CHEIRON Classic Values, Innovative Advice

Ohio Retirement Study Council (ORSC)

Actuarial Audit of the Public Employees Retirement System of Ohio (PERS)

Produced by Cheiron Inc.
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December 3, 2025

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December 3, 2025

Ohio Retirement Study Council
30 East Broad Street, 2nd Floor
Columbus, Ohio 43215
ATTN: Bethany Rhodes, Bethany.Rhodes@orsc.org
Director/General Counsel

Re: Request for Proposals for Actuarial Audit of the Public Employees Retirement System of Ohio

Dear Ms. Rhodes:

Cheiron is pleased to present this proposal to conduct an independent actuarial audit of the Public Employees Retirement System of Ohio (PERS) on behalf of the Ohio Retirement Study Council (ORSC).

We recognize the statutory necessity of this audit to provide the ORSC with objective verification and analysis of the assumptions, procedures, and methods used by the PERS consulting actuary under the Ohio Revised Code (R.C.)171.04(E).

Cheiron is an employee-owned actuarial consulting firm with a reputation for creativity, technological proficiency, and integrity. As an independent firm, we deliver unbiased advice.

Proven Replication Expertise

Our team has decades of experience advising large public pension plans and performing actuarial audits.

We have conducted actuarial audits for various state retirement systems, including those of Alabama, California, Illinois, Mississippi, New Mexico, Rhode Island, Washington, and Wisconsin. We conducted audits for the Wisconsin Retirement System in 2024, the Public Employees' Retirement System of Mississippi in 2022 and 2024, the Pennsylvania Public School Employees' Retirement System in 2022, and the New York State Teachers' Retirement System in 2021. We are currently conducting audits for CalPERS and the Illinois Auditor General, for whom we conduct annual audits.

Technological Innovation

Our proprietary projection tools ***P-Scan*** and ***R-Scan*** let us run thousands of simulations to stress test plans so stakeholders have a better understanding of how the system will respond to adverse situations. We can demonstrate the impact of changes on a system in real time in meetings, letting trustees make informed decisions to manage the financial risks of your plans. In particular, dynamic projections can help validate the evaluation and recommendations made in audits.

Our consultants work diligently to maintain our industry leadership by developing new tools and guidance. We have recently updated our Public Plan Tool, which compares public plans with one another (https://cheiron.us/cheironHome/content/resources/databases/public-plans-risk-metrics).

Quality Control

Strict quality control is a hallmark of our consulting services. It is ingrained in all our procedures, so it is not an afterthought. We view quality control as an investment that drives financial efficiencies. Our co-lead consulting approach provides that several experienced actuaries will consider all aspects of the audit to ensure an objective and accurate review.

Creativity

Our reputation for creative solutions has made us the go-to consultant for some of the nation's most challenged pension plans. They include the San Diego City Employees' Retirement System, the City of Detroit, the City of Philadelphia Board of Pensions and Retirement, the five large Illinois public employee retirement systems, the Dallas Police & Fire Pension System, and the Maine Public Employees Retirement System.

Recently, we recognized that online slide presentations present a challenge for audience engagement, so we have developed new, interactive tools for presenting to clients and other stakeholder audiences. As an example of this technology, we invite you to review this tool we created to deliver the results of an actuarial audit to a public system. (https://presentation.cheiron.us/presentation/view/SCERSActuarialAudit?token=cB9W).

We have worked with clients to implement innovative solutions that manage all the risks the plans face to ensure sustainable benefits for future members.

Thank you for considering Cheiron. We are confident that we can do an outstanding job in providing ORSC with clear, practical findings that will help the Ohio General Assembly oversee PERS. We look forward to answering your questions.

Sincerely,
Cheiron

Michael J. Noble, FSA, EA, MAAA, FCA
Principal Consulting Actuary

William R. Hallmark, ASA, EA, MAAA, FCA
Consulting Actuary

AUDIT PROPOSAL

4.1 PROPOSAL SUMMARY

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

We understand that ORSC is seeking an actuarial consulting firm to independently verify and analyze the assumptions, procedures and methods used by the PERS consulting actuary with respect to its December 31, 2024 actuarial valuation of defined benefit allowances—Traditional, Combined and Member Directed Plans; the PERS 5-Year experience study, January 1, 2016-December 31, 2020, and report on the PERS Annual Actuarial Valuation and Projections of retiree health benefits as of December 31, 2024, including GASB Statement 74 disclosures.

Our audit will assess the validity of the data, as well as the reasonability of the assumptions, methods, and procedures. We will fully replicate the pension and retiree healthcare valuations, and our report will provide a detailed rationale for all recommendations, as well as the general effect of any proposed changes. Finally, we will assess the determination of retiree contributions to health care to ensure they are appropriate and consistent with the implementation of PERS' health care policies. We will present our findings in person to both the ORSC and the PERS Board.

Our comprehensive report will include an assessment of the validity, completeness and appropriateness for PERS structure and funding objectives of the demographic and financial information used by the consulting actuary in the valuation of PERS.

We will also analyze whether the consulting actuary's valuation method and procedures are reasonable and consistent with generally accepted actuarial standards and practices appropriate for PERS structure and funding objectives, and whether they are applied as stated by the actuary. If we find deviations from accepted standards during the audit, we will obtain the rationale for the deviations and determine their effects, including their monetary impact.

We will assess the reasonability of the economic and demographic actuarial valuation assumptions based on PERS experience and consistency with generally accepted actuarial standards and practices. The assumptions evaluated will include mortality, retirement, separation rates, levels of pay adjustments, rates of investment return, and disability factors. As part of this assessment, we will consider and specifically address whether actual experience is appropriately evaluated in experience studies conducted by the PERS actuary at least every five years and whether recent changes in assumptions are appropriate, reasonable, and supported by the experience studies. Also, we will review the gain/loss analyses from the last four actuarial valuation reports.

Our analysis will be based on parallel valuations of pension and retiree health care benefits as

of December 31, 2024, using the validated member census data and the same actuarial assumptions.

If we recommend adjustments in assumptions to more accurately reflect present and future assets, liabilities, and the costs of PERS, we will provide a detailed rationale for our recommendations and describe the general effect on PERS condition as a result of the proposed changes in assumptions.

In addition, we will assess whether PERS appropriately and consistently determines retiree contributions to health care and whether the implementation of the PERS health care policies differ from those determinations.

The primary Cheiron contact for both ORSC staff and PERS staff during the audit will be:

Michael J. Noble,
Principal Consulting Actuary
Address: 230 West Monroe Street, 6th Floor, Suite 650, Chicago, IL 60606
Tel: 877-243-4766 Ext. 1209
Email Address: mnoble@cheiron.us

Cheiron is an employee-owned pension and health actuarial consulting firm organized as a C-corporation. It began operating in November 2002. The firm is independent and does not have any subsidiaries, affiliated companies or joint ventures.

The firm has not undergone any material change in its structure or ownership in the last 18 months, nor is the firm contemplating such changes.

We do not have an independent third-party assessment of client satisfaction. However, we have client references describing their satisfaction with our services. We also participate in formal client reviews.

We regularly solicit feedback from clients to ensure their satisfaction and address any concerns they may have. One of the best measures of satisfaction is our high client retention rate, which drives repeat business. Our consultants are also recognized industry experts who often speak at professional events, including annual conferences of the National Conference on Public Employee Retirement Systems and the National Association of State Retirement Administrators.

Cheiron is not subject to any material litigation.

Cheiron has not been sued by any clients or former clients in the last five years.

Cheiron currently serves as the consulting actuary for the State Teachers Retirement System of Ohio (STRS). We provide the STRS board with both pension and retiree health consulting services, including annual valuations and assessments of assumptions, methods, and potential

plan changes. This experience provides us with some insight into the unique challenges of the Ohio public retirement systems, which we believe will be valuable to the ORSC if we are selected to audit PERS. We do not believe that our relationship with STRS creates a conflict of interest relative to performing the independent actuarial audit of PERS. The two retirement systems are independent of each other, and no finding or recommendation, positive or negative, from the audit would have any impact on our work for STRS. We have also confirmed with STRS that they see no conflict in our potential audit of PERS for ORSC.

4.2 CAPABILITIES AND EXPERIENCE

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

Cheiron possesses the necessary capabilities and recent experience in performing full replication audits of large public retirement systems, comparable in size and complexity to PERS. On the following pages, we list the clients for whom we have performed actuarial audits similar to those required in this request for this proposal in the last five years.

Client	Type of Plan and Number of Employers	Participants	Assets	Audit Performed
• California State Teachers' Retirement System (CalSTRS)	Cost-sharing employer plan; defined benefit and defined contribution	933,410	$208,700,000,000	Full replication of 2019 actuarial valuation of DB program, full replication 2018 experience study, Full replication of the CB Benefit and DBS valuations as of June 30, 2019; Full replication of the MPP actuarial valuation as of June 30, 2019
• Contra Costa County Employees' Retirement Association	Cost-sharing, defined benefit plan	23,000	$8,150,000,000	Full replication of the December 31, 2018 valuation and experience study
• Educational Employees' Supplementary Retirement System of Fairfax County	Single employer plan, defined benefit plan	38,329	$2,279,741,119	2018; limited scope
• Illinois Office of the Auditor General	Cost-sharing and single-employer plans, defined benefit	945,000	$108,000,000,000	2012–ongoing; limited scope audits of the Illinois Teachers, Retirement System, State Employees Retirement System of Illinois, State Universities Retirement System of Illinois, Judges' Retirement System of Illinois, General Assembly Retirement System of Illinois, Public School Teachers Pension and Retirement Fund of Chicago
• Kern County Employees' Retirement Association	Cost-sharing, defined benefit plan	20,600	$4,219,235,000	2021; full replication of the June 30, 2019 valuation and review of actuarial assumptions and methods
• Los Angeles City Employees Retirement System	Single-employer, defined benefit plan	53,515	$17,707,909,933	2019; full replication audit of June 30, 2019 retirement and health plan valuations and 2014–2017 experience study
• Maryland-National Capital Park & Planning Commission Employees' Retirement System	Single-employer, defined benefit plan	4,202	$964,901,537	2018; full replication of actuarial valuation, full replication of option factors, review of actuarial assumption and methods and GASB 67/68 disclosure

Client	Type of Plan and Number of Employers	Participants	Assets	Audit Performed
• Mendocino County Employees' Retirement Association	Cost-sharing defined benefit; 3 employers	2,737	$484,000,000	2022-2023; full replication
• Mississippi Public Employees' Retirement Systems	Cost-sharing, single-employer, and agent, defined benefit plans	345,000	$35,863,000,000	Full replication audit of June 30, 2021 actuarial valuations (4 systems), review of June 30, 2020 experience study, and review of GASB 67/68 disclosure. Full replication audit of June 30, 2024 PERS actuarial valuation
• Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS)	Cost-sharing, defined benefit plan	18,300	$2,200,000,000	Full replication audit of June 30, 2018 actuarial valuation and review of the June 30, 2017 experience study
• Municipal Employees' Retirement System of Michigan (MERS)	Agent multiple-employer, defined benefit plan	83,600	$9,000,000,000	Full replication audit of December 31, 2018 actuarial valuation and review of December 31, 2018 experience study
• New Mexico Public Employees' Retirement Association	Cost-sharing, defined benefit plan	106,000	$15,200,000,000	2020; sample life audit of actuarial valuation; review of experience study; validation of Asset/Liability modeling
• New York State Teachers' Retirement System	Cost-sharing, defined benefit plan	431,000	$118,000,000,000	Study of actuarial opinions related to a Governor's proposal regarding a long-term stable contribution program (2013); detailed examination of NYSTRS based on requirements of Insurance Law and the Retirement and Social Security Law (2017); full replication of June 30, 2018 NYSTRS Valuation Report; audit of the NYSTRS Recommended Actuarial Assumptions 2021 Report
• Orange County Employees' Retirement System	Cost-sharing, defined benefit plan	50,633	$20,700,000,000	Full replication audit of the December 31, 2017 and December 31, 2021 actuarial

Client	Type of Plan and Number of Employers	Participants	Assets	Audit Performed
				valuations and review of actuarial assumptions and methods
• Pennsylvania Public School Employees; Retirement System	Defined benefit, single employer plan	657,000	$58,687,000,000	2022; full replication of June 30, 2020 actuarial valuation, and review of actuarial assumptions and GASB 67/68 disclosure
• Sacramento County Employees' Retirement System	Cost-sharing, defined benefit plan	37,700	$7,700,000,000	Full replication audit of June 30, 2016 and June 30, 2021 actuarial valuations and review of actuarial assumptions and methods
• San Bernardino County Employees' Retirement Association	Cost-sharing defined benefit plan; 21 employers	38,836	$9,200,000,000	Full replication of June 30, 2018 valuation, GASB 67 valuation and review of actuarial assumptions and methods
• San Diego County Employees' Retirement Association	Cost-sharing, defined benefit plan	42,800	$12,288,915,000	Full replication of the June 30, 2018 valuation and 2015-2018 Experience Study
• San Mateo County Employees' Retirement Association	Cost-sharing, defined benefit plan	12,736	$4,723,110,000	Full replication of the June 30, 2020 valuation and review of actuarial methods and assumptions
• Texas County and District Retirement System	Cost-sharing, defined benefit plan	57,997	$40,924,100,000	Full replication of June 30, 2020 valuation for 20 Districts
• University of California Retirement System	Single-employer, defined benefit plan	280,297	$48,700,000,000	Full replication audit of July 1, 2016 Retirement and OPEB Valuations and Independent Audit of July 2, 2014 to June 30, 2018 Experience Study
• Wisconsin Legislative Audit Bureau	Cost-sharing, multiple-employer, defined benefit plan	675,154	$125,111,518,064	Full replication audit of December 31, 2023 actuarial valuation; and review of GASB 67/68 disclosures

In addition to the audit work we have done for public sector systems, we also provide ongoing pension actuarial valuation services and actuarial consulting services to the following clients.

Client	Type of Plan and Number of Employers	Participants	Assets	Date of Hire
• Alameda-Contra Costa Transit District Employees Retirement Plan	Single employer	4,592	$776,785,000	1/1/2013
• Amalgamated Transit Union Local 900 Pension Plan	Single employer	158	$6,995,366	1/1/2007
• Arlington County Retirement System	Single employer	8,715	$29,761,000,000	4/3/2003
• Austin Fire Fighters Relief and Retirement Fund	Single employer	2,213	$1,115,832,870	12/1/2022
• Cincinnati Retirement System Pension	Single employer	8,638	$1,763,884,000	8/8/2018
• City of Alexandria Pension Plans	Single employer	4,344	$551,742,465	11/30/2010
• City of Allentown Pension Plans	Single employer	944	$284,395,284	7/12/2010
• City of Baltimore Fire and Police Employees	Single employer	9,969	$3,054,071,598	3/30/2012
• City of Kansas City, Missouri Employees Retirement System	Single employer	7,036	$1,160,655,852	1/1/2007
• City of Kansas City, Missouri Firefighters Pension System	Single employer	2,029	$6,023,383,893	1/1/2007
• City of Norfolk Employees Retirement System	Single employer	8,627	$1,244,910,000	6/1/2005
• City of Philadelphia Municipal Retirement System	Single employer	64,148	$6,939,833,896	8/7/2007
• City of San Jose Federated City Employees Retirement System	Single employer	11,312	$3,486,311,000	8/12/2010
• City of San Jose Police and Fire Department Retirement Plan	Single employer	4,730	$5,568,979,000	5/5/2011
• City of Wilmington Pension System	Single employer	2,744	$206,576,675	12/28/2011
• DART Contributory Pension Plan	Single employer	1,095	$63,933,076	5/7/2007
• Delaware Public Employees Retirement System	Cost-sharing; 150 employers	72,767	$9,696,899,100	6/1/2006
• Denver Employees Retirement Plan	Single employer	28,384	$2,486,313,817	12/11/2018
• Employees Retirement System of the City of Baltimore	Single employer	18,292	$1,740,450,176	5/5/2005
• Employees Retirement System of the City of St. Louis	Cost-sharing	12,487	$797,777,721	10/1/2010
• Fairfax County Retirement Systems	Single employer	32,797	$7,399,044,443	7/1/2003
• Firefighters Retirement Plan of the City of St. Louis	Single employer	682	$43,948,104	6/25/2014
• Golden Gate Transit-Amalgamated Retirement Plan	Single employer	617	$87,079,579	4/1/2013

