



Public Employees Retirement System of Ohio

# Actuarial Audit

December 5, 2025



Daniel Siblik, ASA, FCA, EA, MAAA  
Vice President and Actuary  
Tel 630.414.2695  
dsiblik@segalco.com

901 Mopac Expressway South  
Building 1, Suite 300  
Austin, TX 78746  
segalco.com

December 5, 2025

Ohio Retirement Study Council  
Attention: Bethany Rhodes  
30 East Broad Street  
Columbus, Ohio 43215

Dear Ms. Rhodes:

Thank you for the opportunity to provide our proposal to perform an independent actuarial audit of the Public Employees Retirement System of Ohio (PERS).

We understand the Ohio Retirement Study Council (ORSC) is seeking an independent evaluation of PERS's existing actuarial studies produced by the retained consulting actuary. The audit will examine the Actuarial Valuation Report for Defined Benefit Allowances—Traditional, Combined, and Member Directed Plans as of December 31, 2023, the 5-Year Actuarial Experience Study for the period ending December 31, 2020, and the Annual Actuarial Valuation and Projections of Retiree Health Benefits (including GASB 74 disclosures) for the period ending December 31, 2023 to assure that the results presented are actuarially sound, reasonable, and consistent with industry standards.

Segal has extensive experience performing level one audits of retirement system actuarial valuations and experience studies, as well as providing a wide range of consulting and actuarial services to state retirement systems. We are fully committed to perform the required work as specified and on schedule.

We look forward to reading the responses to our questions, as well as those of other firms. Please feel free to contact me with any questions at 630.414.2695 or [dsiblik@segalco.com](mailto:dsiblik@segalco.com).

Sincerely,

A handwritten signature in black ink that reads "Daniel Siblik".

Daniel Siblik, ASA, FCA, EA, MAAA  
Vice President and Actuary

# Table of Contents

Questionnaire .....	1
4.1 Proposal summary .....	1
4.2 Capabilities and experience .....	5
4.3 Staff qualifications.....	15
4.4 References .....	20
4.5 Methodology, work product and timeline.....	21
4.6 Additional information .....	28
4.7 Glossary .....	29
4.8 Cost information.....	30
A. Professional biographies .....	33
B. Sample actuarial audit report.....	44

# Questionnaire

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

Segal appreciates the opportunity to present our proposal to perform actuarial audit services for the Public Employees Retirement System of Ohio (PERS). We trust this proposal will demonstrate that Segal is best qualified to provide the services requested.

## Our understanding

We understand the ORSC is seeking an actuarial audit firm to provide an independent verification and analysis of the assumptions, procedures and methods used by the PERS consulting actuary. Segal will provide an independent verification and analysis of the assumptions, procedures, and methods used by the PERS's consulting actuary for the active and retiree lives actuarial valuation of the PERS as of December 31, 2023 (valuation date). Segal will perform a full replication of the calculation of the December 31, 2023 active and retired lives actuarial valuation. Segal will also perform an independent actuarial review of the five-year experience study for the period January 1, 2016, through December 31, 2020.

## Approach

### Verification of data collection and validity

We will complete an assessment of the validity, completeness and appropriateness of the data used by the retained actuary. Additionally, we will assess the degree to which data is sufficient to support the conclusions of the actuarial valuations and the use and appropriateness of any assumptions made regarding the data.

We will examine the participants' individual data for internal consistency. Accuracy will be assessed by comparing the input data from the employer to the output data from the retained actuary and by reviewing the methods used by the retained actuary to reconcile participant data from year to year. We will also assess the use and appropriateness of estimation methods used when certain data is missing or unavailable.

### Review of actuarial assumptions

We will review the economic and non-economic actuarial funding assumptions and consider whether the actuarial valuation assumptions are reasonable and internally consistent and adhere to generally accepted actuarial standards and practices, specifically Actuarial Standard of Practice No. 27 covering economic assumptions and Standard of Practice No. 35 covering

demographic and non-economic assumptions. Additionally, we will identify areas, if any, not addressed in the experience review that may be appropriate for future evaluation. This may include comments or suggestions on alternate ways to analyze certain assumptions and/or develop recommendations that could provide additional refinement of liability calculations. The assumptions we review will include, but are not limited to:

- Mortality
- Retirement and separation rates
- Individual salary increases
- Payroll growth
- Rates of investment return
- Disability factors

## **Evaluation of actuarial methods and procedures**

We will evaluate the appropriateness of PERS's actuarial funding methods for the individual plans as there are different funding approaches (including the resultant actuarial accrued liability, normal cost and contribution rates) and determine whether they are reasonable and consistent with generally accepted actuarial standards and practices and with the particular benefits, investments, demographics and funding objectives of PERS. We will review the funding methods based primarily on the cost patterns they can be expected to produce. Among the considerations we will review are the development of the annual normal cost percentages, the amortizations of the unfunded actuarial accrued liability (if applicable) and the derivations of contribution requirements.

We will also review the actuarial asset methods with attention to the value (in terms of impact on volatility) and reasonableness (in terms of Actuarial Standards of Practice Statement 44 – Selection and Use of Asset Valuation Methods for Pension Valuations) of using an asset smoothing method. Our review will analyze the interrelationship of the length of the smoothing period and size of the corridor around market.

## **Validation of actuarial calculation processes and benefits valued**

An actuarial valuation must communicate the financial condition of the Plan in a clear, concise manner and with the utmost degree of accuracy. Segal's established approach to actuarial valuations defines a sequence, methodology and set of quality controls that allow us to consistently meet this high standard of quality and accuracy.

We will review the plan provisions, as outlined in the statutes, to those included in the actuarial valuation reports to determine if the plan provisions being valued are consistent with those described in the statutes. The Segal actuarial team will program our proprietary actuarial valuation software and, using the raw data provided from the retained actuary, prepare at a minimum a full replication of one valuation report for each funding policy.

We will reconcile any discovered deviations that fall outside the risk tolerance level with PERS to discover the rationale and effect for such deviation. If we recommend any adjustments to the

valuation procedures or results, we will provide a detailed rationale for our recommendations and a description of the general effect on each system.

## Evaluation of actuarial methods and procedures

We will evaluate the appropriateness of the actuarial funding method (including the resultant actuarial accrued liability, normal cost and contribution rates) and determine whether it is reasonable and consistent with generally accepted actuarial standards and practices and with the particular benefits, investments, demographics and funding objectives of PERS. We will review the funding method based primarily on the cost pattern it can be expected to produce. Among the considerations we will review are the development of the annual normal cost percentage, the amortization of the unfunded actuarial accrued liability and the derivation of contribution requirements.

## Method used to certify contributions

Based upon the results of the parallel valuations and using the applicable funding methodologies, Segal will independently determine the contribution requirements. We will compare our calculation of the contribution requirements to those calculated by the actuaries. If the comparison shows a material difference, we will determine the reasons for the differences.

## Evaluation of conclusions and report format

We will evaluate the actuarial valuation reports for consistency and accuracy. Specifically, we will answer the following questions:

- Does the report comply with all relevant Actuarial Standards of Practice?
- Are the key conclusions stated succinctly and in an understandable manner?
- Does the report accurately reflect the status of the plans?
- Do the methods and assumptions listed in the report accurately reflect the processes being implemented by the retained actuary?
- Would any additional information be necessary or helpful?
- *The firm's primary contact for ORSC staff use and, if different, for PERS staff use during the audit, including the contact's address, telephone and e-mail address;*

Segal's primary contact for ORSC and PERS's staff use during the audit is:

Dan Siblik, ASA, FCA, EA, MAAA, Vice President and Consulting Actuary  
901 Mopac Expressway South  
Building 1, Suite 300  
Austin, Texas 78746  
630.414.2695  
[dsiblik@segalco.com](mailto:dsiblik@segalco.com)

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

An independent, privately held consulting firm, Segal has been employee owned by its officers since 1978 and currently has 350 employee owners, with no shareholder owning more than 5% of the company. An 11-member Board of Directors sets policy and governs the organization. Implementation of policies, development of strategies and day-to-day operations are the responsibilities of our Chief Executive Officer.

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

There has not been any material change in the firm's structure or ownership within the last eighteen months. Additionally, we do not expect any material change in ownership, staff or structure in the next one to two years and expect that Segal will continue to be independent and employee owned.

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

Occasionally we complete client satisfaction surveys of our clients, but due to client confidentiality, we do not release those results. We are very proud of our client retention rate of 98% and believe that this demonstrates the satisfaction of our clients.

We place a premium value on our relationships with our clients. Segal's commitment to clients is evidenced by the loyalty of our clients, many of whom have maintained long-standing relationships with us spanning over 60 years, as well as clients who have left that have returned to us. Due to our size, client loyalty, oversight and effort to seek continuous client feedback, surprises are seldom.

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

Segal has been a trusted advisor to our clients for more than 85 years and provides services to more than 2,500 current clients. Throughout our long history, Segal has occasionally been named as a party in litigation. No litigation has ever affected Segal's ability to provide services to its clients or materially affected Segal's financial position or operations.

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

Segal has not been named as a defendant in a civil lawsuit, been sued, or accused of legal violations in the last five years related to the performance of services.

- *A list of any professional relationships involving the ORSC, the five Ohio public retirement systems, the State of Ohio, or its political subdivisions for the past five years, together with a statement explaining why such relationships do not constitute a*

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

There are no professional relationships Segal has with entities mentioned above that would be considered a conflict of interest.

## **4.2 Capabilities and experience**

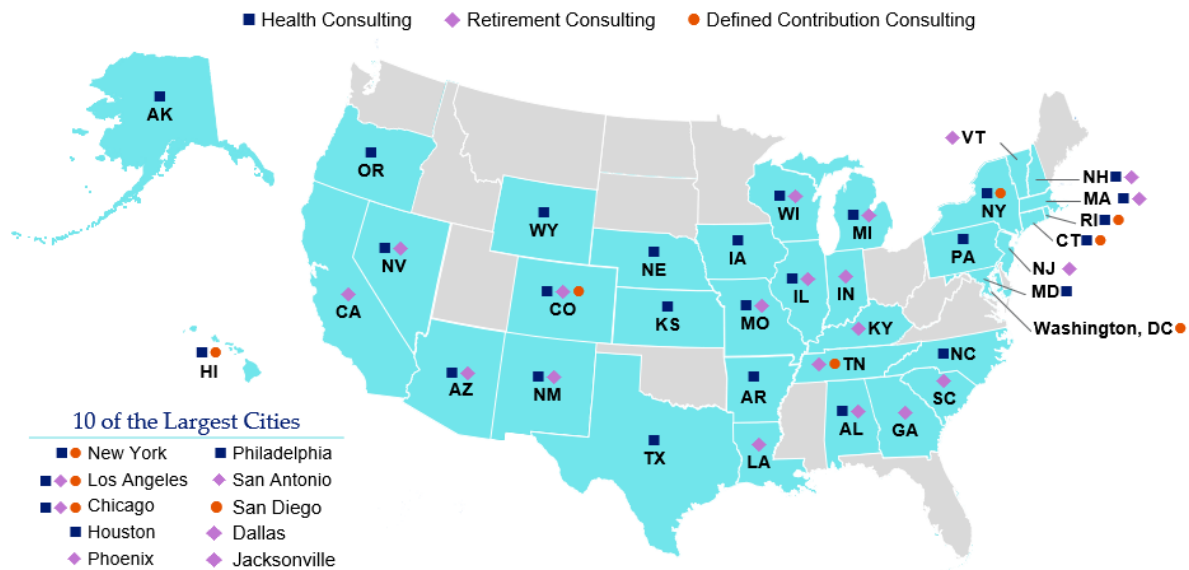
*Each proposal shall describe the firm's capabilities and recent experience (at least during the last five years) in performing actuarial valuations, audits, or studies of public employee retirement systems. The response should include information on the types and sizes of public employee retirement 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.*

### **Our experience**

Segal's pension team of actuaries and consultants functions as a center of excellence for public sector consulting, including the performance of actuarial audits and pension valuations. This team specializes in working with states, local governments and other public sector systems and has extensive experience valuing the liabilities for retirement and retiree health benefits, as well as helping clients manage the magnitude of the liability.

We provide benefit consulting services to more than 500 public sector entities representative of 35 states (as shown in the exhibit below), plus the District of Columbia, the U.S. Virgin Islands, Puerto Rico, the U.S. Government and Canada. Retirement actuarial consulting services are provided to more than 150 public sector funds including state and local entities, transportation authorities and both primary and secondary education venues.

## We Serve 35 Public Sector State Clients



We perform health, retirement and/or defined contribution consulting for 35 states, 10 of the largest U.S. cities, 12 California county retirement systems, the District of Columbia, the U.S. Virgin Islands, Puerto Rico and Canada.

### We provide expert advice

Segal has extensive experience providing actuarial services for state and other large public pension plans. Public pension plans are under ever-increasing scrutiny, and Segal partners with public sector entities to find thoughtful and sustainable solutions that work in today's environment.

- **We understand the changing landscape:** Despite recent changes in plan design, pressures still exist in the funded status of plans. Segal works with states and other public sector entities to find the appropriate solution, looking both at the strategic goals of the plan and the fiscal constraints of the plan's sponsors.
- **Our knowledge of public sector plans and compliance issues is a unique asset:** Segal works closely with national organizations representing state and other large public pension plans at the federal level and supports research organizations such as the National Institute for Retirement Security. Andrew Sherman, Segal's National Director, Public Sector Market, has more than 30 years working with large public sector employee benefit plans and educating policy makers about large public sector entities.
- **The team proposed is recognized as leaders in the actuarial profession:** Our consultants testify before legislatures, lead professional associations and committees, and speak at national and regional conferences and forums.

### Background

A wholly owned subsidiary of The Segal Group, Inc., Segal is a private corporation. Founded in 1939, Segal has been providing benefit services for more than 85 years and actuarial consulting

services for more than 75 years. From the beginning, Segal has been involved in developing health and retirement programs that meet the needs of employees and employers. Segal began to provide services to private sector and public sector plans by the 1950s.

Segal, Segal Benz and Segal Marco Advisors are all members of the Segal family. While company names and logos have evolved over the firm’s history, Segal remains an employee-owned firm known for providing unbiased consulting based on the integrity, expertise, personal investment and trusted advice of our people.

Segal currently has more than 1,100 full-time employees. Segal is headquartered in New York City and has locations throughout the U.S. and Canada.

As actuarial consultants to the public sector, we serve the needs of a wide range of clients, including:

- State and local governments
- Statewide employee retirement systems and health benefit plans
- Public school and higher education institutions
- Federal government agencies and other public organizations and entities
- Special districts: transit, utilities, water, toll and port authorities

**Our teams help a wide range of industries. No matter who you are, we can assist you.**

 **Segal**

Administration and Technology Consulting  
Benefit Audit Solutions  
Compensation and Career Strategies  
Compliance

Health and Welfare Benefits  
HR and Benefits Technology  
Insurance  
Organizational Effectiveness  
Retirement Benefits

 **Segal Benz**

Benefits Communication  
Communication Strategy  
Personalized Benefit Statements  
Surveys and Focus Groups  
Website and Portal Design

 **Segal Marco Advisors**

Corporate Governance and Proxy Voting  
Defined Contribution Consulting  
Discretionary Investment Management  
Intermediary/Advisor Solutions  
Investment Consulting  
OCIO (Outsourced Chief Investment Officer)

## Actuarial auditing expertise

Actuarial audits are a core part of what we do at Segal, and our experience is described in detail in this proposal. Known in the industry for our high caliber of work and rigorous quality control procedures, Segal is often selected to perform actuarial audit and review work. The Firm's actuaries conduct an average of four to five actuarial audits per year and the team proposed for PERS typically works on two actuarial audit projects per year. We adhere to a process for performing audits that is widely recognized by retirement systems as superior and has led to successful auditing assignments.

## Recent experience

Our public sector actuarial experience includes many non-valuation assignments as well. These projects generally include limited and full scope actuarial audits, plan design and funding analyses, expert witness, board of education assignments, among other services. The following chart shows a list of our public sector retirement clients where we have provided services other than routine actuarial valuations and periodic experience studies within the last five years:

Client	Year(s)	Assignment	Asset Size
California State Teachers' Retirement System	2011, 2016, 2024	Actuarial Valuation and Experience Analysis Replication and Review Services	\$258 billion
City of Grand Rapids General Retirement System	2021	Full scope audit	\$450 million
City of San Jose Federated City Employees' Retirement System	2017, 2021	Full scope audit	\$2.5 billion
City of San Jose Police and Fire Department Plan	2017, 2021	Full scope audit	\$4.2 billion
Merced County Employees' Retirement Association	2017, 2020, 2023	Full scope audit	\$686 million
Oklahoma Teachers Retirement System	2022	Full scope audit	\$20 billion
Phoenix – Public Safety Personnel Retirement System	2022	Full scope audit	\$5 billion
Tennessee Consolidated Retirement System	2020	Full-scope audit	\$52 billion
Kentucky Retirement Systems	2015 and 2020	Limited scope audit	\$12 billion
Retirement Systems of Alabama	2011, 2016, 2018, 2021, 2023	Limited scope audit	\$31 billion
Wisconsin Retirement System	2011 and 2015-2017, 2019 and 2020	Actuarial audits	\$80 billion
Illinois Commission on Government Forecasting and Accountability	2012–	Consultant	\$80 billion
New York State Teachers Retirement System	2013–	Consultant	\$95 billion

Client	Year(s)	Assignment	Asset Size
New Hampshire Judicial Retirement System	2018 and 2021	Plan design analysis	\$58 million
San Bernadino County, CA	2022-2023	OPEB plan design	

## Experience performing actuarial valuations of public plans

Segal is well versed in providing consulting services to large public pension plans like PERS including annual valuations, experience studies as well as actuarial audits. In addition to these services, we provide consulting around funding policy, legislative proposals, and benefit adequacy which can be helpful during the auditing process. Following are recent examples of our experience:

- Public Employees' Retirement Association (PERA) of Colorado:** The Colorado Legislature passed a bill creating a link between actuarially calculated contributions and actual contributions in a systematic way to meet long-term funding goals. To monitor progress, Segal works with the PERA Board to generate annual "Signal Light" reports, which provides sensitivity analysis of actuarial assumptions on certain funding targets using stochastic modeling and deterministic projections.
- Public Employees' Retirement System of Nevada:** Segal analyzed a proposed State bill that would have closed the defined benefit system and created a defined contribution plan for new members. Our work included detailed analysis of the short- and long-term costs, discussion of legal and compliance issues, meetings with legislative staff, committee testimony and Board education.
- Vermont Retirement Systems:** In addition to preparing actuarial valuations and accounting disclosures, the Segal team assisted with educating the Boards and other stakeholders on the impact of certain risks to the plans through a comprehensive risk analysis study; worked with various groups to provide detailed analyses of potential changes to benefits, eligibility and contribution rates; and assisted staff with the creation of a new tier of membership within the Vermont State Employees' Retirement System.

