reflect the flat age and gender curve. Alternatively, the ASOP 6 practice note also supports the practice of not age-rating per capita costs for these types of plans.

In addition, although not required under ASOP 6, Milliman generally recommends age, gender, status (spouse or retiree) specific factors to develop aged costs.

To review the reasonableness of CavMac's assumptions, we determined the aging factors using Milliman's Healthcare Cost Guidelines™ for the MA Plan and Aetna Choice POS II (Pre-Medicare) for medical and the Express Scripts prescription drug plan. Based

on information provided by SERS, the majority of retirees participate in these plans. Based on this comparison, CavMac's aging factors are higher than what Milliman would recommend for both Medicare medical and prescription drug. CavMac's age curves anticipate that MA and PDP costs would increase with age while Milliman generally expects MA and PDP costs to remain relatively flat across age bands.

In addition, we recommend that CavMac consider developing separate aging factors for the Aetna Traditional Choice plan as we would expect the aging factors for this plan to be different than the factors used for the MA plan.

Healthcare Trend on Claims Costs

In setting trend rates ASOP 6 provides the following guidance under Section 3.12:

- “The actuary should consider separate trend rates for major cost components such as hospital, prescription drugs, other medical services, Medicare integration, and administrative expenses. Even if the actuary develops one aggregate set of trend rates, the actuary should consider these cost components when developing the aggregate set of trend rates.”
- When developing a long-term trend assumption and the select period for transitioning, the actuary should consider relevant long-term economic factors such as projected growth in per capita gross domestic product (GDP), projected long-term wage inflation, and projected health care expenditures as a percentage of GDP. The actuary should select a transition pattern and select period that reasonably reflects anticipated experience.

Based on ASOP 6, we recommend CavMac consider the following:

1. The Medicare Advantage (MA) and prescription drug cost components in developing Medicare trends due to the different structures of the MA plan (fully insured Medical) and prescription drug plan (self-insured Medicare).
2. The time to the ultimate rate for both pre-Medicare and Medicare. The time to ultimate rate is inconsistent for pre-Medicare and Medicare. In addition, CavMac reaches the ultimate rate sooner for Medicare than Milliman normally recommends to its clients.
3. Relevant long-term economic factors, including considering health costs share of GDP.

To illustrate the impact of these considerations, we developed trend assumptions incorporating the Getzen model developed by the Society of Actuaries (SOA). The Society of Actuaries (SOA) developed and regularly updates this long-term medical trend

model based on detailed research performed by a committee of economists and actuaries, which included a representative from Milliman. Milliman uses this model as the foundation for the trend that it recommends to our clients for postretirement medical valuations, with certain adjustments designed to produce trends that are appropriate for employer plans. These adjustments include incorporating assumed administrative cost trend where applicable and removing the impact of age-related morbidity (since age-related morbidity assumptions are applied separately in the valuation when applicable).

Ultimate rates were determined considering historic and projected rates of real growth, long-term inflation and additional growth attributable to technology, and medical costs as a component of gross domestic product (GDP).

A summary of the cumulative impact on the liability of the difference between the actuary's trend assumptions and Milliman's assumptions is shown below.

Comparison of Cumulative Healthcare Trend Based on Milliman's Model vs CavMac		
Duration from Valuation Date	Pre-Medicare	Medicare
5	-4.6%	2.7%
10	-5.0%	4.0%
20	-3.7%	5.4%

Based on this analysis, Milliman would determine a liability lower by 4% - 5% for pre-Medicare benefits and higher by 4% - 5% for Medicare-eligible benefits.

Based on information provided by SERS, the majority of retirees participate in the Aetna Medicare Plan (PPO) (MA) and Aetna Choice POS II (Pre-Medicare) for medical and participate in the Express Scripts prescription drug plan. The discussion above primarily focuses on these plans. CavMac should also consider developing trends for the Aetna Traditional Choice plan separate from the MA plan trends used in the valuation, as this is not a MA plan and has different cost components.

Retiree Contributions

To estimate the portion of the premium paid by the member, CavMac uses a weighted average of current premiums, separately for current retirees and future retirees, based on actual health plan elections for current retirees and assumed elections upon retirement for future retirees. This methodology is consistent with how the per capita claims costs are developed and applied in the actuarial valuation. This methodology does not reflect the actual elections made by current retirees on an individual basis. We believe this methodology is reasonable, although we suggest that CavMac monitor the elections of

the current retirees to make sure that older retirees, with lower life expectancies, are not impacting the reasonableness of the average elections being utilized.

Participation Assumptions

Upon retirement, SERS subsidizes the cost of healthcare coverage by covering a portion of the premium. The portion covered by SERS increases based on years of service and thus the member's portion decreases based on years of service. The percentage also varies on whether the event is a service retirement or a disability retirement. Since members may be eligible for healthcare coverage outside of SERS, not all members elect coverage through SERS. Furthermore, pre-65 members who do not elect coverage upon retirement may elect coverage upon becoming eligible for Medicare. In addition, members may also elect coverage if any other healthcare coverage is involuntarily terminated.

