

Proposal
To Provide An
Actuarial Audit of the Public Employees Retirement System of Ohio



for

The Ohio Retirement Study Council



December 5, 2025

Submitted by



December 5, 2025

Ms. Bethany Rhodes
Director/General Counsel
Ohio Retirement Study Council
30 East Broad Street, 2nd Floor
Columbus, OH 43215

Dear Bethany:

Pension Trustee Advisors (PTA), partnering with KMS Actuaries (KMS) and Bolton Partners (Bolton), is pleased to present this competitive offer in response to the Ohio Retirement Study Council's (ORSC) request for proposals (RFP) for actuarial audit services of the Public Employees Retirement System of Ohio (OPERS).

The scope of work requested in the RFP is not new to us. We have previously conducted an actuarial audit of OPERS in 2014 and of course, the work we completed on the pension reform study, each of which gave us substantial familiarity with OPERS' operations. This background equips us to deliver a timely, focused, accurate, and high-value audit with minimal learning curve.

We understand the work to be done and will make a commitment to perform the work as scheduled. PTA, KMS and Bolton have the ability, willingness, knowledge, experience and resources to not only meet your needs, but exceed them, subject to the terms of the RFP. William (Flick) Fornia, Linda Bournival and Tom Vicente will be the primary consultants for ORSC and OPERS.

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This type of assignment is our primary business. We would be privileged to continue to serve as your auditing actuary and look forward to the opportunity to present our qualifications to you on the following pages.

Public Pension Focus

The challenges facing public pensions are not unique to Ohio. Flick Fornia, Linda Bournival, and Tom Vicente have been involved considerably in this arena both currently as well as through our prior employers. Our participation has ranged from actuarial valuations and audits of numerous pension systems to working outside the pension systems to help our clients effect change. These engagements have been on all sides of pension analysis and often include state organizations such as ORSC. For example, the proposed team recently completed the audit of the School Employees Retirement System of Ohio, PTA/KMS completed thorough actuarial reviews for the Colorado Office of the State Auditor and the Government of Guam, and, of course, we are extremely proud of the role we played with ORSC in the review of Ohio's funding plans leading to one of the most comprehensive and balanced pension reforms in the country in addition to our audits of all five Ohio retirement systems.

We continue to have substantial involvement in the forefront of the public pension scene. Linda has a sound foundation of public pension and health actuarial valuations both large and small, through KMS and prior firms. Flick is a nationally recognized public plan actuary and advisor. He recently authored an often-cited paper for the National Institute on Retirement Security on the economic efficiencies of defined benefit pensions. He is well known throughout the public pension community for his ability to explain complex matters to a lay audience. Tom Vicente, likewise, is a leader in the public pension community, currently serving as the vice-chair of the American Academy of Actuaries Public Plans Committee, and often speaking on public pension matters to actuarial and pension organizations (including NCPERS, the CCA, and the SOA).

Our Philosophy

Our objective is to provide ORSC and OPERS with accurate, well-understood information so that they can make the right decisions. Pensions can be controversial these days and difficult to understand. We analyze the facts and present them in a manner that will enable the best decisions to be made. We do this through (1) timely and responsive client service; (2) accurate, peer-reviewed, thorough actuarial analysis; and (3) effective oral and written communication of our findings. We encourage you to contact our clients (including ORSC Council members and member system representatives) to confirm how we have accomplished our mission in the past.

We are happy to answer any questions on this proposal and look forward to discussing this with you further.

Sincerely,



William B. Fornia, FSA
President
Pension Trustee Advisors



Linda L. Bournival, FSA
Consulting Actuary
KMS Actuaries, LLC



Thomas Vicente, FSA
Senior Consulting Actuary
Bolton Partners

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1. Proposal Summary

In response to your Request for Proposal (RFP) for an Actuarial Audit, we are pleased to provide this proposal presenting our services for actuarial audit, advisory and related consulting to the Ohio Retirement Study Council (ORSC) and the Public Employees Retirement System of Ohio (OPERS).

The services requested will be for the performance of an actuarial audit for the primary purpose of independent verification and analysis of the assumptions, procedures, and methods used by OPERS' consulting actuary Gabriel, Roeder, Smith & Company (GRS) for:

- OPERS annual pension actuarial valuation as of December 31, 2024 prepared by GRS;
- The five-year experience review for the period January 1, 2016 to December 31, 2020 prepared by GRS; and
- OPERS annual retiree health care actuarial valuation as of December 31, 2024 prepared by GRS, including GASB Statement 74 disclosures.

Because of our fourteen-year history of working with ORSC and prior 2014 audit of OPERS, we have a sound understanding of the services that are sought by the ORSC and OPERS and are ready to begin work immediately to meet all deadlines. Although the RFP was initially requesting audit of the 2023 reports, we will be flexible to use more recently available reports prepared by GRS, as ORSC suggested in their response to questions from potential bidders. The remainder of this proposal is provided upon that change.

Specific Audit Requirements

The ORSC has issued an RFP requesting proposals from qualified actuarial consulting firms interested in performing an actuarial audit of OPERS. The RFP specifically is requesting the following services:

- Perform an actuarial audit for the primary purpose of independent verification and analysis of the assumptions, procedures and methods used by the consulting actuary (GRS) of OPERS for:
 - OPERS annual pension actuarial valuation as of December 31, 2024 prepared by GRS
 - the five-year experience review for the period January 1, 2016 to December 31, 2020 prepared by GRS
 - OPERS annual retiree health care actuarial valuation as of December 31, 2024 prepared by GRS, including GASB 74 disclosures

As part of the independent verification analysis the actuarial audit shall include the following elements and activities:

- **Data Validity:**
 - Assess the validity, completeness, and appropriateness for OPERS' structure and funding objectives of the demographic and financial information used by the consulting actuary in the valuation of OPERS.
- **Actuarial Valuation Method and Procedures:**
 - Assess whether the consulting actuary's valuation method and procedures are reasonable and consistent with generally accepted actuarial standards and practices appropriate for OPERS' structure and funding objectives and are applied as stated by the actuary.
 - Report the impact, if any, of deviations from accepted standards found during the audit, including the rationale for the deviations and determination of effects, including monetary impact.
- **Actuarial Valuation Assumptions:**
 - Determine whether the assumptions utilized in the actuarial valuations:
 - are technically sound,
 - conform to the appropriate Actuarial Standards of Practice,
 - are reasonable based on OPERS' experience, and
 - are appropriate for OPERS' structure and funding objectives
 - Include in the analysis demographic and economic assumptions such as mortality, retirement, separation rates, pay adjustments, rates of investment return and disability factors
 - Determine whether actual experience is appropriately evaluated in the experience study and whether recent changes in assumptions are appropriate, reasonable and supported by the experience study
 - Review the gain/loss analyses from the last four actuarial valuation reports
- **Parallel Valuation:**
 - Perform parallel valuations of pension benefits as of December 31, 2024, and of retiree health care benefits as of December 31, 2024, using the validated member census data and the same actuarial assumptions.
- **Recommendations:**
 - If adjustments to assumptions are recommended to more accurately reflect present and future assets, liabilities, and costs of OPERS:
 - Provide detailed rationale for such recommendations, and
 - Describe the general effect on OPERS' condition resulting from the proposed changes in assumptions.

- **Review of Health Care:**
 - Assess whether the system appropriately and consistently determines retiree contributions to health care and whether the implementation of the OPERS's health care policies differ from those determinations.

This proposal will demonstrate our team's ability to perform the audit and related consulting services that the ORSC requires. Flick Forna, Linda Bournival and Tom Vicente can provide proactive, actuarial consulting advice based on years of experience with public sector plan sponsors. Not only should you review our qualifications and experience that we have detailed in Section 2, but we encourage you to contact the references we provide in Section 3 so you can gain confidence in our ability to provide these services. The fact that we have provided actuarial services during the last 30+ years to a large number of public sector clients speaks to our ability to provide satisfactory services.

Of course, our most important reference is the ORSC itself. From November 2011 through July 2012, we worked with ORSC and OPERS nearly every day reviewing plan details and actuarial calculations as a component of our pension reform study. Further, we performed an actuarial audit of OPERS in 2014. We know ORSC and OPERS quite well and have a thorough understanding of its features and actuarial nuances.

We have conducted audits of all five Ohio Retirement Systems:

- In 2013 and 2025, School Employees Retirement System of Ohio (SERS)
 - In 2014, Public Employees Retirement System of Ohio (OPERS)
 - In 2016, Ohio Police and Fire Pension Fund (OP&F)
 - In 2021, Highway Patrol Retirement System, and
 - In 2022, State Teachers Retirement System (STRS).
- **The firm's primary contact for ORSC staff use and, if different, for OPERS staff use during the audit, including the contact's address, telephone and e-mail address.**

William (Flick) Forna, Linda Bournival and Tom Vicente will be the primary consultants for ORSC and OPERS.

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

Pension Trustee Advisors was incorporated in Colorado in 2010 by its sole owner, William Fornia. KMS Actuaries, formed in 2011 by its sole owner, Linda Bournival, is a limited liability company. Bolton Partners was founded in 1981 by Mr. Robert G. Bolton as an independent actuarial and employee benefits consulting 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.**

No material changes in PTA's, KMS' or Bolton's structure or ownership are currently being contemplated.

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

No third-party assessment of PTA, KMS or Bolton has been conducted to our knowledge. We encourage a discussion of our past performance with our references as well as knowledgeable ORSC councilmembers and staff.

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

No litigation has been threatened against PTA, KMS or Bolton.

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

No litigation has been brought against PTA, KMS or Bolton by existing or former clients at any time.

- **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.**

Other than substantial previous work performed for ORSC since 2011, we have no professional relationships involving the ORSC, the State of Ohio, or its political subdivisions. In 2015, following our audit of OPERS, we were asked by OPERS to conduct a small software training project for their internal actuary. This assignment was approved of and fully supported by ORSC and invoiced through ORSC. We have had no other professional relationships for any of the five Ohio public retirement systems and do not anticipate any in the future. If we were requested for any such assignment by any Ohio public entity, it would only be conducted with the full understanding of ORSC and with ORSC' approval.

2. Capabilities and Experience

PTA and KMS have together provided actuarial consulting services to the following:

PTA/KMS Clients

- Ohio Retirement Study Council
- Government of Guam
- Ingham County, Michigan
- Materials Innovation and Recycling Authority of Connecticut
- Municipal Employees Retirement System of Michigan
- Confidential Multi- $\$$ Billion Public Retirement System
- Colorado Office of the State Auditor
- Kentucky Teachers' Retirement Funding Work Group
- Providence RI Retirees
- Cranston RI Retirees
- Edgewater CO Firemen's Pension Fund
- City of Brockton, Massachusetts
- City of Springfield, Massachusetts

Flick, the proposed lead actuary and consultant for ORSC, has conducted seventeen audits for large defined benefit public retirement systems. We believe that he may have more experience with actuarial audits for statewide systems than anyone. Flick is well known for his ability to explain complex concepts to lay audiences. He is an author and frequent speaker at organizations such as the Pension Research Council, the National Association of State Retirement Administrators (NASRA), the National Council on Teacher Retirement (NCTR), the National Association of Public Pension Attorneys (NAPPA), the National Conference on Public Employee Retirement Systems (NCPERS), the Conference of Consulting Actuaries, the Western Pension and Benefits Conference, the International Foundation of Employee Benefit Plans, The Conference Board, the Government Finance Officers Association (GFOA), and the Brazilian Association of Pension Plans (ABRAPP).

PTA, founded in 2010, is the leading provider of specialized non-routine actuarial services relating to state and local government retirement systems.

PTA, KMS and Bolton have provided actuarial consulting services to hundreds of clients including the following:

- Ohio Retirement Study Council
- Municipal Employees Retirement System of Michigan
- Puerto Rico General Employees Retirement System
- State of Colorado
- State of Nevada
- State of Kentucky
- Colorado Fire and Police Pension Association

- International Association of Firefighters' (IAFF) Locals in twenty jurisdictions
- Alaska Public Pension Coalition

- Government of Guam
- Worcester Regional Retirement System
- Manchester, New Hampshire
- Massachusetts Water Resources Authority
- Plymouth, Massachusetts
- Dukes County, Massachusetts (Cape Cod Islands)
- Massachusetts Public Employee Retirement Administration Commission

- State of Maryland
- State of Maine
- District of Columbia
- City of Providence, RI
- Pension Benefit Guaranty Corporation
- State of Texas
- State of California

Flick Forna specializes in the type of actuarial consulting services that ORSC is requesting. He has conducted seventeen audits for large defined benefit public retirement systems. Flick is well known for his ability to explain complex concepts to lay audiences. He is an author and frequent speaker at organizations such as the National Association of State Retirement Administrators (NASRA), the National Council on Teacher Retirement (NCTR), the National Association of Public Pension Attorneys (NAPPA), the National Conference on Public Employee Retirement Systems (NCPERS), the Conference of Consulting Actuaries, the International Foundation of Employee Benefit Plans, The Conference Board, the Government Finance Officers Association (GFOA), National Association of State Auditors, and the Brazilian Association of Pension Plans (ABRAPP).

PTA, founded in 2010, is the leading provider of specialized non-routine actuarial services relating to state and local government retirement systems.

Linda Bournival has provided actuarial consulting and retirement system valuation services for several municipalities and governmental entities over the past 35 years. In addition, she provides Governmental Accounting Standards Board Statement (GASB) Number 74 (GASB 74) and Number 75 (GASB 75) valuation services and retiree health care consulting services to many large, medium and small public sector clients. Over the years, she has provided a variety of services with respect to retirement plans, including the design and preparation of comprehensive employee benefit statements, the design and development of a complex automated benefit calculation system, the administration and establishment of qualification procedures for domestic relations orders and pension valuations of retirement benefits in divorce situations.

KMS, founded in 2011, has a significant presence in the public sector, providing services to over one hundred entities, including state and local retirement systems, cities, towns, counties and regional school districts.