Client	Type of Plan and Number of Employers	Participants	Assets	Date of Hire
• Hampton Employees Retirement System	Single employer	1,116	$61,861,497	8/27/2009
• Jackson County Revised Pension Plan	Single employer	3,848	$340,868,633	5/1/2016
• Knoxville Utilities Board Pension Plan	Single employer	1,056	$234,507,227	11/15/2011
• Maine Public Employees Retirement System	Cost-sharing and Agent	155,822	$15,075,604,606	3/1/2005
• Marin County Employees Retirement Association	Cost-sharing; 9 employers	7,487	$3,144,663,241	1/1/2013
• Maryland National Park and Planning Commission	Single employer	4,945	$1,127,163,977	3/7/2019
• Merced County Employees Retirement Association	Cost-sharing	6,124	$1,135,081,385	1/1/2013
• Metropolitan Relief Association Death Benefit Plan	Single employer	817	$14,972,083	1/6/2015
• Metropolitan Washington Council of Governments	Single employer	203	$70,448,751	4/1/2003
• Modesto Irrigation District	Single employer	1,037	$451,510	4/1/2019
• Newport News Employees Retirement Fund	Single employer	11,871	$993,211,071	6/3/2010
• Oakland Police and Fire Retirement System	Single employer	653	$416,130	9/18/2013
• Pasadena Fire Fighters Association Benefit Trust	Single employer	261	$7,905,746	1/1/2013
• Pennsylvania Municipal Retirement System	Agent, ~1000 employers	19,104	$3,019,421,000	10/1/2006
• Police & Fire Retirement System of Wichita, Kansas	Single employer	2,236	$805,749,251	7/15/2019
• Port Authority of Allegheny County Retirement and Disability Allowance Plan for Employees Represented by Local 85 of the Amalgamated Transit Union	Single employer	5,430	$759,398,625	1/1/2007
• Retirement Plan for Pace West Division Employees	Single employer	507	$26,172,443	1/1/2007
• Sacramento Regional Transit District	Single employer	2,241	$298,355,348	1/1/2013
• San Diego City Employees Retirement System	Agent; 3 employers	23,930	$10,598,771,205	6/14/2006
• San Diego Transit Corporation Pension Plan	Single employer	1551	$183,997,343	1/1/2013
• San Francisco City and County Employees Retirement System	Cost-sharing; 4 employers	81,175	$35,417,666,000	7/1/2008

Client	Type of Plan and Number of Employers	Participants	Assets	Date of Hire
• San Joaquin County Employees Retirement System	Cost-sharing	14,523	$3,244,361,827	1/1/2013
• Santa Barbara County Employees Retirement System	Cost-sharing	11,487	$4,132,090,000	1/1/2013
• Santa Clara Valley Transportation Authority ATU Pension Plan	Single employer	3,226	$632,627,301	1/1/2013
• Stanislaus County Employees Retirement Association	Cost-sharing	9,793	$2,182,200,000	1/1/2013
• State of New Jersey Division of Pensions and Benefits	Single and cost-sharing plans, 1,672 employers	720,410	$70,372,562,728	8/1/2018
• State Teachers Retirement System of Ohio	Cost-sharing	525,540	$85,001,128,147	5/23/2018
• Sussex County Employee Pension Plan	Single employer	810	$82,759,578	2/1/2016
• The Police Retirement System of St. Louis	Single employer	2,936	$871,099,654	6/1/2012
• Tri-County Metropolitan Transportation District of Oregon	Single employer	3,857	$693,134,687	2/28/2018
• Tulare County Employees Retirement Association	Cost-sharing	9,805	$1,587,476,000	5/6/2015
• U.S. Court of Appeals for Veterans Claims	Single employer	20	$53,562,311	4/1/2003
• United States Army Nonappropriated Fund Employee Retirement Plan	Single employer	61,012	$2,326,400,000	8/1/2003
• Washington Metropolitan Area Transit Authority Retirement Plan	Single employer	1,638	$347,330,827	7/1/2009
• Washington Metropolitan Area Transit Authority, Local 2 Retirement Plan	Single employer	425	$148,050,475	7/1/2009
• Washington Metropolitan Area Transit Authority, Local 922 Retirement Plan	Single employer	795	$238,948,567	6/1/2004
• Washington State Council of Fire Fighters Employee Benefit Trust	Single employer	11,068	$18,130,000	5/22/2014
• Wichita Employees Retirement System	Single employer	3,075	$667,029,106	7/15/2019

4.3 STAFF QUALIFICATIONS

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

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

Please see the following pages for resumes of our proposed team members.

Michael J. Noble, FSA, EA, MAAA, FCA
Principal Consulting Actuary

Michael Noble has 26 years of experience consulting with clients on issues relating to accounting disclosures, plan administration, plan design, and pension and retiree medical valuations for both private and public sector clients.

Mike is part of the team that serves as the State Actuary for Illinois. This position was created by legislation in 2012 to assist the Office of the Auditor General in reviewing the assumptions and methods employed by the five statewide systems. In this role he has been partly responsible for encouraging greater disclosure of the challenges facing these systems.

His other public sector experience includes consulting with the City of Detroit, the Maine Public Employees Retirement System, the State Teachers Retirement System of Ohio, the Jackson County Missouri Revised Pension Plan, the Employees Retirement System of the City of St. Louis, and the Police Retirement System of St. Louis where has provided annual valuation and consulting services. This has included testifying before legislatures, preparing cost studies of legislative proposals, and preparing experience studies for evaluating assumption changes.

Mike has also worked on several special projects including analyzing the impact of alternative plan designs on member benefits and funding requirements for a large public plan, auditing the long-term projections under various economic scenarios and plan designs for a major state retirement system, and auditing the valuations performed by other firms. He has developed Rehabilitation and Funding Improvement Plans for multiemployer plans in critical and endangered status under the Pension Protection Act, consulted on plan terminations, and assisted with the potential merger of multibillion-dollar plans.

He joined Cheiron in November of 2007.

Before joining Cheiron, he was an actuarial consultant with large consulting firms where he provided actuarial services to organizations in several industries ranging from small nonprofit organizations to large publicly traded companies on a range of pension and Other Post-employment Benefit issues.

Mike is a Fellow of the Society of Actuaries, a Fellow of the Conference of Consulting Actuaries, a Member of the American Academy of Actuaries, and Enrolled Actuary under ERISA. He has a Master of Science for Teachers in Mathematics from the University of New Hampshire and graduated *summa cum laude* with a Bachelor of Science in Mathematics from Oral Roberts University.

Contact
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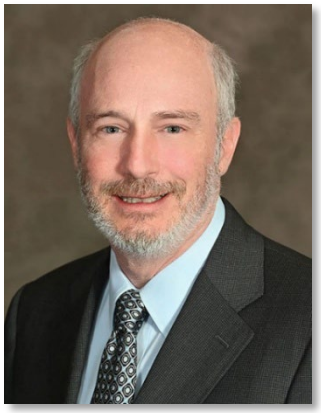
William Hallmark, ASA, EA, MAAA, FCA
Consulting Actuary



William Hallmark is a nationally respected retirement consultant with more than three decades of experience advising public pension plans.

His experience includes serving as the lead actuary for the Oregon Public Employees Retirement System and San Francisco Employees' Retirement System.

He has also audited the California Public Employees' Retirement System and the California State Teachers' Retirement System, the Teachers' Retirement System of Illinois, the State Employees' Retirement System of Illinois, the Public Employees' Retirement System of Washington, the Public Employees' Retirement Association of New Mexico, the Utah Retirement System, the Texas County and District Retirement System (TCDRS), and the Arizona State Retirement System.

He specializes in financial management, designing plans, complying with financial accounting and funding requirements, and retirement valuations. He also developed a framework for analyzing funding strategies for unfunded retiree medical liabilities, designing hybrid plans, and managing risk.

He led various committees of the American Academy of Actuaries, the Conference of Consulting Actuaries and other professional organizations and speaks frequently at industry conferences. Bill served on the advisory committee for the GASB Implementation Guide for Statements 67 and 68.

He joined Cheiron in September 2009 and opened the firm's Portland, Oregon, office.

Bill is an Associate of the Society of Actuaries, an Enrolled Actuary under ERISA, a Member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries. He graduated with a Bachelor of Science from the University of Oregon.

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Daniel Rhodes, FSA, MAAA, FCA
Principal Consulting Actuary

Danny Rhodes has more than 22 years of experience as a health actuary working with public sector, multiemployer, and single-employer plans.

His experience includes retiree medical valuations, retiree drug subsidy attestations, Affordable Care Act minimum value certifications, incurred but not reported reserves, and self-funded rate projections. He has provided OPEB valuations and actuarial consulting services to the states of Arizona, Connecticut, Delaware, Missouri, Nebraska, Nevada, New Hampshire, North Carolina, and Wisconsin; the Ohio State Teachers Retirement System; the counties of Kern, CA, and Barnstable, MA; and the cities of Bakersfield, CA, Boston MA, and Providence, RI.

He is a member of the Actuarial Standards Board Task Force to revise Actuarial Standard of Practice #6, and Vice-Chair for the cross-practice Disability, Long-Term Care, and Long-Duration Health Contracts Exam for the Society of Actuaries.

He frequently speaks on actuarial topics to the Massachusetts Government Finance Officers Association, the Massachusetts Collectors Treasurers Association, the Massachusetts Municipal Association, the Massachusetts Public Employees Retirement Administration Commission, the Connecticut Conference of Municipalities, the New Mexico Retiree Health Care Authority, and the Air Line Pilots Association.

He joined Cheiron in May 2024. He was previously a senior vice president and consulting actuary at Segal.

He is a Fellow of the Society of Actuaries, a Member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries. He received a Bachelor of Arts with Honors in Applied Mathematics from Harvard University.

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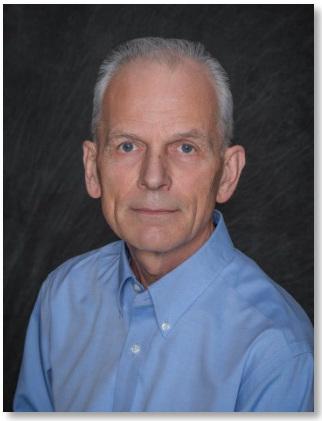
Michael Moehle, FSA, EA, MAAA, FCA
Public Pension Oversight



Michael Moehle has 45 years of experience as an actuarial consultant working with California and other Western public sector and corporate pension funds.

He performs internal audits and reviews of all public sector and multiemployer pension work at Cheiron. In that role, he conducts independent validations of liability and asset valuation results. He also reviews valuation assumptions and methods for compliance with applicable actuarial and GASB standards along with written evaluations of compliance with Cheiron's internal quality control guidelines.

He also has participated in many of our public sector external audits, including those for the Counties of Kern, Orange, San Mateo, Sacramento, San Bernardino and San Diego. He led audits of the Public Employees' Retirement System of Mississippi, New York State Teachers' Retirement System, Pennsylvania School Employees Retirement System, Texas County and District Retirement System and the Wisconsin Retirement System.

He previously worked at the City of San Jose Retirement Services, California, as the in-house actuary and consultant. Before joining the City of San José, he was a principal and senior consultant with a large national benefit consulting firm in California and worked with several California 1937 Act County Retirement Systems. He also advised statewide public employees retirement systems in Nevada, North Dakota, Minnesota, and Washington, and provided funding valuations and GASB 25, 27, 43 and 45 valuations and disclosures, and analysis and consulting on plan changes and plan alternatives.

He joined Cheiron in July 2011.

He is a Fellow of the Society of Actuaries, an Enrolled Actuary under ERISA, a Member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries. He graduated with a Bachelor of Science with a double major in Mathematics and Economics from Southern Illinois University.

Contact
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mmoehle@cheiron.us / 877-243-4766 Ext.1123

Steven M. Hastings, FSA, EA, MAAA, FCA
Consulting Actuary

Steven Hastings has more than two decades of experience advising public, multiemployer, and single-employer pension plans. He has also worked with retiree medical plans.

His experience includes plan design, valuation, experience studies, funding and financial accounting studies, and plan administration. He helped conduct full replication audits for public pension plans, examined costs for pension plans and retiree medical plans in union negotiations, and prepared financial disclosures under GASB 67 and 68.

He serves as backup actuary for several public sector clients, including the Federated City Employees' Retirement System of San Jose (CA), the Tulare County (CA) Employees' Retirement Association, and the Tri-County Metropolitan Transportation District of Oregon Plans.

His public sector audit clients include the Missouri Department of Transportation & Patrol Employees' Retirement System (MPERS), the California State Teachers' Retirement System (CalSTRS), and 1937 Act California plans – the Mendocino County Employees Retirement Association and the San Bernardino County Employees' Retirement Association.

He joined Cheiron in June 2017.

He is a Fellow of the Society of Actuaries, the highest professional accreditation, an Enrolled Actuary under ERISA, a Member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries. He received a Bachelor of Science in Mathematics with a minor in Economics from the University of Puget Sound, where he graduated *magna cum laude* with Honors in Mathematics.

Contact
600 Stewart Street, Suite 400
Seattle, WA 98101
shastings@cheiron.us / 877-243-4766 Ext. 1157

Kathleen Weaver, FSA, MAAA, EA, FCA

Principal Consulting Actuary

Kathy Weaver has worked as an actuary since graduating from Towson University in 1999. She joined Cheiron in June 2010. She specializes in postretirement benefit plans, both private and public sector experience and has extensive experience in the employee benefits arena, which includes pension and retiree medical actuarial valuations, plan design studies, benefit calculations and benefit statements, government filings, experience studies, and programming actuarial models.

Her most recent projects include

- Annual pension valuation work for the Cities of Alexandria and Newport News in Virginia, and the State of Maine
- Annual OPEB valuation work for the Cities of Alexandria, Arlington and Newport News in Virginia, Knoxville Utilities Board, the District of Columbia, the City of Oakland (California), the Tri-County Metropolitan Transportation District of Oregon, Metropolitan Water District of Southern California, Pittsfield Charter Township (Michigan), Alexandria City Public Schools, Arlington Public Schools, and West Chester County Health Care Corporation
- Annual Line of Duty OPEB valuation work for Cities of Alexandria, Hampton and Newport News in Virginia
- Projections of liabilities and costs to assist with budgeting process, funding policy analysis, and legislative changes
- Review of Plan experience for assumption setting

She is a Fellow of the Society of Actuaries, a Member of the American Academy of Actuaries, an Enrolled Actuary under ERISA, and a Fellow of the Conference of Consulting Actuaries. She graduated *summa cum laude* from Towson University with a Bachelors of Science in Mathematics.

Contact

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McLean, VA 22102
kweaver@cheiron.us / 877-243-4766 Ext. 1026

Our proposed personnel exceed your requirements.

Proposed Role	Key Personnel	Relevant Experience
Co-Lead Actuary & Project Director	**Bill Hallmark**	Bill has considerable experience auditing statewide public retirement systems comparable in size and scope to the ORSC. He has audited the California Public Employees' Retirement System and the California State Teachers' Retirement System, the Teachers' Retirement System of Illinois, the State Employees' Retirement System of Illinois, the Public Employees' Retirement System of Washington, the Public Employees' Retirement Association of New Mexico, the Utah Retirement System, the Texas County and District Retirement System (TCDRS), and the Arizona State Retirement System. He is a former Vice President of Pensions for the American Academy of Actuaries and current member of the Board of the Conference of Consulting Actuaries.
Co-Lead Actuary & Technical Reviewer	**Michael J. Noble**	Mike leads the team that serves as the State Actuary for Illinois, a position created by legislation in 2012 to assist the Office of the Auditor General in reviewing the assumptions and methods of the five statewide systems. He was a co-lead of our team that audited the Wisconsin Retirement System in 2024. He is also co-lead consultant for STRS Ohio pension.
OPEB Lead	**Daniel Rhodes**	Danny has decades of OPEB leadership with the States of Arizona, Connecticut, Delaware, Missouri, Nebraska, Nevada, New Hampshire, North Carolina, and Wisconsin, and is currently co-lead for OPEB for STRS Ohio.
Technical and Audit Expert	**Mike Moehle**	Mike's significant public sector engagements include leading audits for the Mississippi Public Employees' Retirement System, New York State Teachers Retirement System, California State Teachers' Retirement System, Texas County and District Retirement System, and the Pennsylvania Public School Employees' Retirement System. Mike has been the audit specialist and project manager for many audits including those for of the Los Angeles City Employees Retirement System, Mississippi Public Employees' Retirement System, Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS), Municipal Employees' Retirement System of Michigan (MERS), New Mexico Public Employees' Retirement Association, Orange County Employees' Retirement

		System, Pennsylvania Public School Employees' Retirement System, San Diego County Employees' Retirement Association, and the University of California Retirement System.
Project Mgr. (Pension)	**Steven Hastings**	Steven has worked as project manager or lead on several public sector audits, including engagements for two statewide retirement systems: Missouri Department of Transportation & Missouri State Highway Patrol Employees' Retirement System, and the California State Teachers' Retirement System.
Project Mgr. (OPEB)	**Kathleen Weaver**	Kathy has performed an OPEB audit for the Los Angeles City Employees' Retirement System and pension audits for New Mexico and Washington State, as well as annual OPEB valuation work for the Cities of Alexandria, Arlington and Newport News in Virginia, Knoxville Utilities Board, the District of Columbia, the City of Oakland (California), the Tri-County Metropolitan Transportation District of Oregon, Metropolitan Water District of Southern California, Pittsfield Charter Township (Michigan), Alexandria City Public Schools, Arlington Public Schools, and West Chester County Health Care Corporation; and Annual Line of Duty OPEB valuation work for the Cities of Alexandria, Hampton and Newport News in Virginia.

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

Cheiron uses co-lead consultants to service our clients. We do not expect any departures, but if a co-lead becomes unavailable, the other co-lead will immediately assume full responsibility to ensure seamless continuity. This approach provides a knowledgeable and experienced actuary as backup to ensure the continued delivery of expert advice.