We currently perform actuarial valuations, experience analysis reviews and general consulting services similar to what is being analyzed in the requested scope of work for the following complex public-sector defined benefit plans. The programs administered by these systems include defined benefit plans. Some systems also administer defined contribution and retiree healthcare plans:

### Representative List of Segal's Public Sector Actuarial Valuation Clients (by Asset Size)

Client	Initial Contract Year	Total Membership	Asset Size
University of California Retirement System	2004	378,231	\$110.7 billion
Colorado Public Employees' Retirement Association	2018	649,581	\$64.8 billion

<b>Client</b>	<b>Initial Contract Year</b>	<b>Total Membership</b>	<b>Asset Size</b>
Public Employees' Retirement System of the State of Nevada	1974	220,687	\$64.4 billion
Illinois Teachers' Retirement System	2016	434,117	\$64.2 billion
City of Los Angeles Fire and Police Pension Plan	2006	27,620	\$31.3 billion
Police and Firemen's Retirement System of New Jersey	2020	89,070	\$27.8 billion
Los Angeles City Employees' Retirement System	2004	62,180	\$25.3 billion
Orange County Employees Retirement System	2004	54,485	\$23.7 billion
San Diego County Employees Retirement Association	2003	52,065	\$19.7 billion
The Water and Power Employees' Retirement Plan of the City of Los Angeles	1999	23,691	\$19.4 billion
San Bernardino County Employees' Retirement Association	2002	52,150	\$16.4 billion
Sacramento County Employees' Retirement System	2004	33,660	\$14.5 billion
Alameda County Employees' Retirement Association	2003	27,156	\$12 billion
Contra Costa County Employees' Retirement Association	2003	25,946	\$11.6 billion
Ventura County Employees' Retirement Association	2003	22,527	\$8.2 billion
Boston Retirement System	prior to 2005	46,066	\$6.8 billion
Fresno County Employees' Retirement Association	2006	21,804	\$6.6 billion
Kern County Employees' Retirement Association	2011	24,326	\$5.8 billion
Vermont Retirement Systems	2017	58,440	\$5.5 billion
Municipal Employees' Annuity and Benefit Fund of Chicago	2014	79,912	\$4.3 billion
University of Missouri Retirement, Disability and Death Benefit Plan	prior to 2005	34,234	\$3.7 billion
Sonoma County Employees' Retirement Association	2007	11,767	\$3.4 billion
Fire and Police Pension Fund, San Antonio	2003	6,976	\$3.4 billion
Los Angeles Department of Water & Power	2002	20,123	\$3.2 billion
East Bay Municipal Utility District Retirement System	2007	4,557	\$2.5 billion
City of Fresno Fire and Police Retirement System	2006	2,633	\$2.2 billion
Georgia Municipal Employees Benefit System	2005	37,448	\$2.1 billion
City of Jacksonville General Employees Retirement Plan	2010	9,348	\$2.0 billion
Dallas Police and Fire Pension System	2016	10,592	\$2.0 billion
Milwaukee County Employees' Retirement System	2017	18,142	\$2.0 billion
City of Fresno Employees Retirement System	2006	5,862	\$1.8 billion
County of Santa Clara (OPEB only)	2011	31,995	\$1.7 billion

<b>Client</b>	<b>Initial Contract Year</b>	<b>Total Membership</b>	<b>Asset Size</b>
Memphis Light, Gas and Water Division Retirement and Pension System	1999	5,260	\$1.6 billion
DeKalb County Pension Plan	1988	11,856	\$1.5 billion
Firemen's Annuity and Benefit Fund of Chicago	2020	10,154	\$1.5 billion
Fulton County Employees Retirement System	2013	3,450	\$1.4 billion
Middlesex County Retirement System	prior to 2005	17,812	\$1.4 billion
City of Atlanta General Employees' Pension Fund	1994	9,205	\$1.4 billion
City of Cambridge Contributory Retirement System	prior to 2005	5,899	\$1.3 billion
Retirement Plan for Employees of NJ Transit Bus Operations, Inc. Amalgamated Transit Union	prior to 2005	8,946	\$1.2 billion
Imperial County Employees' Retirement System	2007	4,646	\$1.2 billion
Barnstable County Retirement System	prior to 2005	8,444	\$1.1 billion
City of Birmingham Retirement and Relief System	prior to 1990	7,638	\$1.0 billion
City of Worcester Retirement System	prior to 2005	6,889	\$952 million
Mendocino County Employees' Retirement Association	2011	3,725	\$793.4 million
Government Employees' Retirement System of the Virgin Islands	1993	18,000	\$769 million
Milwaukee County Transport Employees' Pension Plan	2017	2,334	\$636 million
City of Orlando Police Officers' Pension Fund	1995	1,548	\$623 million
New Jersey Transit Non-Agreement Retirement Plan	prior to 2005	2,557	\$564 million
Massachusetts Water Resource Authority	2013	1,788	\$530 million
Essex Regional Retirement System	2018	5,960	\$525 million
Fairfax County Water Authority Retirement Plan	2015	864	\$427 million
City of Savannah Employees' Retirement Plan	prior to 1997	4,144	\$421 million
City of New Orleans Employees' Retirement System	2018	5,452	\$419 million
Park Employees' Annuity and Benefit Fund of Chicago	2012	5,615	\$415 million
Newton Contributory Retirement System	2014	3,512	\$351 million
Town of Brookline Contributory Retirement System	prior to 2005	3,915	\$309 million
City of Holyoke Retirement System	prior to 2005	2,322	\$300 million
Town of East Hartford Pension Plan	prior to 1995	1,187	\$255 million
Weld County Retirement Plan	2012	2,170	\$255 million
City of Chattanooga Fire and Police Pension Fund	1998	1,705	\$241 million
City of Atlanta General Employees' Pension Fund Employees of the Atlanta Board of Education	1994	2,734	\$230 million
City of Jacksonville Corrections Officers Retirement Plan	2010	926	\$220 million
Judicial Retirement System of Nevada	1976	225	\$210 million

<b>Client</b>	<b>Initial Contract Year</b>	<b>Total Membership</b>	<b>Asset Size</b>
Fulton-DeKalb Hospital Authority Employees' Retirement Plan	2012	6,093	\$197 million
City of Salem Retirement System	2009	1,750	\$178 million
City of Bridgeport Public Safety Plan A	prior to 2000	573	\$169 million
Employees Retirement Plan of the Town of Hamden	prior to 1992	1,104	\$167 million
Town of Wellesley Contributory Retirement System	prior to 2005	1,316	\$164 million
Retirement Plan for Employees of The Water Works and Sewer Board of the City of Birmingham	2008	972	\$163 million
Dedham Contributory Retirement System	2019	927	\$157 million
Town of Andover Retirement System	1998	1,317	\$144 million
Town of Natick Contributory Retirement System	2002	1,179	\$128 million
Chicago Housing Authority Employees' Retirement Plan	2013	1,185	\$121 million
City of Falls Church Basic Retirement Plan	2019	644	\$121 million
Boston Water and Sewer Commission	2006	722	\$114 million
Town of Belmont Retirement System	2013	1,075	\$109 million
Board of Education Employees' Pension Fund of Essex County	prior to 2005	547	\$108 million
City of Gloucester Retirement System	2012	1,105	\$107 million
City of Gainesville Retirement Plan A	2007	862	\$106 million
City of Vero Beach General Employee Retirement Plan	1998	724	\$96 million
Retirement Plan of Hampton Roads Transportation District Commission	prior to 2005	962	\$88 million
City of Bridgeport Plan B (Police)	prior to 2000	135	\$83 million
Pension Plan for General Employees of the Town of North Haven	prior to 1995	340	\$70 million
Swampscott Retirement System	2019	632	\$67 million
Town of Portsmouth, Rhode Island	2014	317	\$53 million
City of Bridgeport Plan B (Fire)	prior to 2000	74	\$44 million
City of Falls Church Police Retirement Plan	2019	81	\$40 million
City of Birmingham Firemen's and Policemen's Supplemental Pension System	prior to 1990	1,791	\$35 million
Town of North Haven Police Department Pension Plan	prior to 1995	107	\$27 million
Town of Johnston, Rhode Island Firefighters Pension System	2001	112	\$24 million
Town of Johnston, Rhode Island Police Pension System	2001	152	\$22 million
Town of North Haven Fire Department Pension Plan	prior to 1995	66	\$19 million

<b>Client</b>	<b>Initial Contract Year</b>	<b>Total Membership</b>	<b>Asset Size</b>
Town of Wolcott Board of Education	Prior to 2010	184	\$18 million
City of Birmingham Retirement and Relief System Health Department Employees	prior to 1990	44	\$16 million
Retirement Plan for Policemen of the Town of Wolcott	prior to 1995	44	\$15 million
Town of Westbrook Retirement Plan	prior to 1995	197	\$14 million
Retirement Plan for Employees of the Town of Wolcott	prior to 1995	105	\$11 million
Retirement Plan of NJ Transit Bus Operations, Inc. for Utility Workers' Union of America, Local 601 Employees	prior to 2005	38	\$7 million
Legislators' Retirement System of the State of Nevada	1976	141	\$5.4 million
University System of New Hampshire Additional Retirement Contribution Plan	2015	358	\$2.3 million
Town of Westbrook Volunteer Fire Plan	Prior to 1995	69	\$2 million
Fort Worth Police Benevolent Association	2016	1,707	\$1.6 million
Town of North Haven Volunteer Fire Plan	prior to 1995	76	\$1 million
City of Birmingham Unclassified Employees' Pension & Relief System	prior to 1990	10	\$0.7 million
Watauga County Law Enforcement Officers' Special Separation Allowance Plan	2017	45	\$0.6 million
Town of Westbrook Constables Plan	2006	11	\$0.3 million
Town of Bethany Volunteer Fire	2016	49	\$0.2 million
City of Bridgeport's Janitors' and Engineers' Retirement Fund	prior to 2005	15	\$0.1 million
Town of North Haven Elected Officials	Prior to 1995	5	\$0.1 million

## Segal's OPEB / Retiree Health Experience

Segal serves as the Retiree Health actuary and consultant to more than 100 state and local governments, including development of OPEB liabilities and costs.

### Representative List of Segal's OPEB / Retiree Health Clients

<b>Name of Entity</b>	<b>State</b>	<b>Name of Entity</b>	<b>State</b>
Birmingham Airport Authority	AL	Chicago Transit Authority Retiree Health Care Trust	IL
City of Birmingham	AL	Indian Prairie Community Unit School District No. 204	IL
Central Arizona Project	AZ	Lake County	IL
City of Chandler	AZ	McHenry County	IL
City of Flagstaff (NAPEBT)	AZ	Park District Risk Management Agency (PDRMA)	IL
City of Nogales	AZ	State of Kansas	KS

City of Tucson	AZ	Barnstable County/Cape Cod Municipal Health Group	MA
Coconino Community College (NAPEBT)	AZ	Belmont Light Department	MA
Coconino County (NAPEBT)	AZ	Boston Public Health Commission	MA
Flagstaff Unified School District (NAPEBT)	AZ	Boston Water and Sewer Commission	MA
Phoenix Union High School	AZ	Cambridge Health Alliance	MA
Tempe Elementary School District	AZ	City of Boston	MA
Alameda County Employees' Retirement Association	CA	City of Gloucester	MA
City of Bakersfield	CA	City of Holyoke	MA
City of Los Angeles Department of Water & Power	CA	City of Newton	MA
City of Los Angeles Fire & Police Pension Plan	CA	City of Quincy	MA
County of Kern	CA	City of Salem	MA
County of Santa Clara	CA	Dedham-Westwood Water District	MA
County of Sonoma	CA	Massachusetts School Building Authority	MA
East Bay Municipal Utility District	CA	Massachusetts State College Building Authority	MA
Los Angeles City Employees' Retirement System	CA	Massachusetts Water Resource Authority	MA
San Diego County Employees Retirement Association	CA	Nashoba Regional School District	MA
Colorado Public Employees' Retirement Association	CO	Quincy College	MA
State of Connecticut	CT	Reading Municipal Light Department	MA
Town of Beacon Falls	CT	Southwick-Tolland Regional School District	MA
Town of Bethel	CT	Town of Acton	MA
Town of East Haven	CT	Town of Belmont	MA
Town of Hamden	CT	Town of Bourne	MA
	CT	Town of Brookline	MA
Town of North Haven	CT	Town of Burlington	MA
Town of Wolcott	CT	Town of Reading	MA
Bartow County	GA	Town of Wakefield	MA
Cherokee County Water and Sewerage Authority	GA	Town of Wellesley	MA
City of Acworth	GA		
City of Atlanta	GA	Wakefield Municipal Gas and Light Department	MA
City of Buford	GA	Wellesley Municipal Light Department	MA
City of Carrollton	GA	State of Maryland	MD
City of Cedartown	GA	Eastern Michigan University	MI
City of Centerville	GA	Michigan Public Schools Employees Retirement	MI
City of Conyers	GA	Western Michigan University	MI
City of Cumming	GA	Grand Village Nursing Home	MN
City of Dallas	GA	Itasca County	MN
City of Doraville	GA	State of Missouri	MO
City of Douglas	GA	University of Missouri	MO

City of Douglasville	GA	State of North Carolina	NC
City of Dublin	GA	Watauga County	NC
City of Gainesville	GA	State of Nebraska	NE
City of Hapeville	GA	State of New Hampshire	NH
City of Jesup	GA	Town of Derry	NH
City of Kennesaw	GA	University System of New Hampshire	NH
City of Kingsland	GA		
City of Lagrange	GA	New Mexico Retiree Health Care Authority	NM
City of Loganville	GA	State of Nevada	NV
City of Madison	GA	New York State Teachers' Retirement System	NY
City of Norcross	GA	Smithtown School District	NY
City of Pooler	GA	Suffolk School Employees Health Plan	NY
City of Savannah	GA	Memphis Light, Gas & Water Division	TN
City of Smyrna	GA	City of Houston	TX
City of Valdosta	GA	City of Falls Church	VA
City of Winder	GA	Fairfax County Water Authority	VA
DeKalb County	GA	Loudon County Public Schools	VA
Fitzgerald Water, Light, and Bond Commission	GA	Vermont Retirement System	VT
Fulton County	GA	State of Wisconsin	WI
State of Iowa	IA	State of Wyoming	WY
University of Idaho	ID		

### 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 qualification.*

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

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

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

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

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

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

We have assigned an experienced team of actuaries and consultants to the actuarial audit team. Additionally, we will make other top Segal public sector actuaries available as resources to the team wherever their special skill sets may be required. In the rare circumstance that a key member of the PERS account team leaves our organization, we have the resources available to replace them at any time because of the size of our firm and depth of consultant and actuary experience and expertise. We have supplied a large client team so that there is notable overlap and many consultants are up to speed on the client and all relevant client issues. This makes handling a sudden departure much more manageable.

Segal has a succession planning procedure in place that allows seamless transition of client assignments for planned departures (e.g., retirement of a senior consultant). Formally, Segal requests 18 months of notice for planned retirements, which allows associate consultants and actuaries to spend at least one valuation cycle working firsthand with the client. Informally, many Segal employees nearing retirement begin training replacement consultants three to five years in advance.

If a need arises to replace a professional due to circumstances beyond our control, we will determine the best fit from our extensive list of qualified and experienced consultants and actuaries, then propose that individual to PERS for approval.

## **Experience Summaries**

### **Daniel Siblik, ASA, MAAA, FCA, EA, Vice President and Actuary**

Dan has more than 30 years of experience as a benefits consultant and focuses primarily on public sector pension consulting, as well as retiree healthcare consulting.

Dan will serve as Principal Actuary and Co-Client Relationship Manager. He will ensure that PERS has the support and access to resources it needs throughout the project. Dan is 100%

committed to providing actuarial services to public sector clients, and his long career in this area provides him with an understanding of the issues specific to public sector retirement systems. As Principal Actuary, he will be available when and where he is needed by PERS, maintaining clear lines of communication to make sure we provide high quality service on time and in conformance with your expectations. Dan will attend all meetings and will review all correspondence and reports.