Tom Vicente is a Senior Consulting Actuary with Bolton and the leader of Bolton's public sector pension practice. Tom has over 30 years of experience in actuarial, retiree medical, and pension consulting services, as well as the administration and communication of retirement programs. He also has significant experience with public pension audits including for the States of Maryland, Maine, Texas, and California as well as design, benchmarking, and retirement adequacy studies for retirement programs, determining cost factors for union-negotiated programs, as well as with hybrid pension plans such as Cash Balance and Retirement Equity programs. He has been a speaker for different groups, including the American Academy of Actuaries, and the Society of Actuaries, as well as local groups, such as the Georgia GFOA where he spoke about the types and benefits of actuarial audits for pension and OPEB plans. He also spoke at an SOA-sponsored webcast on the impact of COVID-19 on public sector pension plans. Tom has published a whitepaper on service purchase rules for governmental pension plans as well as a paper on the impact of accounting rules affecting governmental employers offering post-employment benefit programs and ways in which those employers could manage those costs.

Bolton was founded in 1981 by Mr. Robert G. Bolton as an independent actuarial and employee benefits consulting firm, and since our founding, actuarial services and benefit plan consulting have been our primary focus. The firm has over 40 years of experience providing consulting services to clients in the public and corporate sectors, nonprofit organizations, as well as for the Federal Government.

Flick, Linda and Tom's expertise combined with our experience with ORSC over the last decade bring unparalleled actuarial capabilities to ORSC.

The team we have assembled here has expertise in all retirement-related areas, including financing, plan design, bond analysis, asset-liability studies, retiree healthcare and legislative testimony. The following are the actuarial audits performed by members of the team:

Retirement System Audits (audited actuarial firm noted)

- Alaska Public Employees' Retirement System and Teachers' Retirement System (Buck)
- California State Teachers' Retirement System (Milliman)
- Colorado Public Employees' Retirement Association (Watson Wyatt)
- Colorado Police and Fire Pension Association (GRS)
- Public School Retirement System of Kansas City (Hays)
- Teachers' Retirement System of Louisiana (Hall)
- Maine PERS (Cheiron)
- Maryland SRPS (GRS)
- North Dakota Public Employees' Retirement System (Segal)
- North Dakota Teachers' Fund For Retirement (GRS)
- Ohio Highway Patrol Retirement System (Foster & Foster)*
- Ohio Police and Fire Pension Fund (Buck)*
- Ohio Public Employees Retirement System (GRS)*
- Ohio School Employees Retirement System (Cavanaugh Macdonald)*
- Ohio State Teachers Retirement System (Cheiron)*

- Oklahoma Police Pension and Retirement System (Mercer)
- Oklahoma Public Employees' Retirement System (Mercer)
- Omaha School Employees' Retirement System (Milliman)
- Seattle City Employees Retirement System (Milliman)
- Tacoma City Employees Retirement System (Milliman)
- Texas PERS (Cheiron)
- Vermont Retirement Systems (Buck)
- Confidential Multi-\$Billion Public Retirement System (Internal)*

* PTA Joint work with KMS

3. References

Below, we provide references that you can contact and learn more about our strengths in providing actuarial services.

University of Maine System

Contact: Tracy Elliott, Executive Director of Finance & Controller
Address: Lewiston Hall 65 Texas Ave, Bangor, ME 04401
Phone: (207) 262-7739
Email: tracye@maine.edu

KMS provides actuarial valuation and consulting services to the University of Maine System for two retirement plans and UMS' retiree medical program. KMS has provided these services since 2011. Linda also provided actuarial valuation and consulting services for UMS' retiree medical program while with a former employer, from 2006 – 2011.

We have provided specialized consulting services to UMS including review and development of cost impact of their newly implemented HRA program and OPEB funding policy, lump sum program for terminated vested participants of their defined benefit plan and administrative services including payment system set up and maintenance for approximately 600 retirees.

Worcester Regional Retirement System

Contact: Kevin Blanchette, Chairperson
Address: 23 Midstate Drive, Auburn, MA 01501
Phone: (508) 832-6314
Email: kpblanchette@worcesterregionalretirement.com

KMS serves as actuaries for the Worcester Regional Retirement System. We have provided cost-of-living studies and presented the valuation results to the 100 member units. Linda has provided services to Worcester Regional since 2010, and previously while with Buck Consultants, from 1992 – 2000.

Fire and Police Pension Association of Colorado

Contact: Adam Franklin, General Council
Address: 7979 East Tufts Avenue, Suite 900, Denver, CO 80237
Phone: (303) 770-3772
Email: afranklin@fppaco.org

Bolton completed a full replication (GFOA Level 1) actuarial audit of several of the Fire and Police Association of Colorado retirement programs. The audits included the Statewide Retirement Plan, the Statewide Death and Disability Plan, and the Colorado Springs New Hire Plan. As part of

the audit Bolton determined whether the actuarial methods, assumptions, and procedures used by the System's consulting actuary (GRS) are reasonable and consistent with all applicable laws, Board policies, generally accepted actuarial principles and practices, are appropriate for the plan structure and funding objectives, and are being applied as stated. Bolton also assessed whether the valuation results were complete and accurate, and the conclusions of the valuation reports accurately portray the actuarial status of the System.

Maryland Department of Legislative Services

Contact: Michael Rubenstein, Policy Analyst
Address: 90 State Circle, Annapolis MD 21401
Phone: (410) 946-5520
Email: Michael.Rubenstein@mlis.state.md.us

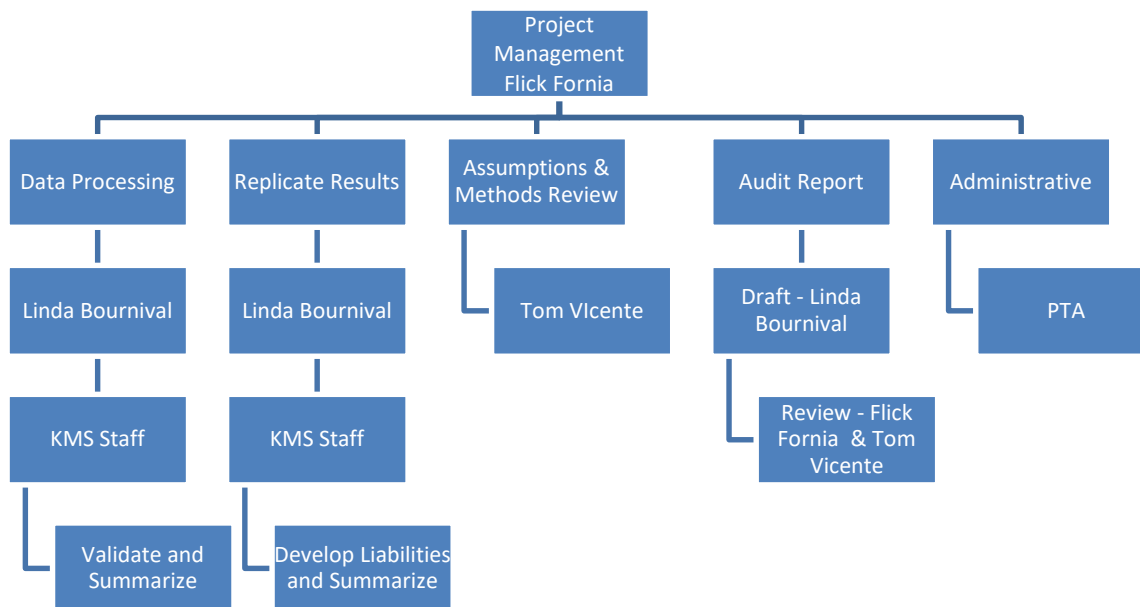
As the actuaries for the Maryland Department of Legislative Services, Bolton provides fiscal analysis for all proposed legislation related to the state's retirement systems. Each year, we begin by matching the most recent actuarial valuation results and reviewing the multi-year cost projections from the actuary for the State Retirement and Pension System, including each component (Teachers, Employees, State Police, Judges, and LEOPS). From these baseline results, we can model the effect of changes in such program aspects as employee contribution rates, benefit levels, employer contributions, salary increases, eligibility, past service credits for military service, and changes in the retirement eligibility age.

4. Staff Qualifications

Pension Trustee Advisors (Flick Forna) is partnering with KMS Actuaries (Linda Bournival) and Bolton Partners (Tom Vicente) to provide actuarial consulting services to ORSC and OPERS. Flick, Linda and Tom are pension and retirement system actuaries with significant experience in providing actuarial consulting services to public sector clients. Flick, Linda and Tom are fully credentialed Fellows of the Society of Actuaries (FSA), the highest level of professional accreditation that an actuary can achieve. They are also members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries necessary to perform the services requested in this RFP and render actuarial opinions with respect to the calculations required.

Flick will serve as the lead actuary and consultant to the ORSC and OPERS. He will be responsible for management of the overall relationship and project. Linda and other KMS team members will perform all the data processing, calculations and modeling using an actuarial valuation system called ProVal, widely used by many national firms, including GRS, OPERS’ actuaries. Tom and other Bolton team members will conduct the assumptions and methods review including review of the 5-year experience study. We estimate the portion of the audit’s time that will be spent by each for completion of the audit to be as follows:

- Flick Forna – 13%
- Linda Bournival – 30%
- Tom Vicente – 23%
- Other Actuarial Staff – 34%



We provide a summary of Flick, Linda, Tom and other members of the team's professional qualifications and experience on the following pages.

William B. (Flick) Forna

Flick, the proposed lead actuary and consultant for the ORSC, has conducted seventeen audits for large defined benefit public retirement systems. We believe that he may have more experience with actuarial audits for statewide systems than anyone.

He is founder and President of Pension Trustee Advisors (PTA). PTA provides consulting services on public pensions with focus on pension advice.

Previous Work History

He was senior vice president at Aon Consulting, leading their public sector pension actuarial consulting practice from 2006 to 2010. Flick has more than 30 years of consulting and actuarial experience, primarily in the areas of retiree pension and healthcare benefits. Prior to Aon, he managed the Denver Retirement Practice of Buck Consultants and has served nationally as a Senior Consultant for Gabriel, Roeder, Smith & Co., both specializing in public pensions.

Work Experience

Flick Forna has expertise in all retirement-related areas, including financing, plan design, bond analysis, asset-liability studies, retiree healthcare and legislative testimony. His career includes serving as corporate actuary for The Boeing Company and as consultant for numerous multinational corporations in Brazil and Argentina during his ten years at Towers Perrin. Previously, he was corporate actuary for Boeing.

He has performed consulting services for 22 statewide retirement systems in Alaska, California, Colorado, Louisiana, Missouri, New Mexico, North Dakota, Oklahoma, Puerto Rico, Utah, Vermont, Wyoming and others. He conducted the first actuarial audits of Oklahoma Police Pension and Retirement System and Oklahoma Public Employees' Retirement System. Other clients have included the US Department of State, Cities of Baltimore, Oakland and Philadelphia, IBM, US WEST and Ford Motor Company.

Articles and Speech Presentations

Flick is well known for his ability to teach complex concepts to lay audiences. He is an author and frequent speaker at organizations such as the Pension Research Council, the National Conference of State Legislators (NCSL), National Association of State Retirement Administrators (NASRA), the National Council on Teacher Retirement (NCTR), the National Association of Public Pension Attorneys (NAPPA), the National Conference on Public Employee Retirement Systems (NCPERS), the Conference of Consulting Actuaries, the Western Pension and Benefits Conference, the International Foundation of Employee Benefit Plans, The Conference Board, the Government Finance Officers Association (GFOA), and the Brazilian Association of Pension Plans (ABRAPP).

Articles and speeches have addressed all aspects of retirement programs including retiree healthcare plans, and the challenges of public sector defined contribution plans. He co-authored "*Still a Better Bang for the Buck – The Economic Efficiencies of Defined Benefit Plans*" with the National Institute of Retirement Security in 2014.

Professional Organizations and Education

He is a Fellow of the Society of Actuaries, Enrolled Actuary, Member of the American Academy of Actuaries, and Fellow of the Conference of Consulting Actuaries. He was elected to serve on the Board of Directors of the 30,000-member Society of Actuaries from 2016 to 2022, where he was also elected by the Board to serve as its Secretary/Treasurer. He served as a founding member of the steering committee of the Conference of Consulting Actuaries Public Pensions Subcommittee and is on the faculty of the Society of Actuaries Fellowship Admissions Course. Flick earned a Bachelor of Arts in Mathematics at Whitman College.

Linda L. Bournival

Linda Bournival formed KMS Actuaries, LLC, after nearly 25 years of actuarial consulting experience with a wide-range of retirement plan and postemployment benefit assignments and issues. A significant portion of her experience includes consulting and actuarial services for pension plans and postemployment benefit programs for governmental entities, including states, cities, towns, school districts and authorities.

Previous Work History

Prior to forming KMS Actuaries, Linda was a Director and Consulting Actuary at Buck Consultants and most recently Executive Vice President at Ricci Consultants. Linda has over 25 years of consulting and actuarial experience and includes services for pension plans and postemployment benefit programs for private and public sector entities. She has worked with clients regarding qualified and non-qualified defined benefit and defined contribution plans.

Work Experience

She has provided a variety of services with respect to retirement plans, including implementation of GASB 67 and GASB 68 for several public retirement systems. She has performed seven actuarial audits of large pension systems.

Since the implementation of Statement Numbers 43 and 45 issued by the Governmental Accounting Standards Board, and their successor statements 74 and 75, Linda has been retained by local entities in New England, including the City of Manchester NH, the Manchester NH School District, Dukes County OPEB Trust, the University of Maine System, the Towns of Littleton and Weston, Massachusetts, Wachusett Regional School Districts and others.

She has presented on “Pension Reform and Plan Design: Around the Country”, “Planning, Preparation and Collaboration for GASB 67/68 Implementation” and “Funding Issues as Full Funding (or 2040!) Approaches” at PERAC’s Emerging Issues Forums. Most recently, she has presented on retiree medical actuarial issues as a panelist in a municipal round table series “Healthcare Cost Management at the Crossroads: What’s Left in My Bag of Tricks?” and at the Conference of Consulting Actuaries Annual Meeting on “OPEB – Anything But GASB” as well as “High Stakes of Decision Making” in 2025.