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

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

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

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

Management Plan

The actuarial audit will be directed by the co-lead actuaries, Bill Hallmark and Mike Noble, who will be the primary contacts to the PERS and ORSC and will attend most meetings. Bill and Mike will also be responsible for drafting reports and other communications regarding the audit.

Danny Rhodes will be responsible for reviewing the health-related aspects of the OPEB valuation. He will also attend meetings as needed.

Steven Hastings will manage the audit project. He will supervise a team of actuarial analysts. Steven will also be available as a day-to-day contact regarding issues such as data collection and processing questions.

Kathy Weaver will manage the OPEB aspects of the audit project.

Mike Moehle is the proposed audit specialist for this engagement. He brings decades of experience reviewing data, valuation coding, cost calculations, and reports to our proposed team.

The bios and the table above provide details on how the individuals on the project team meet the required criteria and the roles each performed on relevant projects.

The estimated overall time allocation of these individuals to the total audit time is as follows:

- Bill Hallmark 15%
- Mike Noble 15%
- Danny Rhodes 10%
- Mike Moehle 16%
- Steven Hastings 18%
- Kathy Weaver 8%
- Actuarial analysts: 15%
- Administrative staff: 3%

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

Cheiron currently serves as the consulting actuary for the State Teachers Retirement System of Ohio (STRS). Cheiron does not believe that this relationship constitutes a conflict of interest relative to performing the independent actuarial audit of PERS. PERS and STRS are distinct, legally separate retirement systems, and our consulting work with STRS will not affect or be affected by our audit of PERS for the ORSC. Cheiron's role for this proposal is strictly that of an independent auditor, reviewing the work of a third-party actuary (GRS) for PERS, to determine the reasonability and appropriateness of the most recent PERS experience study and actuarial valuations.

4.4 REFERENCES

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

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

Client:	**Illinois Office of the Auditor General**
Contact:	Joe Butcher, Director, Performance Audit Division 400 W. Monroe St. Springfield, IL, 62704 JButcher@auditor.illinois.gov / 217-785-1502
Description of Work:	State Actuary from 2012 to present, reviewing actuarial assumptions, methods, and the calculation of the State contribution for each of the five statewide retirement systems and Chicago Teachers Pension Fund; Review of annual economic and triennial demographic experience studies; produce reports for Auditor General and Legislature

Client:	**California State Teachers Retirement System**
Contact:	David Lamoureux, Deputy System Actuary 100 Waterfront Place West Sacramento, CA 95605 DLamoureux@CalSTRS.com / 916-414-1303
Description of Work:	Replication and review of the 2008 Defined Benefit Program valuation. Replication and review of the 2015 DB Supplement and Cash Balance valuations and the 2014 MPP valuation. Replication and review of 2010-2015 experience analysis. Replication and review of all 2019 actuarial valuations and 2020 experience analysis.

Client:	**Texas County and District Retirement System (TCDRS)**
Contact:	Chris Bucknall, Director of Actuarial Services P.O. Box 2034 Austin, TX 78768 Chrisb@tcdrs.org / 800-823-7782 Ext. 208

Client:	Texas County and District Retirement System (TCDRS)
Description of Work:	Independent audit of January 1, 2017 to December 31, 2020 experience analysis; Full replication audit of the December 31, 2020 valuation for a sample of 20 employer plans.

Client:	State of Wisconsin Legislative Audit Bureau
Contact:	Erin Scharlau, Financial Audit Director State of Wisconsin Legislative Audit Bureau 22 East Mifflin Street, Suite 500 Madison, Wisconsin 53703 Erin.Scharlau@legis.wisconsin.gov / 608-266-2818
Description of Work:	Full replication audit of December 31, 2023 actuarial valuation; Independent audit of January 1, 2018 to December 31, 2020 experience analysis; and review of GASB 67/68 disclosures

4.5 METHODOLOGY, WORK PRODUCT, AND TIMELINE

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

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

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

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

- ***Data Validity -*** *Assessment of the validity, completeness, and appropriateness for PERS' structure and funding objectives of the demographic and financial information used by the consulting actuary in the valuations of PERS.*

Cheiron will request the original census data from PERS that was provided to the consulting actuary. Cheiron will also request from the consulting actuary the processed data that was used to produce the valuations. By having these two sets of files, Cheiron will be able to determine whether the data used for the valuations were appropriate and complete. This process will include a review of records that have been adjusted for data discrepancies. Cheiron will pay particular attention to participants whose status has changed from active to retired status. We will request from the consulting actuary detailed sample life output for a few of the active to retiree transfers in order to determine whether the liability and reserves have been calculated consistently.

Cheiron will also request the financial statements used to produce the valuations from PERS. These statements should include a reconciliation from the prior valuation date, contributions made to the system, benefits paid from the system, expenses, and investment returns.

Our review will also consider the requirements of Actuarial Standard of Practice No. 23, *Data Quality*.

- ***Actuarial Valuation Method and Procedures -*** *Assessment of whether the consulting actuary's valuation method and procedures are reasonable and consistent with generally accepted actuarial standards and practices appropriate for PERS' structure and funding objectives and are applied as stated by the actuary. If deviations from accepted standards are found during the audit, the Contractor should obtain the rationale for the deviations and determine their effects, including their monetary impact.*

  Cheiron's review of the valuation methods and procedures will encompass each of the items specified above and will consider all of the following:

  - Relevant Actuarial Standards of Practice (ASOPs): These primarily include, ASOP No. 4 (*Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*), No. 6 (*Measuring Retiree Group Benefits Obligations and Determining Retiree Group Benefits Program Periodic Costs or Actuarially Determined Contributions*), and No. 44 (*Selection and Use of Asset Valuation Methods for Pension Valuations*).

  - GASB Statements No. 67, 68, 74 and 75: We will determine whether the methodology is appropriate for reporting results within the System's and the employers' financial statements.

  - Goals and objectives of the retirement system and of the participating employers. In order to help determine these goals, we will speak with PERS staff.

  - Long-term implications of the actuarial funding methods. For this analysis, Cheiron will use our proprietary projection software tools *P-Scan* and *H-Scan,* as described

below, which will permit us to illustrate how the funding method will react to varying future economic scenarios. This process is described below.

We will request a number of sample lives from the consulting actuary to determine how the valuation method(s) and assumptions have been applied in the determination of liabilities under the valuation. We will also ask for sample lives of recent retirees to compare against actual benefits in payment status to determine if the assumptions are a fair predictor of the ultimate obligations of the System.

Our proprietary *P-Scan* and *H-Scan* models will provide us with insight as to how the assumptions and funding policy align with the long-term objectives of PERS. These projections are useful to further improve the ORSC's understanding of the risks associated with PERS and make prudent and informed recommendations to the Legislature.

Each *P-Scan/H-Scan* is customized so that it reflects the current operation of the plan and can have a variety of policy options programmed in to facilitate discussion of alternatives.

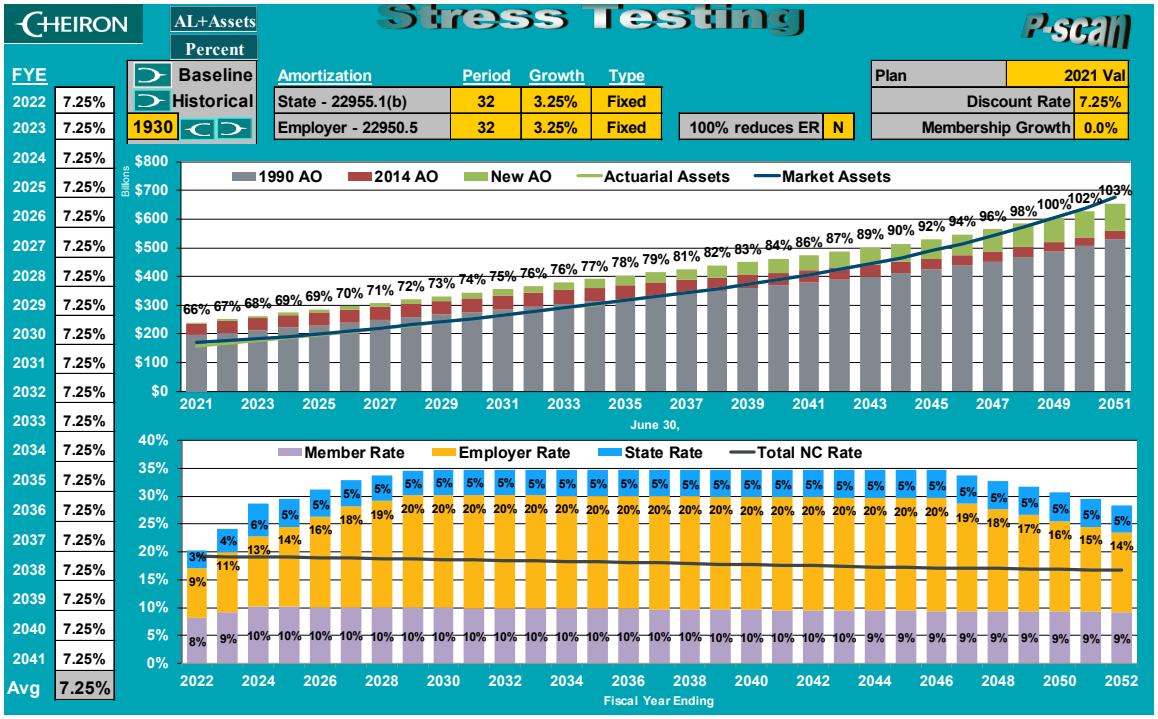
Our P-Scan Interactive Model

Our modeling is performed for all of our recurring client work as well as for actuarial audits. This modeling allows us to determine the implications of the current results for the future and identify results that are not intuitive and/or reflect inconsistencies in the methods and assumptions. This modeling will be an integral part of our report, providing an assessment of the plan's risks, how the valuation methods and assumptions mitigate the risk, and whether the System's financial objectives are being met.

P-Scan is our proprietary software that forecasts assets and liabilities based on any user-selected economic scenario. Additionally, we can enhance our standard forecasts to include any other projections required, for example, changes in benefits, assumptions, funding methods, and contributions. *P-Scan* can also perform multiple stochastically based forecasts, enabling all our projections to incorporate probabilistic answers.

For plan reviews, audits and replications, the *P-Scan* modeling can demonstrate the effectiveness of the funding methods and assumptions in meeting explicit or implicit funding policies of the System. The modeling can also easily demonstrate the long-term implications of changing such policies or responding to current or projected economic conditions, as well as demonstrate the impacts of legislative changes.

The following screenshot from *P-Scan* is intended to illustrate its capabilities and how using this tool in our consulting is different from what our competitors provide. If selected for a finalist presentation, we would be happy to demonstrate the interactive capabilities of this tool.

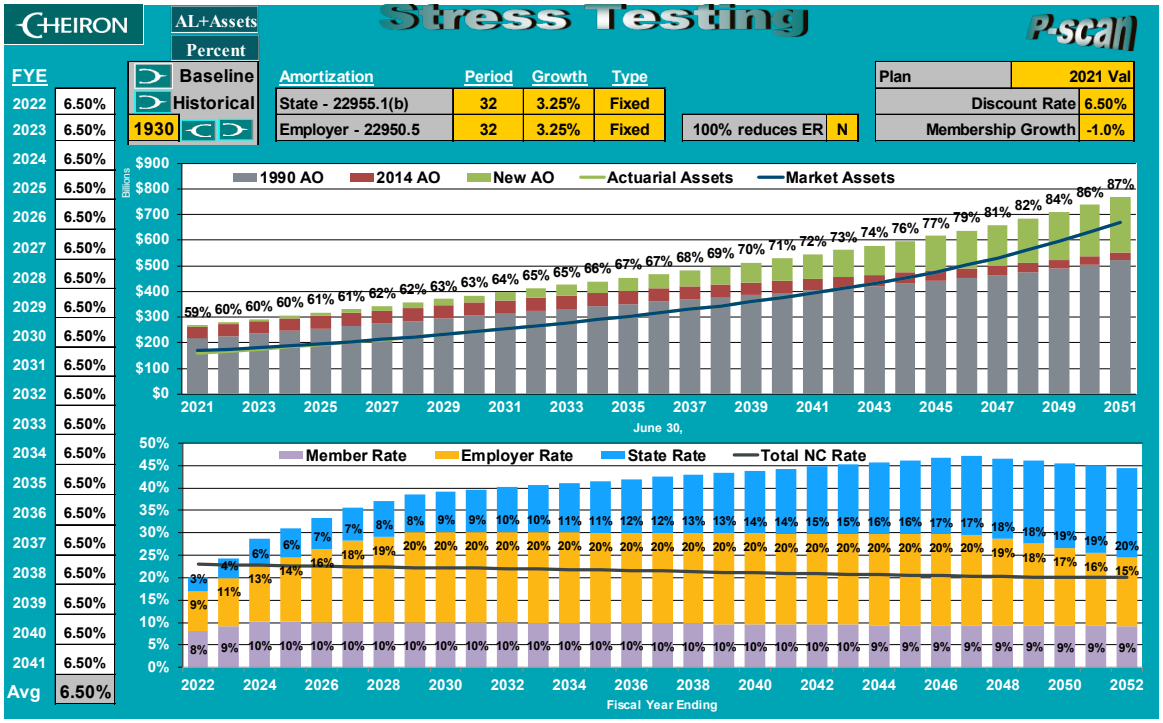


The orange boxes across the top represent variables that can be changed interactively. These variables are customized for the specific topics of interest to clients. For example, we can program discount rate changes, other assumption changes, or benefit changes for current and/or future members.

The top graph shows the projected actuarial liability by benefit formula change (the gray, red, and green bars) and the actuarial and market value of assets (blue and green lines). The numbers above the bars represent the projected funded status. The bottom graph shows the projected contributions for the members, employers, and the state. The black line on this graph represents the contribution attributable to the normal cost. All contributions above the black line go toward the unfunded liability. In this example, the employer and state contributions vary according to parameters set in statute.

On the left side of the screen, the actual investment return is shown for each year of the projection. These returns can be changed to develop different economic scenarios. This particular scenario represents the baseline projection, using the assumed rate of return of 7.25%.

We believe that communicating the potential risks in a system is fundamental to our work. This includes demonstrating the sensitivity to a variety of scenarios and understanding what could harm the system. The screenshot below shows the same Stress Test but assuming the discount rate is reduced to 6.50% and active membership declines by 1% each year. Under the statutory contribution structure, funding levels are much lower even as the state's contribution rate increases significantly.



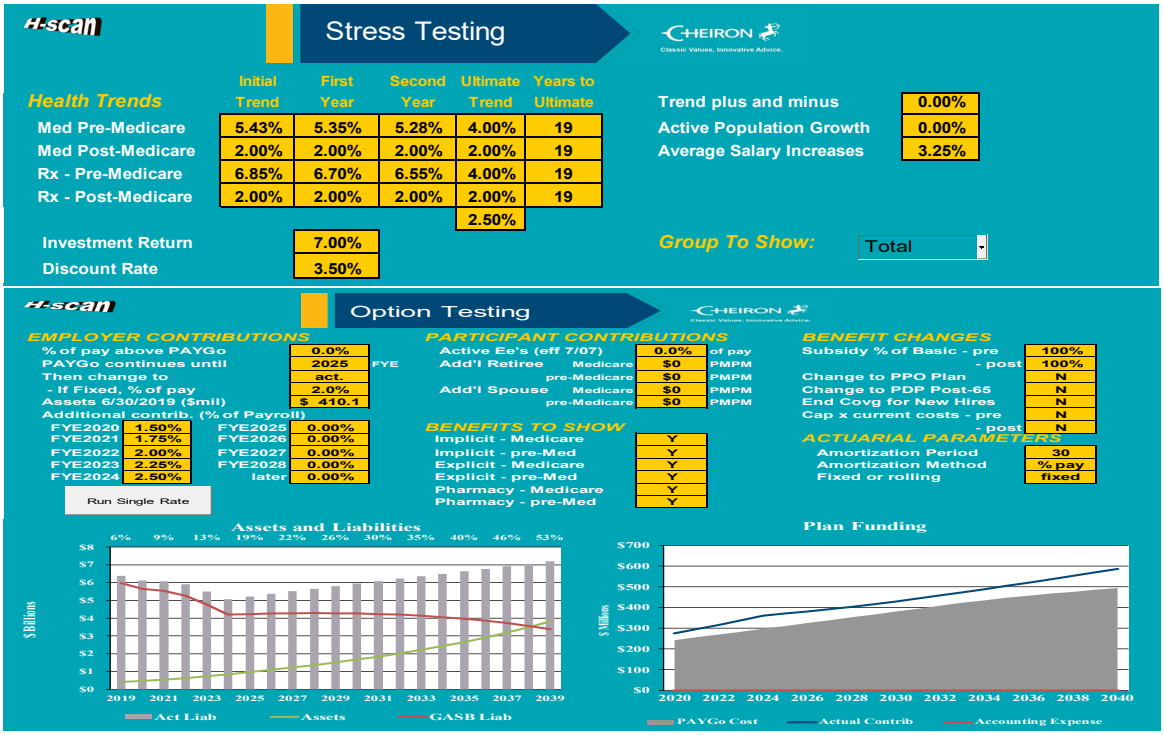
It is important to note that *P-Scan* is a regular part of our actuarial auditing process and not an optional add-on. We will use it at our Board presentation as well as within the actuarial audit report.