Following is his representative client list of actuarial audit clients.

<b>System</b>	<b>Asset size</b>
Teachers' Retirement System of Oklahoma	\$20 billion
Cincinnati Retirement System	\$2 billion
City of Grand Rapids General Retirement System	\$450 million

Dan has also served as supporting actuary to several public sector retirement systems, including:

- Chicago Housing Authority
- Commission on Government Forecasting and Accountability
- Firemen's Annuity and Benefit Fund of Chicago
- Municipal Employees' Annuity and Benefit Fund of Chicago
- Teachers' Retirement System of the State of Illinois

### **Jonathan Scarpa, FSA, MAAA, EA, Vice President and Actuary**

Jon has more than 14 years of experience, working with many public sector pension plans across a range of industries. He has experience with annual actuarial valuations, developing funding strategies, plan design, legislative reviews and asset liability modeling.

Jon will serve as the Secondary Actuary and Co-Client Relationship Manager on our team for PERS, working directly with Dan, and will be an additional contact for PERS's staff. Jon will provide additional consulting insight and guidance and will lead the team of actuaries who will provide the GASB guidance.

Following is his representative client list of actuarial audit clients.

<b>System</b>	<b>Asset size</b>
New York State Teachers' Retirement System	\$146 billion
Teachers' Pension and Annuity Fund of New Jersey	\$34 billion
Public Employees' Retirement System of New Jersey	\$29 billion

Jon has also served as supporting actuary to a number of public sector retirement systems, including:

- The Police and Firemen's Retirement System of New Jersey
- Government Employees Retirement System of the U.S. Virgin Islands

- New Jersey Transit
- Board of Education Employees' Pension Fund of Essex County

The following management plan outlines the roles and responsibilities for the primary professional staff assigned to work on the actuarial audit for PERS.

## Management Plan

Dan and Jon will receive assistance from several other Segal professionals for this engagement. Individuals expected to provide additional technical assistance or consulting oversight are Tanya Dybal, Austin Miller, Diana Yen, Laura Jeske and Maria Manoukarakis. Nicole Llorens and Lauren Osen will manage the OPEB work.

The following table identifies the members of our team and describes their respective roles relative to this engagement. Detailed resumes are included for each individual assigned to the team can be found in *Appendix A*.

### Segal Team

Team Member	Title	Role
<b>Core Consulting Team</b>		
<b>Dan Siblik, ASA, MAAA, FCA, EA</b> <i>Vice President and Actuary</i> 630.414.2695 <a href="mailto:dsiblik@segalco.com">dsiblik@segalco.com</a>	Principal Actuary and Co-Client Relationship Manager (CRM)	Dan will serve as Principal Actuary and Co-CRM for the PERS audit. He will be responsible for evaluating the methods and procedures used by the Retained Actuary in their valuations. Dan will also review the communication of actuarial results and the professional qualifications of the individual actuaries working with PERS, and he will comment on the Retained Actuary's adherence to the applicable Actuarial Standards of Practice. He will summarize the conclusions reached by the actuarial team resulting from Segal's review and will review the initial draft of the audit report. It is anticipated that Dan's time will account for approximately 15% of the hours spent on this engagement.
<b>Jonathan Scarpa, FSA, MAAA, EA</b> <i>Vice President and Consulting Actuary</i> 212.251.5078 <a href="mailto:jscarpa@segalco.com">jscarpa@segalco.com</a>	Secondary Actuary and Co-CRM	Jon will act as the Secondary Actuary and Co-CRM for PERS. He will review correspondence and reports, provide strategic oversight on the analysis and help manage the relationship. He will be responsible for providing progress reports to PERS's staff and will present the report to the Board of Trustees along with Dan. It is anticipated that Jon's time will account for approximately 15% of the hours spent on this engagement.
<b>Tatsiana (Tanya) Dybal, FSA, MAAA, EA</b> <i>Vice President and Actuary</i> 312.984.8671 <a href="mailto:tdybal@segalco.com">tdybal@segalco.com</a>	Senior Reviewing Actuary	Tanya will serve as Senior Reviewing Actuary, responsible for reviewing the communication of actuarial results and ensuring that the project team follows Segal's quality control standards. She will also comment on the Retained Actuary's adherence to the Actuarial Standards of Practice. Tanya will be the final technical reviewer of the actuarial calculations to ensure that Segal's findings and comparisons with the Retained Actuary's test life

Team Member	Title	Role
		results are valid. She will review the draft of the audit report and evaluate the Retained Actuary's data collection and calculation processes and verify that the benefits valued are consistent with the statutes governing the systems. It is anticipated that Tanya's time will account for approximately 10% of the hours spent on this engagement.
<b>Pension Actuarial Team</b>		
<b>Austin Miller</b> <i>Senior Actuarial Associate</i> 952.259.2601 <a href="mailto:asmiller@segalco.com">asmiller@segalco.com</a>	Reviewing Actuary	Austin will serve as the Reviewing Actuary. He will work with the team on the calculations and reviewing the audit report and other deliverables. Austin will review the actuarial test life calculations to ensure that Segal's findings and comparisons with the actuary's results are valid and will also review the actuarial assumptions and methodologies. He will supervise the drafting of the audit report. It is anticipated that Austin's time will account for approximately 15% of the hours spent on this engagement.
<b>Diana Yen, ASA, MAAA</b> <i>Associate Actuarial Consultant</i> 312.984.8582 <a href="mailto:dyen@segalco.com">dyen@segalco.com</a>	Actuarial Analyst	Diana will serve as an Actuarial Analyst. She will evaluate the census data, program our valuation software and calculate the liabilities and normal cost for the valuation replications. She will also assist with matching all mathematical calculations to review for completeness and accuracy. Diana, Laura and Maria's time will collectively account for 15% of the hours spent on this engagement.
<b>Laura Jeske</b> <i>Actuarial Associate</i> 312.984.8663 <a href="mailto:ljeske@segalco.com">ljeske@segalco.com</a>	Actuarial Analyst	Laura will act as an additional Actuarial Analyst and assist with the evaluation of the census data, programming Segal's valuation software and calculating the liabilities and normal cost for the sample test lives identified for review. Diana, Laura and Maria's time will collectively account for 15% of the hours spent on this engagement.
<b>Maria Manoukarakis</b> <i>Actuarial Associate</i> 312.984.8683 <a href="mailto:mmanoukarakis@segalco.com">mmanoukarakis@segalco.com</a>	Actuarial Analyst	Maria will act as an additional Actuarial Analyst and assist with the evaluation of the census data, programming Segal's valuation software and calculating the liabilities and normal cost for the sample test lives identified for review. Diana, Laura and Maria's time will collectively account for 15% of the hours spent on this engagement.
<b>OPEB Actuarial Team</b>		
<b>Nicole Llorens, ASA, MAAA</b> <i>Vice President, OPEB Actuary</i> 312.984.8539 <a href="mailto:nllorens@segalco.com">nllorens@segalco.com</a>	OPEB Actuary	Nicole will manage the OPEB team and serve as the primary reviewer of the health care analysis and audit. It is anticipated that Nicole's time will account for approximately 12% of the hours spent on this engagement.
<b>Lauren Osen</b> <i>Actuarial Associate Consultant</i> 312.984.8579 <a href="mailto:losen@segalco.com">losen@segalco.com</a>	OPEB Analyst	Lauren will serve as an analyst, assisting Nicole with the health care analysis and audit. It is anticipated that Lauren's time will account for approximately 12% of the hours spent on this engagement.

Lastly, we confirm that neither Segal nor 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.

## 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.*

<b>Organization Name:</b>	<b>City of Grand Rapids General Retirement System</b>
Date of actuarial audit work:	2021
Address:	233 Fulton St E, Suite 216 Grand Rapids, MI 49503
Contact name:	Ms. Peggy Korzen, Executive Director
Email address:	<a href="mailto:pkorzen@grpensions.org">pkorzen@grpensions.org</a>
Telephone number:	616.365.5015
Description of work:	Limited scope audit
<b>Organization Name:</b>	<b>Teachers’ Retirement System of Oklahoma</b>
Date of actuarial audit work:	2023
Address:	301 NW 63rd St 5th Floor, Oklahoma City, OK 73116
Contact name:	Ms. Sarah Green, Executive Director
Email address:	<a href="mailto:sarah.green@trs.ok.gov">sarah.green@trs.ok.gov</a>
Telephone number:	405.521.4745
Description of work:	Full scope audit
<b>Organization Name:</b>	<b>Retirement Systems of Alabama</b>
Date of actuarial audit work:	2011, 2016, 2018, 2021, 2023
Address:	201 S Union St, Montgomery, AL 36104
Contact name:	Mr. Taylor Benefield, Actuary
Email address:	<a href="mailto:taylor.benefield@rsa-al.gov">taylor.benefield@rsa-al.gov</a>
Telephone number:	334.517.7374
Description of work:	Limited scope audits

## 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.*

### Section II. scope of audit

We understand the purpose of this project is to have an independent actuary evaluate work performed for PERS by the current Retained Actuary. This evaluation will examine the reasonableness and accuracy of the valuation and GASB results, actuarial assumptions and application of the actuarial cost method. The evaluation will be a full scope audit.

The team we propose for PERS is prepared to provide an actuarial audit for the primary purpose of independent verification and analysis of the assumptions, procedures, and methods used by the Retained Actuary for:

- PERS's annual pension actuarial valuation as of December 31, 2023
- The five-year experience study review for the period July 1, 2016, to December 31, 2020
- PERS's annual retiree health care actuarial valuation as of December 31, 2023
- GASB 74 disclosures

### **Determination if actuarial valuation and experience study are technically sound and based on generally accepted actuarial standards**

Our analysis will specifically focus on the accuracy, consistency, reasonableness and appropriateness of PERS's Consulting Actuary's work in the context of actuarial soundness and in light of the governing plan rules and regulations. Segal recognizes that "actuarial soundness" is neither an absolute nor a unique concept but must be considered in relation to the issues at hand and the accuracy with which future experience can be predicted.

Segal will assess the conclusions of the valuation report for completeness and accuracy. Segal will offer an opinion as to whether or not the valuation conclusions accurately portray the actuarial status of PERS and accurately generate the required contribution rates. Segal will review the format of the valuation report with suggested recommendations for improvement.

Our review will allow us to assess whether the actuarial valuation and experience study are technically sound and based on generally accepted actuarial standards.

### **Verification of data collection and validity**

We will complete an assessment of the validity, completeness and appropriateness of the data used by PERS's Consulting Actuary, the degree to which data is sufficient to support the

conclusions of the actuarial valuations and the use and appropriateness of any assumptions made regarding the data.

We will examine the participants' individual data for internal consistency. Accuracy will be assessed by comparing the input data from the employer to the output data from the Consulting Actuary and by reviewing the methods used by the Consulting Actuary to reconcile participant data from year to year. We will also assess the use and appropriateness of estimation methods used when certain data is missing or unavailable.

We will review the financial information provided by PERS and compare this information to that reported in the actuarial valuations.

We will review the plan provisions, as outlined in the statutes, to those included in the actuarial valuation reports to determine if the plan provisions being valued are consistent with those described in the statutes.

## **Review of actuarial assumptions**

We will review the economic and non-economic actuarial funding assumptions including the Investigation of Experience. This assessment will help determine whether the assumptions are reasonable, based on PERS's experience and appropriate to the current benefit structure. A comparison with national benchmarks and recent trends in public retirement plan funding assumptions will be made. The most recent experience study will be assessed for the Consulting Actuary's approach and recommendations. We will also identify areas, if any, not addressed in the Consulting Actuary's experience reviews that may be appropriate for future evaluation. The assumptions we review will include, but are not limited to, mortality, retirement and separation rates, level of pay adjustments, rates of inflation and investment return and disability factors.

## **Evaluation of actuarial methods and procedures**

We will review PERS's Consulting Actuary's valuation procedures and adjustments to determine whether they are reasonable and consistent with generally accepted actuarial standards and best practices and with the particular features of PERS that they are intended to value. This assessment will determine whether the Consulting Actuary's procedures and adjustments are appropriate for the benefit structure of PERS and any funding policies, and whether the procedures, adjustments and funding method are applied as stated by the Consulting Actuary. The proper applications of actuarial assumptions and plan provisions will be verified based upon testing a sample of liability calculations for plan members ("test lives"). Test lives will be selected that allow for a stratified sampling of combinations of service, age and salary, as well as key benefit breakpoints and decrements. Test cases will check all plan provisions, including the benefits as they compare to the statutes.

We will also review the actuarial asset method with attention to the value (in terms of impact on volatility) and reasonableness (in terms of Actuarial Standards of Practice Statement 44 – Selection and Use of Asset Valuation Methods for Pension Valuations) of using an asset smoothing method. Our review will analyze the interrelationship of the length of the smoothing period and size of the corridor around market value of assets.

## Review of actuarial valuation report

Segal will assess the conclusions of the valuation reports for completeness and accuracy. Segal will offer an opinion as to whether or not the valuation conclusions accurately portray the actuarial status of System and accurately generate the required contribution rates. Segal will determine whether the valuation reports include the information required to be disclosed. Segal will review the format of the valuation reports with suggested recommendations for improvement.

Our review will allow us to assess whether the actuarial valuations are complete and based on generally accepted actuarial standards.

## Written actuarial review report

For each task, we will prepare a written report summarizing the results of our parallel actuarial valuations. Segal will first complete a draft written report, which we will invite PERS to review and provide feedback to be incorporated into a final report. The report will include:

- Our specific findings with regard to each of the parallel valuation and review elements
- A recap of any specific discrepancies, variations or exceptions identified, the estimated impact of those items, the resolution of those items and any items that remain outstanding
- Our opinion as to the reasonableness of the valuation assumptions, methods and conclusions, and their conformance with generally accepted actuarial standards, GASB standards and practices
- A description of any improvements that can be made to the annual actuarial valuation, including the valuation process, the valuation results and the form of presentation
- Our comments on the overall profile of each system, including benefit design, the actuarial funding method and actuarial valuation asset method
- An assessment of the experience study methods and procedures
- Comparative tables displaying the results of the parallel actuarial valuations
- Detailed recommendations based on all of the above findings. These recommendations will be identified within the report and within an executive summary

### 3.1 Written reports

We will prepare a written report summarizing the results of our actuarial audit. Twenty-five bound copies of the final report will be submitted to PERS and a digital and 25 bound copies of the final report will be submitted to the ORSC no later than one week after Segal completes the final report and we will separately present this report, in person, to both the ORSC and the PERS Board. The report will include:

- An overall opinion as to the validity, completeness, and appropriateness of the demographic and financial information used by the consulting actuary to meet PERS's funding objectives;
- An overall opinion as to the reasonableness of the consulting actuary's conclusions and the conformance of the consulting actuary's work with generally accepted actuarial standards and practices;

- A detailed description of each audit exception and the estimated effects of each exception on PERS; and
- Detailed recommendations for improvement. The recommendations should be easily identified within the report by use of bold, underlined, or italicized text, bullets, or other similar techniques.

Our report will be provided in .pdf format, and we understand PowerPoint is not an acceptable format for this report. The report will be written in language clearly understood by lay readers, with terms essential to an understanding of retirement system funding and actuarial valuation, such as unfunded accrued liability, funding method, actuarial cost method, normal cost, etc., explained in lay terms. Additionally, the report will include an executive summary.

The report will contain an appendix with detailed, technical information that the Retained Actuary will need to understand and respond to our findings and analysis. Upon request by the Retained Actuary, we will make available data or other information in such form as requested.

### 3.2 Working papers

The working papers will remain available for review and duplication by the ORSC and its designees during the period of the contract and for a period of not less than four years after the last payment date. Additionally, we will remain available to answer reasonable questions by authorized representatives of the ORSC at no additional cost beyond the contract price.

### 3.3 Additional services

Segal understands that, if we are chosen to perform this audit, we **will be disqualified** from consideration as a contractor for activities relating to the area of our review for a period of one year after completion of the audit.

### 3.4 Project execution and administration

Segal will be responsible for coordinating and obtaining needed information from PERS (e.g., video, telephone conferences or email). Segal will be responsible for all of the Contractor's travel arrangements, travel expenses, and clerical support.

*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.*

In this section, we have provided an audit timeline along with the involvement expected from PERS and the Retained Actuary. We do not anticipate needing any programming support or space from PERS or the Retained 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.*

Please see a sample actuarial audit report attached as *Appendix B*.

*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.*

The following is our proposed work plan for completing the full scope actuarial audit.

<b>:Steps</b>	<b>PERS Involvement</b>	<b>Retained Actuary Involvement</b>	<b>Timing</b>
1. Initial conference call with ORSC/PERS staff	Yes	No	Upon award

If selected to perform this study, Segal will meet with ORSC and/or PERS staff, if desired, either virtually or in-person. The purpose of this meeting will be to review the project timeline and process, materials needed and any other information necessary for the completion of the audit.

<b>Steps</b>	<b>PERS Involvement</b>	<b>Retained Actuary Involvement</b>	<b>Timing</b>
2. Data/document gathering and initial analysis	Yes	Yes	Within 1 month

Once we have the necessary census information, detailed actuarial assumptions and relevant documents, our analysts will commence the initial analysis of the data and reconciliation process. As part of this step, sample participants for whom detailed calculations will be checked are selected and relevant information will be requested from the retained actuary. The principal and supporting actuaries will review the analysts' work. The analysts will document their steps and findings as they work, which aids in the peer review process and begins to lay the framework of the content for our written actuarial review report. These notes are retained in the project file as part of the work papers for this engagement.