Professional Organizations and Education

She is a Fellow of the Society of Actuaries, an Enrolled Actuary, a Member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries. Linda graduated magna cum laude from Providence College, earning a Bachelor of Arts in Mathematics.

Linda served as Council Member on the Society of Actuaries Social Insurance and Public Finance Section from 2022 - 2024.

Tom Vicente

Tom is a Senior Consulting Actuary at Bolton Partners and leads the firm's public sector practice. Tom's focus is on providing high value to clients through innovative solutions, strong communication, and high-quality, timely results.

Previous Work History

Prior to joining Bolton, Tom was a Partner at Aon, serving as a lead pension and retiree medical program consultant.

Work Experience

Tom Vicente has over 30 years of experience in actuarial, retiree medical, and pension consulting services, as well as the administration and communication of retirement programs. He also has significant experience with design, benchmarking, and retirement adequacy studies for retirement programs, determining cost factors for union-negotiated programs, as well as with hybrid pension plans such as Cash Balance and Retirement Equity programs.

Areas of Specialization

- Presenting results and making recommendations to Boards, leadership, and trustees on valuation results (funding and accounting), and special studies for pension and OPEB plans
- Performing and supervising pension plan and OPEB plan valuations
- Auditing pension and OPEB valuations performed by other actuaries
- Developing benchmark reports and peer-group evaluations
- Completing plan design evaluations and determinations of the costs and appropriateness of different changes
- Supervising and preparing benefit statements
- Resolving pension plan administrative issues (such as missing data or participants, overdue payments, complex QDROs, etc.)
- Working with outside auditors to effectively complete year-end accounting and disclosure requirements

Professional Organizations and Education

Tom is a Fellow of the Society of Actuaries, an Enrolled Actuary, a Member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries. Tom is an active member in the Retirement Practice Community of the Society of Actuaries, serving as Content Engagement Workgroup Manager and a member of the public pension subgroup, and is the vice chair of the American Academy of Actuaries Public Plans Committee. Tom graduated from Drexel University earning a Bachelor of Science in Mathematics.

He has been a speaker for different groups including the National Conference of Public Employer Retirement Systems (NCPERS), Maryland GFOA, MIIA, the Massachusetts Municipal Association, the Actuary's Club of Philadelphia, and the Georgia GFOA. Tom has published white papers on the purchase of service provisions in pension plans as well as the impact of accounting rules affecting governmental employers offering post-employment benefit programs and ways in which those employers could manage those costs.

Amanda J. Makarevich

Amanda Makarevich joined KMS in 2017. She is a Consulting Actuary with over ten years of experience working with governmental entities and private-sector clients providing a wide range of actuarial services. Since joining KMS, her focus has been services for pension plans and postemployment benefit programs for governmental entities.

Work Experience

Her background through KMS and prior employers includes preparation of valuations for funding purposes, GASB and FASB accounting disclosures and financial reporting, and funding projections and models for both retirement and OPEB plans. She has also worked on actuarial audits of several large state pension systems.

Additionally, Amanda has been heavily involved with the transition work needed for onboarding new clients over the years. Her responsibilities have included programming assumptions and plan provisions for valuations, reconciling results with those provided by the prior actuary, and developing templates for reports, benefit calculations, and statements.

Professional Organizations and Education

Amanda graduated with distinction from the University of North Carolina at Chapel Hill in 2012, earning a Bachelor of Arts in Mathematics with a second major in Music. She is a Fellow of the Society of Actuaries and Conference of Consulting Actuaries and a Member of the American Academy of Actuaries.

Michael P. Collins

Michael Collins joined KMS full time in May of 2018 and previously worked as an intern during the summers since 2014.

Work Experience

He provides actuarial support to Linda and Amanda, including data analysis and editing, coding valuations in Proval for funding and GASB, setup of actuarial reports and preparation of benefit calculations and employee benefit statements.

Education

In May 2018, Michael graduated from the College of William & Mary with a Bachelor of Science in Computational & Applied Mathematics and Statistics and a minor in Music. Michael has successfully passed seven actuarial exams and most recently the Associate Professionalism Course and is working towards his Associateship in the Society of Actuaries.

Michael A. Bubulo

Michael Bubulo joined KMS in February of 2020.

Work Experience

He provides actuarial support to Linda and Amanda, including data analysis and editing, excel modeling, actuarial report setup and preparation of benefit calculations and employee benefit statements.

Education

Michael graduated from Sacred Heart University in May, 2019, with a Bachelor of Science in Mathematics and Finance and a minor in Actuarial Science. Michael is an Associate of the Society of Actuaries and is working towards his Fellowship in the Society of Actuaries.

Kelly M. Collins

Kelly Collins joined KMS in June of 2021.

Work Experience

She provides actuarial and administrative support to Linda and Amanda and heads KMS' Human Resources, Marketing and Finance departments.

Education

Kelly graduated from Hamilton College in May of 2021.

5. Methodology, Work Product and Timeline

Based on our understanding of the requested services in the ORSC's RFP, the services requested will be for the performance of an actuarial audit for the primary purpose of independent verification and analysis of the assumptions, procedures, and methods used by the consulting actuary GRS of OPERS for:

- OPERS annual pension actuarial valuation as of December 31, 2024 prepared by GRS;
- The five-year experience review for the period January 1, 2016 to December 31, 2020 prepared by GRS; and
- OPERS annual retiree health care actuarial valuation as of December 31, 2024 prepared by GRS, including GASB Statement 74 disclosures.

In our review, we will make a determination as to whether the actuarial methods, considerations and analyses used by GRS in preparing the December 31, 2024 valuations are technically sound and conform to the appropriate Actuarial Standards of Practice as promulgated by the Actuarial Standards Board. Finally, we will prepare a written report summarizing our conclusions and recommendations, including appropriate documentation, and attend two meetings to present to the OPERS Board of Trustees and the ORSC Board.

Our proposed methodology for completion of the scope of review and other consulting services, along with the desired work products and estimated timeline¹ for completion of the reviews, follows:

1. **Hold initial meeting** with ORSC and OPERS to discuss project specifics, deliverables, timeline, etc. (Week 1)

This meeting will be a critical kickoff and will define the work to be completed, the staff support and consulting actuary requirements, deliverables and timeline.

2. **Collect data**, actuarial reports, actuarial calculations etc. used in the December 31, 2024 actuarial valuations of OPERS pension and retiree health care benefits as well as five-year experience review ending December 31, 2020 (Weeks 2-3)

The following information would be required in order to complete the audit:

To be provided by OPERS Staff:

- December 31, 2024 Retirement System actuarial valuation report (received)
- December 31, 2024 Health actuarial valuation report
- Member data submitted to GRS by OPERS
- Financial data submitted to GRS by OPERS
- Current plan provisions as contained in Ohio Revised Code Chapter 145
- All communications and reports pertaining to actuarial calculations

¹ Week 1 of the timeline is the week following the execution of the contract.

To be provided by GRS:

- Member data used by GRS
- Complete tables of pre-retirement decrements and salary scales
- Present value annuity factors for sample ages
- Individual, detailed actuarial valuation results from a sampling of member lives (pensioners, active members and inactive members)
- Health claims cost calculations for retirees, disabled retirees, spouses and children

We anticipate approximately five hours of OPERS' staff time to provide the materials above and approximately ten hours of GRS's time to provide the member data and sample life calculations. Additional hours may be required from GRS if we are unable to match GRS's sample life calculations immediately and need to confer further with them. We will work hard to minimize the time commitment by GRS and OPERS.

3. Review System information. We will thoroughly review all available information gathered (Weeks 3-5)

4. Review the valuation calculation results (Weeks 3-5)

The valuation results are only as good as the methods and assumptions upon which they are developed. Our review would test the appropriateness of these building blocks.

Methodology

- We will review the methodology and process used by GRS to check for adherence to actuarial standards and comment on the appropriateness of the method and procedures.
- We will quantify any issues in terms of actuarial impact.

5. Hold meeting with OPERS staff to review data layouts, plan provisions, etc. (Week 5)

After we thoroughly review the materials provided, we will meet by phone with OPERS staff to review the valuation data, plan provisions and other valuation methodology nuances. This is critical and will help us gain a better understanding of the valuation data elements, determination of plan benefits, etc.

6. Verify the accuracy of the benefits valued and the data used by GRS (Weeks 5-8)

We will verify that all appropriate benefits provided under OPERS have been valued accurately. We will also verify that the data provided by OPERS is consistent with the data used by GRS. Linda and the KMS team will perform all the data processing, calculations and modeling using an actuarial valuation system used by many national firms. KMS has a lease arrangement with Winklevoss Technologies (WinTech) for their software called ProVal, used for pension and OPEB valuations. ProVal can perform the following tasks:

- Funding valuations. The system can produce valuation results under any assumption set
- GASB 67, 68, 74 and 75 accounting valuations
- Client-ready valuation report

- Deterministic and stochastic modeling of assets and liabilities for assessing future costs
- Detailed gain/loss analysis: This module produces a detailed gain/loss analysis by source
- Experience analysis: This produces experience results by decrement
- Multi-cycle valuations
- Data Base development and maintenance
- Data modeling

The WinTech software, which is supported nationally and widely used by actuarial firms, provides us with extensive valuation flexibility including the support to value plan and assumption changes and the ease in conducting plan design studies. We both also use the Microsoft Office suite of software applications including Word, Access, PowerPoint, and Excel. The consultants' involvement in every aspect of the OPERS audit allows for a more streamlined consulting approach and in the end, better service to our clients.

Methodology

- Analyze member data submitted by OPERS to GRS
- Analyze member data used by GRS and compare aggregated data with that submitted by OPERS
- Program the benefits in ProVal and develop actuarial results
- Compare actuarial results to actuarial valuations
- Review for conformity with Actuarial Standard of Practice No. 23, Data Quality

7. Evaluate the actuarial cost method and actuarial asset valuation method used by the System (Weeks 3-8)

OPERS currently utilizes the entry age normal cost funding method. OPERS uses an actuarial asset valuation method which we have thoroughly modeled in our prior ORSC work.

Methodology

- We will first understand OPERS' funding objectives and review any statutory requirements relative to the selection of the funding and/or asset method.
- We will review the funding and asset methods and determine if the methods are technically sound and conform to the Actuarial Standard of Practice as well as the Conference of Consulting Actuaries paper on Actuarial Funding Policies and Practices for Public Pension Plans (CCA White Paper).
- If we find that the funding and/or asset methods are inappropriate, we will recast the costs and such using better methods. We will present in our report a detailed rationale for the recommendations.
- Review for conformity with Actuarial Standard of Practice No. 4, Measuring Pension Obligations and Actuarial Standard of Practice No. 44, Selection and Use of Asset Valuation Methods for Pension Valuations.

8. Verify the reasonableness of the unfunded actuarial accrued liability calculation and the amortization period utilized (Weeks 3-8)

Methodology

- Review the methodology to calculate the unfunded actuarial accrued liability and the amortization period used under the cost method for reasonableness.
- We will show actual projections of contribution patterns under various amortization approaches.
- Make recommendations, if necessary, for changes to the methodology.
- Review for conformity with Actuarial Standard of Practice No. 4, Measuring Pension Obligations as well as the Conference of Consulting Actuaries paper on Actuarial Funding Policies and Practices for Public Pension Plans (CCA White Paper).

9. Perform review of Demographic and Economic Assumptions (Weeks 3-8)

We will review the demographic and economic assumptions used by OPERS in the December 31, 2024 actuarial valuations. Demographic assumptions to be analyzed include the rates of mortality, retirement and separation rates. Economic assumptions to be analyzed include the investment return rate, inflation rate, individual salary increases and payroll growth, health care cost trend rates and morbidity factors.

Methodology

- Review past experience based on information contained in the most recent experience study, comparing that experience with peers and standard benchmarks.
- Review demographic assumptions for consistency with plan provisions. Just as with the economic assumptions, demographic assumptions have a significant impact on funding.
- Compare current assumptions with prevailing actuarial practice utilizing the Public Fund Survey.
- Prepare forward looking assumptions using empirical methods. These methods look at the asset allocation used of the particular client and anticipated real and nominal returns of each asset class. The methodology is consistent from client to client, but the outcomes may be quite different.
- If we find that the economic or demographic assumptions are inappropriate, we will recast the costs and such using better assumptions.
- Review for conformity with Actuarial Standard of Practice No. 27, Selection of Assumptions for Measuring Pension Obligations.

10. Perform review of December 31, 2024 valuation reports (Pension and Health) (Weeks 8-10)

- Review the December 31, 2024 valuation reports prepared by GRS for conformity with Actuarial Standard of Practice No. 41, Actuarial Communications.
- Present any recommendations for improvement to the report.

11. Deliver preliminary draft report to ORSC and OPERS (Weeks 11-16)

We will prepare a written report that is in language clearly understood by lay readers. Our audit report will be in a format similar to that included in Appendix A. Appendix B includes a sample actuarial audit presentation.

- During the course of the reviews, we will provide progress reports to ORSC and OPERS on a monthly basis.
- We will develop a written report containing a description of the work performed, and executive summary, findings, and detailed recommendations and conclusions where appropriate. The key

findings and recommendations will be organized in a manner that clearly identifies to whom they are primarily directed (e.g., the Legislature, OPERS Board, and ORSC).

- Our report will be in language clearly understood by lay readers.
- Our report will contain a glossary of terms essential to an understanding of retirement system funding and actuarial valuations.

12. Present preliminary report to OPERS Executive Director (after delivery of preliminary draft report)

- We will present the preliminary draft report to the OPERS Executive Director prior to the release of the final report.
- We will hold an exit conference with the OPERS staff and consulting actuary to discuss our findings and recommendations contained in our preliminary draft report.

13. Present final report (after meetings to present preliminary draft report)

- Make any required modifications to report and issue final report.
- We will present the final report to the ORSC Board and the OPERS Board of Trustees.
- We will provide a digital and 25 bound copies of the final report to OPERS and a digital and 25 bound copies of the final report to the ORSC not later than one week after completion of the final report.