CavMac developed election percentages that vary by years of service at retirement and by retirement type. Furthermore, a greater percentage is assumed for members reaching eligibility for Medicare which reflects the fact that members who initially waived coverage do elect coverage upon becoming eligible for Medicare.

While a greater percentage of future retirees is assumed to elect coverage upon becoming eligible for Medicare, no assumption is made for current retirees who are under age 65 and may elect coverage upon becoming eligible for Medicare. For example, the participation assumption for a member with 25 years of service is 50% upon retirement and 75% upon becoming eligible for Medicare. Meaning that 50% of the members elect coverage upon retirement for life, 25% elect coverage beginning at eligibility for Medicare and 25% would not elect any coverage. Therefore, for retirees who are under age 65 who have not elected coverage, we would expect that half (25% / 50%) of them would elect coverage upon becoming eligible for Medicare. Currently no liability is held for these members.

We recommend SERS and CavMac review current retirees who are under age 65 to determine how they should be incorporated into the healthcare valuation.

Disability Coverage

When a member qualifies for a disability benefit from SERS, they may also qualify for a disability benefit from Social Security once disabled for 6 months. If qualify for a Social Security disability, the individual would qualify for Medicare if remain disabled after 24 months. Once eligible for Medicare, health claims payable by insurance carrier are reduced significantly as Medicare becomes the primary payor. In the healthcare valuation report, 15% of future disabled retirees are assumed to become eligible for Medicare. In the retiree data, SERS indicates those members receiving the Medicare Part B subsidy. In reviewing the percentage of less than age 65 disabled members who have been retired

more than two years, we found the percentage receiving the Medicare Part B subsidy to be 40%.

We suggest that SERS and CavMac review the percentage of members on disability who qualify for Medicare. We also suggest that CavMac specify how this would impact the future claims costs valued in the valuation program.

Section IV – Actuarial Valuation Report

Actuarial Standards of Practice

We have reviewed the June 30, 2021 actuarial valuation reports from the perspective of serving as an actuarial communication and Statement of Actuarial Opinion (SAO). There are a number of Actuarial Standards of Practice (ASOPs) that apply to the development of the valuation results and the preparation of the actuarial valuation report. We have found that the valuation report is in compliance with the applicable ASOPs (see below), but we have identified several suggestions for consideration for future valuation reports.

The following ASOPs are applicable to pension actuarial reports:

- ASOP 4: Measuring Pension Obligations and Determining Pension Plan Costs or Contributions
- ASOP 6: Measuring Retiree Group Benefits Obligations and Determining retiree Group Benefits Program Periodic Costs or Actuarially Determined Contributions
- ASOP 23: Data Quality
- ASOP 27: Selection of Economic Assumptions for Measuring Pension Obligations
- ASOP 35: Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations
- ASOP 41: Actuarial Communications
- ASOP 44: Selection and Use of Asset Valuation Methods for Pension Valuations
- ASOP 51: Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions
- ASOP 56: Modeling

Review of Compliance with the ASOPs and Suggestions for Future Reports

ASOP 4: This ASOP provides guidance to actuaries when preparing pension valuations, as well as certain other SAOs. The ASOP requires the actuary to include a number of items in the actuarial report, including the purpose of the measurement, summary of plan provisions, data and actuarial methods and assumptions, as well as certain additional information. The valuation report appeared to include the required information.

ASOP 6: This ASOP provides guidance to actuaries when preparing healthcare valuations including the selection of healthcare specific assumptions. Effectively, it incorporates the provisions of ASOP 4 for pension valuations in terms of selection and disclosure of actuarial methods and the provisions of ASOP 35 but applicable to healthcare specific assumptions.

As discussed above in Section III, the healthcare assumptions selected appear to be reasonable and appropriate. In addition, the valuation report contains a description of the assumptions used, and the experience study referenced in the valuation report contains justification for the assumptions that were selected. Therefore, the valuation report is in compliance with ASOP 6.

ASOP 23: This ASOP provides guidance to actuaries when selecting, reviewing, using, or relying on data supplied by others, when performing actuarial services. The ASOP requires the actuary to disclose the source of the data, whether the actuary reviewed the data, and to indicate any concerns about the data and if there are any limitations on the actuarial work product as a result of those concerns.

The cover letter of the report indicates the source of the data and notes that while the actuary checked for year to year consistency, they did not audit the data. This approach is consistent with the requirements of the ASOP and general actuarial practice.

ASOP 27: This ASOP provides guidance to actuaries when selecting economic assumptions for measuring pension obligations in a defined benefit plan. The ASOP also requires actuaries to disclose the assumptions used as well as the rationale for the selection of the assumptions.

As discussed above in Section III, the economic assumptions selected appear to be reasonable and appropriate. In addition, the valuation report contains a description of the assumptions used, and the experience study referenced in the valuation report contains justification for the assumptions that were selected. Therefore, the valuation report is in compliance with ASOP 27.