Our H-Scan Interactive Model

H-Scan provides similar interactivity as *P-Scan* but applied to health plans, with the OPEB module focusing on retiree health (and other postemployment benefits). In the screenshot that follows, the left graph shows the projected actuarial liability (gray bars), the market value of assets (green line), and the liability for the financial statements (the Net OPEB Liability). The numbers at the top of the bars represent the projected funded status. The right graph shows the projected contribution rates for both the employer and (if any) employees, compared to the pay-as-you-go costs (benefits for retirees net of any retiree contributions). The line on this graph represents the accounting expense.

The top of the screen contains the key assumptions, including health care trend, discount rate, and salary scale. Specific inputs are customized based on the client's plan and funding approach. The actual investment return and employer contribution rates are shown for each year of the projection, or we can model pay-as-you-go funding. As with *P-Scan,* we can model changes in investment return; however, most retiree health care plans are less funded and, therefore, less sensitive to this assumption. Of more interest are usually changes to health care trends and the assumed discount rate.

Any potential scenario of health care trends, discount rates, and/or funding approaches may be modeled.



- ***Actuarial Valuation Assumptions*** *- Assessment of whether the actuarial valuation assumptions are reasonable and consistent with generally accepted actuarial standards and practices; are reasonable based on PERS' experience; and are appropriate for PERS' structure and funding objectives. The assumptions evaluated should include both demographic and economic assumptions, such as mortality, retirement, separation rates, levels of pay adjustments, rates of investment return, and disability factors. As part of this assessment, the Contractor should consider and specifically address whether actual experience is appropriately evaluated in experience studies conducted by the consulting actuary at least every five years and whether recent changes in assumptions are appropriate, reasonable, and supported by the experience studies. Also, the Contractor should review the gain/loss analyses from the last four actuarial valuation reports.*

We will review the most recent experience study to determine if the actuarial assumptions used in the actuarial valuations being reviewed are reasonable and consistent with generally accepted actuarial standards and practices. We will use information provided by the System actuary, industry trends, and professional judgment in this process. Below we describe in additional detail some of the considerations for specific assumptions.

Actuarial assumptions are intended to be the actuary's best estimate of the future experience of the System. However, since the future is unknown, the actuaries develop

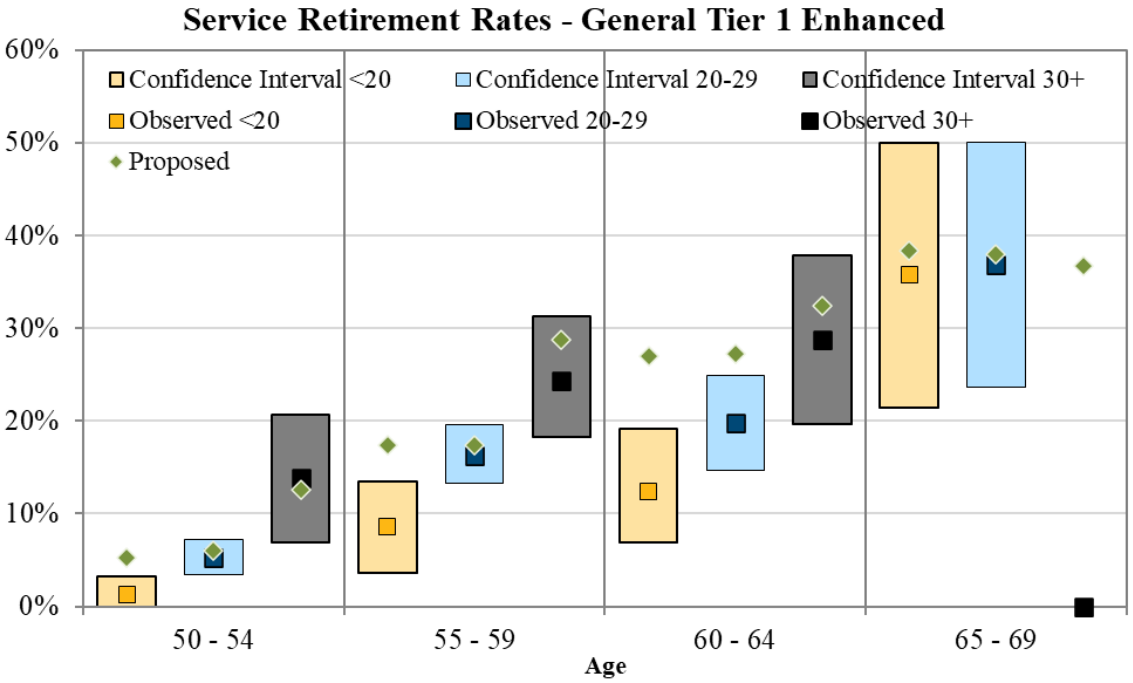
these estimates based on a combination of historical experience, anticipated changes to historical patterns in the future, professional judgment, and the degree of conservatism desired.

For most demographic assumptions, historical experience is an appropriate guide, but this experience should be modified for any expected trends in the future. For example, there is a long historical trend of improvements in mortality, so mortality assumptions include a continued trend of future improvements in mortality.

Our analysis of demographic assumptions will rely upon the information provided in the latest experience study. Our experience study tools allow us to perform statistical analyses and examine the assumptions and historical experience quickly, assessing whether the proposed assumption is reasonable or if there is a different structure to the assumption that captures the underlying experience better.

These tools also allow us to generate charts showing confidence intervals that make the statistical conclusions easy for a layperson to see. For example, in the following chart, the dark squares represent the actual experience observed, and the colored bars represent the 90% confidence interval around that experience, which means the true retirement rate is expected to be within the range 90% of the time. The size of the bars reflects the amount of data available, with shorter bars indicating more data and more confidence that the observed rate is accurate.

The colors represent different service ranges (i.e., gold for less than 20 years, blue for 20 to 29 years, and gray for 30 or more years). The green diamonds are the actuary's proposed assumption. The actuary's analysis had only separated assumptions for those with less than 30 years of service from those with 30 or more years. This analysis illustrated that before age 65, retirement rates for individuals with less than 20 years of service were lower than those with 20 to 29 years of service, and the difference was statistically significant, warranting separate assumptions for those with less than 20 years of service.



Similarly, for retiree health care costs, historical experience is a starting point. However, such experience must be adjusted for changes that have been adopted or are expected in this rapidly changing environment. The data collected for the review of retiree contributions will also be used to evaluate the assumptions for future retiree claims and expenses, as well as for retiree contributions.

For some economic assumptions, such as inflation, there are measures in the market that provide a market consensus assumption about the future, which we weigh heavily in the context of historical patterns. We will also request the capital market assumptions and target asset allocation used by PERS to determine if the investment rate of return is reasonable. The retiree health care trend and discount rate assumptions will be reviewed for consistency with the other economic assumptions. While the emphasis is on expectations for the future, the economic assumptions will also be compared with assumptions used by other large public retirement systems.

The actuarial assumptions will also be reviewed with respect to Actuarial Standards of Practice No. 27 (*Selection of Assumptions for Measuring Pension Obligations*). Assumptions specific to the OPEB valuation will be reviewed with respect to ASOP No. 6 (*Measuring Retiree Group Benefits Obligations and Determining Retiree Group Benefits Program Periodic Costs or Actuarially Determined Contributions*).

The degree of conservatism will be assessed after considering the long-term objectives of the system and the employers, and recognizing which assumptions present the greatest risk to the system.

To the extent that we might have a material disagreement in the selection of any assumptions, we will comment on the approximate effect on system liabilities.

- ***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.*

  To audit the results of the actuarial valuations, including the development of actuarial liabilities and contribution rates as well as the proper application of the methods and assumptions, we propose the following methodology.

  Review Plan Provisions – To start the project, we will review the provisions of the plan both as written in statute and as summarized in the actuarial valuation reports and member handbooks.

  Data Testing – To test the validity of the data used in the actuarial valuation, we will collect the raw census data provided to the consulting actuary and the final census data used in the valuations. We will review the procedures used by the consulting actuary to process the data, and we will compare summary statistics between the raw and processed data to determine if they are substantially the same, reflecting the processing performed by the consulting actuary. We will also test the data to make sure it is complete and reasonable.

  Actuarial Assumptions – We will collect the full set of actuarial assumption tables from the consulting actuary to compare to those reported in the valuation and experience study reports.

  Replication of Liabilities – To test the calculation of the actuarial liabilities, we will independently program the plan into our valuation systems using the data and assumptions provided by the consulting actuary. We will then compare our calculated liabilities, including present value of future benefits, actuarial liability and normal cost, with the liabilities calculated by the consulting actuary. The comparison will be made for active members and inactive members for both the pension and retiree health valuations. Calculations for individual decrements may also be compared as needed.

  It should be noted that due to differences in valuation systems and other factors, it is common for the actual calculated values to differ slightly from one actuarial system to another. However, significant differences would require additional analysis to explain the source of the difference and verify the results of the valuation.

  Sample Life Review – To further test the accuracy of the liability calculations and to ensure that all benefits are being properly valued, we will select some test cases from the data and ask the consulting actuary to provide full sample life output from their valuation systems on those individual test cases.

Historical Review – As part of our audit process, we will ask for a minimum of five years of past valuation results to build what we refer to as a ***Trend Model***. This model incorporates key results from past reporting and allows us to demonstrate if the results in the year of the audit are consistent with the past, and if not, why.

Review of Actuarial Value of Assets – We will ask for the last five years of the market value of assets and will reproduce the calculation of the actuarial value of assets produced in the actuarial valuation reports.

We will also build our ***P-Scan*** and ***H-Scan*** models in this phase of the assignment. Our modeling is performed for all of our recurring client work as well as for actuarial audits. This modeling is an integral part of our quality control cycle because by projecting valuation results, we can make a determination of the implications of the current results into the future and identify results that are not intuitive and/or reflect inconsistencies in the methods and assumptions. This modeling, discussed previously, will be an integral part of our report in providing an assessment of the retirement system's risks and how the valuation process, methods and assumptions act in mitigating the risk.

Review of Actuarial Methods – The actuarial methods, including cost method, asset valuation method, amortization method, and other processes used to develop contribution rates and remaining amortization periods, must meet all applicable Actuarial Standards of Practice where they are not otherwise prescribed by law, as well as being consistent with the System's benefit structure and the objectives of the PERS Board. As we review the selection of the actuarial methods, we will form an opinion about whether the funding policies are appropriate and reasonable.

To illustrate the impact of the selected actuarial methods compared to alternatives on a macro level, we will again apply our proprietary *P-Scan* and *H-Scan* models to perform a series of "what if" projection scenarios as well as stochastic projections to determine the long-term implications of the current set of methods and assumptions. This modeling will allow ORSC to see how well the current and alternative methods achieve given objectives under a variety of stresses.

Review of Accounting Disclosures – We will review the accounting disclosures included in the actuarial report to determine whether these disclosures comply with the requirements of GASB 67, 68, 74, and 75.

- ***Recommendations -*** *If the Contractor recommends assumption adjustments to more accurately reflect present and future assets, liabilities, and costs of PERS, the Contractor should provide detailed rationale for your recommendations and describe the general effect on PERS' condition resulting from the proposed changes in assumptions.*

  If, in our review, we identify any actuarial assumptions where we recommend that the PERS Board should consider alternative assumptions, we will provide a detailed

explanation of why we are recommending this change as well as the general impact such a change would have on the results of the valuation.

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

  To start, we will meet with the appropriate parties to understand what the underlying goals and philosophies are regarding retiree contributions and to know what the intent is of the retiree contribution policy. (For example: What portion of the costs are retirees supposed to pay? Does that portion vary for dependents? By Medicare status?)

  We will then review the data and methods used to determine the retiree contributions, and review the actual calculations made to determine the retiree contribution rates. We envision this review will include several years of calculations to see how changes in the plans available, fluctuations in claims/premiums, and changes in enrollment affect the calculations. We will compare those to best practices in the industry, based on our consulting to other public sector entities. We will also stress test the calculation methods to identify any potential risks (for example, if the plan is at risk for a "death spiral" if enrollment drops.)

  Finally, we will compare the calculation of the retiree contributions to the data received for the retiree health valuation (as well as more recent data if the rates have changed since the valuation) to ensure the implementation is consistent with the retiree contribution rates determined.

  If we find any issues, we will report the potential impact of making changes on both the retirees and on the System.

Please see Appendix A for a sample actuarial audit report.

Timeline

The timeline below is based on our current understanding of the project. If selected, we anticipate reviewing the project and the timeline with the ORSC and PERS and making appropriate adjustments as warranted.

1) Kickoff Meeting and Data Request – Immediately

Once we have been awarded the audit, we will immediately schedule a kickoff conference call to introduce the key members of our team to the key staff at both ORSC and PERS responsible for the audit. We will review the project timeline and make necessary adjustments to accommodate your objectives. We also prepare the data requests necessary to collect the information for replicating the actuarial valuations and conducting the peer

review of the experience study. Once the audit process has commenced, we will provide monthly updates to the ORSC regarding the progress that has been made

2) Review Data Received from the System – Weeks 1 - 2

Once we receive the data from PERS, we will review it for reasonableness and for consistency with the various membership counts reported in the PERS actuary's valuation report. We will resolve any inconsistencies by working with the PERS actuary.

3) Review Actuarial Methods and Assumptions – Weeks 1 - 2

Our review of the demographic assumptions includes mortality, withdrawal, retirement and disability rates. Our review of the economic assumptions includes the investment return assumption, inflation and salary scale.

Our review of actuarial methods and assumptions is based heavily on the most recent actuarial experience study. We will review the report and may request additional information in order to validate the recommendations. We will opine on whether the conclusions and recommendations made from this study were reasonable. We also review the assumptions for compliance with all applicable Actuarial Standards of Practice.

4) Replication of Liabilities – Weeks 3 - 5

We code our valuation system to value the PERS benefits using the same census data, actuarial assumptions, and methods as the PERS actuary and reconcile our liabilities with those of the PERS actuary. We will work with the PERS actuary to reconcile any discrepancies between our interpretation of the statutes and the PERS actuary's description and programming of the benefits.

5) Replicate Actuarial Calculations – Weeks 6 - 7

We will review the calculation of the actuarial value of assets, the funded status, and contribution rates. We will also work to resolve any differences, if any, between our liability calculations and those of the PERS actuary to ensure our interpretation is consistent with the System's understanding and practices. We will also confer with the PERS actuary to verify that we have accounted for all the assumptions and methods they have applied in the development of results.

6) Produce Independent Projections – Weeks 8 – 9

We will build our *P-Scan* model and use this model to review the projections of the PERS actuary for reasonability. We will form an opinion about whether the funding policies are appropriate and reasonable given the Board's objectives.

7) Draft Report – Week 10

We will prepare a preliminary draft report of our findings and present this to the ORSC. The report includes:

- An executive summary identifying all findings, observations, and recommendations, including our review of the experience study, and opinions on all methods and assumptions. This section will also include our forward-looking view of the System and the ability of the current funding approach to meet the obligation to pay promised benefits;
- Description of the process and reconciliation of the valuation results;
- Assessment of the information required under GASB;
- Commentary on each assumption, its application, the results from the experience analysis review, and discussion of the financial implications of any alternative recommendations;
- Summary of all data, reports, and other resources that were used and have bearing on the results contained in our report;
- Summary of the valuation assumptions and methods, as well as any other assumptions used in the audit process; commentary on the clarity and completeness of the report; and
- Commentary on whether the methods, assumptions, and actuarial report meet all applicable Actuarial Standards of Practice.

8) Final Report – upon acceptance of draft report – Week 11

Once we have received feedback on our draft report, we will prepare a final report of our findings and recommendations, making sure to meet the projected time schedule in the RFP.

9) In-Person Presentation – Between Weeks 10 and 11

Along with the written report, we will also use our *P-Scan* and *H-Scan* analysis to present our findings to both the ORSC and the PERS Board, so that the results are easily understood.

4.6 ADDITIONAL INFORMATION

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

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

All relevant information has been addressed elsewhere in this proposal.

4.7 GLOSSARY

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

Glossary

1. **Actuarial Assumptions**

   Estimates of future experience concerning rates of mortality, disability, turnover, retirement, investment income, and salary increases. Demographic assumptions—rates of mortality, disability, turnover, and retirement—are generally based on past experience, and often modified for projected changes in conditions. Economic assumptions—salary increases and investment income—consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

2. **Actuarial Cost Method**

   The procedure for allocating actuarial present values to time periods and to determine current year required contributions or expense.

3. **Actuarial Gain (Loss)**

   The difference between actual experience and actuarial assumption anticipated experience during the period between two actuarial valuation dates, as determined by a particular actuarial funding method.

4. **Actuarial Liability**

   The Actuarial Liability is the present value of all benefits accrued as of the valuation date using the methods and assumptions of the valuation. It is also referred to by some actuaries as the “accrued liability” or “actuarial accrued liability.”