6. Glossary

Below, we provide a glossary of all abbreviations, acronyms and technical terms used to describe the services contained in our proposal.

Actuarial Accrued Liability – The portion of the Actuarial Present Value of future benefits which is allocated to all periods prior to a valuation year and therefore is not provided by future Normal Costs.

Actuarial Assumptions – Assumptions as to the occurrence of future events affecting pension and OPEB costs, such as mortality, withdrawal, disablement and retirement; changes in compensation and Government provided pension benefits; rates of investment earnings and asset appreciation or depreciation; procedures used to determine the Actuarial Value of Assets; characteristics of future entrants for Open Group Actuarial Cost Methods; and other relevant items.

Actuarial Cost Method – A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an actuarially equivalent allocation of such value to time periods, usually in the form of a Normal Cost and an Actuarial Accrued Liability.

Actuarial Present Value of Future Benefits – The present value of the cost to finance all benefits payable in the future, discounted to reflect the probability of payment and the time value of money.

Actuarial Valuation – the determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets and related Actuarial Present Values for a retirement plan or an OPEB plan.

Actuarial Value of Assets – The value of plan assets used in an actuarial valuation. The Actuarial Value of Assets may reflect smoothing techniques intended to dampen year-to-year fluctuations in the market value of assets.

Bolton – Bolton Partners

Chapter 145 of the Ohio Revised Code – The Ohio statutes governing OPERS.

Funded Ratio – The Actuarial Value of Assets expressed as a percentage of the Actuarial Accrued Liability.

FSA – Fellow of the Society of Actuaries, the highest educational standard for actuaries.

GASB – Governmental Accounting Standards Board.

GASB 74 – Financial Reporting for Postemployment Benefit Plans Other Than Pension Plans

GASB 75 – Accounting and Financial Reporting for Postemployment Benefits Other Than Pensions

GASB 67 – Financial Reporting for Pension Plans

GASB 68 – Accounting and Financial Reporting for Pensions.

GRS – **OPERS'** actuaries, Gabriel, Roeder, Smith & Company

HPRS – The Ohio State Highway Patrol Retirement System.

KMS – KMS Actuaries, LLC.

OPEB – Other Postemployment Benefits including medical, dental, vision, hearing and life insurance benefits.

OP&F – Ohio Police and Fire Pension Fund.

OPERS – Public Employees' Retirement System of Ohio.

ORSC – Ohio Retirement Study Council.

ProVal – Winkelvoss Technologies actuarial software used for funding and accounting valuations of retirement benefits and OPEB.

PTA – Pension Trustee Advisors, Inc.

STRS – The Ohio State Teachers Retirement System.

Unfunded Actuarial Accrued Liability – The excess of Actuarial Accrued Liability over the Actuarial Value of Assets

7. Cost Information

Fees are determined based on our estimate of the time required to perform the audit. We propose that invoices, which will include the hourly rate and number of hours worked on the audit by specific personnel, will be submitted on a monthly or quarterly basis.

Our cost proposal is presented below and includes hourly rates for the professional staff assigned to the actuarial audit and an estimate of the number of hours anticipated. In support of our commitment to the ORSC and OPERS and to demonstrate our sincere desire to continue working with you, we provide a discount on our fees and a “not to exceed fee” as shown below:

ORSC / OPERS Audit Fee Development

Task	Team Member Name	Hours	Average Hourly Billing Rate	Estimated Cost
<ul style="list-style-type: none"> Initial Kick-off meeting Data collection Review Information 	William Fornia	5	\$555	\$2,775
	Linda Bournival	10	400	4,000
	Tom Vicente	5	550	2,750
	Other Actuarial Staff	5	300	1,500
	Total	25		\$11,025
<ul style="list-style-type: none"> Data Validity 	Linda Bournival	2	\$400	\$800
	Other Actuarial Staff	8	300	2,400
	Total	10		\$3,200
<ul style="list-style-type: none"> Review of Methods and Procedures 	William Fornia	1	\$555	\$555
	Linda Bournival	2	400	800
	Tom Vicente	8	550	4,400
	Total	11		\$5,755
<ul style="list-style-type: none"> Review of Assumptions 	William Fornia	4	\$555	\$2,220
	Linda Bournival	6	400	2,400
	Tom Vicente	16	550	8,800
	Total	26		\$13,420
<ul style="list-style-type: none"> Perform Parallel Valuations 	Linda Bournival	25	\$400	\$10,000
	Tom Vicente	5	550	2,750
	Other Actuarial Staff	75	300	22,500
	Total	105		\$35,250

ORSC / OPERS Audit Fee Development (continued)

Task	Team Member Name	Hours	Average Hourly Billing Rate	Estimated Cost
• Review Health Care Premiums	Linda Bournival	6	\$400	\$2,400
	Tom Vicente	3	550	1,650
	Total	9		\$4,050
• Prepare Written Report	William Fornia	5	\$555	\$2,775
	Linda Bournival	16	400	6,400
	Tom Vicente	10	550	5,500
	Other Actuarial Staff	12	300	3,600
	Total	43		\$18,275
• Briefings, Meetings and Exit Conference	William Fornia	24	\$555	\$13,320
	Linda Bournival	24	400	9,600
	Tom Vicente	24	550	13,200
	Other Actuarial Staff	5	300	1,500
	Total	77		\$37,620
Total Estimated Cost		306	\$420	\$128,595
Travel Costs				\$12,000
Printing and Other Miscellaneous Costs				\$1,500
Discount for ORSC				(\$13,095)
Total Estimated Fee (not to exceed)				\$129,000

Appendix A – Sample Actuarial Audit Report

**REPORT
TO ORSC**



ACTUARIAL AUDIT
of the
SCHOOL EMPLOYEES RETIREMENT SYSTEM OF OHIO

Actuarial Valuations as of June 30, 2024

and

Experience Study
for the 5-Year Period Ending June 30, 2020

Prepared by:

William B. Forna, FSA, MAAA
Pension Trustee Advisors

Linda L. Bournival, FSA, MAAA
KMS Actuaries

Thomas Vicente, FSA, MAAA
Bolton Partners

June 2025

June 30, 2025

Ohio Retirement Study Council
30 E. Broad Street, 2nd Floor
Columbus, OH 43215

Dear ORSC Members:

We have completed our actuarial audit of the School Employees Retirement System of Ohio (SERS) pursuant to O.R.C. §171.04(E). As shown in the attached findings, we have matched actuarial calculations quite closely and have several related comments. None of the comments reflects a critical concern. Our audit finds that actuarial calculations were reasonable, consistent and accurate.

None of the actuaries signing this report or anyone closely associated with them has a relationship with the Ohio Retirement Study Council (ORSC) or SERS, other than as consulting actuaries for this assignment, that would impair our independence.


The undersigned are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to provide this statement of actuarial opinion.

We are available to answer any questions you may have regarding our findings and recommendations of the actuarial audit.

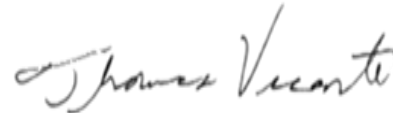
Sincerely,



William B. Fornia, FSA, MAAA
President
Pension Trustee Advisors
303.263.2765



Linda L. Bournival, FSA, MAAA
Consulting Actuary
KMS Actuaries
603.792.9494



Thomas Vicente, FSA, MAAA
Senior Consulting Actuary
Bolton Partners
443.573.3918

cc: School Employees Retirement System of Ohio

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Section 1 – General Findings

The Ohio Revised Code §171.04(E) requires that the Ohio Retirement Study Council (ORSC) contract for an independent audit of the state retirement systems' actuaries not less than once every ten years. ORSC specified that the firm conducting the audit is to provide:

- An overall opinion as to the validity, completeness, and appropriateness of the demographic and financial information used by the consulting actuary to meet the School Employees Retirement System of Ohio (SERS') funding objectives;
- An overall opinion as to the reasonableness of the consulting actuary's conclusions and the conformance of the consulting actuary's work with generally accepted actuarial standards and practices;
- A detailed description of each audit exception and the estimated effects of each exception on SERS; and
- Detailed recommendations for improvement.

Our opinion is that these standards were met, as will be discussed in the following pages.

SERS provides retirement benefits and health care benefits to employees in K-12 schools, community colleges and the University of Akron. Actuarial values were reported through two actuarial reports:

- SERS Report on the Annual Basic Benefits Valuation prepared as of June 30, 2024, dated November 5, 2024
- SERS Report on the Retiree Health Care Valuation prepared as of June 30, 2024, dated November 7, 2024

Pension Trustee Advisors (PTA), KMS Actuaries (KMS) and Bolton Partners (Bolton), collectively PTA/KMS/Bolton, replicated these June 30, 2024 actuarial valuations conducted by Cavanaugh MacDonald, LLC (CavMac), SERS' actuary, and the results match within the acceptable thresholds for this type of exercise. This match confirms that CavMac has captured the complexity of SERS accurately and that SERS should have confidence in the actuarial calculations provided to them. In addition, we reviewed CavMac's 2020 Experience Study For the Five-Year Period Ending June 30, 2020 (the 2020 Experience Study) and its recommendations. We found that the assumptions proposed by CavMac and adopted by the Board were reasonable.

The primary purpose of an actuarial audit is to confirm that there are no significant errors in the actuarial calculations. Based on our replication, we report that **we have found no significant discrepancies and conclude that there are no significant errors**. This is confirmed on the tables and discussion below.

The following tables summarize the actuarial liabilities and normal costs produced by CavMac and PTA/KMS/Bolton actuarial valuations.

Section 1 – General Findings

Table 1.1
Actuarial Liabilities and Normal Cost as of June 30, 2024 (\$ in thousands) – Pension Benefits

	CavMac	PTA/KMS/Bolton	% Diff.
Present Value of Benefits	28,043,269	28,103,922	0.22%
Actuarial Accrued Liability	23,820,119	23,593,668	-0.95%
Normal Cost (% of payroll)	10.75%	11.33%	5.38%

Table 1.2
Actuarial Liabilities and Normal Cost as of June 30, 2024 (\$ in thousands) – Health Care Benefits

	CavMac	PTA/KMS/Bolton	% Diff.
Present Value of Benefits	\$1,895,990	\$1,864,156	-1.68%
Actuarial Accrued Liability	\$1,325,702	\$1,296,089	-2.23%
Normal Cost	\$59,576	\$57,183	-4.02%

The grand total actuarial liability calculated by PTA/KMS/Bolton was within 1% of the same calculated by CavMac. Our grand total normal cost was within 4.5% of that calculated by CavMac. Our grand total present value of benefits deviated by only \$29 million, or 0.1%, from that calculated by CavMac. These are within actuarial norms and strong evidence that the CavMac actuarial valuations are reliable.

Section 1 – General Findings

The differences in present value of benefits and actuarial accrued liability are illustrated by the following charts:

Figure 1.1
Comparison of Present Value of Benefits and Actuarial Accrued Liability - Pension Benefits

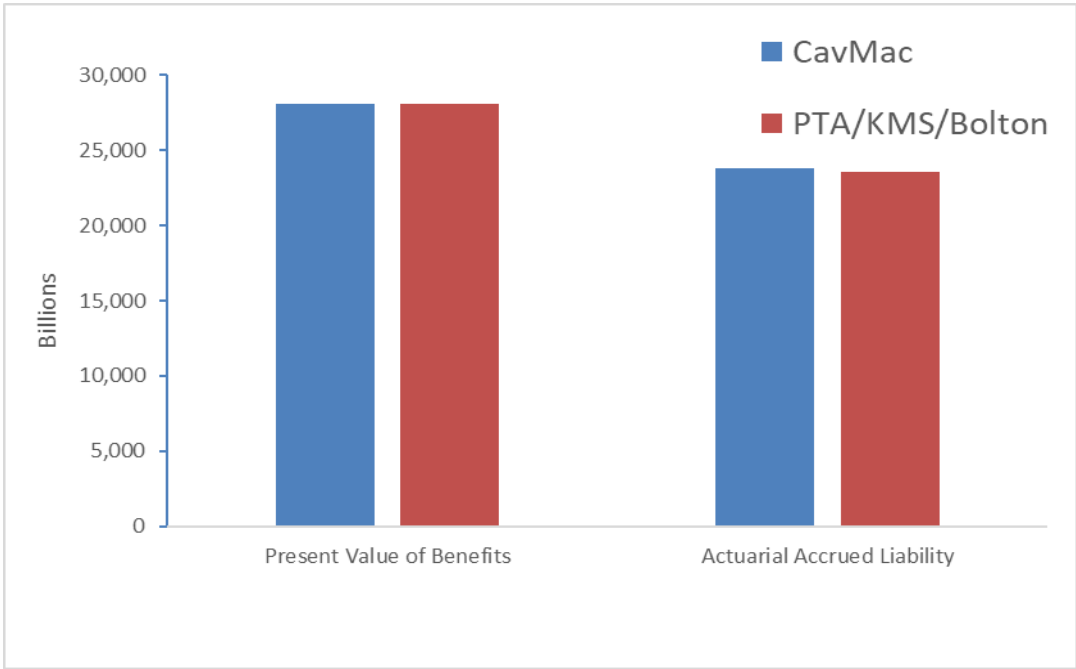
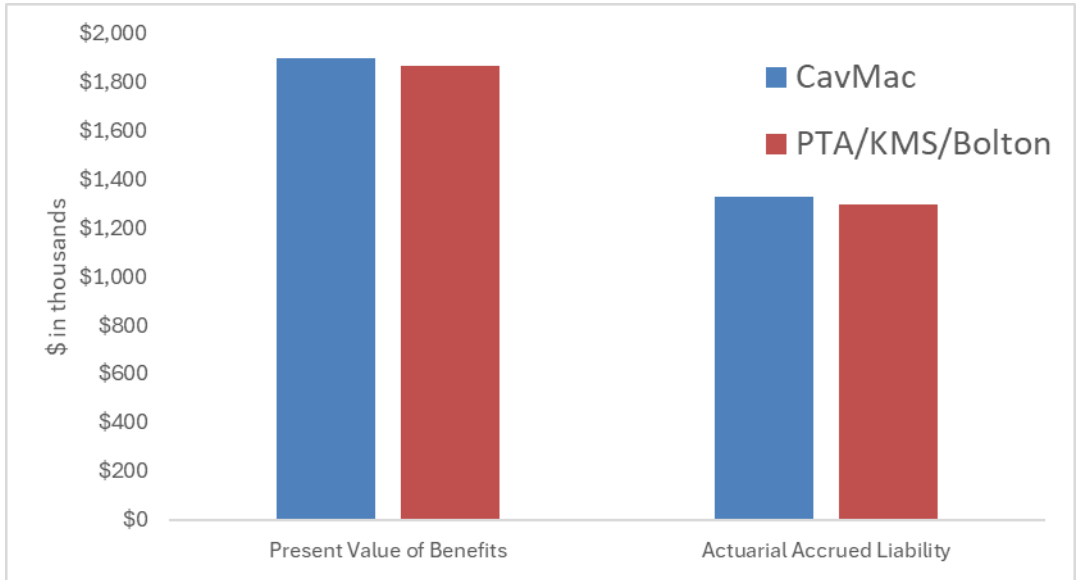