<b>Steps</b>	<b>PERS Involvement</b>	<b>Retained Actuary Involvement</b>	<b>Timing</b>
3. Review of census data	No	No	Within 2 months

Segal will compare the census data provided by PERS to the census data used by the current actuarial firm for the actuarial valuations. We will compare distributions of the data as well as the edits that the current actuarial firm makes to the census data.

<b>Steps</b>	<b>PERS Involvement</b>	<b>Retained Actuary Involvement</b>	<b>Timing</b>
4. Analysis of current actuarial methods and procedures	No	Minimal	Within 2.5 months

Each actuary involved in this case will review the actuarial report and most recent experience study and independently note their findings and comments with respect to assumptions, methodology, report content, etc. We will discuss all our observations in an internal meeting and outline those points that will be included in our written report. An assessment will be made as to the reasonableness of the methods and procedures and the consistency with generally accepted actuarial standards of practice. Any deviations will be discussed with PERS and the current actuarial firm before inclusion in our draft report.

<b>Steps</b>	<b>PERS Involvement</b>	<b>Retained Actuary Involvement</b>	<b>Timing</b>
5. Preparation of test life review and liability replication	No	No	Within 3 months

After the detailed calculation information is received from the retained actuary, our analysts will begin the sample test life review and replication of valuation results. The analysts will program our valuation software and calculate the liabilities and normal cost for the Plans. If Segal's calculation of the actuarial liabilities and normal costs compared to those calculated by the Actuary fall outside our tolerance level, we will reconcile the reasons for the differences. We will perform this task by analyzing the source of the liabilities (e.g., retirement, disability, etc.) compared to the current actuarial firm's calculations. We will also analyze additional test lives, if necessary.

<b>Steps</b>	<b>PERS Involvement</b>	<b>Retained Actuary Involvement</b>	<b>Timing</b>
6. Assumption review	No	No	Within 3.5 months

As part of the audit, Segal will review major economic assumptions for reasonableness and consistency. When analyzing the investment return assumption, we will project an expected long-term real rate of return for each asset class that PERS includes in their investment policy. These results, combined with an underlying expectation for future inflation and weighted in proportion to investment policy guidelines, will allow us to create an independent investment return assumption and compare that to the current assumption. We will also comment specifically on the reasonableness of the investment return, price inflation and wage inflation assumptions.

While not specifically requested in the scope, and at no additional charge to PERS, Segal will review the last experience study report performed by the retained actuary. Statistical information contained in the experience study report will be used to analyze the reasonableness of the assumption setting process (and the reasonableness of the assumptions themselves). Demographic assumptions will be reviewed, including, but not limited to, mortality, retirement,

turnover, incidence and type of disability, and levels of pay adjustment. Any recommended adjustments or suggestions for improvement will be included in our draft report.

<b>Steps</b>	<b>PERS Involvement</b>	<b>Retained Actuary Involvement</b>	<b>Timing</b>
7. Preparation of replication valuations	No	Not anticipated	Within 4 months

The analysts will run final versions of our computer valuation programs to generate aggregate liabilities and normal costs. Spreadsheets to replicate actuarial costs, contribution rates, etc., for the Plans will be prepared by the analyst team and reviewed by the reviewing actuaries as well as the primary and secondary actuaries. Segal's results will be compared to those in the reports and a summary comparison of results relative to those in the valuation reports will be generated and included in the draft actuarial audit report.

<b>Step</b>	<b>PERS Involvement</b>	<b>Retained Actuary Involvement</b>	<b>Timing</b>
8. Review the actuarial valuation reports	No	No	Within 5 months

The primary and secondary actuaries, the senior reviewing actuary, and the reviewing actuaries will review the valuation reports and assess whether the Plans are being funded on an adequate basis using actuarial assumptions and methods that are reasonable, consistent and meet generally accepted actuarial principles, and, with respect to actuarial matters, whether the Plans are in compliance with State law and the policy of the Board of Trustees. The Segal team will provide commentary on areas that could improve the usefulness or understanding of the valuation reports to include in the draft actuarial audit report.

<b>Steps</b>	<b>PERS Involvement</b>	<b>Retained Actuary Involvement</b>	<b>Timing</b>
9. Prepare and deliver draft valuation audit reports	Yes	Yes	Within 5.5 months

Draft reports will be compiled based on the findings from the steps above and will include Segal's overall opinion as to the reasonableness of the current actuary's conclusions and a detailed account of any items noted as exceptions. The report will be in a language clearly understood by a lay reader. Terms essential to an understanding of retirement system funding and actuarial valuation will be defined. A separate appendix will be included in the report that provides detailed and technical information for the current actuary to be able to review and provide a formal response to Segal's findings and analysis prior to the final report being provided to PERS. Based on the comments and feedback received, we will adjust and finalize our reports accordingly, for presentation to the PERS Board of Trustees when requested.

<b>Steps</b>	<b>PERS Involvement</b>	<b>Retained Actuary Involvement</b>	<b>Timing</b>
10. Deliver final report and present audit materials to PERS Board	Yes	No	As requested

Reports will include all recommendations and findings in both summary and fully explained detailed form.

## 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.*

Segal has quality control principles in place that mandate at least two levels of review of prepared work for all actuarial assignments. An actuarial manager oversees this comprehensive review process.

1. Following the completion of the work product by an actuarial analyst or a senior actuarial analyst, a mid-level actuary will review it for accuracy, consistency, reasonableness and completeness. Included in this review are the data provided, the plan of benefits, the liability programming, the cost calculations and the text of the actuarial communication.
2. After this process is completed, a credentialed actuary will give the product another review, ensuring that the conclusions are reasonable, that they correlate appropriately with prior results and that the results are correctly and clearly stated for the client. This actuary is also responsible for ensuring that all of Segal's processes were followed appropriately in completing the work and that the Actuarial Standards of Practice mandated by the American Academy of Actuaries have been followed.

Our quality standards are maintained by the implementation of the following programs, in addition to separate, detailed quality control procedures for our actuarial work:

- **Mandatory peer review of actuarial reports:** The two-step peer review ensures that current regulations and requirements are considered, all assumptions and calculations have been appropriately documented, checked and reviewed, quality control checklists completed and followed, the review process is fully documented, data reasonability criteria met, and adherence is maintained with all of the firm's policies and procedures as well as professional actuarial standards.
- **Work product quality assurance:** Reports, memoranda and letters on complex or technical matters all follow the same process indicated above. They are prepared by the actuarial team and reviewed by a senior consultant familiar with the client's situation and the area addressed by the material.
- **Team consulting:** Our client service teams enable us to make checks and balances for quality control an organic feature of the consulting process.



Meetings, calls and other contacts with the client are documented in file memoranda that are shared with the team. In the course of keeping one another informed about client developments, the team members go through an automatic quality-review procedure.

- **Early warning system:** Each office and region have an early warning system to identify and deal with potential difficulties and anomalies as they emerge and before they become problematic. As an example, Segal has a solvency reporting policy where notification is required if a plan is expected to become insolvent within the next few years. Depending on the situation, our policy requires consultation with the local actuarial manager, the Office of the Chief Actuary, market experts and/or in-house General Counsel.
- **Company-wide standards and training:** We engage in ongoing staff development and training to ensure the consistency and quality in the delivery of services. We are committed to providing both the highest level of quality service to our clients and professional development opportunities for our employees. We operate numerous programs to train, enrich and mentor our professional staff. Highlights include:
  - Participation in industry conferences, seminars and associations. Not only do we encourage consultants to actively engage in external events, we also organize many of these conferences and seminars each year and serve as a corporate sponsor to a number of benefits-related associations.
  - Training initiatives for time management, presentation techniques, written communications and negotiations
  - Leadership and management training for senior managers. These sessions also serve as an opportunity for our senior consultants to interface and share their knowledge of industry trends and innovations.
  - Active training committees within each practice area that identify specific training needs and conduct training sessions and workshops on a broad range of professional and technical topics. These comprehensive, ongoing internal educational efforts are led by experts.
- **Relationship management:** Segal realizes that each project's success depends on the team supporting the project. Therefore, we focus on involving the appropriate mix of technical and resource staff in each project to develop achievable solutions.
- **National peer review program:** Our health and retirement actuarial work for clients is subject to an annual on-site peer review of each actuarial practice or department in the company, in accordance with Segal's actuarial policy and quality standards.
- **Software:** To maintain accuracy and quality, the firm's actuarial software is internally developed and tested by credentialed actuaries working in our national Actuarial Technology and Systems unit. The same basic actuarial modeling software is used in all valuations, with customized applications that develop appropriate results for each type of plan.

## 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

Term:	Explanation
ASA	Associate of the Society of Actuaries
EA	Enrolled Actuary
FCA	Fellow of the Conference of Consulting Actuaries
FSA	Fellow of the Society of Actuaries
GASB	Government Accounting Standards Board
MAAA	Member of the American Academy of Actuaries

### 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.*

We are fully aware of the sensitivity of budget allocations for public sector employers such as PERS. Our pricing approach is focused on achieving your objectives in the most cost-effective manner consistent with quality, accuracy, and timeliness. If our proposed fees are inconsistent with your understanding of the engagement, we request the opportunity to explain our pricing assumptions or to modify the scope of services to best fit your objectives.

**Our fee to perform the requested audit services as outlined in the RFP is not to exceed \$123,200. The breakout of rates and time proposed, and any other fees is as follows:**

Description	Role	Estimated Hours	Hourly Rates	Total
Personnel				
	Senior Actuary	95	\$530	\$50,350
	Reviewing Actuary	85	\$350	\$29,750
	Actuarial Analyst	170	\$240	\$40,800
<b>Sub Total</b>		<b>350</b>		<b>\$120,900</b>
<b>Travel/Lodging</b>				<b>\$2,300</b>
<b>Total</b>				<b>\$123,200</b>

Our fees are all inclusive (including charges for time, computer, phone, fax, mail and other out-of-pocket expenses) and there are no additional administration, start-up, or implementation fees associated with the engagement. We have developed our fees based on expected time commitments and our schedule of hourly time charge rates. Total fees that are incurred for specific projects result from the amount of time spent on each project and from the level of skill and experience of the professional staff involved. We delegate tasks within projects to staff levels that have the competence to complete the assigned work at the lowest possible hourly time charge rates consistent with our quality standards. Unlike some consulting firms, we do not charge for clerical time spent completing projects. That overhead expense is built into the hourly time charge rates of our professional staff.

# Appendix

- A. Professional biographies
- B. Sample actuarial audit report

## A. Professional biographies

Daniel J. Siblik, ASA, MAAA, FCA, EA

*Vice President and Actuary, Chicago*

**Project Role: Principal Actuary and Co-Client Relationship Manager**



### Expertise

Dan is a Vice President and Actuary, working primarily with staff in Chicago's office. He has more than 25 years of experience as a benefits consultant and focuses primarily on public sector pension consulting, as well as retiree healthcare consulting.

Dan's clients have included statewide pension plans, public safety systems, municipalities, counties, boards, transit authorities as well as Native American tribes. His primary roles include, but are not limited to, reviewing and delivering pension valuation results, preparing experience studies and developing recommended assumptions, actuarial audits, modeling projections, preparing cost-impact statements for proposed legislation and/or plan changes and reporting to the Governmental Accounting Standards Board (GASB). His client work has covered many states including Alaska, California, Illinois, Michigan, South Carolina, Texas and West Virginia.

In addition to his consulting responsibilities, Dan also works with training junior staff and new business opportunities.

Dan's pension exposure includes extensive involvement in GASB Statement Nos. 67 and 68 reporting. His retiree healthcare work involved GASB Statement Nos. 74 and 75. Dan also spent more than a decade working on multiemployer pension plans. That work included a similar scope to his current public sector consulting.

### Professional background

Prior to rejoining Segal, Dan was a consulting actuary at other benefit consulting firms. His projects ranged from annual actuarial valuations, experience studies and GASB Statement Nos. 67 and 68 disclosures to legislative requests.

### Education/professional designations

Dan earned a BS in Actuarial Science from the University of Illinois Urbana-Champaign. He is an Associate of the Society of Actuaries, a Member of the American Academy of Actuaries, a Fellow of the Conference of Consulting Actuaries and an Enrolled Actuary.

### Publications/speeches

- ["With Paycheck-to-Paycheck Living More Common, a Defined Benefit Plan Provides a Secure Retirement Path."](#) NCPERS *PERSist*, Fall 2024

- Co-presenter and co-author of “The Role of Defined Benefit Pensions in Recruiting and Retaining Public Safety Professionals,” National Institute on Retirement Security and TEXPERS Summer Educational Forum, August 2024
- [“Public Pension Oversimplification Can Complicate Things Quickly,”](#) NCPERS *PERSist*, Winter 2024
- Co-panelist on “Plan Design and How It Affects Your Workforce,” Conference of Consulting Actuaries, October 2023
- Co-presenter of [“A Current Look at Public Pension Plans, Inflation, and Social Security,”](#) the opening general session of the National Conference of Public Employee Retirement Systems’ (NCPERS) Financial, Actuarial, and Legislative & Legal (FALL) Conference, as well as full training day with Trustees, October 2023
- [“How Do Public Pension Plans Measure Up to Social Security on Inflation Protection?”](#), NCPERS *PERSist*, Summer 2023
- “Can We Teach Old Pension Plans New Tricks? And Do We Need to?,” Special Pension Briefing (Illinois Commission on Government Forecasting and Accountability), Fall 2022

Jonathan P. Scarpa, FSA, MAAA, EA  
*Vice President and Consulting Actuary*  
*New York*

**Project Role: Secondary Actuary and Co-Client Relationship Manager**



### Expertise

Jonathan is a Vice President and Consulting Actuary in Segal's New York office. He works with many public sector pension plans across a range of industries. He has experience with annual actuarial valuations, developing funding strategies, plan design, legislative reviews and asset liability modeling.

Jonathan is the Public Sector Retirement Practice expert in Segal's New York office and is responsible for monitoring specific public sector retirement market issues and developments in the New York/New Jersey region.

The public sector clients he has worked with include the Police and Firemen's Retirement System of New Jersey, Government Employees' Retirement System of the U.S. Virgin Islands, University of Missouri, New Jersey Education Association, Communication Workers of America, NJ Transit, the New Jersey Turnpike Authority and the Employees Retirement System of the Government of the Commonwealth of Puerto Rico. In addition to annual valuations and experience studies, examples of special projects Jonathan has worked on include the following:

- Evaluations of alternative funding sources including utilizing lottery revenue as a funding source and the use of bond revenue to prevent plan insolvency
- Study on the impact of reversing benefit reductions related to the creation of lower cost benefit tiers after the financial crisis of 2008 and 2009. This study included matching the valuation results of the plan actuary, similar to the process of an actuarial audit.
- Benchmarking study on the post-retirement Cost of Living Adjustments provided by large state-wide retirement systems and the financial impact of re-instating a COLA for a state-wide retirement system
- Experience study for a large statewide retirement system including analysis and providing recommendations for economic and demographic assumptions

As part of an experience study working group in New York, Jonathan helps to ensure quality controls and procedures are met and adhere to actuarial standards of practice. He has extensive experience performing experience studies for both public sector and large multiemployer pension plans.

Jonathan also serves as a member of the Segal national public sector report committee. As part of his responsibilities, he ensures that public sector valuation reports adhere to actuarial principles and standard of practices as well as meet the needs of clients across the country.

## Professional background

Prior to joining Segal, Jonathan served as a financial analyst for a financial services company.

## Education/professional designations

Jonathan received a BS in Biomedical Engineering from Rutgers University. He is a Fellow of the Society of Actuaries, a Member of the American Academy of Actuaries and an Enrolled Actuary.

## Publications/speeches

Jonathan is an attendee and speaker at public plan conferences and recently wrote an article for the NCPERS *PERSist*, Summer 2024 edition titled “Unintended Effects of Benefit-Tier-Related Pension Reforms.” Jonathan has also presented to Boards of Trustees on various topics including valuation results, experience study results, projections highlighting risks to pension plans and education sessions for Trustees and legislatures

**Tatsiana Dybal, FSA, MAAA, EA**  
*Vice President and Actuary, Chicago*  
**Project Role: Senior Reviewing Actuary**



### **Expertise**

Tatsiana is a Vice President and Actuary in Segal's Chicago office with over 15 years of experience in actuarial consulting. She is responsible for preparing annual valuations and projections and assisting with plan design and experience studies. Her clients include public sector and multiemployer plans and range in size from several hundred to over 500,000 participants.

Tanya has experience working on GASB Statement Nos. 67 and 68 reporting as well as plan health monitoring for large statewide plans. She has also done extensive auditing work in addition to work related to bankruptcy proceedings.

### **Professional background**

Prior to joining Segal in 2007, Tanya worked in the marketing department of a technology firm for seven years.

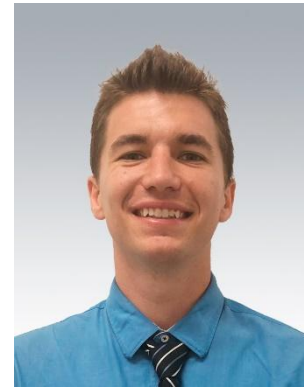
### **Education/professional designations**

Tatsiana received an MS in Physics and Mathematics from State University (Minsk, Belarus) and an MS with high distinction in Actuarial Science from DePaul University. She is a Fellow of the Society of Actuaries, a Member of the American Academy of Actuaries and an Enrolled Actuary. Tatsiana has received the firm's prestigious Quality Star and One Company awards.