Please refer to Section III above for our comments on the economic assumptions.

ASOP 35: This ASOP provides guidance to actuaries when selecting demographic assumptions for measuring pension obligations in a defined benefit plan. The ASOP also requires actuaries to disclose the assumptions used as well as the rationale for the selection of the assumptions.

As discussed above in Section III, the demographic assumptions selected appear to be reasonable and appropriate. In addition, the valuation report contains a description of the assumptions used, and the experience study referenced in the valuation report generally contains justification for the assumptions that were selected. Therefore, the valuation report is in compliance with ASOP 27.

Please refer to Section III above for our comments on the demographic assumptions as well as below for some additional disclosure suggestions.

ASOP 41: This ASOP provides guidance to actuaries when issuing actuarial communications. The ASOP requires actuaries to include various disclosure items in the actuarial report including the intended user, scope, purpose, actuarial qualifications. The report prepared by CavMac included the required information. Therefore, the valuation report is in compliance with ASOP 41.

ASOP 44: This ASOP provides guidance to actuaries when selecting an asset valuation method for an actuarial valuation. The asset valuation method recognizes 1/4th of actuarial investment gains and losses and contains a 12% corridor around the market value of assets. This method satisfies Section 3.3 and 3.4 of the ASOP without any bias. Therefore, the valuation report is in compliance with ASOP 44.

ASOP 51: This ASOP provides guidance to actuaries on the assessment and disclosure of the risks that future measurements may differ from that which is expected. The valuation report discusses several risks facing SERS and presents various risk metrics with an explanation of the importance of those metrics. Therefore, the report is in compliance with ASOP 51.

Summary of Plan Provisions

CavMac's valuation reports provide a robust summary of the applicable plan provisions, but recommend the following items be included for additional clarity:

- Specify the current actuarial equivalent rates that apply upon early retirement
- Clarify how the benefits are determined upon date of conversion under the New Disability Plan
- Clarify that the Survivor Allowances apply to disability recipients
- Clarify that joint and survivor options include a pop-up element
- Clarify that the single life allowance includes a modified cash refund equal to the member's contribution balance
- For the healthcare valuation, clarify how recipient premium contribution percentage is calculated

Summary of Actuarial Assumptions

The summary of actuarial assumptions included in the actuarial valuation report is a robust summary and includes nearly all of the assumptions reflected in the valuation model. In future valuation reports, we suggest the following assumptions be included:

- Provide sample rates of the base mortality tables reflecting the adjusted base rates in 2017
- Note that the contingent survivor mortality rates apply to beneficiaries of retirees currently receiving benefits and to dependents in the healthcare valuation
- Denote any assumptions used to estimate the benefits payable upon conversion for New Disability Plan members for both the pension and healthcare valuations
- Specify the commencement age for members who terminate prior to eligibility for retirement
- Disclose assumption for whether a current active member upon withdrawal will take a refund of their contributions or keep their contributions with SERS and receive a deferred monthly allowance at a later date.

- Specify any assumptions made in valuing certain plan features such as:
 - Accumulated contributions are assumed to be exhausted at time of death and no additional liability is held for payment of these benefits
 - Retirees who elect multiple beneficiaries are assumed to have elected a 100% joint and survivor annuity; specify the joint date of birth used
- Denote when disabled members are assumed to be eligible for the Medicare Part B premium and the impact on per capita claims costs and premiums in the healthcare valuation
- Disclose the estimated average premiums used to determine the retiree contributions for current and future retirees
- Clarify how the healthcare cost trends apply to retiree contributions including the \$35 surcharge.
- Suggest expanding the table of per capita claims cost to detail the expected costs at ages other than 65.

Section V – Sample Life Review

A Level II audit requires a review of detailed sample lives provided by the actuary. Sample life refers to the development of liabilities for specific individuals in the valuation model. As requested by Milliman, CavMac provided 15 sample lives for various categories of individuals representing a cross section of members by hire age, grandfathered status, status, form of payment, etc. to review the projected benefits produced by the actuarial model for both the pension and healthcare actuarial valuations as of June 30, 2021.

CavMac provided a high-level summary of the present values calculated by decrement, i.e., the portion of the liability attributable to the future retirement, termination, disablement or death of the member. The present values reflected the following liability determinations:

- Present Value of Benefits (PVB) - the total measure of an individual's liability. A reasonable match on the PVB indicates that we are valuing the benefits provided by SERS consistent with the current actuary.
- Entry Age Accrued Liability (EAAL) – the portion of an individual's liability attributable to past service as determined by the Entry Age Normal cost method. For retirees, survivors and deferred inactive members, the EAAL equals the PVB. For active members the EAAL is typically less than the PVB reflecting benefits expected to be accrued in the future. Differences in the application of the cost method, such as the determination of the assumed salary a member earned from date of hire to the valuation date, can impact the match on active members from one actuary's determination to another. We typically see a wider range of results for the EAAL.
- Entry Age Normal Cost (EANC) – the portion of an individual's liability attributable to the current year of service. Similar to the EAAL, the application of the cost method can result in even wider differences than the EAAL between one actuary's method to another. There is no normal cost for retirees, survivors and deferred inactive members.