Figure 1.2
Comparison of Present Value of Benefits and Actuarial Accrued Liability - Health Care Benefits



Section 1 – General Findings

Although the match was reasonably close, there is still room for improvement. We make the following recommendations for enhancement in the accuracy of calculations and completeness in the reports:

- Correct minor calculations as discussed in the following pages
- Expand disclosure of methodology and assumptions more rigorously in the next actuarial experience study and valuation reports
- Consider the below updates to the actuarial methods and assumptions:
 - Implement an asset smoothing method for the Health Fund
 - Revise the ADC approach used for comparison with the fixed rate contribution
 - Update the assumed retirement patterns for non-grandfathered employees
 - Update the retirement rates for deferred vested members
 - The method of developing the health care claims cost assumptions is not clearly described in the reports.
 - Consider an assumption for the Health Premium Discount Program
 - Consider an assumption for future child dependents in the Health Benefits valuation

In the process of this actuarial audit, SERS notified us that certain benefits in pay status had been calculated using incorrect actuarial factors and have been subsequently corrected in the SERS administration system. A measurement of the actuarial valuation impact of this correction is beyond the scope of this audit, but our understanding is that it would be insignificant.

Section 2 – Audit of Actuarial Methods, Factors and Assumptions

The first step in the actuarial audit process is to review the actuarial methods, actuarial factors, and actuarial assumptions used in the actuarial valuations.

As part of the audit we referenced the Actuarial Standards of Practice (ASOPs) promulgated by the Actuarial Standards Board. There are several Standards that are particularly appropriate for pension plans and health programs in setting assumptions and methods for funding purposes:

- 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 (note this standard was restated effective January 1, 2025)
- ASOP 35: Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations (note this standard was repealed and combined with ASOP 27 effective January 1, 2025)
- 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

In addition, we reference the *Actuarial Funding Policies and Practices for Public Pension Plans* published by the Conference of Consulting Actuaries (“CCA White Paper Second Edition”). We also reviewed the 2021 actuarial audit that had been commissioned by SERS. This was completed by Milliman in December 2022 (Milliman audit).

ACTUARIAL METHODS

CavMac uses several actuarial methods in determining costs and liabilities for SERS.

- The actuarial funding method is the Individual Entry Age actuarial cost method.
- The actuarial asset valuation method for pension is a four-year smoothed market value.
- The actuarial asset valuation method for health is market value.
- The plan is funded with a fixed rate contribution set by the Board and is within their policy.
- An ASOP 4 defined Actuarially Determined Contribution (ADC) is determined for comparison with the fixed rate contribution. The ADC uses an amortization of the unfunded actuarial accrued liability and is based on a level payroll, closed period method of 20 years as of July 1, 2024.

Actuarial Funding Method

The Individual Entry Age Normal actuarial cost method is used for both pension and health care actuarial valuations. This method is designed to maintain constant plan costs throughout each employee's career as a portion of pay. We believe this is a reasonable and appropriate method. It is the most common method used by large public pension systems such as SERS. CavMac is applying the method reasonably, consistently, and accurately. This approach is considered a "Model Practice" for a Level Cost Allocation Method in the CCA White Paper Second Edition.

Actuarial Asset Valuation Method

CavMac employs a four-year smoothed market value actuarial asset valuation method for the retirement plan actuarial valuation. Unlike actuarial funding methods, actuarial asset valuation methods are not precisely defined. Some actuaries use what could be categorized as a four-year or five-year smoothed market value actuarial asset valuation method as does CavMac, but might use different methods. We have reviewed the precise provisions of the method that CavMac employs and find them to be reasonable, consistently applied, and accurate.

The method is a conventional and appropriate application of a four-year smoothed method. The method spreads any investment gains or losses (relative to the actuarial assumption) over four years and applies a 20% maximum disparity from true market value. This is a reasonable and appropriate method.

This approach is considered a "Model Practice" for a Level Cost Allocation Method in the CCA White Paper Second Edition.

The Actuarial Standards Board has published ASOP 44 (effective March 15, 2008) to define the Selection and Use of Asset Valuation Methods for Pension Valuations. The selected approach fits within the provisions of this ASOP.

CavMac uses the Market Value of Assets (without smoothing) for the Health Fund valuation. This is also a reasonable method with regard to ASOP 44. We do note however, that given the current funding level of the Health Fund (62%) on a market value basis, the implementation of a smoothed asset approach might be advisable to reduce future cost volatility.

Determination of ASOP 4 Actuarially Determined Contribution (ADC)

The valuation determines an Actuarially Determined Contribution (ADC) meeting the requirements of ASOP 4. The ADC equals the employer paid Normal Cost plus the amortization of the unfunded liability (single layer fixed percentage of pay described below). This amount (9.56%) is less than the fixed rate employer contribution (14.00%) scheduled to be paid into the plan. As a result, the fixed rate amount is sufficient to fund the plan in a reasonable manner.

Amortization Method for Determining the ASOP 4 ADC Funding Amounts

In addition to the Entry Age Normal actuarial cost method, CavMac and SERS use a conventional method for amortizing components of unfunded liability. The method includes a closed period, which decreased from 28 years as of June 30, 2016, to 20 years as of June 30, 2024 with all changes in unfunded liabilities rolled into the same amortization base.

The other amortization feature being used is to amortize the costs as a constant percentage of payroll. With payroll growing at an assumed rate of 1.75% per year, this maintains steady costs as a percentage of payroll. We believe the level percent of payroll method is a reasonable approach for funding. With 20 years remaining, the amortization amount is large enough to cover the interest on the unfunded liability (7.00%) plus a part of the principal amount. The 1.75% payroll growth rate is reasonable in the aggregate based on a stable population and was analyzed in the 2020 Experience Study.

The current amortization method would be considered a “Non-recommended” approach for a Level Cost Allocation Method in the CCA White Paper Second Edition. The reasons for assigning this category are that:

1. The single closed amortization period approach is not sustainable. At a certain point, the amortization period will become so short that it will cause unmanageable volatility in the contribution determination. That typically leads to a restatement of the entire amortization period, effectively making it an open rolling amortization period.
2. The policy makes the approach less transparent and does not allow the Board to identify the sources of change in the UAAL (experience versus assumption changes versus plan changes, for example).

Those concerns aside, in this year for this valuation, we find the amortization method reasonable, consistent, and accurate but we do recommend the method be reviewed and a more sustainable approach be adopted for the future.

ACTUARIAL ASSUMPTIONS

We have reviewed the actuarial assumptions used by the actuary and find them to be reasonable, consistent, and accurate. CavMac conducted the 2020 Experience Study. We encourage CavMac and the SERS Board to consider our comments in the process of adopting proposed assumption changes.

The actuary uses a large number of actuarial assumptions, including:

- Demographic Assumptions
 - Post-Retirement Mortality
 - Disabled Post-Retirement Mortality
 - Pre-Retirement Mortality
 - Withdrawal from Service Before Retirement
 - Retirement
 - Disability Retirement
 - Other Demographic Assumptions
- Economic Assumptions
 - Investment Return Rate
 - Inflation
 - Wage Inflation
 - Individual Salary Increases
- Post-Employment Healthcare Assumptions
 - Gross Claim Rate Derivation
 - Health Care Cost Trend Rate
 - Morbidity
 - Retiree – Paid Premiums
 - Health Plan Participation Rates and Elections

Detailed comments on each assumption are included below.

DEMOGRAPHIC ASSUMPTIONS

Demographic Experience Since the 2020 Experience Study

Experience in the past five years, since the 2020 Experience Study, indicates that the demographic actuarial assumptions have generated cumulative actuarial losses of 0.5% over five years. This is an indication that the demographic assumptions in the aggregate have been a reasonable measure of anticipated experience.

**Table 2.1
Demographic Actuarial Gains/(Losses) By Component (\$millions)**

Source	FY 20	FY 21	FY 22	FY 23	FY 24	Total
Age & Service Retirements	(94.0)	(96.2)	(65.8)	(65.1)	(53.1)	(374.2)
Disability Retirements	(3.1)	(5.0)	(6.4)	(3.2)	(1.2)	(18.9)
Pre-Retirement Deaths	(5.4)	(4.7)	(7.0)	(5.4)	(7.4)	(29.9)
Withdrawal from Employment	(104.2)	(107.5)	(43.5)	(40.1)	(46.2)	(341.5)
Pay Increases	136.2	136.7	(212.3)	(139.7)	(105.3)	(184.4)
New Members	(22.2)	(16.6)	(52.6)	(66.3)	(63.7)	(221.4)
Death after retirement	28.9	59.8	82.7	54.5	43.0	268.9
Other	62.3	189.3	(25.2)	87.7	80.1	394.2
Total Gain/(Loss)	(1.5)	155.8	(330.1)	(177.6)	(153.8)	(507.2)
Actuarial Liability (\$millions)	21,034	21,530	22,371	23,084	23,820	111,839
Gain/(Loss) as % of FYE Liability	0.0%	0.7%	-1.5%	-0.8%	-0.6%	-0.5%
	Loss	Gain	Loss	Loss	Loss	Loss

Rates of Post-Retirement Mortality

CavMac is using rates from the PUB 2010 family of mortality tables. As detailed in their 2020 Experience Study report, the benefit-weighted tables for below median compensated general public sector employees separated by gender formed a good fit to the actual five-year experience. The standard tables were adjusted by the use of an age set-forward and percentage adjustment to fit the experience for the groups. In addition, the MP-2020 mortality improvement projection scale is applied on a generational basis.

Many trends have contributed to lengthening life expectancies, including:

- Continued eradication of diseases
- Advances in medicine
- Advances in nutrition
- Improved access to medical care

But other trends may suggest that life expectancies may not continue to improve, including:

- Emergence of new diseases including COVID-19 and potential future variants
- Obesity
- Many factors which improved mortality are one-time, and cannot be repeated, for example, smoking cessation trends (one can only quit smoking once)
- More sedentary lifestyles
- Substance abuse
- Climate change

As a result of the uncertainty of these contrary trends, we encourage CavMac to continue to study the post-2020 period experience and the appropriate application of projection scales. They may choose to incorporate different short-term and long-term mortality improvement scales. The Society of Actuaries has also developed more recent projection scales such as MP-2021.

The table above illustrates that over the five-year period, the retiree mortality assumptions have generated actuarial gains of \$269 million, while the current retiree actuarial liability is \$14 billion. This is about 1.9% of the retiree liability. Based on the relatively small size of the gain, the assumed rates provide a good fit to the actual experience over the last five years.

The healthcare valuation uses amount-weighted mortality tables as opposed to the more generally accepted headcount-weighted tables for this type of valuation. We compared the liabilities when using headcount-weighted mortality, and the resulting liabilities only differed from those developed using amount-weighted mortality by around 1%. The difference is immaterial.

Despite the above finding, it is recommended that for the healthcare valuation, the headcount-weighted version of the mortality table be used. This avoids assessing different longevity rates due to the enrollment in more or less expensive medical plans.

Rates of Disabled Post-Retirement Mortality

CavMac is using rates from the PUB 2010 family of mortality tables. In this case they are using the tables applicable to disabled retirees with an age and percentage adjustment. These rates were developed as part of the 2020 Experience Study. In addition, the MP–2020 mortality improvement projection scale is applied on a generational basis. We find this approach reasonable.

Rates of Pre-Retirement Mortality

The pre-retirement mortality assumption also appears reasonable. Very few active members die, so the use of a standard mortality table is generally appropriate.

Withdrawal from Service before Retirement

We concur that the withdrawal tables developed by CavMac are reasonable, consistent, and accurate. CavMac uses a table based on service. We find that this is a sound methodology because research has shown that individuals do have higher likelihood of termination during their first few years of employment than later in their careers. Over the last five years, the turnover assumption has consistently generated actuarial losses indicating the assumption might be too aggressive. However, as a percentage, the loss has been less than one-half of a percent of the liability, so the difference is minor overall.

Retirement

We concur that the retirement tables used by CavMac are reasonable, consistent, and accurate. Varying retirement rates are used for grandfathered (employees with over 25 years of service on August 1, 2017) and non-grandfathered groups (employees with less than 25 years of service on August 1, 2017). For each group the assumption is age-based with separate assumptions for:

- Early retirement with less than 25 years of service
- Early retirement with more than 25 years of service
- First year of eligibility for Normal Retirement
- Normal retirement subsequent to first eligibility

Note that at the time of the 2020 Experience Study there was very little data on the retirement patterns of the non-grandfathered group. This data is likely more robust now and could provide a better determinant for the expected future retirement decrements.

The assumption has produced a consistent actuarial loss over the last five years possibly indicating that it is an aggressive assumption. However, as a percentage of liability the loss has been less than one half of a percent of the liability, so the difference is minor overall. Nevertheless, we recommend that CavMac pay particular attention to this assumption in the next experience study.

