

## **Montana Legislative Fiscal Division**

### **Information Regarding Actuarial Services**

**August 15, 2020**

**Produced by Cheiron, Inc.**

August 15, 2020

Ms. Amy Carlson  
Director and Legislative Fiscal Analyst  
Montana Legislative Fiscal Division  
State Capital  
PO Box 201706  
Helena, MT 59620-1706

***Re: Request for Information regarding Actuarial Consulting Services***

Dear Ms. Carlson:

Cheiron, Inc. is pleased to present information regarding possible actuarial consulting services for the Montana Legislative Fiscal Division.

Our understanding is that the Legislative Fiscal Division and the Pensions & Local Government Pensions Subcommittee (Subcommittee) is seeking information about possible independent actuarial services to advise the legislature in regards to Montana's retirement systems, framing the costs, benefits, and risks of the systems in light of the State's revenue and workforce needs. We agree that this type of analysis is necessary and critical to the legislature's responsibilities related to pensions, particularly recognizing that where the system Boards have fiduciary obligations to the members of the systems, the legislators' obligations are to all of the taxpayers, not just those who are members of the systems.

Based on our extensive experience providing services of this nature as well as regular valuation work and audits of systems involving similar services, we have identified three options for possible services below:

1. **Basic** – consisting of reviewing the existing system reports and presentations and providing feedback on the assumptions and methods as well as insights tailored to the State (rather than the system focus of the existing reports) based on these reports.
2. **Intermediate** – in addition to the work in the Basic option, we would request detailed valuation results from the system actuaries as well as revenue information from the State and use these to develop our own models and stress testing explicitly reflecting the needs of the State for decision useful information as the sponsor.
3. **Replication** – this option would have us independently perform actuarial valuations of the systems from original data and then develop the same information as in the middle option. We would only recommend this option if the State is not able to get detailed valuation results from the systems or the Subcommittee feels they would like the benefit of independent calculation and confirmation of the underlying liability information.

While the actual range of services we could provide is a continuum, we believe these three identified levels of services will assist the Subcommittee in identifying the general level of services appropriate for your needs.

Ms. Amy Carlson

August 15, 2020

Page 2

While there is value in the basic option, it does not have specifically customized dynamic models designed to demonstrate the risks from the sponsor's perspective and is limited to the information developed solely in consideration of the system perspective. As such, this option is of limited value compared to the other two options where the models we develop provide valuable information in the decision-making process and really support an understanding of why changes result in specific outcomes. The benefits of the intermediate and replication options to the legislature are very similar, with the only difference being that the replication approach would provide the legislature with independent confirmation of the validity and appropriateness of the valuation results. However, this independent confirmation would come at significant additional cost over the intermediate option.

All three options (as well as any other options along the continuum) would reflect our comprehensive research, experience, and developments related to retirement systems.

We note that in addition to this work framing the existing benefits and funding policies to the perspective of the sponsor, further work exploring the level of the benefits and the contributions for each system as well as the efficiency of the benefits that are being provided should be considered by the Subcommittee.

We have provided specific examples of work in Attachment A following this letter that we have done with other clients that we believe highlight our ability to provide the type of services under consideration by the legislature.

We have included a number of attachments to this letter that we believe may assist you in your consideration of these possible services. These are as follows:

- Attachment A – Information on services Cheiron provides to other legislatures and retirement systems that we believe are pertinent to Montana's current request
- Attachment B – Highlighted areas of analysis for the state
- Attachment C – General information on Cheiron highlighting areas of strength
- Attachment D – List of Cheiron's public pension clients
- Attachment E – Information on Cheiron's proprietary modeling tools, *P-Scan* and *R-Scan*
- Attachment F – Biographies for a number of Cheiron's public sector actuaries
- Attachment G – Hourly rate information by employee class

We are confident that we can help the Subcommittee, as well as the greater legislature, understand the likelihood and range of risks that Montana is exposed to related to pensions, both financial and workforce management. Thank you for the opportunity to provide you with information on possible services that we could provide the legislature,

Sincerely,  
Cheiron



Elizabeth Wiley, FSA, FCA, MAAA, EA  
Consulting Actuary

## **Attachment A – Relevant Experience**

---

### Office of the Chief Financial Officer of the City of Detroit

Cheiron has served as the actuary to the Office of the Chief Financial Officer of the City of Detroit since 2016, providing review and analysis of the work of the system actuaries as well as developing new and tailored projections focused on the future impact of the systems on Detroit's financial condition and exploring possible funding options. We continue to provide support to them on their strategy to fund the retirement system, including an online modeling tool allowing them to perform scenario testing on demand for both possible changes and evaluating alternative assumption scenarios.