## Austin Miller

*Associate Actuarial Consultant, Minneapolis*

**Project Role: Actuarial Analyst**



### Expertise

Austin is an Associate Actuarial Consultant in Segal's Retirement Practice, specializing in public sector, multiemployer and corporate plans. Based in Minneapolis, he is responsible for annual actuarial valuations of defined benefit plans, consulting and technical support with respect to plan design, benefit communication and calculations, as well as data validation.

### Professional background

Prior to joining Segal, Austin was an Actuarial Analyst at another national consulting firm, where he prepared actuarial valuations of defined benefit plans and provided consultation to public sector and corporate retirement plan sponsors. His past work included data preparations, projections and benefit calculations.

### Education/professional designations

Austin received a BS in Mathematics with a focus on Actuarial Science, from the University of Minnesota — Twin Cities. He is currently pursuing designations as an Associate of the Society of Actuaries, a Member of the American Academy of Actuaries and an Enrolled Actuary.

**Diana W. Yen, ASA, MAAA**  
*Associate Actuarial Consultant, Chicago*  
**Project Role: Actuarial Analyst**



### **Expertise**

Diana is an Associate Actuarial Consultant in Segal's Chicago office, with 10 years of experience. She specializes in generating and reviewing calculations for defined benefit pension work, with a focus on actuarial valuations, experience studies, audits and government reporting under GASB Statement Nos. 67 and 68. Diana also works on individual benefit calculations as well as plan design and redesign work. Her clients include statewide retirement systems, public safety plans, municipalities, authorities and unions.

### **Professional background**

Prior to joining Segal, Diana worked at another national consulting firm, where she prepared actuarial valuations of defined benefit plans.

### **Education/professional designations**

Diana holds a BS degrees in Actuarial Science and Operations Management from The Ohio State University. She is an Associate of the Society of Actuaries (ASA) and a Member of the American Academy of Actuaries (MAAA).

Laura C. Jeske

*Senior Actuarial Associate, Chicago*

**Project Role: Actuarial Analyst**



### Expertise

Laura is a Senior Actuarial Associate for the Retirement practice in Segal's Chicago office. She focuses on evaluating retirement plans and developing actuarial results. Her primary roles focus on analyzing plan data, financial statements and deterministic projections. She works on public and multiemployer clients, involving a range of liabilities and diverse plan provisions.

### Education/professional designations

Laura graduated from the University of Wisconsin – Milwaukee with a BA in Actuarial Science. She is currently pursuing designations as an Associate of the Society of Actuaries, a Member of the American Academy of Actuaries and an Enrolled Actuary.

**Maria Manoukarakis**  
*Actuarial Associate, Chicago*  
**Project Role: Actuarial Analyst**



**Expertise**

Maria is an Actuarial Associate in the Retirement practice based in Segal's Chicago office. She focuses on evaluating retirement plans and developing actuarial results. Her primary roles focus on analyzing plan data, financial statements and deterministic projections.

Maria works with multiemployer clients, involving a range of liabilities and diverse plan provisions. She has conducted in-depth variable annuity plan design analyses, reviewing historical data and the projected effects. Furthermore, she has worked on benefit improvements to maintain financial stability over the long term for multiemployer pension plans.

**Education/professional designations**

Maria graduated with a BS in Actuarial Science from the University of Illinois Urbana-Champaign. She is currently pursuing designations as an Associate of the Society of Actuaries, a Member of the American Academy of Actuaries and an Enrolled Actuary.

**Nicole Llorens, ASA, MAAA**  
*Vice President, Actuary, Chicago*  
**Project Role: OPEB Actuary**



### **Expertise**

Nicole is a Vice President and Actuary in Segal's Chicago office, with nearly 15 years of experience. She works as both a signing actuary and reviewing actuary for numerous clients. Her responsibilities include quantifying obligations for OPEB valuations, conducting pre-funding studies for welfare plans, performing retiree contribution analyses and other calculations.

Nicole manages the analysts within the Midwest Retiree Health practice and is involved in the training of Retiree Health analysts within the Midwest and other regions. She routinely participates in Segal's peer review initiatives.

### **Professional background**

Nicole has worked on retiree health plans throughout her career

### **Education/professional designations**

Nicole received her BS in Actuarial Science from Bradley University. She is an Associate of the Society of Actuaries and a Member of the American Academy of Actuaries. She received Segal's One Company Award for 2022, recognizing colleagues who exemplify the attitudes and behaviors of teamwork and collaboration that are inherent in our One Company philosophy.

## Lauren Osen

*Actuarial Associate Consultant, Chicago*

**Project Role: OPEB Analyst**



### Expertise

Lauren is an Associate Actuarial Consultant in Segal's Chicago office with experience in retiree health plan analysis. She joined Segal in 2014.

Lauren prepares valuations of Other Post-Employment Benefits (OPEB). She quantifies obligations under FASB ASC 965 for multiemployer plans and GASB 74/75 for public sector plans, conducts pre-funding studies for welfare plans and performs retiree contribution analysis and other calculations.

### Education/professional designations

Lauren received her BS in Actuarial Mathematics from the University of Pittsburgh and is working towards becoming an Associate of the Society of Actuaries. She received Segal's One Company Award for 2023, recognizing colleagues who exemplify the attitudes and behaviors of teamwork and collaboration that are inherent in our One Company philosophy.

## **B. Sample actuarial audit report**

A sample actuarial audit report begins on the following page.



ABC State Employees Retirement System

# Level One Actuarial Audit

**Legacy Plan (Groups 021 and 024) and Hybrid Plan**

August 10, 2021

Actuary, FSA, FCA. MAAA, EA / Actuary, FSA, FCA, MAAA, EA



101 N. Wacker Drive  
Suite 500  
Chicago, IL 60606  
T 312.984.8500  
segalco.com

August 10, 2020

Director  
ABC State Employees Retirement System  
100 XYZ Street  
City, ST 12345

**Re: Level One Actuarial Audit of the ABC State Employees Retirement System**

Dear Mr. Director:

We are pleased to present the results of our full-scope (Level one) audit of the ABC State Employees Retirement System (System). The purpose of this audit is to replicate the results presented in the Actuarial Valuation Report as of June 30, 2019 prepared by the System's actuary, Findley, and to determine whether the Plans are being funded on an adequate basis using actuarial assumptions that are reasonable, consistent and meet generally accepted actuarial principles, and, with respect to actuarial matters, whether the Plans are in compliance with State law and the policy of the Board of Trustees.

Segal reviewed the State and Higher Education Employees and K-12 Public School Teacher classifications in both the Legacy defined benefit (DB) plan and the Hybrid (DB/DC) plan. Other employee classifications were not reviewed. Our audit also includes a review of the Experience Study covering the period July 1, 2012 – June 30, 2016 prepared by Findley.

This review was conducted under the supervision of Actuary 1 and Actuary 2. Both are Fellows of the Society of Actuaries, Fellows of the Conference of Consulting Actuaries, members of the American Academy of Actuaries, and Enrolled Actuaries under ERISA. This review was conducted in accordance with the standards of practice prescribed by the Actuarial Standards Board.

The assistance of the System staff and Findley is gratefully acknowledged.

We appreciate the opportunity to serve as an independent actuarial advisor for the SABC State Employees Retirement System and we are available to answer any questions you may have on this report.

Sincerely,

Actuary, FSA, FCA, MAAA, EA Vice  
President and Consulting Actuary

Actuary  
Vice President and Consulting Actuary

# Table of Contents

---

## Level One Actuarial Audit of the ABC State Employees Retirement System

August 10, 2020

Executive Summary .....2

Section I: Review of June 30, 2019 Actuarial Valuation Reports .....6

Section II: Review of Actuarial Methods ..... 20

Section III: Review of Test Lives ..... 23

Section IV: Parallel Valuation Results..... 25

Section V: Conclusions ..... 32

# Executive Summary

---

The State Treasury Department retained Segal to conduct an independent Level one actuarial audit of the June 30, 2019 Actuarial Valuation Reports of the ABC State Retirement System (System) performed by Findley.

The objectives for this engagement included:

- A review of the quality of the Actuarial Valuation reports and Experience Study report;
- A review of the reasonableness and consistency of actuarial methods and assumptions, including the major economic assumptions (earnings, cost-of-living increases and salary);
- Replication of the valuation results to confirm reasonableness and accuracy of contribution rates and accrued liabilities;
- An evaluation of whether the valuation reflects state statutes and Board policies; and
- An evaluation of whether the valuation was performed in accordance with Actuarial Standards of Practice (ASOPs).

The primary objective of an actuarial audit of any valuation is to provide validation that the liabilities and costs of the System are reasonable and calculated as intended. This independent audit includes a full replication of the actuarial valuation results, plus a review of the key components in the valuation process that encompass the derivation of the liabilities and costs for System.

These key components include the benefits valued, the actuarial assumptions and funding method used, and the asset valuation method employed. The valuation report and select valuation output for a number of active, terminated vested, and pay status test lives provided the detail necessary to validate each of these key components. We were not asked to evaluate the demographic data, any gain/loss analysis, or previous year valuations.

We reviewed all information supplied by System, including sample benefit calculations for recent retirees. We also requested and reviewed additional information from Findley, including test lives and documentation of procedures beyond those disclosed in the valuation report.

## Summary of Findings

This peer review validates the findings of the June 30, 2019 actuarial valuations. Segal was able to match the valuation results and the test life output within an acceptable range. We concluded the valuations were performed in accordance with the Actuarial Standards of Practice (ASOPs) promulgated by the Actuarial Standards Board (ASB).

## Actuarial Valuation Reports

We began with a review of the Actuarial Valuation Reports for compliance with applicable standards of practice and governmental required reporting. Overall, it is our opinion that the reports completely and fairly present the results of the actuarial valuations and comply with all

applicable actuarial standards. We also offer ideas for improving the quality and understanding of the Actuarial Valuation Reports. The following is a summary of our key recommendations:

1. **We strongly suggest that Findley include an *Executive Summary or Valuation Highlights* section at the front of the valuation report that provides key results.**
2. **We suggest the *2019 Valuation* section, currently located on page C-11, be provided before the ten-page history.**
3. The *2019 Valuation* summary notes that the amortization schedule of each gain/loss tier was adjusted with the 2019 valuation. **We suggest the actuary show the number of years in the prior amortization schedules and the adjusted amortization schedules as well as the impact of the adjustment.**
4. **While the 2019 Actuarial Report prepared by Findley includes a basic Risk Discussion, we suggest the disclosure could be improved by providing financial projections.**
5. The Legacy Plan report shows a negative Unfunded Actuarial Accrued Liability (or surplus) for Teachers. **The report should indicate how this surplus is amortized in determining the contribution rates.**

## **Experience Study**

We also reviewed the Experience Study report for July 1, 2012 through June 30, 2016, the methodologies used to set the assumptions, and the recommendations that Findley provided. We considered the reasonableness of the proposed actuarial assumptions and methods in the context of our own experience, and those of other state and local pension systems. Details on our suggested modifications before the next experience study are in Section 1. We also offer ideas for improving the quality and understanding of the Experience Study report.

On February 29, 2016, the Pension Task Force (PTF) of the Actuarial Standards Board (ASB) released a report summarizing its opinions on various proposals to change pension standards related to public pension plans. The Experience Study was published on February 6, 2019 and we suggest Findley should have considered the PTF Report conclusions in preparing their reports.

## **Methods and Assumptions**

Overall, it is our opinion that the methodologies used to examine the System's assumptions and methods are reasonable and comply with the Actuarial Standards of Practice. The following is a summary of our key conclusions:

1. In our opinion, the Experience Study for July 1, 2012 through June 30, 2016 conforms to the appropriate Standards of Practice as promulgated by the Actuarial Standards Board.
2. The procedures used to analyze the assumptions are reasonable.
3. The recommended economic and demographic assumptions appear to be reasonable in light of the plan experience.
4. The actuarial cost method (individual entry age normal) also meets actuarial standards, and

is the most commonly used method among public sector plans.

5. In our opinion, the asset valuation method, with ten-year smoothing and a 20% corridor around market value, is reasonable and meets actuarial standards. However, we note that the majority of public plans use a shorter smoothing period.
6. The Pension Task Force of the Actuarial Standards Board (ASB) suggests disclosure of a solvency (market-consistent) value of liabilities in the actuarial valuation report. The Actuarial Standards Board has issued an Exposure Draft for ASOP No. 4 that would require this disclosure in valuation reports.

## Valuation Results

Our replication of the System's Legacy valuation produced results that are 0.7% higher than Findley for the total Actuarial Present Value of Projected Benefits, 0.7% lower for retirees and beneficiaries, 0.5% higher for inactive and vested deferred members and 2.4% higher for active members.

Our replication of the System's Hybrid valuation produced results that are 1.1% higher than Findley for the total Actuarial Present Value of Projected Benefits, 0.7% higher for inactive and vested deferred members, 1.2% higher for active members, and an exact match for retirees.

Differences less than 5% are generally considered a reasonable match. The results for both Plans are well within that tolerance. Additional detail on the replication of the valuations are in Sections III and IV.

With that said, Segal did find some areas where the valuation could be improved with regard to the accuracy of liability calculations. Our key recommendations are as follows:

1. Return of Excess Contributions – TCA 8-37-212 provides that the excess, if any, of accumulated contributions over the sum of actual retirement allowance payments received be paid as a lump sum to the surviving beneficiary or estate. Our analysis of the test lives indicates that this provision was not valued in the liability, although it is described on page G-2 of the Legacy valuation report. The effect of this coding difference was minimal. **We recommend that Findley program the return of contributions plan provision.**
2. For current terminated vested participants and for Legacy vested active participants assumed to withdraw from employment before eligibility for retirement and elect a deferred annuity, Findley programming assumes there is no liability for deaths prior to commencement of the deferred annuity. However, a death benefit would be payable in that situation (an annuity to married participants with 10 or more years of service or lump sum return of contributions in all other cases). The effect of this coding difference was minimal. **We recommend that Findley program these pre-retirement death benefit provisions.**
3. For retirements from active status, Findley currently assumes that no participants will elect reduced early retirement benefits. We think this is likely an oversimplification (although we have not analyzed any actual retirement experience). **We recommend use of early retirement decrements be considered and anticipate that implementing a reduced early retirement assumption could increase liabilities for the Legacy Plan.**

4. For retirements from terminated vested status, Findley currently assumes that participants will commence benefits at Service Retirement eligibility (except Legacy active participants terminating in a future year, who are assumed to retire at their earliest retirement age). A single retirement age for terminated vested participants is unlikely to adequately capture the range of retirement scenarios for such participants. **We recommend that consideration be given to retirement rates based on age/eligibility, similar to the assumption for retirements from active status.**
5. Findley notes in its summary of plan provisions that all pre-retirement deaths are assumed to be ordinary (i.e. not in the line of duty). We expect that, in most cases, the benefit for a line-of-duty death would be more valuable than the ordinary death benefit, so that implementing any probability of line-of-duty deaths would increase liabilities. However, the magnitude of the change would be dependent on the exact assumption chosen. **We recommend that an explicit assumption be applied to determine ordinary and line-of-duty deaths.**
6. For pre-retirement deaths that occur after reaching retirement eligibility, an annuity is payable to the beneficiary of all participants (not just married participants). Findley's current methodology assumes that only 80% of participants (those assumed to be married) receive the annuity, while the remaining 20% receive the lump sum death benefit. **We recommend valuing the greater of the two possible death benefits for 100% of deaths occurring after retirement eligibility.**
7. For pre-retirement deaths that occur before reaching retirement eligibility and where the participant is assumed to be married, Findley's coding for the Hybrid Plan does not appear to reflect any early retirement reductions that would apply. **We recommend applying the early retirement reductions, where applicable.**

These items and our recommendations are described in more detail throughout this report.

# Section I: Review of June 30, 2019 Actuarial Valuation Reports

---

Findley generally provides a comprehensive actuarial valuation report which includes sufficient information for an individual to gain an understanding of the financial picture of the System. In reviewing the reports, we paid particular attention to the Actuarial Standards of Practice (ASOPs) No. 4, 41, and 51. Those ASOPs are briefly summarized below, followed by our comments on the reports.

## **ASOP No. 4**

Actuarial Standard of Practice (ASOP) No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*, is the umbrella standard for actuaries performing pension plan valuations. It provides guidance to the actuary for measuring and disclosing pension plan obligations. Actuaries should assess the plan sponsor's funding policy and disclose rationale for the procedures used. In general, we find the Findley actuaries have met the standards of ASOP No. 4 and the procedures used to determine required contribution rates are reasonable.

Disclosures required by ASOP No. 4 include the intended purpose of the measurement, a summary of the plan provisions, data, and assumptions, a description of the normal cost method used, the amortization method, funded status using both an actuarial value and market value, and disclaimers about future measurements.

ASOP No. 4 directs actuaries to other actuarial standards for guidance on assumptions and methods. Our audit of the Findley Experience Study includes commentary on the guidance provided by ASOP No. 27 (Economic Assumptions) and No. 35 (Non-Economic Assumptions). We generally found Findley to have met these standards.