Other Demographic Assumptions

We reviewed the other demographic assumptions which could be analyzed by CavMac. We find their study reasonable, consistent, and accurate. These assumptions include:

Disability Rates – CavMac uses an assumption for disability retirement based on five-year experience. The assumption was somewhat conservative given the relatively small number of disability retirements and the relative size of the liability when a person does become disabled. Historical actuarial gains or losses have been minimal.

Marriage Rates – CavMac assumes 80% of future retirees would be married. Current retirees use actual marriage data at the time of valuation. We support this approach.

Age Difference between Husbands and Wives – CavMac assumes female retirees are three years younger than their husbands and that male retirees are three years older than their wives. We find this reasonable. Many retirement systems use three years as a widely established norm.

Number of Dependents – CavMac assumes that the spouse is the only dependent for the survivor benefit in the retirement plan. Because the pre-retirement death benefit is greater when there are dependent children, we recommend this assumption be reviewed in the next experience study.

For the health valuation, CavMac assumes that of those future retirees who elect to continue health coverage, 25% have an eligible spouse who also opts for health coverage at that time and no dependent children. We recommend that these assumptions be analyzed in future experience studies.

Retirement Age for Inactive Vested Participants – An assumption was not disclosed in the actuarial report. Nor was this reviewed in the experience study. We would recommend reviewing this assumption and disclosing what is being assumed.

Retiree Health Participation – CavMac assumes a range of future eligible retirees and inactive vested participants who do not cash out will elect health coverage at retirement. The ranges vary by the type of retirement, the number of years of service the retiree had and whether the retiree is over or under age 65. This is reasonable at this time, and an important assumption. CavMac included this assumption in the 2020 Experience Study and made changes based on recent experience.

Section 2 – Audit of Actuarial Methods, Factors and Assumptions

Future Child Dependents – No assumption was made in the healthcare valuation. We recommend that CavMac implement an assumption given that current dependent children are already valued.

ECONOMIC ASSUMPTIONS

Investment Return Rate

In 2020, CavMac recommended a decrease in the investment return rate assumption from 7.50% to 7%. This assumption change was a bit “ahead of the curve” with respect to rates used by most systems in 2020, when 7.25% was the assumption most commonly used. Today, however, 7% is the median return according to the Public Funds Survey.

SERS adopted the 7% rate at that time.

Actuaries are required under their standards of practice to opine if they believe that the rate is not reasonable. Even though experience studies are typically conducted only every five years, this standard applies each year.

Currently, the rates used by the statewide systems in Ohio are:

- Ohio Police and Fire Pension Fund (OP&F) – 7.50% (reduced from 8.00% effective 2022)
- State Teachers Retirement System of Ohio (STRS) – 7.00%
- Ohio Public Employees Retirement System (OPERS) – 6.90%
- Ohio Highway Patrol Retirement System (HPRS) – 7.25%

A simple comparison of what other systems are using is helpful, but it is not sufficient criterion for establishing an assumed rate of investment return.

CavMac used a forward-looking “building block” method, where they developed an inflation assumption, a real return assumption and an assumption for expenses. Each of these components was calculated independently, then summed (net of expenses) to develop the net investment return assumption.

Their 7% net investment return assumption recommendation was comprised of 2.4% inflation plus 4.6% real return net of administrative expenses. Inflation is discussed in the section below, so we will focus on the real return component and the administrative expense component.

Based on our experience, investment consultants continue to pare back their expectations for future returns. This is partially a consequence of continued low inflation expectations and short-term fixed income rates, but can also be on a real return basis.

Recent inflation experience may result in changes in expected rates of return. We trust that CavMac rigorously analyzes both the expected real return as well as the inflation assumption.

According to state data from the Public Funds Survey as of March, 2024, the average real rate of return assumption for 119 state systems, 47 of which disclosed this, is 4.44%. Although not

Section 2 – Audit of Actuarial Methods, Factors and Assumptions

specifically asked, this is presumably after a reduction for administrative expenses in most responses.

The 4.6% real rate currently used by SERS is consistent with the rates used by the other statewide systems in Ohio. The other systems' expected real rates of return are:

- Ohio Police and Fire Pension Fund (OP&F) – 4.30%
- State Teachers Retirement System of Ohio (STRS) – 4.60%
- Ohio Public Employees Retirement System (OPERS) – 4.55%
- Ohio Highway Patrol Retirement System (HPRS) – 4.75%

Administrative Expenses – SERS' anticipated administrative expenses are incorporated into its valuation by reducing the assumed rate of return by 0.22%. The investment return rate is thus assumed to be net of administrative expenses. CavMac incorporated a thorough analysis of this assumption in the 2020 Experience Study.

Health Care Plan Rate of Investment Return – CavMac uses the same 7% investment return assumption for the healthcare valuation as is the assumed return from plan assets.

Inflation

We reviewed the development of the 2.4% inflation rate developed by CavMac. We find that the assumption is reasonable. The CavMac investigation considered forward looking data such as the yields on inflation-indexed treasury bonds and economist forecasts to the extent that they are not purely short term.

According to the Public Funds Survey data cited above as of March, 2024, the median inflation assumption for those who reported their inflation rate is 2.47%.

A 2.4% rate is consistent with the other statewide systems in Ohio. The other systems' expected inflation rates are:

- Ohio Police and Fire Pension Fund (OP&F) – 2.75%
- State Teachers Retirement System (STRS) – 2.50%
- Ohio Public Employees Retirement System (OPERS) – 2.35%
- Ohio Highway Patrol Retirement System (HPRS) – 2.50%

Wage Inflation

CavMac uses a real wage inflation rate of 0.85%. When added to 2.4% inflation, this results in a base payroll growth assumption of 3.25%. We find this to be reasonable, consistent, and accurate. CavMac provided a robust analysis in support of this assumption in its 2020 Experience Study.

A different population level wage inflation assumption is also used for the amortization policy. For the amortization policy the level of wage growth is assumed to be 1.75%. This provides a more conservative ADC computation for purposes of the funding policy.

Individual Salary Increases

CavMac analyzed individual salary increase rates, and made recommendations for updates. CavMac utilized a “building block” approach and analyzed inflation, productivity (real wage increases) and merit/promotion. We found this approach to be appropriate.

POST-EMPLOYMENT HEALTHCARE ASSUMPTIONS

Gross Claim Rate Derivation

It is common practice for actuaries to project future claim costs by measuring past experience and adjusting it to reflect the effects of inflation and plan design. CavMac referenced 2025 premium levels in its report. Based on our review of the report, we find that the health care claim cost assumption is reasonable. We recommend that the development of the rates be more rigorously documented in the actuarial report.

Health Care Cost Trend Rate

To properly measure future liabilities, actuaries apply trend rates (health inflation) to the base claim costs described above. Standard practice is to use prevailing national trend rates and grade down to an ultimate trend rate that is slightly higher than prevailing CPI rates. In this case, CavMac set the initial trend rate using published annual health care inflation surveys in conjunction with actual plan experience, where credible, and developed the ultimate trend rate of 4.40% assuming a grading period of five to ten years and use of a “GDP+1.5%” to “GDP+2.5%” assumption.

We find this approach reasonable and the trend rates which it produces reasonable, but recommend CavMac provide support for the trend rates used in the actuarial report.

COVID has had a profound effect on healthcare costs. We encourage CavMac to consider this carefully in the next experience study. This might lead to projections based on long run trends, extrapolating from 2026 forward, leaving the intervening turbulence (years 2022 -2025) mostly unspecified.

Morbidity

In a health insurance valuation, morbidity is sometimes defined as the difference in claims costs at different ages. Morbidity rates are also known as aging factors. They are used to transform average health cost assumptions to health care cost assumptions which vary by age and gender. CavMac did not disclose in the valuation report what data was used for development of aging factors.

We encourage CavMac to review these factors in the next experience study to the extent data is available. At the very least, we would recommend that the experience study report disclose the process used for the choice of these aging factors. We reviewed the aging factors developed by CavMac and found them appropriate.

Retiree Contributions

The true measure of a plan's liability is the difference between total claims costs and the amount that retirees contribute to offset those total costs. In developing the Plan's liability, CavMac used the specific SERS subsidy provisions. We reviewed the methodology used by CavMac and found it

appropriate. However, additional detail could be provided directly in the report as we found it necessary to reference the retiree benefit booklets provided on the SERS website for clarification of the retiree contribution provisions. For clarity and transparency, we recommend that this information be included in the actuarial valuation report.

Health Plan Participation Rates and Elections

CavMac developed a participation election rate system that varies by whether the participant is over or under age 65, how many years of service they had at retirement and the type of retirement they incurred. The rates range from a low of 25% to as high as 90%. The election rates were part of the 2020 Experience Study and appear to be reasonable.

Child Dependents

Benefits are valued for current dependent children beginning at age 15, although no disclosures for benefit terms are provided in the report. We assumed children dependents not eligible for Medicare are eligible to receive benefits up to age 26 and children dependents eligible for Medicare are eligible to receive benefits for their lifetime. CavMac assumes 0% participation for future child dependents. Although the liability for child dependents is generally small, we recommend that CavMac consider an adjustment to value children younger than age 15 and review the assumption for 0% participation for future child dependents.

Health Premium Discount Program

Current Medicare-eligible service retirees, disabled benefit recipients, spouses and dependent children reported as qualifying for the Health Care Premium Discount Program were assumed to continue participating in the program for their lifetime but no assumption was made for any future eligible benefit recipients. We recommend CavMac consider an assumption for future benefit recipients who may qualify for the Discount Program.

DISCLOSURE OF ACTUARIAL ASSUMPTIONS AND METHODOLOGY

CavMac’s disclosure of actuarial assumptions (and methods) was robust, particularly given the complexity of SERS. However, there are some disclosures that are omitted from the report that we identify in Section 4 that we recommend CavMac consider including in future valuation reports.

If SERS were ever to change actuaries from CavMac, based on our experience with the audit, the new actuary would be able to confirm the reasonableness of CavMac’s calculations.

Section 3 – Audit of Compilation of Actuarial Valuations

The cornerstone of an actuarial audit is a replication of the actuarial valuations. As mentioned above, we matched the costs and liabilities developed by CavMac for the retirement system within standard actuarial ranges. Consequently, we conclude that the valuation results are reasonable, consistent, and accurate.

The following table summarizes the present value of benefits, actuarial accrued liability and normal cost for the Pension Benefits produced by the CavMac and PTA/KMS/Bolton actuarial valuations.

Section 3 – Audit of Compilation of Actuarial Valuations

Table 3.1
Liabilities as of June 30, 2024 (\$ in thousands) – Pension Benefits

	CavMac	PTA/KMS/Bolton	% Diff.
Present Value of Benefits			
Active Members			
Pension Benefits	12,969,731	13,158,102	1.45%
Medicare Part B	243,316	246,558	1.33%
Post-Retirement Death Benefit	13,424	13,408	-0.12%
Total	13,226,471	13,418,068	1.45%
Retirees and Beneficiaries			
Pension Benefits	13,700,033	13,574,528	-0.92%
Medicare Part B	200,477	199,850	-0.31%
Post-Retirement Death Benefit	32,711	32,688	-0.07%
Total	13,933,221	13,807,065	-0.91%
Inactive and Deferred Vested Members			
Pension Benefits	858,410	853,629	-0.56%
Medicare Part B	23,906	23,897	-0.04%
Post-Retirement Death Benefit	1,261	1,262	0.11%
Total	883,577	878,789	-0.54%
Total of Present Value of Benefits	28,043,269	28,103,922	0.22%
Actuarial Accrued Liability			
Active Members			
Pension Benefits	8,837,164	8,742,768	-1.07%
Medicare Part B	157,570	156,507	-0.67%
Post-Retirement Death Benefit	8,587	8,539	-0.56%
Total	9,003,321	8,907,814	-1.06%
Retirees and Beneficiaries			
Pension Benefits	13,700,033	13,574,528	-0.92%
Medicare Part B	200,477	199,850	-0.31%
Post-Retirement Death Benefit	32,711	32,688	-0.07%
Total	13,933,221	13,807,065	-0.91%
Inactive and Deferred Vested Members			
Pension Benefits	858,410	853,629	-0.56%
Medicare Part B	23,906	23,897	-0.04%
Post-Retirement Death Benefit	1,261	1,262	0.11%
Total	883,577	878,789	-0.54%
Total Accrued Liability	23,820,119	23,593,668	-0.95%
Normal Cost (% of payroll)	10.75%	11.33%	5.38%

Section 3 – Audit of Compilation of Actuarial Valuations

The following table summarizes the present value of benefits, actuarial accrued liability and normal cost for the retiree health benefits produced by CavMac and PTA/KMS/Bolton actuarial valuations.

Table 3.2
Liabilities as of June 30, 2024 (\$ in thousands) – Health Benefits

	CavMac	PTA/KMS/Bolton	% Diff.
Present Value of Benefits			
Active Members	\$1,395,666	\$1,382,431	-0.95%
Retirees, Spouses and Beneficiaries	479,899	461,183	-3.90%
Inactive Members	20,425	20,542	0.57%
Total	\$1,895,990	\$1,864,156	-1.68%
Actuarial Accrued Liability			
Active Members*	\$825,378	\$814,364	-1.33%
Retirees, Spouses and Beneficiaries	479,899	461,183	-3.90%
Inactive Members	20,425	20,542	0.57%
Total	\$1,325,702	\$1,296,089	-2.23%
*Actuarial Accrued Liability for Active Members was not disclosed in the CavMac report. \$825,378 was calculated as the difference of the total liability and liabilities for inactives and retirees/spouses/beneficiaries.			
Normal Cost	\$59,576	\$57,183	-4.02%

Table 3.3
Summary of Deviation of Results

	Pension Benefits Valuation Results	Retiree Health Valuation Results
Present Value of Benefits	0.22%	-1.68%
Accrued Liability	-0.95%	-2.23%
Normal Cost	5.38%	-4.02%

Actuaries generally use a 5% deviation as an acceptable range of error. As the total actuarial accrued liabilities and normal costs deviations calculated by PTA/KMS/Bolton were within this “margin of error,” we are satisfied that the numbers are appropriate.