5. **Actuarial Present Value**

   The amount of funds currently required to provide a payment or series of payments in the future. It is determined by discounting future payments at predetermined rates of interest, and by probabilities of payment.

6. Actuarial Standards of Practice (ASOPs)

ASOPs are issued by the Actuarial Standards Board. All credentialed actuaries are expected to comply with the ASOPs. Deviations from ASOPs within actuarial reports must be disclosed.

7. Actuarial Valuation Method

The general procedures of allocating cost within an actuarial valuation. The actuarial valuation method includes the actuarial cost method, the amortization method, and the Actuarial Value of Assets.

8. Actuarial Value of Assets

The Actuarial Value of Assets equals the Market Value of Assets adjusted according to the asset smoothing method. The asset smoothing method is intended to smooth out the short-term volatility of investment returns to stabilize contribution rates and the funded status.

9. Amortization Method

The allocation of payments designed to pay off the Unfunded Actuarial Liability. Key parameters of the method include the annual rate of increase in payments, the length of the amortization period, and whether the amortization is open, closed with a single base, or closed with layers.

10. Funded Status

The Actuarial Value of Assets divided by the Actuarial Liability. The Funded Status can also be calculated using the Market Value of Assets.

11. Governmental Accounting Standards Board

The Governmental Accounting Standards Board (GASB) defines the accounting and financial reporting requirements for governmental entities. GASB Statement No. 67 defines the plan accounting and financial reporting for governmental pension plans, and GASB Statement No. 68 defines the employer accounting and financial reporting for participating in a governmental pension plan. GASB Statement No. 74 defines the plan accounting and financial reporting for governmental postemployment benefit plans other than pension plans, and GASB Statement No. 75 defines the employer accounting and financial reporting for participating in a governmental postemployment plan other than a pension plan.

12. Market Value of Assets

The fair value of the plan's assets, assuming that all holdings are liquidated on the measurement date.

13. Normal Cost

The portion of the present value of future benefits allocated to the current year by the actuarial cost method. It is sometimes referred to as "current service cost." Any payment toward the unfunded actuarial liability is not part of the normal cost.

14. Present Value of Future Benefits

The estimated amount of assets needed today to pay for all benefits promised in the future to current members of the Fund, assuming all Actuarial Assumptions are met.

15. *P-Scan and H-Scan*

Cheiron's proprietary projection software, *P-Scan* and *H-Scan* is used interactively during meetings to illustrate the effects of various changes in economic scenarios, plan provisions or actuarial methods and assumptions as well as being used to produce graphs for the reports.

16. Unfunded Actuarial Liability (UAL)

The difference between the Actuarial Liability and the Actuarial Value of Assets. This is sometimes referred to as the "unfunded accrued liability."

4.8 COST INFORMATION

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

The following is our best estimate and not-to-exceed fee and includes all expenses. Our not-to-exceed fee is $115,400.

• Data validity	$ 6,495
• Review of Methods and procedures	$ 15,000
• Review of assumptions	$ 19,870
• Parallel Valuation	$ 32,520
• Recommendations/Report	$ 23,125
• Review of Health Care	$ 4,980
• Presentation to ORSC and Legislature	$ 13,410

	Hallmark		Noble		Rhodes		Moehle		Hastings		Weaver		Analyst		Admin	
	Hours	Rate $500	Hours	Rate $500	Hours	Rate $460	Hours	Rate $440	Hours	Rate $405	Hours	Rate $440	Hours	Rate $220	Hours	Rate $150
Element		**Fee**		**Fee**		**Fee**		**Fee**		**Fee**		**Fee**		**Fee**		**Fee**
1) Data Validity							3	$1,320	3	$1,215	3	$1,320	12	$2,640		
2) Actuarial Valuation Method and Procedures	10	$5,000	10	$5,000			4	$1,760	8	$3,240						
3) Actuarial Valuation Assumptions	10	$5,000	10	$5,000	5	$2,300	3	$1,320	10	$4,050			10	$2,200		
4) Parallel Valuation	1	$500	1	$500	5	$2,300	30	$13,200	20	$8,100	10	$4,400	16	$3,520		
5) Recommendations/ Report	11	$5,500	11	$5,500	6	$2,760	4.75	$2,090	7.5	$3,037.50	5.5	$2,420	4	$880	6.25	$937.50
6) Review of Health Care					7	$3,220					4	$1,760				
7) Presentation to ORSC and Legislature	10	$5,000	10	$5,000	5	$2,300			2	$810					2	$300
TOTAL	42	$21,000	42	$21,000	28	$12,880	44.75	$19,690	50.5	$20,452.50	22.5	$9,900	42	$9,240	8.25	$1,237.50

TOTAL COST	**$115,400**
TOTAL HOURS	**280**

Appendix A

Sample Actuarial Audit Report

CHEIRON Classic Values, Innovative Advice

State of Wisconsin
Legislative Audit Bureau

Actuarial Audit Report on the Wisconsin Retirement System December 31, 2023 Actuarial Valuation and Peer Review of the Three-Year Experience Study for the Period Ending December 31, 2020

Produced by Cheiron

April 2025

www.cheiron.us 1.877.CHEIRON (243.4766)

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April 7, 2025

Mr. Joe Chrisman
State Auditor
State of Wisconsin Legislative Audit Bureau
22 East Mifflin Street, Suite 500
Madison, Wisconsin 53703

Dear Mr. Chrisman:

Cheiron has performed an independent full replication audit of the December 31, 2023 Actuarial Valuation of the Wisconsin Retirement System (WRS or System) and a review of the January 1, 2018 to December 31, 2020 Experience Study prepared by Gabriel Roeder Smith (GRS).

The purpose of this report is to present the results of our audit. Section I of this report describes the project scope and Section II summarizes our findings. Section III provides the detailed results of Cheiron's replication of the December 31, 2023 Actuarial Valuation. Section IV presents Cheiron's findings on our review of the actuarial assumptions and methods recommended in the January 1, 2018 to December 31, 2020 Experience Study.

We would like to thank the Wisconsin Legislative Audit Bureau, the Wisconsin Department of Employee Trust Funds (ETF) and GRS for providing us with information and explanations that facilitated the actuarial audit process and ensured that our findings are accurate.

Based on our review, we believe the December 31, 2023 Actuarial Valuation is accurate and produces reasonable required employer contributions, based on the assumptions and methods in effect at the time the valuation was prepared. However, we have recommendations for GRS and/or ETF to consider. None of these recommendations would materially change the valuation results. More details on these key findings will follow in this report.

In preparing this report, we relied on information (some oral and some written) supplied by ETF and GRS. This information includes census data, the actuarial assumptions and methods adopted by the System, plan provisions, the December 31 annual actuarial valuation reports, and the Experience Study covering the three-year period ending December 31, 2020. A detailed description of all information provided for this review is contained in Appendix B.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the State of Wisconsin Legislative Audit Bureau for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to such other users.

Sincerely,
Cheiron

Janet Cranna, FSA, FCA, EA, MAAA
Principal Consulting Actuary

Michael Noble, FSA, EA, MAAA
Principal Consulting Actuary

Graham Schmidt, FSA, EA, MAAA
Principal Consulting Actuary

SECTION I – REPORT SCOPE

Cheiron was retained by the State of Wisconsin Legislative Audit Bureau (SWLAB) to perform the following actuarial audit services:

- Conduct a full replication of the WRS Actuarial Valuation as of December 31, 2023 (which includes both the *41st Annual Actuarial Valuation of Retired Lives* and the *43rd Annual Actuarial Valuation and Gain/Loss Analysis*),
- Determine if the demographic and financial information used by GRS in the valuation is valid, complete and appropriate,
- Determine if the calculations reflect all statutory requirements governing the WRS,
- Review the experience study performed for the three years ending December 31, 2020,
- Determine if the actuarial valuation assumptions and methods are reasonable and consistent with generally accepted actuarial standards and practices, and are appropriate based on WRS experience,
- Determine whether the valuation was performed in accordance with Actuarial Standards of Practice (ASOP), and
- Determine whether the System's financial objectives are being met.

In conducting the 2023 actuarial valuation replication, Cheiron received the complete December 31, 2023 actuarial valuation census data and financial information from ETF. Additionally, Cheiron received the processed actuarial valuation census data, and information related to actuarial assumptions and methods from GRS. With this information, we coded our valuation software to independently calculate and verify the December 31, 2023 actuarial valuation results.

For purposes of this replication of the valuation results, Cheiron utilized ProVal, an actuarial valuation software leased from Winklevoss Technologies (WinTech) to calculate liabilities and project benefit payments. We have relied on WinTech as the developer of ProVal. We have reviewed ProVal and have used ProVal in accordance with its original intended purpose. We have not identified any material inconsistencies in assumptions or output of ProVal that would affect these results.

This audit report includes projections of future assets, liabilities, funded status and contributions for the purpose of assessing whether the funding objectives of the Board are being met. The projections utilize *P-Scan*, our proprietary projection software. These projections are based on the same census data and financial information as of December 31, 2023 which were provided to us. The projections assume continuation of the plan provisions and actuarial assumptions in effect as of December 31, 2023 and do not reflect the impact of any changes in benefits or actuarial assumptions that may be adopted after December 31, 2023 unless otherwise indicated. The future outcomes become increasingly uncertain over time, and therefore, the general trends and not the absolute values should be considered in the review of these projections.

SECTION II – EXECUTIVE SUMMARY

Our primary findings are as follows:

1. Cheiron's replication of the December 31, 2023 Actuarial Valuation results was extremely close to the results presented by GRS. Cheiron's calculations of total System liabilities were within 1% of the GRS liabilities. This is well within the tolerance expected for actuarial replications.

2. The actuarial valuation was performed in accordance with principles and practices prescribed by the Actuarial Standards Board and Actuarial Standards of Practice (ASOP).

3. With respect to the actuarial assumptions, we found that GRS's recommended assumptions shown in the December 31, 2020 Experience Study, with the exception of the salary increase assumption, were reasonable and performed in accordance with the ASOPs. We recommend that the salary increase assumption be increased for certain member classifications.

4. With respect to the actuarial methods, including the calculation of actuarial determined contribution, Cheiron has performed projections for WRS and confirmed that the employer and employee contributions are expected to be sufficient to appropriately fund the system, assuming all assumptions are met. However, with regard to certain elements of the funding policy, we believe additional disclosures may be required to comply with ASOP 4.

5. We find that the actuarial valuation reports prepared by GRS generally meet the professional standards set out by the ASOPs. However, throughout this report we note where additional disclosures may be warranted, and have made some recommendations to improve the clarity of the report.

SECTION III – RESULTS OF THE ACTUARIAL VALUATION REPLICATION

This section provides the detailed results of Cheiron's replication of the December 31, 2023 Actuarial Valuation.

Valuation Results

Overall, we find that the results in the December 31, 2023 Actuarial Valuation, including the calculations of the liabilities, actuarial value of assets, funded status, and employee and employer contribution rates, based on the current funding policies, methods and assumptions, are reasonable and generally conform to Actuarial Standards of Practice (ASOPs). This is based on our full replication of the December 31, 2023 Actuarial Valuation, our review of the reports, the census data used in the valuation, the economic and demographic assumptions, and the funding methods. Our determination of the gross normal cost rate (sum of employer and employee rates) is slightly lower than GRS's calculation.

Census Data

ETF provided us with the data that was sent to GRS for the December 31, 2023 Actuarial Valuation. GRS also provided us with the final data used in the valuation, after reflecting adjustments they deemed necessary based on their review of the initial data provided by ETF. We find that the data used in the valuation is valid, complete and contains the necessary data elements.

SECTION III – RESULTS OF THE ACTUARIAL VALUATION REPLICATION

The table below shows the comparison of the final GRS data used in the valuation and the original data provided to Cheiron by WRS, after excluding non-participants.

Wisconsin Retirement System
December 31, 2023
Membership Data
$ in Millions

	GRS	Cheiron	Ratio
Number of Actives	263,737	264,581	1.003
Average Age	44.2	44.2	1.001
Average Service	10.7	10.7	1.001
Total Current Earnings	$ 17,136	$ 17,978	1.049
Number of Inactives	186,977	186,977	1.000
Average Service	3.5	3.5	1.000
Money Purchase Balance	$ 22,026	$ 22,411	1.017
Total Annuities being Paid			
Number of Retirees	229,091	229,295	1.001
Annual Amount	$ 6,864.0	$ 6,860.0	0.999
Number of Disabilities	7,532	7,196	0.955
Annual Amount	$ 203.0	$ 203.1	1.001
Number of Death-In-Service	1,488	1,407	0.946
Annual Amount	$ 30.0	$ 29.0	0.967

GRS confirmed that the Current Earnings of $17.136 billion, as shown on page B-2 of the Annual (Active) Actuarial Valuation, was based on the annualized actual earnings reported to WRS by the employers for calendar year 2023 and does not include any adjustments for expected salary increases for 2024. GRS used this amount to calculate the Pooled Amortization Rate for the coming year in the valuation.

On the other hand, our projected pay amount - $17.978 billion – does include an adjustment for expected salary increases for the coming year, based on the Plan's pay growth assumption. When the dollar amount of the amortization payment represents the amount expected to be collected for

the coming year (as is the case in the amortization payments amounts GRS and Cheiron calculate), we expect the payroll used in the calculation of contribution rates to include the overall anticipated wage growth for the Plan, so that the pay used as the divisor in the amortization rate calculation will match the pay upon which those contributions are expected to be collected.

The methodology used by GRS produces an amortization rate that is slightly conservative. However, because of the well-funded status of the Plan, the amount of conservatism is minimal, since the overall amortization rate would only decrease by 0.02% of pay if GRS were to include a full year of expected wage growth to the pay used in their calculation. We believe it would improve the clarity of the report if GRS were to explicitly state what the "Current Earnings" item in the table on page B-2 represents and provide an explanation for why this result is appropriate for determining the amortization rate.

Plan Provisions

We compared the summary of benefit and contribution provisions shown on pages G-1 to G-3 of the December 31, 2023 Annual Actuarial Valuation and Gain/Loss Analysis (Annual Actuarial Valuation) to what is contained in the Wisconsin Statutes, the member handbooks and other information provided by WRS. We found that the benefit and contribution provisions matched our source documents.

Liabilities, Normal Cost and Contribution Rates

Based on our replication of the December 31, 2023 Annual Actuarial Valuation, we find that the calculations of the present value of future benefits, the actuarial liability, normal cost, assets and contribution rates are reasonable.

The following tables show the comparison of the calculation of present value of future benefits, actuarial liability, and employer contribution rates in GRS's valuation and Cheiron's replication in total and by General, Executives, and Elected Officials, Protective with Social Security and Protective without Social Security.

We note larger percentage differences in the Unfunded Actuarial Liability (UAL) and associated amortization rates due to the System's strong funded status, which amplifies differences in UAL calculations. Similarly, the Normal Cost (NC) rates for smaller groups, such as Protective with and without Social Security, show greater variability. However, the Present Value of Benefits (PVB) and overall NC rates remain within 5%, with employer contribution rate differences further leveraged by the fact that member contribution rates are closely aligned (within 1%). These differences are not material to the overall funding of the System.