## **ASOP No. 41**

ASOP No. 41, *Actuarial Communications*, recognizes that complete disclosure of all supporting information is neither practical nor necessary. Section 3.2 of ASOP 41 states that the actuary should "identify the methods, procedures, assumptions, and data used by the actuary with sufficient clarity that another actuary qualified in the same practice area could make an objective appraisal of the reasonableness of the actuary's work as presented in the actuarial report."

In general, we found the Findley description of assumptions and methods to be clear and comprehensive. However, we believe Findley's January 24, 2020 "Supplement to the System June 30, 2019 Actuarial Valuation" (Legacy Plan) may have overlooked some of the ASOP No. 41 requirements, specifically a summary of methods and assumptions and a statement of professional opinion. We also note that the Supplement was dated four months before the Actuarial Report dated May 18, 2020.

Other suggestions for improved communication in the actuarial report can be found in Section I.

## ASOP No. 51

ASOP No. 51, *Assessment and Disclosure of Risk*, is effective for valuations with measurement dates on or after November 1, 2018. Findley included some basic risk measures and generally met the requirements of this standard. **We recommend providing additional information about the risks of actual future measurements deviating from expected due to experience deviating from the assumptions. We also suggest that the risk measures presented include a discussion of how these measures evaluate risk and any trends that may be developing.**

### System Legacy Plans Actuarial Valuation and Report

1. **We strongly suggest that Findley include an *Executive Summary* or *Valuation Highlights* section at the front of the valuation report that provides key results.** This might include items such as the current and prior year actuarially determined contribution rates, assets and liabilities, funded percentages, and any significant changes since the prior valuation (for example, investment or demographic gains or losses, assumption changes, plan changes, membership changes). It could also include consultative commentary.
2. Section C, Determination of Funding Levels, includes the System's detailed funding history from 1981 through 2018. **We suggest the *2019 Valuation* section, currently located on page C-11, be provided before the ten-page history.** Perhaps the history could be included as an Appendix to the valuation report, so that the reader can readily reach the current valuation results.
3. The *2019 Valuation* summary notes that the amortization schedule of each gain/loss tier was adjusted with the 2019 valuation. **We suggest the actuary show the number of years in the prior amortization schedules and the adjusted amortization schedules as well as the impact of the adjustment.** It would be useful for the user of the report to know whether the amortization periods for individual schedules were extended, shortened, or both.
4. The first paragraph under *Future Expectations* (page C-12) discusses the ten-year period for smoothing investment gains or losses, and also managing volatility by resetting the amortization period for the unfunded accrued liability. This is, in effect, a double-smoothing. **We suggest that Findley provide System with projections of expected future contribution requirements that show effect of each smoothing technique by itself, and together, so that it is clear to the reader how much the combined approach is deferring overall experience gains or losses.**
5. The newest Actuarial Standard of Practice (ASOP) No. 51 addresses *Assessment and Disclosure of Risks Associated with Managing Pension Obligations*. **While the 2019 Actuarial Report prepared by Findley includes a basic Risk Discussion, we suggest the disclosure could be improved by providing financial projections.**

For example, the investment risk discussion notes that there is a risk that the funded status and required contributions could be "very volatile". The System would benefit by

having projections that quantify what “very volatile” means in terms of potential required changes in contributions. Similarly, it may be useful for the System to understand how contribution requirements may differ if the total payroll grows less quickly (or declines) compared to the payroll growth assumption.

ASOP No. 51 also requires that the actuary recommend a more detailed assessment of risks if he or she thinks believes it would provide the System with a better understanding of risks inherent in a plan. We note that Findley did not suggest any further analysis of risk for the System. A review of any additional risk analyses, if performed, is beyond the scope of our audit.

6. Page C-15 provides a chart showing the Value of Benefits. **We suggest commentary be included to help the System understand the numbers presented.**
7. Page C-16 provides a chart showing the History of Contribution Rates. Findley should clarify whether these are Total Rates or Employer Rates. **It could also be interesting to compare the contribution rate history to other key metrics such as the funded percentage history or growth in assets over the 30-year time period.**
8. Page C-18 provides a breakdown of liability by status. We note that the liability for “present active members” includes certain individuals in the data with an active status code, but P (“prior”) service status. Such participants are valued as though they are terminated, so they may be more accurately classified in the “former members” group. In either case, **the active and inactive group descriptions in the report could be improved to more easily distinguish where the liability is included.**
9. **We recommend the *Gain and Loss Analysis* include a demonstration of the total gain or loss in the Unfunded Accrued Liability since the prior valuation, and show what portion is related to investment experience.** The *Gain and Loss Analysis* does include a useful breakdown of the causes of change in contribution rates.
10. **We suggest that the increases from prior service purchases and sick leave credits could be addressed by setting an explicit assumption for these variables. We recommend that the actuary explicitly describe the re-amortization of unfunded liability.** (The contribution rates increased as result of this item, which indicates the amortization period was reduced.)  
The “Other” category is a material source of change, particularly for the Teachers where it represents more than 20% of the total change prior to amortization period adjustments. **We recommend that when this “Other” source of change is large, that further investigation into the sources such as retirement and turnover experience be shown.**
11. Page E-2 shows a negative Unfunded Actuarial Accrued Liability (or surplus) for Teachers. **The report should indicate how the surplus is amortized in determining the contribution rates.**  
This page is titled “Schedule of Funding Progress,” but includes only the current year information. The reader is directed to the System Comprehensive Annual Financial Report for information on earlier periods. **Adding a graph with the historical funded ratios would be informative.**

12. The Appendix includes Tables I and II that show a distribution of active members by Age (Table I) and Service (Table II). **Generally, data is shown in a single combined Age and Service table, and that format may be more useful to the reader.**
13. Table VI-2 shows each amortization unfunded liability base and the number of years over which it is amortized in the current year valuation. **We recommend the number of years over which the bases were amortized in the prior year valuation also be shown.**
14. Table VIII summarizes actuarial assumptions and methods. Actuarial standards related to actuarial communications require that assumptions be sufficiently described for another actuary to be able to understand what was used in the calculations. Based on our review of test lives and related discussions with Findley, **the Post-Retirement Mortality table descriptions on page H-29 should be clarified to indicate that there are three separate mortality improvement scales used to convert the SOA RP-2014 table into the final valuation mortality table.** The base RP-2014 tables are projected back to 2006 using MP2014, forward to 2014 using MP2016 (this produces the base rates from the 2016 experience study), and then from 2014 to 2025 using MP2018. Findley could opt to refer to the RP-2014 table with MP2014 backed out as RP-2006, which has recently become accepted terminology.
15. We note that Findley does not assume that future disabled retirees will receive any worker's compensation benefits when determining the maximum disability benefit. **We recommend disclosing this assumption in the Summary of Actuarial Methods and Assumptions in the report.**
16. Our review of test lives indicates that the actual Pre-Retirement Mortality table in use for Legacy participants is the base 2006 rates from the RP2014 Employee Mortality Table (colloquially, the RP2006 Employee Mortality Table) with projection from 2006 to 2034 (15 years beyond valuation date) using the MP2014 projection scale. This differs from the description on page H-29 of the valuation report. We assume that this is the intended table, and **the pre-retirement mortality assumption in the report should be updated to reflect the table being used.**
17. For Legacy participants hired before July 1, 1997, Findley does not assume that any future disablements will occur in the line-of-duty. **We recommend disclosing this disability assumption in the Summary of Actuarial Methods and Assumptions in the report.**
18. Table IX states there were no changes in assumptions. However, there were updates to the administrative expense assumption and generational mortality improvement scales. **We recommend all assumption changes and their impact on liabilities be disclosed.**

### **Comments on the Legacy Plan Provision Summary**

The System benefit provisions, summarized in Section G of the Legacy Plan's Actuarial Valuation Report, are generally consistent with the TCA Title 8, Chapters 34 – 39. Nonetheless, we observed some areas where the descriptions could be clarified. Note that in areas where the plan provisions differed by group, our review was limited to Group I. The Findley valuation report page numbers are included for clarity.

## Page G-1

1. The Average Final Compensation definition should specify that it is limited to average earnable compensation, and further define “earnable compensation” as specified in TCA 34-101(14) (i.e., bonuses are generally included, and also includes cash value of cafeteria benefits).
2. The Average Final Compensation definition should indicate that compensation in excess of IRC Section 401(a)(17) limits is disregarded.

## Page G-2

3. **The actuarial reductions for optional forms of payment should be described further by indicating the actuarial basis for such adjustments.**
4. The cost of living adjustment (COLA) section should indicate the exact CPI index used (All Items, US City Average) and describe the rounding conventions described in TCA 8-36-701 when the increase in index falls between 0% and 1%.
5. **The current interest rate used to accumulate the employee contribution account balance (5%) should be disclosed.**

## Page G-4

6. **The age 60 requirement for Service Retirement requires five years of service for members with Date of Hire after 1991. (TCA, Chapter 36, Part 2, paragraph 201(a)(1)). This should be noted in the report.**
7. The benefit percentages listed should clarify that the formula is a flat 1.75% for members who do not participate in Social Security.
8. **We suggest including a description of the Retirement Benefit for Teachers and General State employees who work beyond age 65, where the benefit is actuarially increased for delayed commencement (TCA 8-36-208(b)).**

## Page G-5

9. **The Vested Benefit amount should be clarified to indicate that the 15% reduction for each year of service less than 10 years is only applicable if the benefit commences before service retirement eligibility.**
10. The Minimum Benefit of \$96 per year of service is applicable for members with 10 years of service. If the member has less than ten years of service, the Minimum Benefit is \$84 per year of service (TCA 8-36-209). This is explained on page G-3, but can be easily missed. We suggest that adding this directly into the Minimum Benefit section would help avoid confusion.
11. The Ordinary Disability benefit amount may be more easily described as 9/10 of the Service Retirement benefit (including projection of service, as applicable). This would also be more consistent with the phrasing in TCA 8-36-501.

12. **The Maximum Disability Benefit should be clearly described as 75% of AFC when applied to the combined value of the Ordinary Disability benefit and any worker's compensation benefit (TCA 8-36-501(c)(7)).**
13. The Minimum Benefit of \$96 per year of service is applicable for members with 10 years of service. If the member has less than ten years of service, the Minimum Benefit is \$84 per year of service (TCA 8-36-209). This is explained on page G-3, but can be easily missed. We think that adding this directly into the Minimum Benefit section would help avoid confusion.
14. **The Accidental Disability benefit is also subject to the maximum of 75% of AFC, when considered in combination with any workers compensation benefit (TCA 8-36-502(c)(1)(C)).**
15. **It is worth clarifying that the age 55 Inactive Disability Benefit to which the actuarial adjustment is applied would also reflect early retirement adjustments of 4/10 of 1% per month prior to the service retirement date and 15% reductions for each year of service less than 10 years.**
16. **The Ordinary Death Benefit should be clarified to explain that the beneficiary need not be a spouse.** In addition, in the event that the beneficiary is a spouse and the spouse dies before all children reach age 19 (age 22 if full-time student), the benefit continues until all children reach age 19 (age 22 if full-time student), marry, or die (TCA 8-36-109(a)(3)).

17. **The eligibility for the Ordinary Death Benefit for those with at least 5 years of service, but not eligible for early or service retirement, could be further clarified to include only participants who are married at the time of death.**
18. The description should clarify that the duration of Accidental Death Benefit payments is dependent on the relationship of the beneficiary to the participant. For surviving spouses, the benefit is payable for life. For surviving children, the benefit is payable until all children reach age 19 (age 22 if full-time student), marry, or die.
19. The assumption that all death benefits are Ordinary Death benefits for valuation purposes would be more appropriate to include in the summary of actuarial assumptions.
20. **The Inactive Death Benefit eligibility description could be further clarified to include only participants who are married at the time of death.**
21. The description should be clarified that the Inactive Death Benefit amount is reduced by 4/10 of 1% for each month the death preceded the Service Retirement date (TCA 8-36-123).
22. **The Inactive Death Benefit section would be more complete by including the lump sum return of the member's account balance in situations where the participant is unmarried at the time of death or has less than 10 years of service.**

## **System Hybrid Pension Plans Actuarial Valuation and Report**

1. **We suggest that the Summary include other key valuation results in addition to the actuarially determined contribution rates.** This might include items such as the current and prior year actuarially determined contribution rates, assets and liabilities, funded percentages, and any significant changes since the prior valuation (for example, investment or demographic gains or losses, assumption changes, plan changes, membership changes). It could also include consultative commentary.
2. **While the 2019 Actuarial Report prepared by Findley includes a basic Risk Discussion, we suggest the disclosure could be improved by providing financial projections.** For example, the investment risk discussion observes the historical returns highlight substantial volatility from year to year. The System would benefit by having projections that quantify what this means in terms of potential required changes in contributions. Similarly, it may be useful for the System to understand how contribution requirements may differ if the total payroll grows less quickly (or declines) compared to the payroll growth assumption.
3. **We suggest including rationale for the 3.625% addition to the actuarially determined Hybrid Plan contribution rate (presumably this is a timing adjustment).**
4. The assumed rates of retirement for the Hybrid Plan are identical to those used for the Legacy Plan. While there is no credible experience for the Hybrid Plan as of yet, it is unusual that a new plan design would not have any anticipated effect on participant behaviors, such as retirement decisions. We recommend that retirement experience be monitored for the Hybrid and Legacy plans in case different retirement assumptions are warranted.
5. Page 26 states there were no changes in assumptions. However, there were updates to the administrative expense assumption and generational mortality improvement scales. **We recommend that the effect of these assumption changes be disclosed.**

## **Comments on the Hybrid Plan Provisions Summary**

The description of the defined benefit component provisions of the Hybrid Plan in the Findley reports are generally consistent with the TCA Title 8, Chapters 34-39. Nonetheless, we observed some areas where the descriptions could be clarified. The Findley valuation report page numbers are included for clarity.

### **Page 16**

1. "Credited Service" used throughout section is more accurately labeled "Creditable Service". The definition of Creditable Service should include mention of military service, similar to Legacy Plan description.
2. "Average Earnings" used throughout section is more accurately labeled "Average Final Compensation". The Average Final Compensation definition should specify that it is limited to average "Earnable Compensation", and further define "Earnable Compensation" as specified in TCA 34-101(14) (i.e. bonuses generally included, and includes cash value of cafeteria benefits).

3. The Average Final Compensation definition should indicate that compensation in excess of IRC 401(a)(17) limits is disregarded.
4. In the Accrued Benefit definition, the \$80,000 maximum is indexed annually from July 1, 2012, not July 1, 2014 (TCA 8-35-256(h)). Although “Accrued Benefit” does not appear to be used anywhere in the actual code, we do agree that defining it here makes the summary easier to understand and organize.
5. The Accrued Benefit definition should also indicate the index with which the \$80,000 maximum is increased (CPI All Items, US City Average).

#### Page 17

6. **The Early Retirement Benefit actuarial reduction should indicate the actuarial basis used, and perhaps include sample factors for each integer retirement age from 60 through 64 (for Teachers and General State employees).**
7. The Disability Benefit description is far less detailed than in the Legacy valuation report. We recommend including the eligibility requirements, the projection of service to the Service Retirement Date, and the maximum of 75% of AFC when considered in combination with any worker’s compensation benefit.
8. The Death Benefit descriptions are far less detailed than in the Legacy valuation report. We recommend including the eligibility requirements and the amounts payable for the Lump Sum benefit or the Line-of-Duty benefit. There should also be a description of the actuarial reductions applicable to both 100% Joint and Survivor death benefits in the event the death occurs prior to the Service Retirement Date.
9. **For the Refund of Contributions benefit, the current interest rate used to accumulate the employee contribution account balance (5%) should be disclosed.**
10. The optional forms of payment should be disclosed, as well as the actuarial basis used to calculate the actuarial reductions.

#### Page 18

11. **The Cost of Living Adjustment section should indicate the exact CPI index used (All Items, US City Average) and describe the rounding conventions described in TCA 8-36-701 when the increase in index falls between 0% and 1%.**

### **Comments on the Experience Study Report**

Overall, the methodology that Findley used to review experience and set proposed assumptions meets professional actuarial standards of practice. Our findings with respect to specific sections of Findley’s Experience Study report are summarized as follows.

## Summary of Report

1. State Code Annotated, Section 8-34-503(b) requires an experience study at least once in each six-year period. The Government Finance Officers Association (GFOA) recommends that these studies be performed no less frequently than once every five years. The System has been commissioning experience studies every four (4) years which is more frequent than recommended by the GFOA and more frequent than required since the Code was amended in 1992. Most comparable retirement systems perform five-year studies. **Since the State frequency exceeds the standard, we recommend the Board of Trustees consider whether the additional expense of performing studies over a four-year period is justified.**
2. The Introduction on page 1 begins with a discussion of the experience from 1976. Throughout the report, there is a substantial amount of history from 1976 forward. While this may be interesting, it is not necessarily relevant for any current assumption recommendations. **We suggest deleting this discussion of historical experience study results or moving to an Appendix. We recommend that more detail be added that is specific to the four-year period being studied.**
3. **Discussion of data collection refinements over time could also be moved to an Appendix.** We note that although the Introduction makes note of a more elaborate analysis of information that was not previously available, there is no detail provided as to what information was newly available or how it added to the experience analysis.
4. The primary reason for completion of actuarial experience studies is to ensure that the package of actuarial assumptions closely captures the experience of the Plan, which minimizes gains and losses from year to year, and by extension minimizes significant fluctuations in the actuarially determined contributions. **Segal recommends that a summary of the investment and non-investment gains and losses during the four-year period be included in the experience review, so that the System can see how closely the assumptions are tracking to experience.** There will always be gains and losses from year to year, as the assumptions are never going to be perfect. However, trends of consistent gains or consistent losses over several years can be telling when the actuary is recommending changes for the future.
5. We noted that relatively few assumption changes were made. There were no changes recommended for retirement rates, turnover rates, disability rates, or disability mortality. **While there is mention of the fact that each of the last two four-year study periods were unusual due to the Great Recession and subsequent recovery, impacting behavior patterns of State employees, more detailed analysis would have been useful.**
6. **We recommend that the report summary include the impact of changing to the recommended assumptions, with the effect of economic and demographic changes shown separately.** GRS made a similar recommendation in their 2010 audit of the System. The impact of changes will allow the System Board to make better informed decisions on the recommended changes.