Programming differences can lead to higher variability at the individual level, but in total, would produce reasonably similar results when performing a full replication. For example, how a valuation system determines age or service for a particular decrement may result in differences at the individual level, but when applied to the entire population may result in the determination of similar aggregate liabilities.

Since we were only provided high level information for the samples and not specific projected benefits by individual, our calculations will not be expected to match each individual exactly. We independently programmed the benefits and actuarial assumptions, incorporating clarifications provided by CavMac to determine if the results produced by CavMac are reasonable for the individuals provided. Please note that our

reasonableness coding may not have incorporated all of the features of the plans, such as the \$86 minimum benefit.

While we have no material concern with the overall determination of the liabilities for each of the plans based on the sample lives that we reviewed, we did not perform a full replication to determine if any programming differences would yield a materially different result in aggregate.

Basic Pension Benefits – Retirees & Survivors

The following chart displays our comparison of the liability for basic benefits for nine (9) different sample lives who are currently in payment. Basic benefits include the pension benefits, Medicare Part B subsidy and post-retirement lump sum death benefit. The sample lives varied by status (service retiree, disabled retiree and survivor) and by form of payment (straight life, joint and survivor, multiple beneficiaries, etc.).

The following table describes the items reviewed for the basic benefits for retirees.

Actuarial Program of Basic Pension Benefits: Retiree Liability		Milliman
1.	Mortality tables applied appropriately for healthy retirees, disabled retirees and survivors (see discussion Section III regarding use of contingent survivor mortality tables and disabled retirees who subsequently converted to service retirees)	✓
2.	Cost-of-living-adjustment was calculated on a simple interest basis based on the original retirement benefit and reflected the 3-year delay for members who retired on or after April 1, 2018	✓
3.	Refund of contributions were valued for members who elected a single life annuity (see discussion in Section I)	✓
4.	Joint and survivor benefits were valued properly based on retiree’s age and spouse’s age (see discussion below on Multiple Plan beneficiaries)	✓
5.	Survivor benefits were valued properly for disabled members (see discussion in Section I for survivor benefits for Old Disability Plan members, New Disability Plan members until age 65, and refund of contributions for New Disability Plan members beginning at age 65)	✓
6.	For members receiving a New Disability Plan benefit, properly reflecting the conversion benefit at age 65 (see discussion in Section I)	✓
7.	For eligible members receiving the Medicare Part B subsidy (see discussion below on eligible and not yet eligible disabled members)	✓

Based on our match, we are within 2% for each retiree for each benefit except the member with multiple plan beneficiaries and the disabled member receiving the Medicare Part B subsidy. The following details these situations:

- **Multiple Plan Beneficiaries:** CavMac values retirees who elected a joint and survivor annuity with multiple plan beneficiaries as had elected a 100% joint and survivor annuity for ease of coding. The data provided by SERS does indicate the amounts payable to each beneficiary and the cumulative joint and survivor percentage could be determined. For example, the sample life member with multiple beneficiaries had a cumulative joint and survivor percentage of 33%. While there are few members who elect this option, we would recommend that CavMac review their data procedures and value the actual cumulative joint and survivor percentage. We would also suggest using the youngest beneficiary. Note that CavMac's method of assuming all multiple plan beneficiaries elected a 100% joint and survivor annuity is conservative in that it will result in a higher liability in most cases.
- **Medicare Part B:** SERS indicates which retirees are receiving the Medicare Part B subsidy, which may include disabled members who are under age 65. CavMac assumes the Medicare Part B benefit begins at age 65 regardless of the indicator on the data. We recommend that CavMac value the Medicare Part B subsidy for disabled members indicated by SERS and incorporate an assumption for disabled members who are within 24 – 30 months of their commencement date. Medicare includes a 25 month elimination period.