### Illinois Office of the Auditor General

Cheiron is the State Actuary for the state of Illinois, working for the Office of the Auditor General. In this role since 2012, we review the work of actuaries working for the five statewide pension systems and have recommended changes to assumptions, methods, and information included in the valuations to increase the transparency of the reports and mitigate some of the risks faced by the Systems. We prepare an annual report on each of the five statewide systems analyzing and evaluating the assumptions, methods, and commentary of the actuaries working for the Systems and giving recommendations to improve the funding of the systems as well as the communication of the risks faced by each system. As part of this process, we develop customized projection models of each system, including dynamic presentation of the impact of alternative assumptions and methods beyond what was developed by the system actuaries.

### Maryland Department of Legislative Services

Cheiron was the actuarial consultant to the Maryland Department of Legislative Services for years, a role in which we reviewed and replicated the system actuary's work, provided fiscal impact statements for proposed legislation, and developed customized modeling projecting the items of importance to the state in regards to the retirement systems. In this role we interfaced with both staff and legislators.

### City of Philadelphia Municipal Retirement System and State Oversight Commission

In addition to performing routine valuation services to the System covering all uniform and non-uniform employees of the City as well as special studies on legislative proposals, alternative funding methods, and benefit changes, we also perform special projects for State oversight commissions on the funded status and progress of the System over time and addressing the long-term financial strains the System has on the City to allow for budget management.

### Oregon Governor's Office

In Oregon, the Governor's office retained Cheiron to provide expert testimony and analysis to help defend the State against multiple lawsuits totaling \$9 billion brought on by government employees and their unions to challenge the 2003 PERS Reform Legislation. In order to perform this task, Cheiron had to review all work performed by the PERS actuary over the previous ten years and provide an independent assessment of the current and projected financial condition of PERS to a

## Attachment A – Relevant Experience

---

Special Master appointed by the Oregon Supreme Court to hear the case. In the end, the court ruled in favor of the State; and in his written decision, the Special Master relied heavily on Cheiron's testimony and modeling.

### State of Pennsylvania Legislature

We served as a consultant to the State of Pennsylvania Legislature when they were looking for a solution to a financial challenge facing their over 3,000 municipal retirement systems. We were instrumental in critiquing the legislative alternatives, in particular, identifying changes that could result in excessive risk if assumptions were not met as well as clearly demonstrating the long-term implications of the options.

### New York State Teachers Retirement System

We were retained to review a Governor's proposed funding policy for NYSTRS, including developing 30-year deterministic and stochastic projections modeling expected funding and cost implications as well as risks. We provided analysis and recommendations specific to the state as the sponsor in addition to information about the implications on the System as well as the benefits of the members.

### System Actuary Work

In addition to these special projects serving in roles other than directly to the system, we have extensive experience working as the system actuary for both state and local systems. We want to highlight our work with Maine as an example of the applicability of experience as a system actuary to providing services for the legislature in their role as a sponsor.

Cheiron has been the ongoing actuary for the Maine Public Employees Retirement System (MainePERS) since 2005, performing annual actuarial valuations, experience studies, analysis of legislative proposals, and special studies on funding policies. Prior to Cheiron's creation, Gene Kalwarski, Cheiron's CEO, first began as the system actuary in 1985. In 1985, MainePERS was one of the worst funded public sector retirement systems in the country, under 30% funded with a 10% discount rate. Today, MainePERS is over 80% funded with a 6.7% discount rate. This improvement was achieved largely through intentional use of actuarial gains to reduce the risk of the plan, made possible with risk modeling similar to what we are proposing for the state of Montana. This approach also served to manage the budget risks to the state, as evidenced by the fact that the contribution rate over this 35-year period remained between 15-20% as a percentage of payroll.

Additionally, we worked with MainePERS to evaluate and recalibrate the costs and benefits of their multiple-employer plan, including developing a risk-sharing model, which won the 2017 Retirement 20/20 Call for Models for Public Pension Plans Contest.

### Auditing Actuary Work

## Attachment A – Relevant Experience

---

A final type of work that we perform that we would like to highlight as examples of our ability to provide support for the legislature's work at assessing and managing the risks that the retirement systems pose to the state is our extensive experience providing actuarial audits. These projects generally involve us evaluating all of the work performed by the systems' retained actuaries as well as assessing the financial risks of the systems and replication of the liabilities and funded status.

We have performed this type of work for dozens of systems, providing not just validation of the information regarding the systems, but also development of extended risk assessment and analysis and customized expanded projections of the future condition of the systems under both baseline scenarios and alternative assumptions and possible conditions. We have performed these types of analysis for states such as Washington, Rhode Island, California, Utah, and Maryland as well as a large number of cities and counties.