7. **We recommend that the actuary disclose total System experience for each member classification. The total experience should then be separated into investment and liability experience gains and losses.**
8. **We recommend that trends be summarized at a high level. This is helpful to the reader in understanding the magnitude of deviations between actual and assumed experience, and trends that may have emerged over the four years can be recognized.**

## **Demographic Assumptions**

1. Actuarial Standard of Practice No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations* (ASOP No. 35) provides guidance for setting noneconomic assumptions used in actuarial valuations. The demographic assumptions used to value the System reflect the expected occurrence of various events among participants. The assumptions should reflect specific characteristics of the System and produce reasonable results. A reasonable assumption is one that is expected to model the contingency being measured and not expected to produce significant gains and losses.

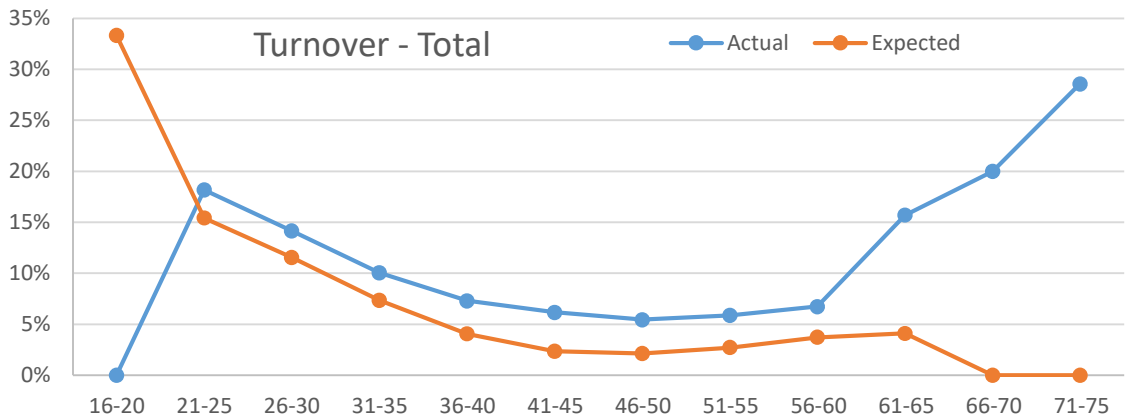
Overall, the methodology that Findley used to review experience and set proposed assumptions is appropriate and satisfies the relevant standards of practice.

2. **While we recognize stable contributions to be a desirable goal, the American Academy of Actuaries Pension Task Force also recommends consideration of benefit security and generational equity. One method of evaluating these competing objectives would be to introduce risk analyses that consider the impact on each objective when actual experience differs from projected.**
3. **In general, we suggest that the summaries of Actual and Expected experience be shown in graphical form, rather than just data tables.** For example, page 5 shows General State Ultimate Withdrawal experience for males and females, and for all members.

The total section shows:

Age	Exposure	Actual	Expected	Act/Exp
16-20	3	0	1	0.00
21-25	1,492	271	230	117.62
26-30	8,828	1,249	1,019	122.55
31-35	15,944	1,601	1,169	136.90
36-40	19,482	1,420	789	179.88
41-45	23,633	1,456	554	262.92
46-50	25,999	1,414	553	255.88
51-55	26,717	1,566	724	216.23
56-60	10,408	701	386	181.58
61-65	293	46	12	377.32
66-70	75	15	0	n/a
71-75	14	4	0	n/a
<b>TOTAL</b>	<b>132,888</b>	<b>9,743</b>	<b>5,438</b>	<b>179.17</b>

In our experience, showing the same data in another format can make it easier for readers to understand the experience and appropriateness of any new assumptions that are recommended. In this situation, a graph of the tabular information shows:



While 5-year age groupings may be appropriate in some situations, a review by individual age will generally be helpful. This is especially important for retirement rates, as there are often noticeable patterns of retirement upon reaching certain ages (such as Social Security or Medicare eligibility).

4. There does not appear to be an assumption for sick leave at retirement, even though sick leave is counted in credited service at the time benefits are calculated. Without an assumption, there are likely losses occurring annually when new retirees have more service than anticipated. **We recommend that Findley consider adding an assumption for sick leave in the future.** Depending on the average level of sick leave accumulated at retirement, we estimate introduction of a sick leave assumption could increase the actuarial liabilities for active participants by approximately 1% - 2%.
5. **We recommend showing the assumed decrement rates as well as counts of exposure and expected counts.** This would be helpful in identifying where rates are the same for different groups. For example, on page 5, it is not obvious whether the Withdrawal assumption is the same or different for Male and Female employees.
6. On page 6 of the report, Findley discusses the weighting of exposures and decrements by the liability amounts. **We suggest that the charts in the report include both unweighted and weighted results, so that the reader can determine the actual number of exposed lives and the number of assumed and actual deaths, retirements, etc. Titles and headings should clearly indicate when the numbers shown are weighted, or a footnote should be added to reflect this fact.**
7. In January 2019, the Society of Actuaries (SOA) released mortality tables based on the experience of public sector plan participants for the first time. **We recommend consideration of the SOA public sector tables, adjusted to reflect the System's experience, at the time of the next experience review.**
8. We note that the mortality experience for male teachers is eleven percent higher than the standard RP-2014 White Collar Table. The SOA tables recently published show both

male and female teachers have the lowest mortality rates (and the longest life expectancies), even compared to white-collar workers. **Given the unusual experience, the actuary may want to further investigate the System' atypical mortality experience of male teachers.**

9. Even though the number of lives included in the mortality study is not fully credible, the System's experience has showed consistent mortality improvement. **The actuary may want to evaluate the impact of using full generational mortality improvement, rather than limiting mortality improvement to six (6) years for the Legacy Plan.** GRS made a similar recommendation in their 2010 audit of the System. We also note that Findley recommended generational mortality improvement for the Hybrid Plan, and we agree with this recommendation.
10. The discussion of pre-retirement mortality includes a statement that "deaths appear to be understated". We believe it would be helpful to include how the actuary confirmed the finding.
11. Findley opted to keep the disability mortality assumption, which is a table based on pre-1995 experience. Although there might not be enough deaths to be fully credible, the ratio of actual to expected deaths in this category was quite high. **Segal likely would have recommended a disability mortality table from the same family of RP-2006/RP-2014 tables that were chosen for non-disabled lives.** We estimate that the impact on the total actuarial accrued liability from a newer disability mortality table would not be material (approximately a 0.1% increase).
13. **We also recommend implementing an assumption for the proportion of pre-retirement deaths that are ordinary versus line-of-duty.** We anticipate that implementing any probability of line-of-duty deaths would increase liabilities. However, the magnitude of the change would be dependent on the exact assumption chosen.
14. The actuary noted that disability rates were inconsistent among all groups. Given the relatively small number of disability retirements, we would not necessarily characterize the results as inconsistent, particularly for male employees. The male disability Actual to Expected ratios range from 51.87% for Political Subdivisions to 54.82% for General State employees; the female disability rates range from 41.39% for Political Subdivisions to 62.07% for General State employees and 69.06% for Teachers.  
**We suggest the Experience Study report disclose whether the disability rates are based on System experience, or a standard table such as the Social Security Disability Rates, or some combination thereof.**
15. **The turnover discussion states that "ultimate rates are more important than the 'first-year' or 'second-year' tables". Although the ultimate rates are very important, the magnitude of the assumed turnover rates in the first two years of employment is relatively high.** For example, for General State male employees, the assumed turnover rate for an employee hired at age 30 is 23% in the first year and 18.6% in the second year of their careers, compared to a rate of only 9.6% in subsequent years. Turnover rates are critical in the development of normal cost under the entry age actuarial cost method.

However, we acknowledge the impact of the economic factors during much of the 2012-2016 study period and agree that the current assumptions are reasonable.

16. Findley currently assumes that no participants will elect reduced early retirement benefits. We think this is likely an oversimplification. **We recommend implementing an early retirement assumption**, and note this was also recommended by GRS in their 2010 independent audit of the System.
17. **We suggest the actuary clarify if the retirement experience summarized was for employees only, or both employees and vested inactive participants, and recommend participant groups be studied both separately and together.**
18. **The actuarial valuation uses assumptions for the percentage of participants who are married and the age difference between participants and spouses. These assumptions are not discussed in the experience study, and we recommend that they be reviewed as part of the next review.**

## **Economic Assumptions**

1. Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*, provides guidance in developing economic assumptions used in actuarial valuations. This ASOP was adopted in September 2013 and is applicable for actuarial valuations with measurement dates on or after September 30, 2014.  
A key feature of ASOP 27 is the "building block" approach to setting assumptions. The "building block" approach uses the actuary's best estimate for the key components of economic assumptions: inflation, the risk-free rate of return, and the expected return premium (or risk premium) for each asset class. Generally, the actuary begins with a reasonable range for each component, and then selects a specific point within the range based on historical data, System specific data and the expectation concerning the future economic environment. Findley did not specify if they used the building block approach, but a specific illustration of the methodology used would be helpful.
2. The System actuary used the 2017 Social Security (OASDI) Annual Report to review the System's inflation assumption. The 2.50% assumption is consistent with the average annual intermediate inflation rate of 2.6% used by the Social Security Administration Office of the Chief Actuary. The NASRA Issue Brief reports the average inflation assumption to be 2.8%. We believe the recommendation to decrease the rate of future inflation from 3.0% to 2.5% is reasonable.
3. The Experience Study reports states that "System investments emphasize bonds and other fixed income securities..." but the System Investment Policy target is only 20% domestic bonds and the target is 0% for inflation indexed bonds and international bonds. The total equity target for domestic stocks, international stocks and emerging market stocks is 49%.
4. The trend among public retirement systems is to lower the investment return assumption, particularly given the outlook for a low inflation environment. The NASRA

February 2020 Issue Brief reports that more than 70% of plans reduced their assumed rate of return since 2017. The average return assumption (weighted by plan size) for public sector retirement systems in the 2020 PPD data was 7.22%. The median investment return assumption reported in the NASRA February 2020 Issue Brief is 7.25%. The net investment return assumptions range from 6.5% to 8.0%, with an average 7.22% average return. The 7.25% assumption used for the June 30, 2019 valuations is in line with national benchmarks.

5. The System actuary used the long-term average expected real returns from the 2017 Horizon Survey of Capital Market Assumptions in recommending a decrease in the System's return assumption from 7.50% to 7.25%. **We suggest the analysis could also include benchmarks from the NASRA Public Fund Survey or other similar surveys.**
6. The actuary tested the 7.25% assumption using long-term average returns, standard deviations, and correlations by asset class from the 2017 Horizon report, which showed a 50th percentile return of 7.24%. The 50th percentile is a critical value because there is a 50% probability that the actual annualized return exceed 7.24% and a 50% probability that the actual annualized return falls below 7.24%. **Investment risk can be evaluated by projecting key funding metrics as the rate of return varies. For example, the funded percentage or required employer contributions by using a 5.92% rate of return (the 25th percentile) or a 8.71% rate of return (the 75th percentile). We suggest this is a helpful alternative approach to viewing the range of results that may occur.**
7. The salary experience for System was reviewed separately for Teachers and General employees but a single set of salary increases are used for both groups. **We recommend separate salary increases for Teachers and General employees be considered based on the actual experience.**
8. Economic assumptions have a significant effect on the development of System liabilities. Changes to these assumptions can substantially alter the results determined by the actuary. The goal is to have a consistent set of economic assumptions that appropriately reflect expected future economic trends, including inflation, investment returns and salary scale. Findley recommended a 0.5% reduction in future inflation with a 0.25% reduction in the rate of return and salary scale assumptions. **We suggest a discussion of the various components of the rate of return and salary scale be included in the next experience study to explain the rationale for this inconsistencies.**

## **Other Groups**

**We suggest the discussion of Group II and Group III classifications include a summary of the participants included in those groups (as is done in the Summary of the report).**

## Section II: Review of Actuarial Methods

---

### Actuarial Methods

In October of 2014, the Conference of Consulting Actuaries Public Plans Community (CCA PPC) prepared a White Paper on Public Pension Funding Policy that supports a level cost allocation method as the basis for public plan funding policies. More recently, the Pension Task Force commissioned by the Actuarial Standards Board also made suggestions for public plan standards of practice. In particular, the PTF suggested that a reasonable actuarially determined contribution meets the following requirements:

ASOP Nos. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*, 27 and 35 are met

Each member's normal cost should be based on the benefit structure applicable to that member

The amortization payments should be greater than the nominal interest on the unfunded liability or pay off the unfunded liability in a reasonable period of time.

Fundamentally, the contribution requirement has two components:

Normal cost – the allocation to the coming year of pension costs for active employees in that year.

Amortization of the unfunded actuarial accrued liability (UAAL) – the coming year's payment toward pension costs allocated to prior years for which assets are not yet on hand.

The methods used for System are in line with the CCA PPC White Paper and PTF suggestions.

### Actuarial Cost Method

The funding method employed is the traditional entry age normal (EAN) actuarial cost method and is the method used by the majority of the retirement systems in the Public Funds Survey. The traditional entry age normal (EAN) actuarial cost method determines the normal cost for an individual by calculating the level percent of pay that, if contributed each year over that person's career, would accumulate with interest to the amount projected to be needed to pay that person's pension benefits.

We find the current method to be reasonable. In addition, it is the same cost method required to determine liabilities under GASB accounting standards and therefore provides consistency among the various liability measures used in the valuation. We concur with the recommendation to maintain the method.

### Asset Valuation Method

An essential part of the public sector budgeting process is that material budget items, including pension contributions, should have a level cost pattern from year to year to the extent possible. An asset valuation method should establish a reasonable methodology for recognizing investment gains and losses and should limit the potential volatility that may result in increased contributions due to investment results.

The actuary's guide for determining the reasonableness of an asset smoothing method is ASOP No. 44, *Selection and Use of Asset Valuation Methods for Pension Valuations*. Two key principles arise from ASOP No. 44. First, an acceptable asset smoothing approach must create asset values that fall within a reasonable range around market value, and second, that gains and losses are recognized in a reasonable period of time. In lieu of satisfying both of these principles, a smoothing method could satisfy the requirements if, in the actuary's professional judgment, the range around market value is sufficiently narrow or the differences are recognized in a sufficiently short period.

Both the Legacy Plan and Hybrid Plan use an actuarial value of assets that recognizes a portion of the difference between the market value of assets and the expected market value of assets, based on the assumed valuation rate of return. The amount recognized each year is 10% of the difference. The actuarial value of assets is limited to a 20% corridor around market value, and the method treats gains and losses the same. This method has no systematic bias that would consistently produce an actuarial value of assets that is greater than or less than market value. In addition, the ten-year smoothing period is a reasonable time over which to recognize the market results. We agree the method is reasonable, but note that most public plans smooth the assets over fewer than ten years.

### **Amortization Methods**

The System Legacy and Hybrid Plans both use a layered amortization method, with each new base amortized over a closed period not to exceed 20 years. Amortization payments are calculated as a level dollar amounts.

This approach will amortize the existing unfunded liability over a scheduled period. This method also has the result that every dollar of the current unfunded liability will be retired by a specified date, assuming the valuation and payroll growth assumptions are accurate.

Findley current creates one new amortization layer with each annual valuation. We recommend the actuary establish separate bases for experience gains or losses, assumption changes and plan changes rather than a combined base. The total amortization payment will be the same but the disclosure of sources of changes in liability is valuable information for the Board's plan management.

### **Comments on the Funding Policy**

The funding policy description for the Legacy Plan on page C-1 (5th paragraph) outlines the methodology used to calculate the Actuarially Determined Contribution requirement. We recommend the description be expanded to disclose that the state (TCA 8- 37-4) requires that the ADC be contributed each year.

The Hybrid Plan's funding policy is described on page 2 of the Hybrid Plan valuation report under the Analysis of Cost Controls and Unfunded Liability Controls. The employer's contribution is 4% of payroll, regardless of the ADC calculated in the annual actuarial valuation. If the ADC is less than 4% of payroll, the excess is contributed to a stabilization reserve account. If the ADC exceeds 4% of payroll, the shortfall will be covered by funds from the stabilization reserve, a reduction or suspension of the retiree COLA, movement of DC plan contributions, an additional 1% employee contribution, and reduction or suspension of future

service accruals. We recommend including a table that summarizes the ADC, employer contribution, and the reserve account contribution or shortfall for each plan or fiscal year.

## Section III: Review of Test Lives

### Test Life Output

We requested specific test lives in order to compare the benefit amounts projected in the valuation against our understanding of the System benefits summarized in the valuation report and to assist in the matching of the overall results. A review of test lives generally permits the auditing actuary to understand the retained actuary's valuation programming on a benefit-by-benefit basis.