SECTION III – RESULTS OF THE ACTUARIAL VALUATION REPLICATION

Wisconsin Retirement System
December 31, 2023
$ in Millions

Total System	GRS	Cheiron	Ratio
Record Counts			
Actives	263,737	264,581	1.00
Inactive, not Retired	186,977	186,977	1.00
Retired	238,111	237,898	1.00
Total	688,825	689,456	1.00
Present Value of Future Benefits			
Actives	$ 65,692.7	$ 65,780.8	1.00
Inactive, not Retired	$ 10,321.5	$ 9,488.1	0.92
Additional Contributions	$ 294.0	$ 294.0	1.00
Retired	$ 80,672.8	$ 81,038.3	1.00
Total	$ 156,981.0	$ 156,601.2	1.00
Entry Age Normal Actuarial Liability			
Actives	$ 42,706.1	$ 42,953.3	1.01
Inactive, not Retired	$ 10,321.5	$ 9,488.1	0.92
Additional Contributions	$ 294.0	$ 294.0	1.00
Retired	$ 80,672.8	$ 81,038.3	1.00
Total	$ 133,994.4	$ 133,773.7	1.00
Future Entry Age Normal Costs	$ 22,986.6	$ 22,827.5	0.99
Current Earnings	$ 17,136.2	$ 17,977.8	1.05
Pesent Value Future Earnings	$ 162,482.4	$ 164,118.7	1.01
Assets for Funding	$ 132,132.8	$ 132,132.8	1.00
Entry Age Unfunded Liability	$ 1,861.6	$ 1,640.9	0.88
Frozen Initial Liability	$ 5.0	$ 5.0	1.00
Pooled Unfunded Liability (EAR)	$ 1,856.6	$ 1,635.9	0.88
Pooled Amortization Rate	0.77%	0.65%	0.84
Pooled Entry Age Normal Cost Rate	14.15%	13.91%	0.98
Total Pooled Rate	14.92%	14.56%	0.98
2025 FIL Normal Cost Rates			
Participant	6.95%	6.86%	0.99
Employer Normal Cost Rate	7.97%	7.70%	0.97
Total	14.92%	14.56%	0.98
Entry Age Funded Ratio	98.61%	98.77%	1.00

SECTION III – RESULTS OF THE ACTUARIAL VALUATION REPLICATION

Wisconsin Retirement System
December 31, 2023
$ in Millions

General, Executives and Elected	GRS	Cheiron	Ratio
Record Counts			
Actives	241,527	242,317	1.00
Present Value of Future Benefits			
Actives	$ 55,007.6	$ 55,398.1	1.01
Inactive, not Retired	$ 9,396.2	$ 8,618.7	0.92
Variable Adjustment	$ 811.5	$ 815.2	1.00
Total	$ 65,215.3	$ 64,832.0	0.99
Future Entry Age Normal Costs	$ 19,434.9	$ 19,386.7	1.00
Current Earnings	$ 15,200.3	$ 15,950.0	1.05
Present Value Future Earnings	$ 143,101.8	$ 144,692.8	1.01
Pooled Entry Age Normal Cost Rate	13.58%	13.40%	0.99
Entry Age Accrued Liability	$ 45,780.4	$ 45,445.3	0.99
Assets for Funding	$ 45,049.4	$ 45,049.4	1.00
Total Entry Age Unfunded Liability	$ 731.0	$ 712.6	0.97
Frozen Initial Liability Portion	$ 4.3	$ 4.3	1.00
Pooled Unfunded Liability (EAR)	$ 726.7	$ 708.3	0.97
20-year Amortization Factor	14.0212	14.0187	1.00
Pooled Amortization Rate	0.34%	0.32%	0.93
Total Pooled Rate	13.90%	13.72%	0.99
2025 FIL Normal Cost Rates			
Participant	6.95%	6.86%	0.99
Employer Normal Cost Rate	6.95%	6.86%	0.99
Total	13.90%	13.72%	0.99
Entry Age Funded Ratio	98.4%	99.1%	1.01

SECTION III – RESULTS OF THE ACTUARIAL VALUATION REPLICATION

Wisconsin Retirement System
December 31, 2023
$ in Millions

Protective with Social Security	GRS	Cheiron	Ratio
Record Counts			
Actives	19,338	19,387	1.00
Present Value of Future Benefits			
Actives	$ 8,023.2	$ 7,775.2	0.97
Inactive, not Retired	$ 846.0	$ 793.4	0.94
Variable Adjustment	$ 71.1	$ 67.6	0.95
Total	$ 8,940.3	$ 8,636.3	0.97
Future Entry Age Normal Costs	$ 2,899.4	$ 2,806.2	0.97
Current Earnings	$ 1,670.0	$ 1,750.0	1.05
Present Value Future Earnings	$ 16,501.0	$ 16,473.9	1.00
Pooled Entry Age Normal Cost Rate	17.57%	17.03%	0.97
Entry Age Accrued Liability	$ 6,040.9	$ 5,830.1	0.97
Assets for Funding	$ 5,029.6	$ 5,029.6	1.00
Total Entry Age Unfunded Liability	$ 1,011.3	$ 841.1	0.83
Frozen Initial Liability Portion	$ 0.7	$ 0.7	1.00
Pooled Unfunded Liability (EAR)	$ 1,010.6	$ 840.4	0.83
20-year Amortization Factor	14.0212	14.0187	1.00
Pooled Amortization Rate	4.32%	3.43%	0.79
Total Pooled Rate	21.90%	20.46%	0.93
2025 FIL Normal Cost Rates			
Participant	6.95%	6.86%	0.99
Employer Normal Cost Rate	14.95%	13.60%	0.91
Total	21.90%	20.46%	0.93
Entry Age Funded Ratio	83.3%	86.3%	1.04

SECTION III – RESULTS OF THE ACTUARIAL VALUATION REPLICATION

Wisconsin Retirement System
December 31, 2023
$ in Millions

Protective without Social Security	GRS	Cheiron	Ratio
Record Counts			
Actives	2,872	2,877	1.00
Present Value of Future Benefits			
Actives	$ 1,764.2	$ 1,709.8	0.97
Inactive, not Retired	$ 79.3	$ 75.9	0.96
Variable Adjustment	$ 15.1	$ 15.0	0.99
Total	$ 1,858.6	$ 1,800.7	0.97
Future Entry Age Normal Costs	$ 652.3	$ 634.6	0.97
Current Earnings	$ 265.9	$ 277.8	1.04
Present Value Future Earnings	$ 2,879.6	$ 2,951.9	1.03
Pooled Entry Age Normal Cost Rate	22.65%	21.50%	0.95
Entry Age Accrued Liability	$ 1,206.3	$ 1,166.1	0.97
Assets for Funding	$ 1,087.0	$ 1,087.0	1.00
Total Entry Age Unfunded Liability	$ 119.3	$ 87.2	0.73
Frozen Initial Liability Portion	$ -	$ -	
Pooled Unfunded Liability (EAR)	$ 119.3	$ 87.2	0.73
20-year Amortization Factor	14.0212	14.0187	1.00
Pooled Amortization Rate	3.20%	2.24%	0.70
Total Pooled Rate	25.90%	23.74%	0.92
2025 FIL Normal Cost Rates			
Participant	6.95%	6.86%	0.99
Employer Normal Cost Rate	18.95%	16.88%	0.89
Total	25.90%	23.74%	0.92
Entry Age Funded Ratio	90.1%	93.2%	1.03

SECTION III – RESULTS OF THE ACTUARIAL VALUATION REPLICATION

Funding Objective

As stated in the funding policy document, shown in Appendix A:

> *"The main financial objective of the WRS is to fully fund the long-term cost of benefits provided by statute, through disciplined and timely accumulation of sufficient assets to deliver earned benefits on a continuing basis."*

This funding policy seeks to balance three main objectives:

- Contribution Adequacy — Contributions and current plan assets must be sufficient to provide for all benefits expected to be paid to members and their beneficiaries when due.
- Contribution Stability and Predictability — Contribution volatility must be controlled to the extent reasonably possible, consistent with other policy goals.
- Inter-Generational Equity — Costs of benefits should be paid for by the generation that receives the benefits."

We recommend that GRS identify and assess key risks to the system as required by ASOP 51, *Assessment and Disclosure of Risk Associated With Measuring Pension Obligations and Determining Pension Plan Contributions.* Section 3.2 of ASOP 51 requires the actuary to identify risks that "may **reasonably be anticipated to significantly affect** the plan's future financial condition." [emphasis added]. The risks currently identified on page B-9 of the Annual Actuarial Valuation appear to largely duplicate the list of examples in ASOP 51 and could apply to almost any pension plan. For each risk identified above, Section 3.3 of ASOP 51 requires the actuary to provide an assessment that takes into account "circumstances specific to the plan." For the identified risks, the actuary has only provided a generic statement that could apply to any plan. We recommend that for each identified risk the actuary provide an assessment, preferably quantitative, that considers the specific circumstances of this plan.

In order to evaluate whether the objectives of the System are expected to be achieved, we have performed projections. Actuarial projections are based on a set of assumptions about future economic and demographic experience and a set of actuarial methodologies used to calculate the System's funded status and actuarially determined contributions. We used the same actuarial assumptions and methods used in the actuarial valuation to perform our projections. These assumptions represent a reasonable estimate of future experience, but actual future experience will undoubtedly be different and may be significantly different. We recommend that GRS include projections of assets, liabilities and contributions in their reports and provide a discussion about the funded status of the System.

Assuming the experience of the System follows expectations, including investment returns of 6.8% each year, Cheiron projects WRS will remain close to 100% funded through 2043 if the actuarially determined contribution rate continues to be made each year. However, a relatively small shortfall is expected to continue during this period, due to current differences between the assets and liabilities, the presence of deferred losses in the current smoothed actuarial asset value, and the

SECTION III – RESULTS OF THE ACTUARIAL VALUATION REPLICATION

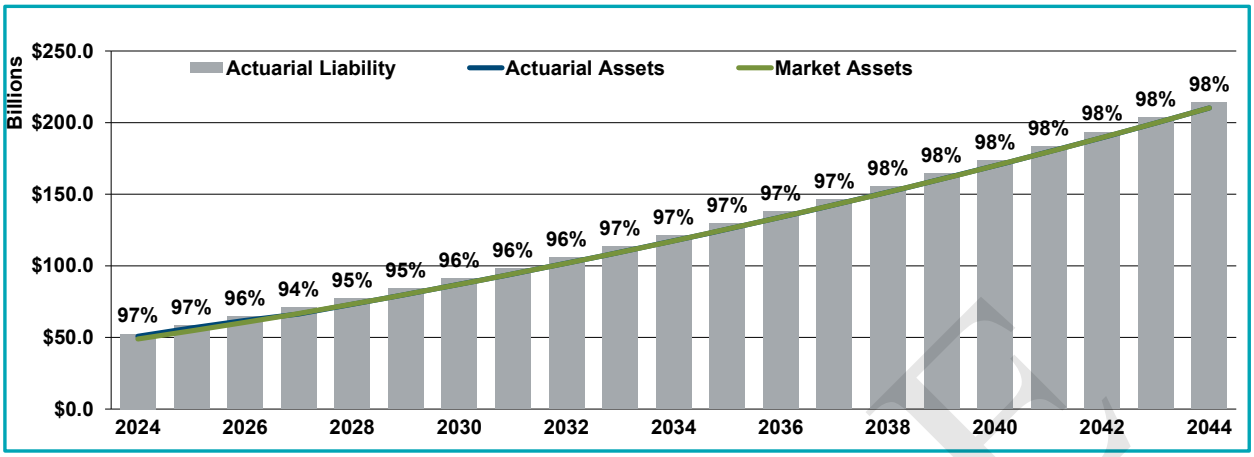
amortization policy used in the calculation of the contribution rates. While this level of shortfall is not expected to represent a significant risk to the System, in large part because of the System's built-in risk-sharing mechanisms, we believe the presence of the shortfall should be disclosed and its causes understood.

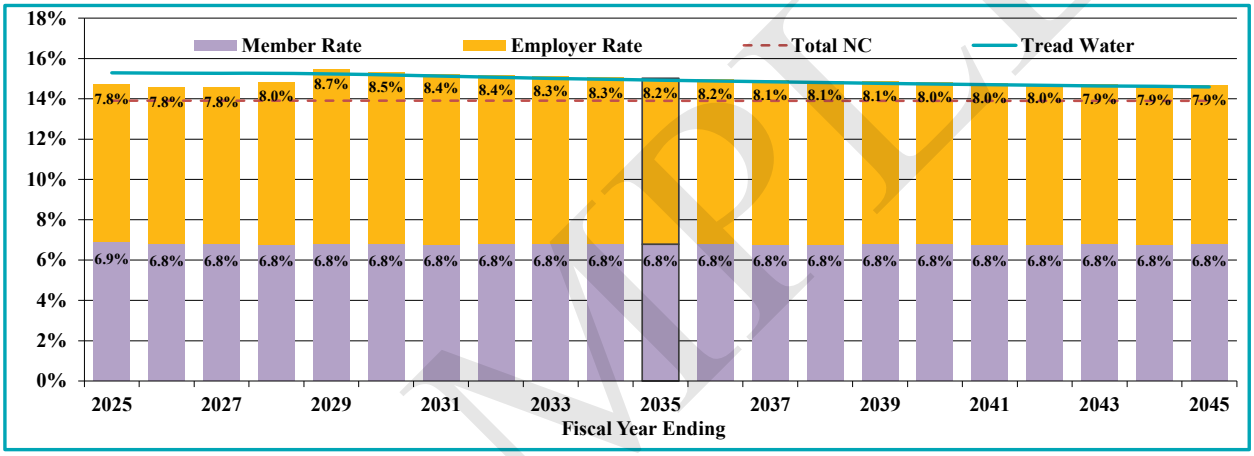
Our projections are summarized in the following two graphs. The first graph shows the projected actuarial assets and market assets (blue and green lines) and liabilities (gray bars) for WRS, with the Retired Lives Liabilities and Assets excluded, since those are automatically adjusted to remain in balance. The percents above the bars represent the Actuarial Value of Assets (AVA) funded ratio. Since this projection assumes the market asset return is as expected each year, after five years the market assets and actuarial assets are the same since all previous unrecognized asset gains and losses will be fully recognized.

The second graph shows the projected employer contributions (gold bars) and member contributions (purple bars) as a percent of payroll. For WRS, the member plus employer contributions, which equal the Actuarially Determined Contributions, are the sum of the EAN normal cost and the amortization of the unfunded actuarial liability using a rolling 20-year level percent of payroll method, based on our understanding of the actual determination of the annual contribution rate. Additionally, we show the total normal cost (dashed red line) and the Tread Water contribution (solid teal line). The difference between the dashed red line and the purple bars is the employer portion of the normal cost.

The Tread Water contribution is the normal cost plus the interest on the unfunded actuarial liability on a market value of assets (MVA) basis. This amount shows the minimum contributions that are needed to avoid an increase in the unfunded actuarial liability (UAL), if the UAL were to be determined using the market value of assets. The difference between the solid teal line and the dashed red line is the interest on the unfunded actuarial liabilities. When the contributions exceed the solid teal line the unfunded actuarial liability is expected to decrease, and the funded ratio is expected to increase. In the years where contributions fall below the teal line, then the unfunded actuarial liability is expected to increase and the funded ratio is expected to decrease. Since the current method to determine contributions is so close to Tread Water, the increase in funded ratio is very slow.

SECTION III – RESULTS OF THE ACTUARIAL VALUATION REPLICATION





SECTION IV – AUDIT OF THE ACTUARIAL ASSUMPTIONS AND METHODS

In this section, we provide detailed analysis of the assumptions and methods recommended in the January 1, 2018 to December 31, 2020 Experience Study. These assumptions were first effective with the December 31, 2021 Actuarial Valuations.

Economic Assumptions

We find that the recommended economic assumptions are reasonable and in compliance with ASOP 27 *Selection of Economic Assumptions for Measuring Pension Obligations*.

1. *Interest Rate*

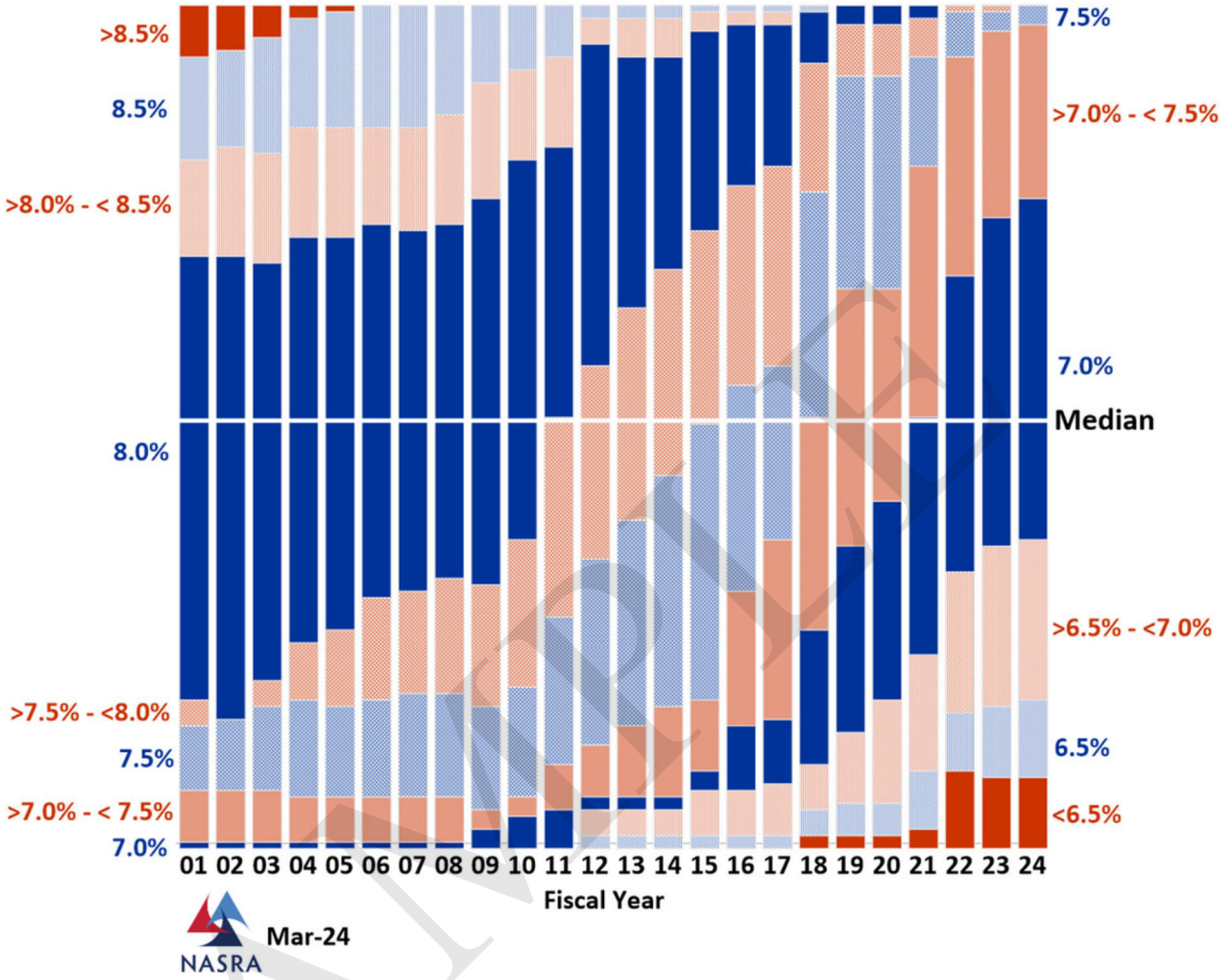
   The interest rate assumption (also called the investment return or discount rate) is the most impactful assumption affecting the actuarial valuation. The 2023 Actuarial Valuation uses a 6.8% interest rate assumption, prior to retirement, and a 5.0% interest rate assumption post retirement. The 5.0% interest rate assumption is mandated by Section 40.02 of the Wisconsin Statutes.