Although we did match within an acceptable range, there are several areas which we would encourage CavMac to explore further:

Section 3 – Audit of Compilation of Actuarial Valuations

Following are a few items we uncovered that could be corrected, but overall would be immaterial to the valuation results:

- CavMac uses the deferred allowance date provided in the data as the assumed commencement date for deferred vested members, which was not explicitly stated in the report. Further, we noted inconsistencies with these dates and the early retirement provisions. We would recommend that CavMac review these dates more closely and disclose in the report the assumed commencement dates.
- We were unable to closely match termination liabilities, particularly for grandfathered participants. We believe this may be related to how the entry age normal method was applied to the calculation of the refund benefits, but sufficient information was not given for us to determine what the source of the discrepancy was.
- We were not able to validate the source of the total annual converted disability benefits as it did not line up with the current benefit field in the data as we would have expected. As a result, our total annual disability benefits were slightly lower than those shown in the CavMac report.
- The pension normal cost in CavMac's report was not provided. Only percentages of payroll for specific benefits were reported. We used this information and the total annual salary from the report to determine the CavMac pension normal cost. Our match of the total normal cost for both pension and health (4.5%) was not as strong as our close match of the accrued liabilities (1%) and present value of future benefits (0.1%). If the pension normal cost dollar figure had been reported in detail, we would have been better able to understand their normal cost calculation nuances.

Section 4 – Audit of Member Data Used in Valuations

SERS provided us with the pension system data for all active members and pensioners. Detailed data layouts that identified all the data elements used by CavMac were provided for the pension valuation. CavMac also provided us with the data files they utilized in performing the valuations. In performing our replication, we used the data files provided by CavMac.

The following tables summarize the demographic statistics for the pension benefits valuation produced by CavMac and PTA/KMS/Bolton actuarial valuations:

Table 4.1
Active Members as of June 30, 2024 (\$ in thousands) – Pension Benefits

Active Members	CavMac	PTA/KMS/Bolton	% Diff.
Number of Members	163,350	163,350	0.00%
Annual Salaries	4,547,316	4,553,337	0.13%
Average Annual Salary	28	28	0.13%
Average Age	46.80	46.73	-0.15%
Average Service	7.00	7.00	0.00%

Section 4 – Audit of Member Data Used in Valuations

Table 4.2
Retirees and Beneficiaries as of June 30, 2024 (\$ in thousands) – Pension Benefits

<u>Service Retirees</u>	CavMac	PTA/KMS/Bolton	% Diff.
Number of Members	72,722	72,722	0.00%
Annual Allowance	1,241,322	1,241,325	0.00%
Average Allowance	17.07	17.07	0.00%

<u>Survivors and Beneficiaries</u>	CavMac	PTA/KMS/Bolton	% Diff.
Number of Members	4,049	4,049	0.00%
Annual Allowance	41,811	41,811	0.00%
Average Allowance	10.33	10.33	0.00%

<u>Disability Retirees</u>	CavMac	PTA/KMS/Bolton	% Diff.
Number of Members	5,719	5,719	0.00%
Annual Allowance	100,617	100,112	-0.50%
Average Allowance	17.59	17.51	-0.50%

<u>Total</u>	CavMac	PTA/KMS/Bolton	% Diff.
Number of Members	82,490	82,490	0.00%
Annual Allowance	1,383,750	1,383,248	-0.04%
Average Allowance	16.77	16.77	-0.04%

Section 4 – Audit of Member Data Used in Valuations

Table 4.3
Inactive Members as of June 30, 2024 – Pension Benefits

<u>Inactive and Deferred Vested Members</u>	CavMac	PTA/KMS/Bolton	% Diff.
Number of Members	6,607	6,607	0.00%
Annual Allowance	47,685	47,685	0.00%
Average Allowance	7.22	7.22	0.00%

Section 4 – Audit of Member Data Used in Valuations

SERS provided us with the health benefits system data for all active members and retirees. Detailed data layouts that identified all the data elements used by CavMac were provided for the health care valuation. CavMac also provided us with the data files they utilized in performing the valuations. In performing our replication, we utilized the data files provided by CavMac.

The following tables summarize the demographic statistics for the health benefits valuation produced by CavMac and PTA/KMS/Bolton actuarial valuations:

Table 4.4
Members as of June 30, 2024 – Health Benefits

Status	Number		% Diff.
	CavMac	PTA/KMS/Bolton	
Active Members	163,350	163,350	0.00%
Service Retirees	29,735	29,735	0.00%
Disability Retirees	2,575	2,575	0.00%
Spouses of Retirees	4,851	4,851	0.00%
Spouses of Deceased Retirees	1,322	1,322	0.00%
Survivor Benefit Recipients	489	489	0.00%
Non-Spouse Dependents	220	220	0.00%
Deferred Vested	6,607	6,607	0.00%
Grand Total	202,322	202,322	0.00%
In addition, CavMac valued the following pre-Medicare eligible retired members who are waiving coverage			
Waived-Service Retirees	3,119	3,119	0.00%
Waived-Disabled Retirees	1,429	1,429	0.00%

SAMPLE LIVES

Initially, a limited number of sample lives was provided by CavMac. We requested additional sample lives for various categories of SERS members, including active test lives at various ages and group, retirees with various payment forms and disabled lives. We matched most of the sample lives.

The following tables summarize the results of the sample lives valuations produced by CavMac and PTA/KMS/Bolton:

**Table 5.1
Comparison of Present Value of Benefits (\$ in thousands) – Pension Benefits**

Sample Life Description	CavMac Liability (PVFB)	PTA/KMS/Bolton Liability (PVFB)	Ratio of PTA/KMS/Bolton To CavMac
Active Sample Lives			
Age 53, Not Grandfathered	37,323	38,859	104.12%
Age 64, Grandfathered	1,037,116	1,022,554	98.60%
Age 57, Grandfathered	52,833	52,186	98.78%
Age 49, Not Grandfathered	392,462	386,044	98.36%
Disabled Sample Lives			
Disabled under 65	155,993	157,302	100.84%
Disabled at least 65	58,804	58,396	99.31%
Retired Sample Lives			
Retiree with Straight Life, Male	35,586	35,101	98.64%
Retiree with Straight Life, Female	179,708	177,029	98.51%
Retiree with J&S	221,768	220,998	99.65%
Retiree with 10-Year Certain and Life	322,588	321,957	99.80%
Deferred Vested Sample Lives			
Age 48 Terminated Vested Employee	16,604	16,375	98.62%
Beneficiary Sample Lives			
Multiple Beneficiaries of Deceased Retiree	412,729	322,461	78.13%

We note the following regarding the pension benefit sample lives:

- We were unable to closely match the sample life for the pension survivor with multiple beneficiaries that was provided to us. Given this, we are uncertain of the method being used to value these survivors and if it is appropriate. This remains immaterial, however, as there are a very small number of these survivors.

**Table 5.2
Comparison of Present Value of Benefits (\$ in thousands) – Health Benefits**

Test Life Description	CavMac Liability (PVFB)	PTA/KMS/Bolton Liability (PVFB)	Ratio of PTA/KMS/Bolton To CavMac
Active Test Lives			
Age 53, Not Grandfathered	2,023	2,150	106.28%
Age 64, Grandfathered	21,314	21,891	102.71%
Age 57, Grandfathered	63,687	64,357	101.05%
Age 49, Not Grandfathered	52,128	51,351	98.51%
Disabled Test Lives			
Disabled under 65	21,113	21,005	99.49%
Dependent under 26	67,099	59,148	88.15%
Waived Disabled Retiree	1,087	2,734	251.52%
Retired Test Lives			
Retiree with J&S reversionary	8,883	8,887	100.04%
Safety net, age 62, with spouse	61,632	61,628	99.99%
Waived Service Retiree	2,152	2,152	99.98%
Terminated Vested Test Lives			
Age 54 Terminated Vested Employee	1,319	1,346	102.06%
Age 67 Terminated Vested Employee	747	632	84.55%
Surviving Spouse Test Lives			
Spouse of Deceased Retiree	9,850	9,850	100.00%
Dependent over 26	2,024	7,986	394.55%

We note the following regarding the health benefit sample lives:

- The disabled sample life with a dependent under age 26 was low by 12%.
- The survivor sample life for a dependent over age 26 was high by 295%.
- The disabled and survivor sample lives without dependents were matched closely but we were unable to determine the cause of the dependent discrepancy because sample lives provided to us for retirees with dependents did not break out the liabilities by retiree and

Section 5 – Other Considerations

dependents. Further, payment commencement and end ages were not disclosed in the report. Dependents' liabilities represent a small fraction of the total liability.

- Our valuation of the waived disabled test life was high by 152%. This suggests that our valuation of waived disabled retirees and/or their spouses (with a reversionary benefit) may be incorrect as no payment forms for these retirees were provided which determines the period over which spouses receive benefits. This error accounts for such a small fraction of the total liability that the discrepancy is likely immaterial.

ACTUARIAL REPORT

We found the CavMac actuarial valuation reports to be well written, and focused on important issues. Actuarial Standard of Practice (ASOP) No. 41 provides extensive guidance to actuaries regarding actuarial communications. We find that the CavMac reports fully comply with the guidance of ASOP 41.

We recommend a few modifications to enhance the completeness of the actuarial valuation reports. These include items discussed in Section 3 as well as the following:

Pension Benefits:

- Breakout of liabilities by pre-65 and post-65 health care benefits.
- An explicit table of the early retirement factors for non-grandfathered retirees, especially since these factors have been readily calculated for use in benefit calculations.
- Whether any disabled retirees under age 65 are assumed to receive the Medicare Part B reimbursement and if so, at what age or after what period of time these disabled retirees would be assumed to go on Medicare, if applicable.
- The current year normal cost in the pension report in dollars.
- Clarification in the comments section of the report that the contributions “...consist of normal contributions and accrued liability contributions.”

Health Benefits:

- Breakout of retiree, survivor and beneficiary present value of benefits and actuarial accrued liabilities by status, given that each status uses different participation rates, claims costs and cost-sharing methods.
- Details of the valuation of waived service and disabled retirees, including the selection of claims and contributions.
- Details of the valuation of Medicare-eligible dependents, including the selection of claims and contributions and duration of benefit payments.
- Disclosure of the active entry age normal accrued liability.
- Claims costs used for current retirees and spouses.
- Benefit commencement ages for terminated vested members.
- Coverage start dates for waived service retirees, disabled retirees and spouses.
- Termination of benefits for spouses of waived service and disabled retirees.
- More robust rationale for the trend rate selection.

ACTUARIAL AUDIT PROCESS

Overall, CavMac has been cooperative in sharing individual calculations supporting the calculations reported in the actuarial valuation report. However, there were additional details that CavMac could have provided for specific individuals that would have helped in the replication process. The inactive test lives for the pension valuation provided results for the present value of future benefits and accrued liability broken out by pension benefits, Medicare Part B, and the lump sum death benefit. Additional details would have been helpful for unique cases like the survivor with multiple beneficiaries. The active pension test lives had slightly more detail as the present value of future benefits, accrued liability, and normal cost were broken out by benefits attributed to individual decrements as well, but details were lacking for specific benefits within those decrements. As a consequence of this lack of information, (1) we cannot confirm that CavMac is properly making the calculations, only that our calculations match within a reasonable margin, and (2) the audit process is much more tedious, time-consuming and drawn out than necessary. The test lives provided for the healthcare valuation also lacked details. For example, CavMac provided one single number for the present value of benefits for a retired test life with two dependents that we were not able to match.

We understand that there may be sound business, competitive, or legal reasons for CavMac to have a non-disclosure policy. We also understand that at some other major actuarial firms (some of which do not consult to public pensions) have a similar policy. However, it is important to point out that this policy can make actuarial audits more problematic, lengthy and dubious than normal, as indicated in the previous paragraph. It would probably be helpful if future auditors were aware of the limits on shared information in advance. This issue is not unique to SERS and CavMac. Actuarial firms are more often taking this approach of limiting detailed information that is shared. While most of the more than 20 audits that we have conducted in the last 20 years have not had this issue, many of the ones we have conducted in the last five years do have this issue.

CONCLUSIONS

We found CavMac’s work to be reasonable, consistent, and accurate. We do not believe that any methods, assumptions, or calculations are erroneous to the level of necessary recalculations.

CavMac, the ORSC, and the SERS staff were fully cooperative and responsive, which assisted in the process. Finally, we wish to reaffirm that the work done by CavMac was reasonable, consistent, and accurate.