**Comparison of June 30, 2021 Retiree Sample Life Review
Basic Benefits Valuation**

	CavMac Liability (PVB)	Milliman Liability (PVB)	Ratio of Milliman / CavMac
Total Basic Benefits			
Straight Life	250,900	245,855	97.99%
Joint & 100% Survivor	270,553	272,771	100.82%
Joint & 50% Survivor	242,719	245,658	101.21%
10-Year Certain & Life	354,533	360,043	101.55%
Multiple Beneficiaries ¹	1,054,428	662,759	62.85%
Survivor with Life Benefit	92,371	93,658	101.39%
Disabled - Less than 10 Years of Service	181,336	186,159	102.66%
Disabled - At least 10, but less than 25 Years of Service	221,063	224,281	101.46%
Disabled - 25 or more Years of Service	<u>62,583</u>	<u>63,198</u>	100.98%
Grand Total	2,730,487	2,354,382	86.23%
Pension Benefits			
Straight Life	250,221	245,177	97.98%
Joint & 100% Survivor	266,120	268,338	100.83%
Joint & 50% Survivor	238,502	241,442	101.23%
10-Year Certain & Life	354,029	359,539	101.56%
Multiple Beneficiaries ¹	1,051,405	659,736	62.75%
Survivor with Life Benefit	92,371	93,658	101.39%
Disabled - Less than 10 Years of Service	180,939	185,763	102.67%
Disabled - At least 10, but less than 25 Years of Service	217,087	219,314	101.03%
Disabled - 25 or more Years of Service	58,039	58,654	101.06%
Medicare Part B			
Straight Life	0	0	100.00%
Joint & 100% Survivor	3,808	3,808	100.00%
Joint & 50% Survivor	3,611	3,611	100.00%
10-Year Certain & Life	0	0	100.00%
Multiple Beneficiaries	2,308	2,308	100.00%
Survivor with Life Benefit	0	0	100.00%
Disabled - Less than 10 Years of Service	0	0	100.00%
Disabled - At least 10, but less than 25 Years of Service ²	3,535	4,526	128.03%
Disabled - 25 or more Years of Service	4,044	4,044	100.00%
Lump Sum Death Benefit			
Straight Life	679	679	99.93%
Joint & 100% Survivor	625	625	99.92%
Joint & 50% Survivor	606	605	99.92%
10-Year Certain & Life	504	503	99.91%
Multiple Beneficiaries	715	715	99.93%
Survivor with Life Benefit	0	0	100.00%
Disabled - Less than 10 Years of Service	397	396	99.89%
Disabled - At least 10, but less than 25 Years of Service	441	441	99.90%
Disabled - 25 or more Years of Service	501	500	99.91%

¹ See discussion on multiple plan beneficiaries

² See discussion on Medicare Part B

Basic Pension Benefits - Actives

The following chart displays our comparison of the liability for basic benefits for six (6) different sample lives. Basic benefits include the pension benefits, Medicare Part B subsidy and post-retirement lump sum death benefit. The sample lives varied by the age at hire (young age 23, middle age 30, and older age 50) and whether grandfathered status (25 years of service by August 1, 2017 or not).

The following table describes the items reviewed for the basic benefits for retirees.

Actuarial Program of Basic Pension Benefits: Active Liability		Milliman
1.	Proper application of the various decrements (termination, retirement, disability and pre-retirement death)	✓
2.	Projection of compensation based on salary increase assumption, including ages prior to the valuation date	✓
3.	Projection of termination and retirement benefits at each projected age by for each service component, including ages prior to the valuation date reflecting actual compensation history	✓
4.	Applying eligibility criteria for each benefit type by grandfathered status	✓
5.	Proper application of early retirement factors	✓
6.	Determination of cost-of-living-adjustment on a simple interest basis reflecting the 3-year delay	✓
7.	Refund of contributions were valued for members assumed to die after commencement (see discussion in Section I)	✓
8.	Projection of benefits paid upon disability, including those occurring beginning on date of conversion (see discussion in Section 1 and below)	X
9.	Projection of benefits paid upon death, including benefits paid under Schedules I, II and III and the 100% joint and survivor annuity for those eligible for retirement	✓

Based on our match, we are within 4% for the total liability for active members reviewed on each liability basis (PVB, EAAL and EANC). There are a few situations where the match is further apart on a particular liability basis, but we believe these differences are due to differences in valuation systems that can result in larger variations at an individual level.

As noted in this report, we believe the programming for disability benefits needs to be reviewed to account for the following. Our reasonableness calculations did not incorporate these items.

- The adjustment to the benefit that occurs at the date of conversion, essentially age 65 for New Disability Plan members, including the cost-of-living adjustment.

- The valuation of survivor benefits for the lifetime of Old Disability Plan members and until date of conversion for New Disability Plan members.
- The Medicare Part B subsidy occurring prior to age 65.
- The elimination of the disability decrement prior to accruing the 5 years of service eligibility criteria and at the point that the service retirement benefit is greater than the disability.