We were provided with results for 13 test lives, including six active members, two terminated vested members, and five retirees and beneficiaries. The key characteristics of these test lives, as well as a comparison of the Actuarial Present Value of Projected Benefits between Findley and Segal are outlined below. We were ultimately able to replicate all test life results within a reasonable tolerance, as shown in the charts below.

#### Active Test Lives

Plan	Description	Findley PVB	Segal PVB	Percent Difference
<b>Legacy</b>	• State employee, later entrant	\$647,735	\$644,525	-0.5%
	• State employee, earlier entrant	326,022	324,187	-0.6%
	• Teacher, later entrant	182,862	181,947	-0.5%
	• Teacher, earlier entrant	313,399	313,337	0.0%
<b>Hybrid</b>	• State employee, later entrant	18,600	18,453	-0.8%
	• State employee, earlier entrant	55,536	55,586	0.1%
<b>Total Active Test Life Suite:</b>		\$1,544,154	\$1,538,035	-0.4%

*We also note that Segal's Normal Cost for the active test life suite matched Findley within 2% and the Actuarial Accrued Liability matched Findley within 0.1%.*

#### Terminated Vested Test Lives

Plan	Description	Findley	Segal	Percent Difference
<b>Legacy</b>	• State employee, no account balance	\$32,276	\$32,584	1.0%
<b>Hybrid</b>	• Teacher, account balance exceeds annuity value	12,281	12,251	-0.2%
<b>Total Terminated Vested Test Life Suite:</b>		\$44,557	\$44,835	0.6%

#### Pay Status Test Lives

Plan	Description	Findley	Segal	Percent Difference
------	-------------	---------	-------	--------------------

<b>Legacy</b>	• State, disabled retiree, Member Only Option	\$254,799	\$254,800	0.0%
	• State, nondisabled retiree, SS Leveling Option	113,539	113,576	0.0%
	• State, surviving beneficiary	61,928	61,928	0.0%
	• Teacher, nondisabled retiree, J&S Option 1	259,641	259,641	0.0%
<b>Hybrid</b>	• Teacher, nondisabled retiree, Member Only Option	37,813	37,813	0.0%
<b>Total Pay Status Test Life Suite:</b>		\$727,720	\$727,758	0.0%

## Section IV: Parallel Valuation Results

### Liability Replication

In replicating the results of the System valuations as of July 1, 2019, we found that, overall, Findley has a sound valuation process. We matched the valuation results and the test life output within an acceptable range. A comparison of the valuation results is displayed on the following page. Differences less than 5% are generally considered a reasonable match. The results are well within that tolerance.

Please note that Segal's results throughout this section do not include the effect of the programming recommendations presented later in this section. The results shown represent the closest match of Findley results based on our reading of their valuation report, the test life information provided, and their responses to our follow-up questions.

As described earlier, our parallel valuation was limited to the State and Higher Education Employees and K-12 Public School Teacher classifications of both the Legacy and Hybrid Plans. Therefore, the Findley results presented here do match exactly to any numbers shown in the System valuation reports as of July 1, 2019. The results for the specific subgroupings were provided to Segal by Findley.

#### Legacy DB Plan

	Findley	Segal	Percent Difference
<b>Active Members</b>			
• Actuarial Present Value of Projected Benefits	\$18,352,919,400	\$18,795,513,406	2.4%
• Total Normal Cost	481,899,930	491,983,442	2.1%
• Normal Cost (Net of Employee Contributions)	323,293,396	333,122,425	3.0%
• Actuarial Accrued Liability (AAL)	13,950,614,787	14,308,481,130	2.6%
<b>Inactive and Vested Deferred Members</b>	\$1,675,097,636	\$1,683,800,928	0.5%
<b>Retirees and Beneficiaries</b>	\$23,082,525,539	\$22,914,715,285	-0.7%
<b>Total</b>			
• Actuarial Present Value of Projected Benefits	\$43,110,542,575	\$43,394,029,619	0.7%
• Actuarial Accrued Liability (AAL)	38,708,237,962	38,906,997,343	0.5%

#### Hybrid DB/DC Plan

	Findley	Segal	Percent Difference
<b>Active Members</b>			
• Actuarial Present Value of Projected Benefits	\$1,924,383,699	\$1,946,622,653	1.2%
• Total Normal Cost	129,018,984	126,227,938	-2.2%
• Normal Cost (Net of Employee Contributions)	33,473,599	30,067,958	-10.2%
• Actuarial Accrued Liability (AAL)	375,915,569	428,793,452	14.1%

<b>Inactive and Vested Deferred Members</b>	\$45,040,554	\$45,349,096	0.7%
<b>Retirees and Beneficiaries</b>	\$656,271	\$656,250	-0.0%
<b>Total</b>			
• Actuarial Present Value of Projected Benefits	\$1,970,080,524	\$1,992,627,999	1.1%
• Actuarial Accrued Liability (AAL)	421,612,394	474,798,798	12.6%

Actuarial firms each have their own software programs for calculating normal costs and liabilities. Even with the same actuarial assumptions and cost method, it is unlikely that any two firms will perform calculations in exactly the same way. For example, even though Findley and Segal both assumed mid-year decrements, the application of that methodology was different between the two firms. Ultimately, we were able to approximate Findley's mid-year methodology. Pointing out software differences should not be construed as an indication that one firm or the other is "correct." We do so only to provide complete disclosure.

In particular, differences between firms in the determination of the Normal Cost and Actuarial Accrued Liability are very common. As can be seen in the chart above, the replication of the Total Actuarial Present Value of Projected Benefits was within 0.7% (Legacy) and 1.1% (Hybrid). However, our methodology yields a 10.2% lower Normal Cost in the Hybrid Plan, causing Segal's Actuarial Accrued Liability to be 12.6% higher. There are two Hybrid Plan characteristics that led to minor differences in Segal and Findley methodology to result in more significant differences in results:

- The final Normal Cost shown in each year's valuation is the *Employer* Normal Cost, calculated as the "Total" Normal Cost expected to be sufficient to fund the plan of benefits, minus the expected employee contributions for the year. The Total Normal Cost is the key metric produced by the valuation program, and where the differences in results occur. In the case of the Hybrid Plan, the expected employee contributions cover a very significant portion of the Total Normal Cost (approximately 75%) under both Segal and Findley calculations, meaning that any difference in Total Normal Cost between firms will be magnified in the final *Employer* Normal Cost. Our results show a close match in Total Normal Cost for the Hybrid Plan (2.2%), which is then magnified in final *Employer* Normal Cost (10.2%). **We are comfortable with the difference in Hybrid Plan Normal Cost and do not believe it indicates that Findley's results were incorrect, nor that there were any material differences between Findley and Segal calculations.**
- Since the Hybrid Plan was implemented for employees hired on or after July 1, 2014, the majority of the expected future benefits have not yet been "accrued" by participants. In other words, the Actuarial Accrued Liability is a small percentage of the Actuarial Present Value of Benefits (approximately 20%). Again, this means that small differences in methodology in the allocation of benefits between Actuarial Accrued Liability and Normal Cost are magnified in the final Actuarial Accrued Liability. Our results show the Hybrid Plan Actuarial Accrued Liability is 12.6% higher than Findley's results, despite the close match in the Actuarial Present Value of Benefits of 1.2%. **We are comfortable with the difference in Hybrid Plan Actuarial Accrued Liability and do not believe it indicates that Findley's results were incorrect, nor that there were any material differences between Findley and Segal calculations.**

The results for State Employees and Teacher classification for each plan are shown below:

### Legacy DB Plan

#### State Employees/Higher Education Employees

	Findley	Segal	Percent Difference
<b>Active Members</b>			
• Actuarial Present Value of Projected Benefits	6,203,858,941	6,505,983,442	4.9%
• Total Normal Cost	157,340,385	163,296,126	3.8%
• Normal Cost (Net of Employee Contributions)	157,340,385	163,296,126	3.8%
• Actuarial Accrued Liability (AAL)	4,919,101,422	5,145,798,600	4.6%
<b>Inactive and Vested Deferred Members</b>	1,021,743,228	1,040,238,982	1.8%
<b>Retirees and Beneficiaries</b>	9,232,953,381	9,163,211,750	-0.8%
<b>Total</b>			
• Actuarial Present Value of Projected Benefits	16,458,555,550	16,709,434,174	1.5%
• Actuarial Accrued Liability (AAL)	15,173,798,031	15,349,249,332	1.2%

### Hybrid DB/DC Plan

#### State Employees/Higher Education Employees

	Findley	Segal	Percent Difference
<b>Active Members</b>			
• Actuarial Present Value of Projected Benefits	781,437,812	785,316,022	0.5%
• Total Normal Cost	57,146,172	55,821,806	-2.3%
• Normal Cost (Net of Employee Contributions)	13,784,937	11,978,773	-13.1%
• Actuarial Accrued Liability (AAL)	155,056,472	174,946,459	12.8%
<b>Inactive and Vested Deferred Members</b>	21,474,273	21,694,499	1.0%
<b>Retirees and Beneficiaries</b>	363,827	363,806	-0.0%
<b>Total</b>			
• Actuarial Present Value of Projected Benefits	803,275,912	807,374,327	0.5%
• Actuarial Accrued Liability (AAL)	176,894,572	197,004,764	11.4%

## Legacy DB Plan

### K-12 Public School Teachers

	Findley	Segal	Percent Difference
<b>Active Members</b>			
• Actuarial Present Value of Projected Benefits	12,149,060,459	12,289,529,964	1.2%
• Total Normal Cost	324,559,545	328,687,316	1.3%
• Normal Cost (Net of Employee Contributions)	165,953,011	169,826,299	2.3%
• Actuarial Accrued Liability (AAL)	9,031,513,365	9,162,682,530	1.5%
<b>Inactive and Vested Deferred Members</b>	653,354,408	643,561,946	-1.5%
<b>Retirees and Beneficiaries</b>	13,849,572,158	13,751,503,535	-0.7%
<b>Total</b>			
• Actuarial Present Value of Projected Benefits	26,651,987,025	26,684,595,445	0.1%
• Actuarial Accrued Liability (AAL)	23,534,439,931	23,557,748,011	0.1%

## Hybrid DB/DC Plan

### K-12 Public School Teachers

	Findley	Segal	Percent Difference
<b>Active Members</b>			
• Actuarial Present Value of Projected Benefits	1,142,945,887	1,161,306,631	1.6%
• Total Normal Cost	71,872,812	70,406,132	-2.0%
• Normal Cost (Net of Employee Contributions)	19,688,662	18,089,185	-8.1%
• Actuarial Accrued Liability (AAL)	220,859,097	253,846,993	14.9%
<b>Inactive and Vested Deferred Members</b>	23,566,281	23,654,597	0.4%
<b>Retirees and Beneficiaries</b>	292,444	292,444	0.0%
<b>Total</b>			
• Actuarial Present Value of Projected Benefits	1,166,804,612	1,185,253,672	1.6%
• Actuarial Accrued Liability (AAL)	244,717,822	277,794,034	13.5%

## Contribution Rates

We were able to replicate the methodology used to determine the amortization payments on the unfunded actuarial accrued liability, and consequently, the total and employer contribution rates, as a percentage of payroll.

## Recommendations

As mentioned previously, the results presented throughout this section represent the closest match of Findley results based on our reading of their valuation report, the test life information provided, and their responses to our follow-up questions. Given that we were able to replicate their results closely, we are confident that we understand Findley's programming methodology. With that in mind, we offer the following suggestions to improve the accuracy of the results:

1. Return of Excess Contributions – TCA 8-37-212 provides that the excess, if any, of accumulated contributions over the sum of actual retirement allowance payments received be paid as a lump sum to the surviving beneficiary or estate. Our analysis of the test lives indicates that this provision was not valued in the liability, although it is described on page G-2 of the Legacy valuation report. **We recommend that Findley program the return of contributions plan provision.**

We estimate that implementing this change would increase the Actuarial Accrued Liability by approximately \$157 million, or 0.40%, across all groups studied.

2. For current terminated vested participants and for Legacy vested active participants assumed to withdraw from employment before eligibility for retirement and elect a deferred annuity, Findley programming assumes there is no liability for deaths prior to commencement of the deferred annuity. However, a death benefit would be payable in that situation (an annuity to married participants with 10 or more years of service or lump sum return of contributions in all other cases). **We recommend that Findley program these pre-retirement death benefit provisions.**

We estimate that implementing this change would increase the Actuarial Accrued Liability by approximately \$7 million, or 0.02%, across all groups studied.

3. For retirements from active status, Findley currently assumes that no participants will elect reduced early retirement benefits. We think this is likely an oversimplification (although we have not analyzed any actual retirement experience). **We recommend use of early retirement decrements and anticipate that implementing a reduced early retirement assumption would increase liabilities for the Legacy Plan.** However, the magnitude of the change would be dependent on the exact assumptions chosen. We expect this change would have less of an impact on the Hybrid Plan due to fact that early retirement reductions are calculated based on actuarially equivalent factors in that plan.
4. For future vested terminations from active status in the Legacy Plan, Findley assumes that terminated vested participants will retire at the first retirement eligibility. This differs from the stated assumption and the assumption used for current Legacy terminated vested participants (as well as the assumption used for the Hybrid Plan), which is that the participant will retire at the first service retirement eligibility. **Unless there is reason to believe that current and future terminated vested participants will behave differently, we recommend applying the same assumption in both scenarios.**
5. Furthermore, a single retirement age for terminated vested participants is unlikely to adequately capture the range of retirement scenarios for such participants. **Our preference is to set a table of rates based on age/eligibility, similar to the assumption for retirements from active status.** We expect that implementing this change would decrease

the liability for those currently assumed to retire at early retirement eligibility. For those currently assumed to retire at service retirement eligibility, the result would likely be an increase in liability (but could still be a decrease if the assumed rates extend beyond the service retirement date). The magnitude of any change would be dependent on the exact rates chosen.

6. For future vested terminations from active status in the Legacy Plan, Findley does not compare the present value of the deferred annuity with an immediate return of contributions. This differs from the methodology used for current terminated vested participants, where the greater present value is taken. **We recommend implementing the same comparison of return of contributions or deferred annuities for future terminations.**

We estimate that implementing this change would increase the Actuarial Present Value of Benefits by approximately \$14 million, or 0.03%, across all groups studied.

7. For future retirements from active status, the programming of the first-year cost of living adjustment (COLA) appears to be inconsistent between the Legacy and Hybrid Plans. For the Legacy Plan, there is no COLA given as of the July 1<sup>st</sup> following the year of retirement. We believe this is correct because retirements are assumed to occur in the middle of the year and no COLAs are given until the July 1<sup>st</sup> following completion of 12 full months of retirement. However, for the Hybrid Plan, there appears to be approximately a half year of COLA given as of the July 1<sup>st</sup> following the year of retirement. **We recommend adjusting the Hybrid Plan coding to match the Legacy Plan coding.**

We estimate that implementing this change would decrease the Actuarial Accrued Liability by approximately \$4.4 million, or 0.92%, for the Hybrid Plan.

8. Findley notes in its summary of plan provisions that all pre-retirement deaths are assumed to be ordinary (i.e. not in the line of duty). We expect that, in most cases, the benefit for a line-of-duty death would be more valuable than the ordinary death benefit so that implementing any probability of line-of-duty deaths would increase liabilities. However, the magnitude of the change would be dependent on the exact assumption chosen.
9. For pre-retirement deaths that occur after reaching retirement eligibility, an annuity is payable to the beneficiary of all participants (not just married participants). Findley's current methodology assumes that only 80% of participants (those assumed to be married) receive the annuity, while the remaining 20% receive the lump sum death benefit. **We recommend valuing the greater of the two possible death benefits for 100% of deaths occurring after retirement eligibility.**

We estimate that implementing this change would increase the Actuarial Accrued Liability by approximately \$28 million, or 0.07%, across all groups studied.

10. For pre-retirement deaths that occur before reaching retirement eligibility and where the participant is assumed to be married, Findley's coding for the Hybrid Plan does not appear to reflect any early retirement reductions that would apply. **We recommend applying the early retirement reductions, where applicable.**

We estimate that implementing this change would decrease the Actuarial Accrued Liability by approximately \$4.6 million, or 0.97%, for the Hybrid Plan.

11. We note that Findley does not assume that future disabled retirees will receive any worker's compensation benefits when determining the maximum disability benefit payable from the Plan. In the absence of any information to the contrary, we agree that this seems to be a reasonable assumption.
12. We note that, for Legacy participants hired before July 1, 1997, Findley does not assume that any future disablements will occur in the line-of-duty. Given that the ordinary and line-of-duty disability benefits are identical for those hired on or after July 1, 1997, we agree that this is a reasonable simplification due to its immateriality.

## Section V: Conclusions

---

To reiterate our comments in the Executive Summary, Findley appears to have reasonably valued the expected liability, based on their stated assumptions and methods, of both the Legacy Plan and the Hybrid Plan for the State Employees and the K-12 Teachers classifications. Findley has applied the funding methodology appropriately to develop contribution recommendations for the Legacy Plan and Hybrid Plan, and the valuation reports conform to accepted actuarial principles and practices.

In this audit, we have noted areas that we believe will refine the liability calculations and improve the usefulness and clarity of the System's annual actuarial valuation reports. We are available to discuss any aspect of our review with the State Treasury Department, the System Board of Trustees, System Staff, or the System's actuary.

Segal is independent of Findley, and we are not aware of any conflict of interest that would impair the objectivity of our actuarial audit of their work.