Appendix B – Sample Actuarial Audit Presentation

Actuarial Audit of the
School Employees Retirement System of Ohio
for Ohio Retirement Study Council

Linda L. Bournival, FSA

To ORSC – August 14, 2025

To SERS – TBD

Agenda

- Major Findings of Actuarial Review
- Actuarial Assumptions
 - Demographic
 - Economic
 - Healthcare
- Actuarial Methods
- Actuarial Valuation Replication
- Healthcare Review
- Audit Conclusions

Major Findings of Actuarial Review

- We believe the actuarial math and numbers are correct
 - Our calculations match Cavanaugh MacDonald (CavMac) calculations
 - The CavMac calculations captured key provisions accurately
- Actuarial Assumptions are reasonable, and have been periodically revised based on results of experience studies
- Improved transparency in the CavMac reporting is desirable
 - Development of assumptions
 - Disclosure of calculations
- References
 - Actuarial Standards of Practice (ASOPs)
 - Actuarial Funding Policies and Practices for Public Pension Plans
 - CCA White Paper Second Edition

Findings of Actuarial Review - Summary

Actuarial Assumptions

- ↳ Reasonable and consistent
- ↳ Some minor concerns

Actuarial Methods

- ↳ Reasonable and consistent
- ↳ Some minor concerns with disclosures

Actuarial Valuation Replication

- ↳ Close match (1% on total liability)
- ↳ Reasonable, consistent and accurate

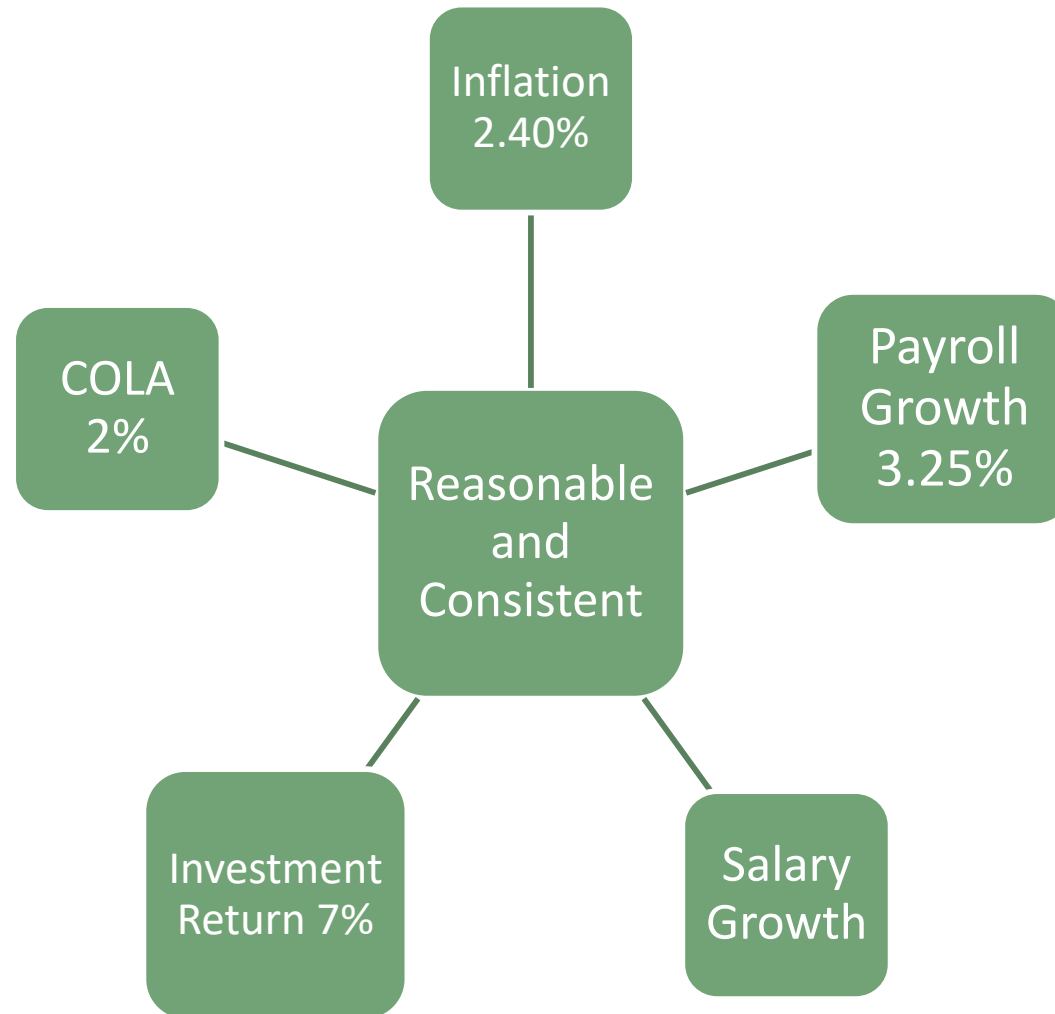
Actuarial Process

- ↳ Unable to precisely verify certain detailed calculations
- ↳ But overall close replication match suggests confidence in numbers

Demographic Assumptions



Economic Assumptions



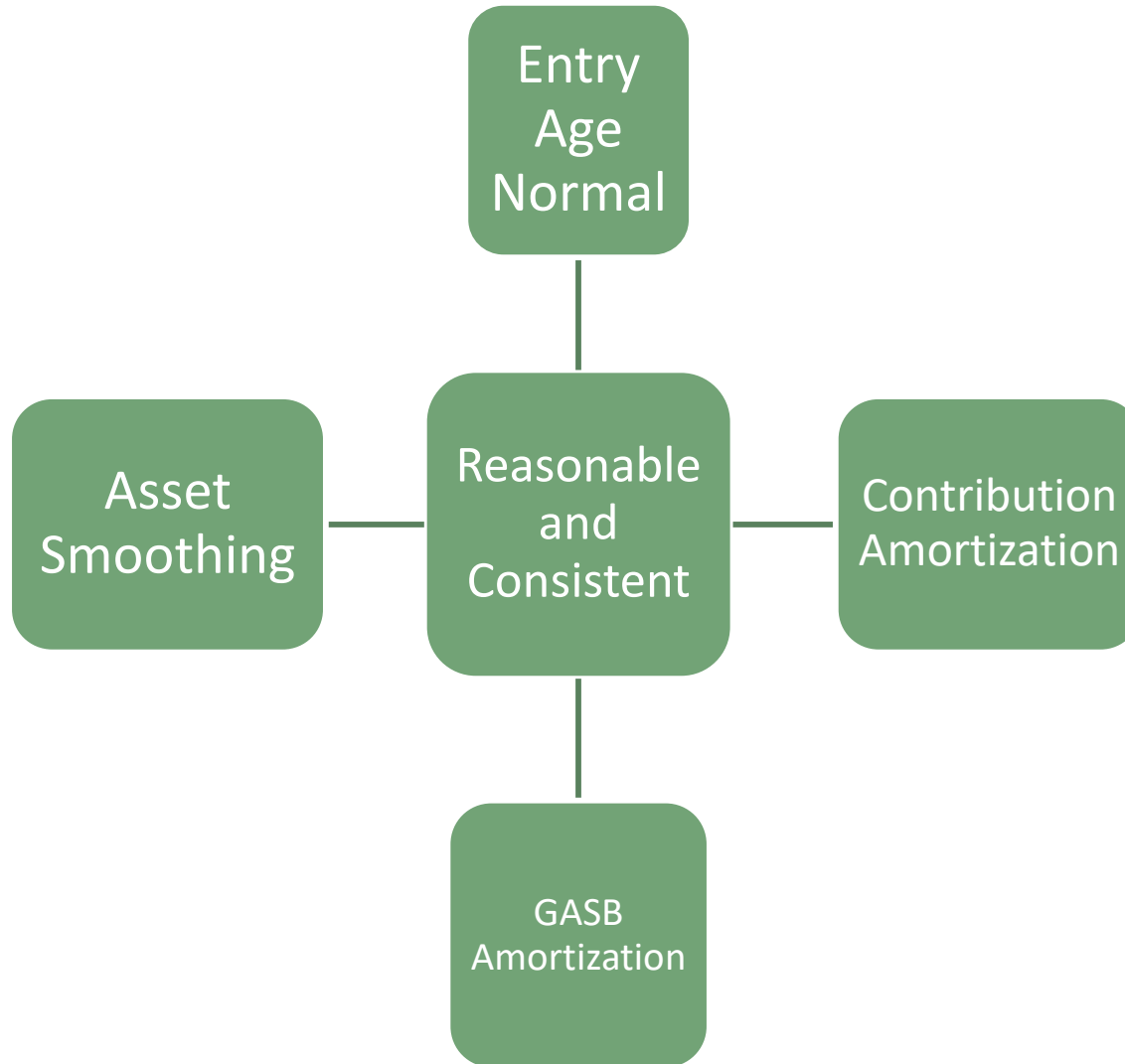
Economic Assumptions

- Investment Return Rate of 7%
 - Consistent with Ohio systems (range is 6.90%-7.50%)
 - Slightly higher than current NASRA average of 6.91%
- Inflation Rate of 2.40%
 - Consistent with peers (median is 2.47%)
- Payroll Growth of 3.25%
 - Real wage inflation of 0.85% plus 2.40% inflation
- Salary Growth Rate
 - Reasonable, experience study analyzed inflation-adjusted salary growth appropriately
- Cost Of Living Allowance – 2% assumed – reasonable

Healthcare Assumptions



Actuarial Methods



Amortization Methods

- For determination of satisfying Ohio 30-year Statute
 - Based on increasing payroll (3.25% of total payroll)
 - 3.25% payroll growth reasonable in aggregate for a stable population
 - Amortization period is 20 years as of June 30, 2024
 - Down from 28 years as of June 30, 2016
 - Indicates satisfactory progress in amortizing unfunded liability

Amortization Methods

- For determination of contribution requirements under ASOP 4
 - “Single closed period” approach is a “non-recommended” approach for a Level Cost Allocation Method in the CCA White Paper
 - Due to volatility as period declines
 - CavMac may wish to introduce “layered approach” in future
 - However closed period approach is preferred over open 30-year period approach which is permitted under statute

Actuarial Valuation Replication

- Data used by CavMac consistent with data provided by SERS
- Reasonable match
- Thorough, complete work by CavMac

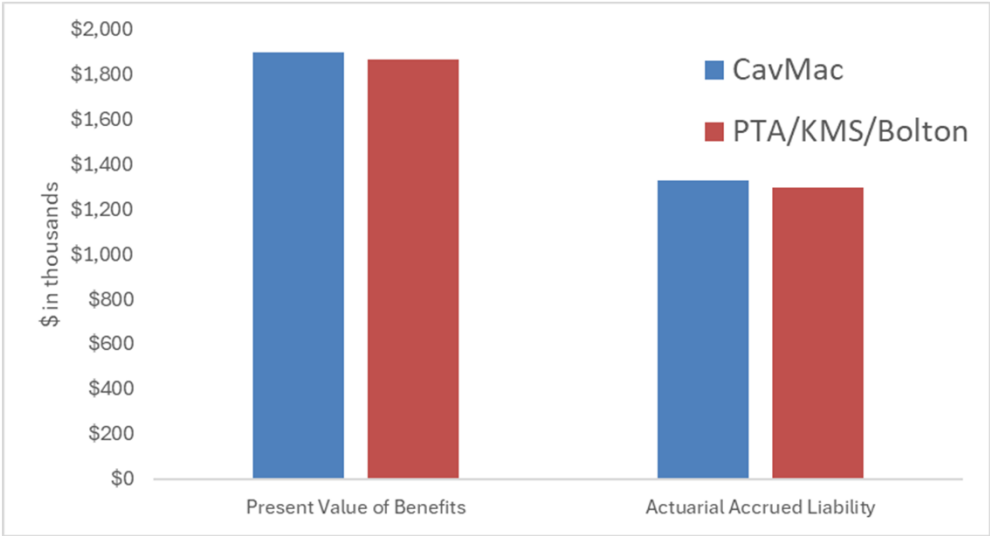
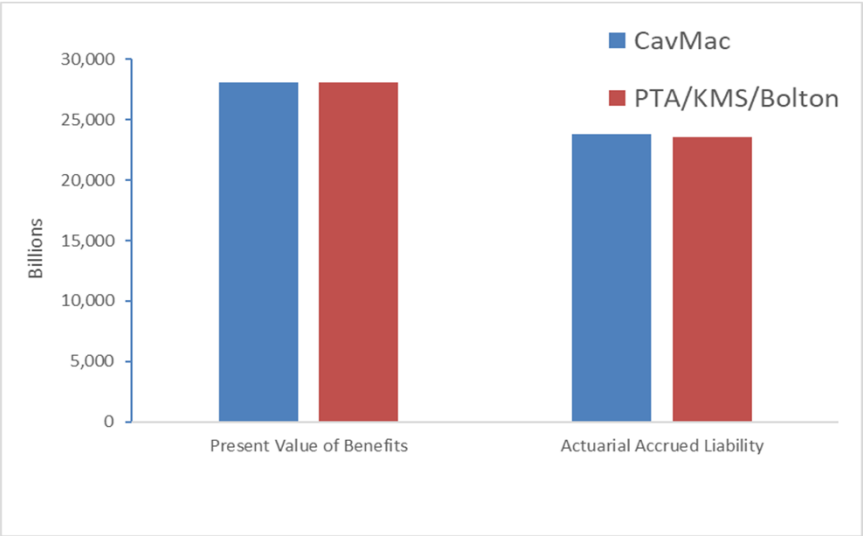
Actuarial Valuation Replication

- Actuarial liabilities match within 1% in total
- Total present values match was within 0.1%
- Normal costs values did not match as closely
 - Nearly 5% deviation
- However, the strong match in Actuarial Accrued Liability and Present Value of Benefits is more important indicator that costs are also being reasonably calculated.

Actuarial Replication Match

Comparison of Present Value of Benefits and Actuarial Accrued Liability - Pension Benefits

Comparison of Present Value of Benefits and Actuarial Accrued Liability - Health Care Benefits



Summary of Deviation of Results

	Pension Benefits Valuation Results	Retiree Health Valuation Results
Present Value of Benefits	0.22%	-1.68%
Accrued Liability	-0.95%	-2.23%
Normal Cost	5.38%	-4.02%



Employee Benefits, Actuarial & Investment Consulting

Health Care Review

- Assumed 2024 monthly rates are reasonable
- Age-adjusted rates reflect reasonable morbidity by age, are consistent with monthly rates and are reasonable

Audit Conclusions

- Reasonable match in valuation replication
- Other Assumptions, Methods and Factors
 - Reasonable
 - Consistent
 - Accurate
- Health care rates are reasonable
- CavMac reports are complete
- Recommendations
 - Provide next auditor with more transparent calculations
 - Correct minor issues mentioned in audit report
 - Provide more robust development of certain assumptions and methods mentioned in audit report

Findings of Actuarial Review - Recap

Actuarial Assumptions

- ↳ Reasonable and consistent
- ↳ Some minor concerns

Actuarial Methods

- ↳ Reasonable and consistent
- ↳ Some minor concerns with disclosures

Actuarial Valuation Replication

- ↳ Close match (1% on total liability)
- ↳ Reasonable, consistent and accurate

Actuarial Process

- ↳ Unable to precisely verify certain detailed calculations
- ↳ But overall close replication match suggests confidence in numbers