**Comparison of June 30, 2021 Active Sample Life Review
Basic Benefits Valuation - Present Value of Benefits**

	CavMac Liability (PVB)	Milliman Liability (PVB)	Ratio of Milliman / CavMac
Total Basic Benefits			
Attained 25 YOS before 8/1/2017 - EA of 23	754,675	731,222	96.89%
Attained 25 YOS before 8/1/2017 - EA of 30	47,222	45,158	95.63%
Attained 25 YOS before 8/1/2017 - EA of 50	169,282	168,338	99.44%
Attained 25 YOS after 8/1/2017 - EA of 23	434,063	409,535	94.35%
Attained 25 YOS after 8/1/2017 - EA of 30	77,768	74,169	95.37%
Attained 25 YOS after 8/1/2017 - EA of 50	<u>40,017</u>	<u>40,968</u>	102.38%
Grand Total	1,523,026	1,469,388	96.48%
Pension Benefits			
Attained 25 YOS before 8/1/2017 - EA of 23	751,643	728,146	96.87%
Attained 25 YOS before 8/1/2017 - EA of 30	42,549	40,262	94.63%
Attained 25 YOS before 8/1/2017 - EA of 50	163,781	162,825	99.42%
Attained 25 YOS after 8/1/2017 - EA of 23	432,339	407,777	94.32%
Attained 25 YOS after 8/1/2017 - EA of 30	77,314	73,745	95.38%
Attained 25 YOS after 8/1/2017 - EA of 50	38,836	39,802	102.49%
Medicare Part B			
Attained 25 YOS before 8/1/2017 - EA of 23	2,898	2,938	101.36%
Attained 25 YOS before 8/1/2017 - EA of 30	4,479	4,695	104.83%
Attained 25 YOS before 8/1/2017 - EA of 50	5,276	5,282	100.10%
Attained 25 YOS after 8/1/2017 - EA of 23	1,620	1,657	102.33%
Attained 25 YOS after 8/1/2017 - EA of 30	427	401	93.98%
Attained 25 YOS after 8/1/2017 - EA of 50	1,126	1,100	97.72%
Lump Sum Death Benefit			
Attained 25 YOS before 8/1/2017 - EA of 23	135	138	102.26%
Attained 25 YOS before 8/1/2017 - EA of 30	195	201	103.10%
Attained 25 YOS before 8/1/2017 - EA of 50	224	231	102.79%
Attained 25 YOS after 8/1/2017 - EA of 23	104	100	96.52%
Attained 25 YOS after 8/1/2017 - EA of 30	27	23	84.22%
Attained 25 YOS after 8/1/2017 - EA of 50	55	65	119.15%

**Comparison of June 30, 2021 Active Sample Life Review
Basic Benefits Valuation - Entry Age Accrued Liability**

	CavMac Liability (EAN)	Milliman Liability (EAN)	Ratio of Milliman / CavMac
Total Basic Benefits			
Attained 25 YOS before 8/1/2017 - EA of 23	716,176	698,451	97.53%
Attained 25 YOS before 8/1/2017 - EA of 30	44,521	43,228	97.09%
Attained 25 YOS before 8/1/2017 - EA of 50	152,975	151,625	99.12%
Attained 25 YOS after 8/1/2017 - EA of 23	363,459	337,733	92.92%
Attained 25 YOS after 8/1/2017 - EA of 30 ¹	21,876	17,335	79.24%
Attained 25 YOS after 8/1/2017 - EA of 50	<u>10,404</u>	<u>11,039</u>	106.11%
Grand Total	1,309,410	1,259,411	96.18%
Pension Benefits			
Attained 25 YOS before 8/1/2017 - EA of 23	713,346	695,558	97.51%
Attained 25 YOS before 8/1/2017 - EA of 30	40,138	38,548	96.04%
Attained 25 YOS before 8/1/2017 - EA of 50	148,002	146,512	98.99%
Attained 25 YOS after 8/1/2017 - EA of 23	362,080	336,263	92.87%
Attained 25 YOS after 8/1/2017 - EA of 30 ¹	21,744	17,159	78.91%
Attained 25 YOS after 8/1/2017 - EA of 50	10,084	10,737	106.47%
Medicare Part B			
Attained 25 YOS before 8/1/2017 - EA of 23	2,709	2,770	102.24%
Attained 25 YOS before 8/1/2017 - EA of 30	4,209	4,495	106.81%
Attained 25 YOS before 8/1/2017 - EA of 50	4,779	4,916	102.87%
Attained 25 YOS after 8/1/2017 - EA of 23	1,299	1,392	107.13%
Attained 25 YOS after 8/1/2017 - EA of 30 ¹	124	169	136.76%
Attained 25 YOS after 8/1/2017 - EA of 50	305	289	94.82%
Lump Sum Death Benefit			
Attained 25 YOS before 8/1/2017 - EA of 23	120	124	102.71%
Attained 25 YOS before 8/1/2017 - EA of 30	175	184	105.43%
Attained 25 YOS before 8/1/2017 - EA of 50	194	197	101.57%
Attained 25 YOS after 8/1/2017 - EA of 23	80	79	99.56%
Attained 25 YOS after 8/1/2017 - EA of 30 ¹	8	7	84.02%
Attained 25 YOS after 8/1/2017 - EA of 50	15	14	91.87%

¹ We believe difference is due to application of actuarial cost method in estimating portion of total present value allocated to past service.