   Our rationale for supporting GRS's investment rate recommended range of 6.20% to 6.80% is as follows:

   - In the December 31, 2020 Experience Study, GRS performed their analysis using the GRS 2021 Capital Market Assumption Modeler (CMAM). Their analysis also compared the CMAM results to the SWIB/NEPC Forecast. The CMAM analysis showed an expected 10-year average geometric rate of return of 6.19% and a 20-30 year average geometric return of 7.26%. compared to SWIB/NEPC geometric returns of 5.40% (10 year) and 6.60% (30 year). Based on these returns GRS developed a reasonable range of 5.4% to 7.0% and a recommended range of 6.2% to 6.8%.

   - While the discount rate assumption should be based on the future expected investment returns for the System's investment portfolio, survey information can provide an important context for evaluating the assumption. The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The latest Public Fund Survey covers 131 large retirement plans. The following graphic from the survey shows the distribution of investment return assumptions since 2001. Each colored bar shows the percentage of retirement plans in a year that assumed an investment return range. In 2008 the median assumption was 8.0% with only 1 plan assuming 7.0%. By 2023 no plans were assuming 8.0% and 7.0% was the median assumption. The latest data includes results collected through March 2024.

SECTION IV – AUDIT OF THE ACTUARIAL ASSUMPTIONS AND METHODS



Over the period shown in this survey, there continues to be a pattern of reducing the investment return assumption partially reflecting long-term changes in capital markets, interest rates and underlying inflation. Of the 131 plans shown, 94, or 72% have reduced their assumed rate of return since 2020, and all have done so since 2010. The average return assumption is 6.91%. The data is consistent with the experience of other Cheiron clients, which have generally shown a significant trend of reducing their investment return assumptions over the last several years.

- As is the case with most maturing pension plans, the System is experiencing negative cash flows, measured as contributions less benefits and administrative expenses. A negative cash flow increases the impact of investment risk to a pension system, as it can magnify losses during a market decline: as assets are being depleted to pay benefits in down markets, there is less principal available to be reinvested during favorable return periods.

SECTION IV – AUDIT OF THE ACTUARIAL ASSUMPTIONS AND METHODS

However, a negative cash flow is an expected characteristic for a well-funded mature plan, as the investment earnings reduce the contributions needed to pay benefits. The System's negative cash flow rate of 3.7% of assets represents a larger net negative cash flow than that of the median large public plan in the most recent survey (-2.2%, as of 2023[1]); largely a result of the System's strong funded status requiring lower contributions than other systems. This does not represent an existential threat to the System; it just means that the System's investments are subject to the potential for more significant fluctuations in the face of market downturns than a similarly invested plan in a more positive cash flow position.

1 https://publicplansdata.org/

SECTION IV – AUDIT OF THE ACTUARIAL ASSUMPTIONS AND METHODS

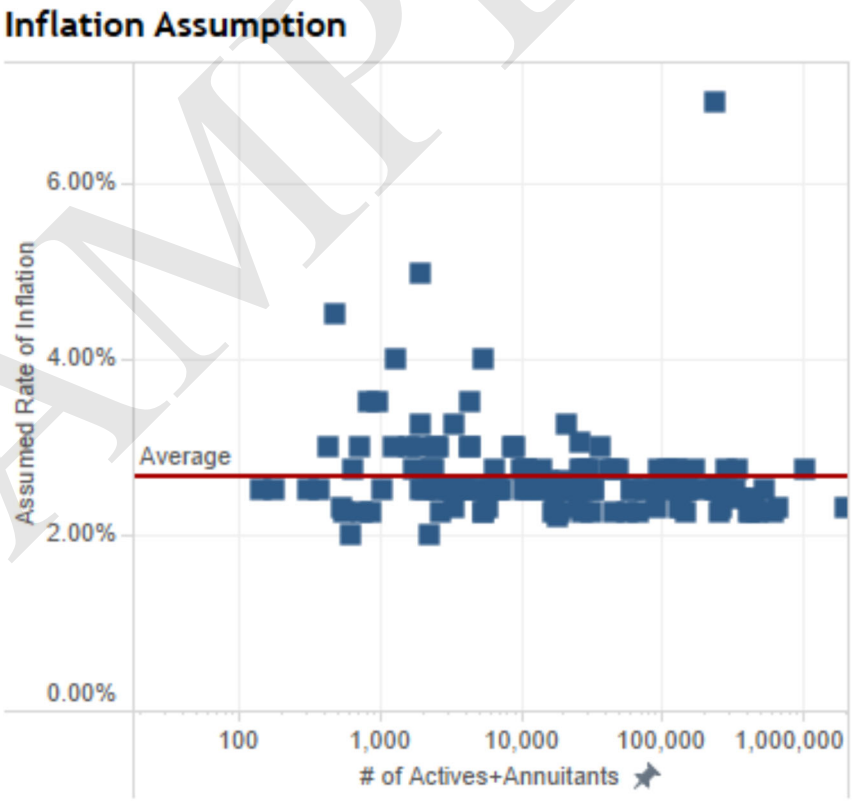
2. Inflation Assumption

The inflation assumption impacts the discount rate and salary increase assumptions.

We find the inflation assumption of 2.40% reasonable.
Our rationale for concurring with the 2.40% assumption:

- The May 2024 Old-Age, Survivors, and Disability Insurance (OASDI) Trustees Report projects that over the long-term (next 75 years) inflation will average somewhere between 1.8% and 3.0%. The Social Security Administration uses an assumption of 2.4% under the intermediate cost projection.

- The *National Conference on Public Employers Retirement Systems* (NCPERS) 2024 Public Retirement System Study includes the following graphic of respondents' inflation assumptions:



Each square shows the inflation assumption for an individual retirement system. This shows that the recommended assumption of 2.40% is in line with the inflation assumptions used among the 157 systems that responded to this study. The average of all systems was 2.7%.

SECTION IV – AUDIT OF THE ACTUARIAL ASSUMPTIONS AND METHODS

3. Salary Increase Assumption (Merit and Longevity Portion)

The salary increase assumption is based on service and varies by employment classification as follows:

1. General Non-State
2. General State
3. Public Schools Non-State
4. University State
5. Protective with Social Security Non-State
6. Protective with Social Security State
7. Protective without Social Security Non-State
8. Executive and Elected Non-State
9. Executive and Elected State

GRS recommended no change to the salary increase assumptions in the Experience Study for the period ending December 31, 2020. However, the actual salary experience for classifications 2, 3, 5, 6, 8 and 9 shown in that study was significantly higher than the assumptions. Page 4 of the Experience Study Report notes that the actual experience was slightly impacted for the study period as some members had 27 pay periods during 2020; however, this would not significantly impact the experience over the three-year period. In addition, there were salary experience losses in four out of the last five most recent actuarial valuations. We strongly recommend that the salary increase assumption be increased for these classifications.

4. Wage Inflation

In the December 31, 2020 Experience Study, GRS recommended maintaining the wage inflation assumption of 3.00%. Based on the analysis in the Experience Study, we find this assumption reasonable.

SECTION IV – AUDIT OF THE ACTUARIAL ASSUMPTIONS AND METHODS

Demographic Assumptions

The December 31, 2020 Experience Study covers the period January 1, 2018 through December 31, 2020. GRS notes that there is insufficient data to analyze all assumptions by employment classification.

We find the recommended demographic assumptions reasonable and in compliance with ASOP 35 *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations,* which effective January 1, 2025, is now part of *ASOP 27, Selection of Assumptions for Measuring Pension Plans.* We recommend that GRS, in the next experience study, add the following:

- A discussion of credibility to address whether there is enough data to discern an actual trend in behavior,
- Graphs showing actual, current and recommended rates to make it easier for the reader to understand the analysis,
- Results showing the A/E ratio for the current and recommended assumptions (actual observances to that which is expected based on the assumption).

We have the following observations on the demographic assumptions:

1. *Mortality*

   Post-retirement mortality for healthy service retirements is based on the 2020 WRS Experience Tables for Healthy Retirees, with a blend based on benefit weighted and population weighted experience. For disabled annuitants, post-retirement mortality is based on the 2020 WRS Experience Tables for Disabled Retirees, with a blend based on benefit weighted and population weighted experience. For pre-retirement actives, mortality is based on the 2020 WRS Experience Tables for Active Employees, with a blend based on benefit weighted and population weighted experience. Mortality improvements for each table are based on 100% of the Society of Actuaries MP-2021 scale, projected generationally from a base year of 2010.

   The Society of Actuaries (SOA) completed an extensive mortality study of public pension plan experience and issued a set of mortality tables named the Pub-2010 mortality tables which provide insights into the composition of gender-specific pension mortality by factors such as job category (e.g., General Employees, Teachers, Public Safety), salary/benefit amount, and health status (e.g., healthy or disabled). Mortality studies in the U.S. have also shown that individuals with higher salaries if active, or higher benefit income if retired, have longer life expectancies than individuals with lower income. In the Experience Study, GRS indicates that they used the Pub-2010 Tables for comparison and to determine the best fit and shape to the Wisconsin experience.

   We find GRS's pre and post-retirement mortality assumptions reasonable.

SECTION IV – AUDIT OF THE ACTUARIAL ASSUMPTIONS AND METHODS

2. *Deferred Retirement Age for Terminated Vested Participants*

   This assumption was not analyzed in the December 31, 2020 Experience Study. We recommend that this assumption be reviewed in the next experience study.

With the exception of the above comments, we have concluded that the following other demographic assumptions used in the valuation appear reasonable and meet the requirements of ASOP 35. These other demographic assumptions are as follows:

1. *Normal Retirement and Reduced Retirement*

   Service retirement rates are based on age, gender (except for Protective and Executive and Elective), employment classification and State vs Non-State employment.

2. *Withdrawal*

   Withdrawal rates are based on age (if 10 or more years of service), service (if less than 10 years of service), gender (except for Protective and Executive and Elective), employment classification and State vs Non-State employment.

3. *Disability Retirement*

   Disability rates are based on age, gender (except for Protective and Executive and Elective), employment classification and State vs Non-State employment.

Actuarial Methods

Actuarial methods typically consist of three components: (1) the funding method, which is the allocation of total costs to past, current, and future years; (2) the amortization basis of the Unfunded Actuarial Liability; and (3) the method of calculating the actuarial value of assets (i.e., asset smoothing).

Funding Method

GRS states that the System uses the Frozen Initial Liability (FIL) funding method, also known as the Frozen Entry Age Method. Under this method, the remaining unfunded actuarial liability is adjusted for amortization payments, interest and any additional liability created by new employers. We find the Frozen Initial Liability funding method reasonable.

However, based on the actual calculation used to determine the contributions rates, the method is more typically referred to as Aggregate Entry Age. This is because the unfunded liability – shown as the difference between the System's assets and Entry Age Accrued Liability, net of the very small FIL base of approximately $5 million – is amortized over a period as specified in the

SECTION IV – AUDIT OF THE ACTUARIAL ASSUMPTIONS AND METHODS

Experience Amortization Reserve (EAR) policy. This means that experience gains or losses are amortized over the EAR amortization period and are **not** spread over the average future working lifetime of the active participant group, which appears to conflict with the statement made by GRS in their description of the System's actuarial funding method on page F-6 of the Annual Actuarial Valuation report.

We recommend that GRS clarify the funding method used in the valuation report, and review the statement referenced above regarding the amortization of gains and losses for accuracy. Also see our additional comments below related to the amortization method.

Amortization Method

It is our understanding that the FIL balances are maintained by ETF. Each subsequent experience gain or loss and assumption change is reflected in the normal cost; therefore, typically under the Frozen Initial Liability Method, they would be amortized over the average future working lifetime of the active participant group as a level percent of payroll. However, under the Wisconsin Funding Policy, the standard amortization period is set at 20 years, rather than using the average future working lifetime. This is more typical of the Entry Age Normal Funding Method, as noted above.

GRS states on page F-6 of the Annual Actuarial Valuation that the amortization period is reconsidered as part of each triennial experience study under the WRS Funding Policy. The minimum and maximum amortization periods are 10 and 30 years, respectively. We did not find a discussion of the amortization period in the Experience Study. We recommend that this discussion be included in the next experience study.

Also, we note that because the standard amortization period is reset to 20 years each year, this constitutes a rolling amortization period. Actuarial Standard of Practice No. 4 (ASOP 4) includes the following guidance for selecting an amortization method:

> *When selecting an **amortization method**, the actuary should select an **amortization method** that is expected to produce total amortization payments that are expected to fully amortize the unfunded **actuarial accrued liability** within a reasonable time period or reduce the unfunded **actuarial accrued liability** by a reasonable amount within a sufficiently short period.*
>
> *The actuary should assess whether the unfunded **actuarial accrued liability** is expected to be fully amortized.*

Using a rolling amortization period will result in a payment not expected to fully amortize the unfunded liability, because the period is reset each year. Even if a review of the EAR policy were to result in a reduction in the amortization period, the funding policy states that the minimum amortization period is 10 years, resulting in an unfunded liability that is not expected to be fully amortized. Thus, the amortization method does not satisfy the first condition described in the ASOP 4 language above.

SECTION IV – AUDIT OF THE ACTUARIAL ASSUMPTIONS AND METHODS

In addition, the use of a 20-year period results in an amortization payment that barely exceeds the interest on the unfunded liability, resulting in very little reduction of the principal balance. Therefore, the amortization policy also does not satisfy the second condition for a reasonable amortization method.

We note that we find that the methods used to determine the contributions – including the amortization method – still result in a contribution expected to achieve the financing objectives of the System, in particular because the System's risk sharing mechanisms are designed the keep the System well-funded, and thus the unfunded liability balances and associated payments should constitute a minor portion of the overall funding requirements.

However, ASOP 4 does require the Actuary to disclose if the amortization method is not consistent with the guidance reflected in the standard. In addition, the standard requires a specific disclosure if the unfunded liability is not expected to be fully amortized (Section 4.1.s). We recommend that GRS include these disclosures in future reports as appropriate.

Asset Smoothing Method

There are generally two types of asset values disclosed in an actuarial valuation, the market value of assets and the actuarial value of assets. The market value represents a "snap-shot" or "cash-out" value which provides the principal basis for measuring financial performance from one year to the next. Market values, however, can fluctuate widely with corresponding swings in the marketplace. As a result, market values are usually not as suitable for long-range planning as are the actuarial value of assets which reflect smoothing of annual investment returns.

The actuarial value of Core assets is a five-year smoothed market value. Unanticipated changes in market value are recognized over a five-year closed period in the actuarial value of Core assets. The adjusted Effective Earnings Rate is used to determine Core dividends in each fiscal year.

Assets in the Variable Investment Trust are not smoothed and are marked to market each year. The adjusted Effective Earnings Rate is used to determine Variable Dividends each fiscal year.

This smoothing method complies with ASOP 44 *Selection and Use of Asset Valuation Methods for Pension Valuation*. Smoothing the market gains and losses over a reasonable period of time to determine the actuarial value of assets is a generally accepted approach, and we concur with its use.

Dividend (Core Annuity Fund) and Variable Annuity

The Discussion of Dividend (Core Annuity Fund) and the Discussion of Variable Annuity Change sections of the Retired Lives Valuation report both contain items (4,7,8 and 10) which we could not independently verify from the source documents we were provided. Given the importance of the dividends in the operation of the System, we recommend the report be changed to contain sufficient details of the methodology used to determine the dividends so an independent reader can review the calculation of these items.

SECTION IV – AUDIT OF THE ACTUARIAL ASSUMPTIONS AND METHODS

Actuarial Standards of Practice No. 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions

We recommend the Annual Actuarial Valuation report include a statement on whether the computed contribution rates meet the definition of a reasonable actuarially determined contribution, as defined in ASOP 4. If the computed contribution rate does not meet the definition of a reasonable actuarially determined contribution, GRS will need to compute one and describe any material assumptions or methods used in the calculation that are not disclosed elsewhere. GRS should also discuss how the particular conditions of the System are taken into account in making this determination.

APPENDIX A – FUNDING POLICY

FUNDING POLICY OF THE WISCONSIN RETIREMENT SYSTEM

Reprinted from WRS Funding Policy: approved December 11, 2014; revised March 24, 2022

The financing objective of the Wisconsin Retirement System is defined below:

FINANCIAL OBJECTIVE

The main financial objective of the WRS is to fully fund the long-term cost of benefits provided by statute, through disciplined and timely accumulation of sufficient assets to deliver earned benefits on a continuing basis.