**Comparison of June 30, 2021 Active Sample Life Review
Basic Benefits Valuation - Entry Age Normal Cost**

	CavMac Normal Cost (EAN)	Milliman Normal Cost (EAN)	Ratio of Milliman / CavMac
Basic Benefits			
Attained 25 YOS before 8/1/2017 - EA of 23	8,846	7,553	85.39%
Attained 25 YOS before 8/1/2017 - EA of 30	705	542	76.86%
Attained 25 YOS before 8/1/2017 - EA of 50	7,297	7,429	101.81%
Attained 25 YOS after 8/1/2017 - EA of 23	7,035	7,127	101.31%
Attained 25 YOS after 8/1/2017 - EA of 30	4,733	4,724	99.81%
Attained 25 YOS after 8/1/2017 - EA of 50	<u>3,410</u>	<u>3,418</u>	100.21%
Grand Total	32,026	30,793	96.15%
Pension Benefits			
Attained 25 YOS before 8/1/2017 - EA of 23	8,799	7,511	85.36%
Attained 25 YOS before 8/1/2017 - EA of 30 ¹	629	481	76.48%
Attained 25 YOS before 8/1/2017 - EA of 50	7,060	7,251	102.70%
Attained 25 YOS after 8/1/2017 - EA of 23	7,001	7,099	101.40%
Attained 25 YOS after 8/1/2017 - EA of 30	4,706	4,703	99.93%
Attained 25 YOS after 8/1/2017 - EA of 50	3,311	3,319	100.24%
Medicare Part B			
Attained 25 YOS before 8/1/2017 - EA of 23	43	39	89.07%
Attained 25 YOS before 8/1/2017 - EA of 30	70	56	79.68%
Attained 25 YOS before 8/1/2017 - EA of 50	222	162	73.04%
Attained 25 YOS after 8/1/2017 - EA of 23	32	26	82.53%
Attained 25 YOS after 8/1/2017 - EA of 30	26	20	79.06%
Attained 25 YOS after 8/1/2017 - EA of 50	95	93	97.96%
Lump Sum Death Benefit			
Attained 25 YOS before 8/1/2017 - EA of 23	3	3	98.76%
Attained 25 YOS before 8/1/2017 - EA of 30	5	4	84.75%
Attained 25 YOS before 8/1/2017 - EA of 50	14	15	109.70%
Attained 25 YOS after 8/1/2017 - EA of 23	2	2	86.09%
Attained 25 YOS after 8/1/2017 - EA of 30	2	1	85.86%
Attained 25 YOS after 8/1/2017 - EA of 50	5	6	126.95%

¹ We believe difference is due to application of \$86 minimum benefit as Milliman did not incorporate it in our reasonableness calculations.

Healthcare Benefits - Retirees

The following chart displays our comparison of the liability for healthcare benefits for the same retiree sample lives used for pension benefits. Due to the nature of healthcare benefits, we would expect our match on healthcare benefits to vary further than pension benefits due to the application of healthcare specific assumptions such as age-based per capita costs, trend assumptions and determination of portion of benefits paid by retirees.

The following table describes the items reviewed for the healthcare benefits for retirees that are in addition to those used for pension benefits.

Actuarial Program of Healthcare Benefits: Retiree Liability		Milliman
1.	Application of age-based per capita costs	✓
2.	Application of healthcare trend on age-based on per capita costs	✓
3.	Determination of retiree and dependent costs	✓
4.	Determination of portion of premium covered by retiree (see comment below)	✓
5.	Application of healthcare trend on retiree's portion of cost (see comment below on application of surcharge)	✓

The following table details our match for each retiree. The reason for the differences is noted below:

- Contribution Premium Percentage:** The percentage of the premium paid by SERS and the retiree is based on years of service at retirement. At 35 years, the percentage decreases by 1% for each additional year of service if the member retired on or after August 1, 2008 such that at 50 years the premium is fully subsidized by SERS. In addition, the retiree is not charged the \$35 surcharge. In reviewing the edited retiree data, the contribution premium percentage is 20% rather than 0%. In addition, CavMac is valuing the surcharge for these members. We recommend that CavMac review its data procedures and valuation programs to verify the contribution premium percentage is determined correctly.

Please note that the majority of the samples provided to us just happened to have at least 50 years of service, so the results of the match appear to be larger than if we valued the entire population which only has a small proportion with 50 or more years of service.

- Surcharge:** In addition to the contribution premium percentage, each retiree contributes a \$35 per month surcharge. CavMac assumes this surcharge increases with the applicable healthcare trend each year in the future. While we are uncertain on the history of the surcharge that SERS has charged, we recommend that SERS and CavMac verify that 1) future increases should be applied to this feature in the valuation and 2) the future increases are consistent

with healthcare trend or if a separate assumption should be developed for this purpose.

**Comparison of June 30, 2021 Retiree Sample Life Review
Healthcare Benefits**

	CavMac Liability (PVB)	Milliman Liability (PVB)	Ratio of Milliman / CavMac
Total Basic Benefits			
Straight Life	7,885	9,564	121.30% ¹
Joint & 100% Survivor	9,704	9,142	94.21%
Joint & 50% Survivor	9,907	12,231	123.46% ¹
10-Year Certain & Life	12,666	15,981	126.17% ¹
Multiple Beneficiaries	6,937	8,313	119.83% ¹
Survivor with Life Benefit	31	28	90.32%
Disabled - Less than 10 Years of Service	29,138	28,539	97.95%
Disabled - At least 10, but less than 25 Years of Service	24,064	23,437	97.39%
Disabled - 25 or more Years of Service	<u>16,895</u>	<u>16,242</u>	96.13%
Grand Total	117,227	123,478	105.33%

¹ These retired participants were reported with 50 or more years of service and retirement dates after August 1, 2008. Milliman's liability reflects a 0% retiree contribution, whereas CavMac's liability reflects a 20% retiree contribution. See discussion on Contribution Premium Percentage.

Healthcare Benefits - Actives

The following chart displays our comparison of the liability for healthcare benefits for the same active sample lives used for pension benefits.

The following table describes the items reviewed for the basic benefits for retirees.

Actuarial Program of Healthcare Benefits: Active Liability		Milliman
1.	Proper application of the various decrements (termination, retirement, disability and pre-retirement death)	✓
2.	Projection of age-based per capita costs upon termination and retirement at each projected age	✓
3.	Projection of spouse and/dependent costs at each projected age	✓
4.	Projection of retiree's and spouse's portion of the contribution	✓
5.	Projection of costs paid upon disability, including those occurring beginning on date of conversion (see discussion below)	✓
6.	Projection of costs paid upon death	✓

Based on our match, we are within 3% for the total liability for active members reviewed on each liability basis (PVB, EAAL and EANC). There are a few situations where the match is further apart on a particular liability basis, but we believe these differences are due to differences in valuation systems that can result in larger variations at an individual level.

As noted in this report, we believe the programming for disability benefits needs to be reviewed to account for the following. Our reasonableness calculations did not incorporate this item.

- Disability Benefits:** For New Disability Plan members, the years of service used to determine the contribution premium percentage includes the period of disability at the date of conversion. We believe CavMac is assuming the contribution premium percentage remains the same based on years of service at the time of disability. We recommend that CavMac review its actuarial programs to reflect a possible lower contribution premium percentage at the date of conversion for future and current retirees.

**Comparison of June 30, 2021 Active Sample Life Review
Healthcare Benefits**

	CavMac Liability (PVB)	Milliman Liability (PVB)	Ratio of Milliman / CavMac
PVFB			
Attained 25 YOS before 8/1/2017 - EA of 23	73,466	73,996	100.72%
Attained 25 YOS before 8/1/2017 - EA of 30	30,286	30,051	99.23%
Attained 25 YOS before 8/1/2017 - EA of 50 ¹	407	0	0.00%
Attained 25 YOS after 8/1/2017 - EA of 23	41,956	41,584	99.11%
Attained 25 YOS after 8/1/2017 - EA of 30	9,237	9,359	101.32%
Attained 25 YOS after 8/1/2017 - EA of 50	<u>1,025</u>	<u>1,100</u>	107.28%
Grand Total	156,377	156,090	99.82%
Entry Age Accrued Liability			
Attained 25 YOS before 8/1/2017 - EA of 23	69,982	70,638	100.94%
Attained 25 YOS before 8/1/2017 - EA of 30	28,454	28,212	99.15%
Attained 25 YOS before 8/1/2017 - EA of 50 ¹	341	0	0.00%
Attained 25 YOS after 8/1/2017 - EA of 23	35,795	35,557	99.33%
Attained 25 YOS after 8/1/2017 - EA of 30	2,677	2,707	101.14%
Attained 25 YOS after 8/1/2017 - EA of 50	<u>278</u>	<u>296</u>	106.62%
Grand Total	137,527	137,411	99.92%
Entry Age Normal Cost			
Attained 25 YOS before 8/1/2017 - EA of 23	800	768	96.00%
Attained 25 YOS before 8/1/2017 - EA of 30	478	478	99.97%
Attained 25 YOS before 8/1/2017 - EA of 50 ¹	30	0	0.00%
Attained 25 YOS after 8/1/2017 - EA of 23	600	586	97.66%
Attained 25 YOS after 8/1/2017 - EA of 30	556	562	101.13%
Attained 25 YOS after 8/1/2017 - EA of 50	<u>86</u>	<u>92</u>	107.22%
Grand Total	2,550	2,486	97.50%

¹ Milliman estimate of the retiree's portion of the contribution exceeds the value of the gross claims cost such that the liability equals \$0. We believe this could be due to differences in valuation programming parameters that can result in differences at an individual level.



Milliman is an independent consulting, benefits and technology firm. Our expert guidance and advanced analytical solutions empower leading insurers, healthcare companies and employers to protect the health and financial well-being of people everywhere. Every day, in countries across the globe, we collaborate with clients to improve healthcare systems, manage risk, and advance financial security, so millions of people can live for today and plan for tomorrow with greater confidence.

milliman.com

CONTACT

Scott Porter, FSA, EA, MAAA

Tel +1 610 975 8070

scott.porter@milliman.com