FUNDING GUIDELINES

This funding policy seeks to balance three main objectives:

- **Contribution Adequacy** — Contributions and current plan assets must be sufficient to provide for all benefits expected to be paid to members and their beneficiaries when due.
- **Contribution Stability and Predictability** — Contribution volatility must be controlled to the extent reasonably possible, consistent with other policy goals.
- **Inter-Generational Equity** — Costs of benefits should be paid for by the generation that receives the benefits.

FUNDING METHODS AND PRINCIPLES

The following methods and principles, most of which are stipulated by statute, will be used to implement this policy:

- Actuarial Cost Method – [Wis. Stat. § 40.05(2)]. Normal cost[1] for the WRS is calculated using the *frozen initial liability* method, modified to adjust the normal cost by the amortization of the Experience Amortization Reserve (EAR)[2].

[1] "Normal cost" refers the amount of money that must be set aside for future payment of pension benefits that have accrued this year. Normal cost is calculated differently depending on the cost method chosen.

[2] The EAR is a reserve created in the mid-1980's by ETF Secretary, Gary Gates, under authority granted in Wis. Stat. § 40.04(1). The EAR helps reduce volatility in contribution rates. It allows an actuarial loss to be absorbed in what would be the unfunded actuarial liability under the entry age actuarial cost method. The resulting liability can then be amortized over an extended period to mitigate the effects of short-term negative experience.

APPENDIX A – FUNDING POLICY

Under the Frozen Initial Liability method as modified, normal costs are determined in the aggregate. The first component of normal cost is equal to a level percentage of payroll, which is determined in the aggregate as the ratio of the present value of future entry age normal costs for all participants divided by the present value of expected future pay for all participants. The second component of normal cost is equal to an amortization of the EAR over a period of years, which is reconsidered with each triennial experience study.

- Asset Smoothing Method – [Wis. Stat. § 40.04(3)]. Asset smoothing reduces volatility in contribution rates by increasing the period over which asset gains and losses are recognized. The WRS's Market Recognition Account (MRA) annually distributes 20% of each year's Core Fund annual gains and losses over/under the Assumed Rate. Therefore, the actual market gain or loss experienced in a given year is fully recognized by the Core Fund in five years. The Variable Fund is not smoothed and recognizes actual gains or losses each year.

- Assumed Rate – [Wis. Stat. § 40.02(7)]. The Assumed Rate is the expected rate of return on Core Fund assets. The anticipated rate of investment earnings for the Core Fund is 6.8%[3].

- Assumed Benefit Rate – [Wis. Stat. § 40.02(6)]. The anticipated rate of investment earnings for the Core Fund's annuity reserve is 5%. The Assumed Benefit Rate is used for calculating reserve transfers at the time of retirement.

- Funding Target – The funding objective is to reach and maintain 100% funding measured against the Entry Age Normal Actuarial Cost Method.

- Amortization – [Wis. Stat. § 40.05(2)(b)]. For employers who joined the WRS prior to 2009, the entry age unfunded actuarial accrued liability (UAAL) is amortized as a level percentage of payroll over 40 years. UAAL for employers who joined the WRS beginning in 2009 is amortized over 30 years.

- Discount Rate – Active and inactive member liabilities are discounted at the same rate as the Assumed Rate. Post-retirement liabilities are discounted using the Assumed Benefit Rate.

- Dividend Liability – Dividend Liability refers to the present value of all previously-granted post-retirement annuity adjustments.

[3] Approved by the ETF Board December 9, 2021.

APPENDIX A – FUNDING POLICY

RISK MANAGEMENT

As with all retirement plans, the WRS is subject to risks. These risks include demographic risk, economic risk, benefit risk, governance risk, and dividend liability risk. Methods for managing and minimizing these risks are outlined here. The Board will periodically engage the Board's actuary to undertake stress testing and scenario testing or review the results of stress and scenario testing performed by the SWIB in order to gain an understanding of the potential effects of major risks that may affect the WRS.

Demographic Risk: *the possibility that the plan's experience related to retirement patterns, mortality and other demographic factors will not match actuarial assumptions.*

The Board approves actuarial assumptions based on recommendations of the actuary. Regular review of actuarial assumptions is a best practice in the management of demographic risks. Wisconsin law provides that the actuary must make a general investigation at least once every three years of the experience of the WRS relating to mortality, disability, retirement, separation, interest, employee earnings rates, and of any other factors deemed pertinent to the administration of the system. [Wis. Stat. § 40.03(5)(b)]. The Board will use the results of the experience studies to adopt assumptions for future valuations. The demographic portion of the experience study will include these principal areas of risk assumption:

- Rates of mortality among participants, retirees, and beneficiaries.
- Rates of withdrawal of active participants.
- Rates of disability among participants.
- Patterns of salary increases to be experienced by participants.
- Age and service distribution of actual retirements.

As noted in the "Funding Methods and Principles" section above, the triennial experience study also investigates the EAR amortization period. The ETF Secretary may, in consultation with the Board's actuary, adjust the operation of the EAR, including the EAR amortization period. For example, if the EAR is underfunded, the amortization period will be set to minimize the amount of negative amortization that would otherwise occur.

Economic Risk: *investment, price inflation, and wage inflation risk.*

Investment risk relates to market returns differing from actuarial assumptions. Price inflation and wage inflation risks relate to unexpected movements in underlying inflation that will create variation in contribution rates and potential loss of purchasing power for members.

APPENDIX A – FUNDING POLICY

The financial assets that are accumulated to pay the pensions of WRS participants are invested by an independent state entity: the State of Wisconsin Investment Board (SWIB). SWIB is required to prudently invest the assets in a diversified manner to meet funding needs while minimizing the risk of large losses. SWIB establishes asset allocation policies, investment guidelines, and performance benchmarks. SWIB is subject to these additional requirements:

- Annual review of the WRS asset allocation and report to ETF on the market value of the assets of the Core and Variable Funds.

- For any change in investment policies or guidelines, provide a summary report to the Joint Legislative Audit Committee, the Joint Committee on Finance, and the chief clerk of each house of the legislature.

- Annual report to Legislature with a description of the Board's annual investment goals and long-term investment strategies; an assessment of the Board's progress in meeting its annual investment goals; information on the types of investments held by the Board, including the market values and degree of risk associated with the investments.

The ETF Board and its actuary will review economic assumptions (for example, long-term rates of investment income likely to be generated by fund assets and wage assumptions) based on recommendations from SWIB and will consider appropriate adjustments to ensure assumptions comport with the WRS asset allocation and the principles of long-term stability and predictability. The review of economic assumptions, including the Assumed Rate, occurs with each experience study (see description under Demographic Risk section).

Benefit Risk: *the risk that benefit changes will result in future contributions that are unaffordable.*

The Board and ETF will review legislative proposals and consult with the actuary as appropriate to determine possible impacts on the WRS. If it is determined that a legislative proposal might materially affect plan funding, the Board may recommend to the Joint Survey Committee on Retirement Systems (JSCRS; see description below) that an actuarial valuation be conducted, and ask that the results of the valuation be reflected in JSCRS' written report of the proposed legislation.

Governance Risk: *the risk that the plan's administrative policies and procedures are not fully appropriate for carrying out the functions of the plan.*

APPENDIX A – FUNDING POLICY

Management of governance risk requires sufficient administrative structures for monitoring compliance with this policy and ensuring that actuarially determined contributions are made. Mitigation of governance risk also requires that structures be in place to determine long-term costs of benefit changes before passage of any law that materially affects plan funding. For the WRS, such risk is addressed by the following:

- Joint Survey Committee on Retirement Systems (JSCRS): serves as the legislative oversight committee for all matters relating to proposed statutory changes to state-operated public employee pension plans. Current law prohibits the Legislature from acting on any bill or amendment which would create, modify, or in any way provide for the retirement or payment of pensions to public employees unless the proposal has first been referred to the JSCRS, and the Committee has provided a written report on the bill or amendment.

- Legislative Council: provides legal and research assistance to the JSCRS and may prepare fiscal estimates on bills referred to the JSCRS. The Legislative Council staff must prepare a comparative study of major public employee retirement systems in the U.S. every two years. The Legislative Council consults with groups representing participants in the WRS and suggests to the Joint Legislative Council subjects for study or investigation of public employee retirement issues. Finally, funds may be appropriated to enable the Legislative Council staff to contract for actuarial studies approved by the JSCRS.

- Consulting Actuary to the ETF Board: serves as the technical advisor for the Board and ETF on actuarial matters affecting the soundness or operation of the retirement fund. The actuary is required under contract to provide periodic reports, including:
    - *Retired Lives Valuation* - Annual valuation of core and variable fund annuities being paid from the Wisconsin Retirement System. (each March).
    - *Active Lives Valuation* and Gain/Loss Analysis - Annual valuation of liabilities and costs associated with non-retired participants of the Wisconsin Retirement System and analysis of experience among participants. (each June).
    - *Valuation to meet plan and employer disclosure requirements under Governmental Accounting Standards Board Statements 67 and 68.* - (each June).
    - *Three-Year Experience Study*.

- Legislative Audit Bureau (LAB) Oversight of Actuarial Services to the ETF Board: The Legislative Audit Bureau is required by Wis. Stat. § 13.94(1)(dc) to contract for the performance of an actuarial audit of the WRS at least once every five years. The purpose of the audit is to review the actuarial methods, assumptions and procedures employed by the WRS. LAB also performs an annual financial audit of ETF to ensure that ETF's financial statements and internal controls are in compliance with applicable statutes, policies, and

guidelines The LAB also conducts an annual audit of SWIB to ensure that their financial statements and internal controls comply with applicable statutes, policies, and guidelines.

- Ensuring Contributions are Made: WRS contributions are required to be made under Wis. Stat. § 40.05(1) and (2), according to the assumptions the actuary recommends and that the Board approves.

- Determination of Long-Term Costs: The Board's actuary periodically produces a 50-year projection study that uses stochastic projections that compares future benefits with future contributions against a range of investment returns. The Board will use the results of this and other such studies to make recommendations to JSCRS when relevant and appropriate to any proposed legislation.

- Funding Policy Review: This WRS Funding Policy will, at a minimum, be formally reviewed by the ETF Board in conjunction with each three-year experience study.

Dividend Liability Risk: *the risk that the Dividend Liability will decrease to a very low level.*

While it is considered normal for the level of Dividend Liability to fluctuate with annual investment return gains and losses, it is of concern if the Dividend Liability level becomes very low. When the Dividend Liability is very low, the effect of future adverse investment experience can potentially have a magnified effect on contribution rates. At zero, all annuities would be at their base "guaranteed floor" levels and would have no inflation protection. To monitor Dividend Liability risk, the Board and ETF will review Dividend Liability levels and consult with the actuary at a minimum, as a part of the biennial Stress Testing and the annual Retired Lives Valuation discussions.

Risk Measures

Risk measures allow the quantification of the risks in this policy. Risk measures will be included in annual valuation reports in accordance with actuarial standards of practice and also investigated whenever evaluating legislative proposals. Many risk sharing features inherent in the WRS plan design mitigate some of the items below. Examples of risk measures include:

- Funded Ratio (Assets/Accrued Liabilities): The funded ratio is the most widely known measure of a plan's financial strength, but the trend in the funded ratio is much more important than the absolute ratio. The funded ratio should trend to 100%. As it approaches 100%, it is important to re-evaluate the level of investment risk in the portfolio and potentially to re-evaluate the Assumed Rate.

APPENDIX A – FUNDING POLICY

- Total Unfunded Actuarial Accrued Liabilities as a Percentage of Total Payroll: Gives an indication of the plan sponsor's ability to pay off the unfunded liability. A ratio above approximately 300% or 400% may indicate difficulty in discharging the unfunded liability within a reasonable time frame.

- Annuitant Liabilities as a Percentage of Total Accrued Liabilities: Gives an indication of the maturity of the system. As the ratio increases, cash flow needs increase, and the investment policy may need to change. A ratio on the order of 50% indicates a maturing system.

- Other Measures: Other measures as deemed appropriate by the Actuary and the Board consistent with Actuarial Standards of Practice are included in the annual valuations of the retirement system.

APPENDIX B – INFORMATION RELIED UPON IN PREPARING THIS REPORT

- Wisconsin Statutes:
  - Chapter 40
  - Member Benefit brochures found on the ETF website
- Files received from ETF (either directly or from the website):
  - Actuarial Valuation Reports as of December 31, 2023
  - Experience Study for the Period January 1, 2018 to December 31, 2020
  - December 31, 2023 Annual Comprehensive Financial Report
  - Valuation data for the December 31, 2023 Actuarial Valuations
  - Actuarial Equivalence Factors
  - Sample retirement calculations
  - WRS Funding Policy
- Files received from GRS:
  - Valuation data for the December 31, 2023 Actuarial Valuation
  - Assumptions used in the December 31, 2023 Actuarial Valuation
  - Detailed liability results by division
- Other:
  - 2024 *National Conference on Public Employees Retirement Systems* (NCPERS) Public Retirement Systems Study
  - March 2024 Survey published by the National Association of State Retirement Agencies (NASRA)
  - 2024 *Old-Age, Survivors and Disability Insurance Trustees Report* (OASDI)

APPENDIX C – GLOSSARY OF TERMS

1. Actuarial Assumptions

Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, withdrawal, disability, and retirement; changes in compensation; inflation; rates of investment earnings, and asset appreciation or depreciation; and other relevant items.

2. Actuarial Cost Method

A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an allocation of such value to each year of service, usually in the form of a Normal Cost and an Actuarial Liability.

3. Actuarial Gain (Loss)

A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions during the period between two Actuarial Valuation dates, as determined in accordance with a particular Actuarial Cost Method.

4. Actuarial Liability (also known as Actuarial Accrued Liability and Accrued Liability)

The portion of the Actuarial Present Value of Projected Benefits which will not be paid by future Normal Costs. It represents the value of the past Normal Costs with interest to the valuation date.

5. Actuarial Present Value

The value as of a given date of a future amount or series of payments. The Actuarial Present Value discounts the payments to the given date at the assumed investment return and includes the probability of the payment being made. As a simple example: assume you owe $100 to a friend one year from now. Also, assume there is a 1% probability of your friend dying over the next year, in which case you won't be obligated to pay him. If the assumed investment return is 10%, the actuarial present value is:

Amount		Probability of Payment		1/(1+Investment Return)		
$100	x	(1 - .01)	x	1/(1+.1)	=	$90

6. Actuarial Valuation

The determination, as of a specified date, of the Normal Cost, Actuarial Liability, Actuarial Value of Assets, and related Actuarial Present Values for a pension plan.

APPENDIX C – GLOSSARY OF TERMS

7. Actuarial Value of Assets

The value of cash, investments and other property belonging to a pension plan as used by the actuary for the purpose of an Actuarial Valuation. The purpose of an Actuarial Value of Assets is to smooth out fluctuations in market values. This way long-term costs are not distorted by short-term fluctuations in the market.

8. Amortization Payment

The portion of the pension plan contribution which is designed to pay interest and principal on the Unfunded Actuarial Liability in order to pay for that liability in a given number of years.

9. Entry Age Normal Cost Method

A method under which the Actuarial Present Value of Future Benefits of each individual included in an actuarial valuation is allocated on a level basis over the earnings or service of the individual between entry age and assumed exit age(s). The portion of this Present Value of Future Benefits allocated to a valuation year is called the Normal Cost. The portion of this Present Value of Future Benefits not provided for at a valuation date by the Present Value of Future Normal Costs is called the Actuarial Liability. This is the method used under Governmental Accounting Standards Board (GASB) Statement Nos. 67 and 68.

10. Frozen Initial Liability Cost Method

A method under which a Frozen Initial Liability is initially established at the time the method is first adopted, typically based on the difference between the Actuarial Value of Assets and the Actuarial Present Value of Benefits at that time. This initial liability is then amortized over a specified period. In subsequent years, the difference between the Present Value of Benefits and the Actuarial Value of Benefits, net of the remaining balance of the Frozen Initial Liability, is funded as the Present Value of Future Normal Costs and generally spread out over the Present Value of Future Salaries. Changes in the liability due to actuarial gains or losses or changes in actuarial assumptions are typically funded through the Present Value of Future Normal Costs, rather than being separately amortized. As a result, this method becomes what is generally known as the Aggregate Funding Method once the initial liability is fully amortized.

11. Funded Ratio

The ratio of the Actuarial Value of Assets to the Actuarial Liabilities.

12. Market Value of Assets

The fair value of the Plan's assets assuming that all holdings are liquidated on the measurement date.

APPENDIX C – GLOSSARY OF TERMS

13. Normal Cost

That portion of the Actuarial Present Value of pension plan benefits and expenses, if applicable, which is allocated to a valuation year by the Actuarial Cost Method.

14. Projected Benefits

Those pension plan benefit amounts which are expected to be paid in the future under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and increases in future compensation and service credits.

15. Unfunded Actuarial Liability (UAL)

The excess of the Actuarial Liability over the Actuarial Value of Assets.