While the modeling of future conditions and communications regarding risks of the systems and implications of alternative funding and conditions are most applicable to the type of support being currently considered by the Montana legislature, we believe the recommendations in regards to actuarial standards of practice and communications that we make in these types of projects is also an important service that we can provide for your efforts.

In some of these projects, such as that performed for the Utah Retirement System, we have explicitly worked with the legislature to expand upon the system's work and analysis to provide information and risk analysis specific to the perspective of the state, including evaluation of the implications of a proposed set of pension reforms. Further, in addition to providing information assessing the risk, we worked with the legislature to identify and assess potential methods to dampen the risks the state faces from the retirement systems.

## Attachment B – Highlighted Areas of Analysis for State

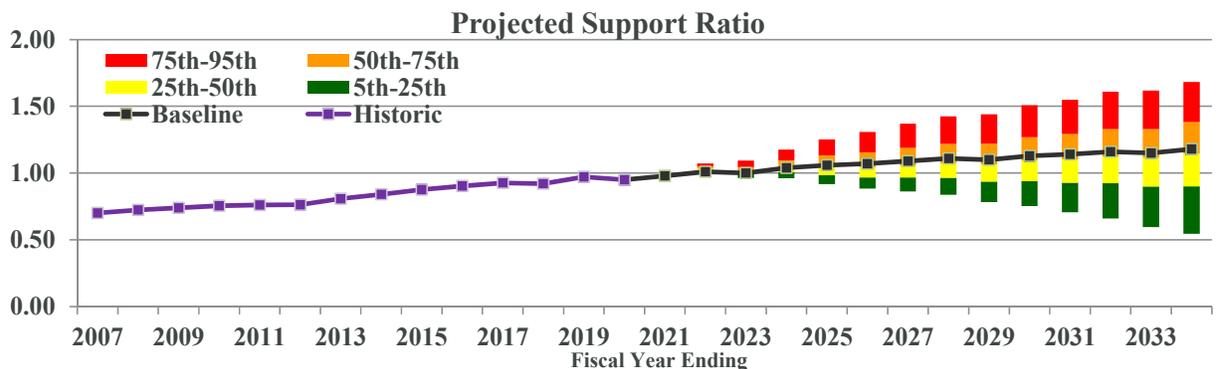
If asked to provide services related to the request, we would engage in conversations with the Division and the Subcommittee to identify the specific information that is being sought as well as the format of such information, but for illustrative purposes we have identified a few possible risks for consideration in this attachment. This list is far from exhaustive and is instead simply meant for discussion purposes.

### Risks related to population of the systems as well as Montana as a whole

Especially for fixed rate plans, understanding the anticipated future size of the inactive populations compared to the active populations is important to understand future risks. Further, for a plan sponsor, viewing the changes in this ratio in light of the forecasts for the tax base and revenue projections is important.

For example, related to investment risks, losses on the assets occur over the entire assets, which relate to liabilities for both those members who are still working and those who are no longer working, but the contributions coming into the systems are based on the payroll that relates to only the active part of the liability. So as the ratio of active members relative to inactive declines, making up investment losses becomes more challenging and requires longer periods of time. As such, we believe it is important to consider investment risk from the state's perspective reflecting these changes.

The system actuaries provide information related to the size of the populations for the current and past periods, but we would recommend developing forecasts of this ratio as well in the analysis performed for the state. We have provided an example of the format this could take based on a non-Montana system.



And for the state in particular, assessing the expected growth in the liabilities in total and the proportion related to those who are no longer working is important to do relative to forecasted growth in revenue. If the inactive portion of the liability is growing faster than the expected revenue base, the exposure to the risks related to investment losses are relatively greater for the sponsor.

## Attachment B – Highlighted Areas of Analysis for State

---

### Cash flow considerations

It is important for the state, as the primary entity paying the employer contributions and largely responsible for ensuring that benefits are paid as due, to know the magnitude of the negative cash flows for the systems, both currently and as projected for future years. The Montana systems, and almost all public retirement systems that have been in place for decades, have negative cash flows where the contributions coming into the systems are less than the benefit payments and administrative expenses that must be paid each year. As such, investment returns must fill the size of this gap before they can contribute to further growth in the assets.

The system actuaries have provided projections of the level of this net cash flow for the next 30 years for the two largest systems. While both PERS and TRS show the size of this gap expected to grow over the next 10-15 years before then beginning to shrink, for PERS in particular these forecasts are concerning for the state as the sponsor. The PERS forecasts show the size of this gap growing from the currently level of almost negative four percent to around negative six percent over the next 15 years before returning to a level similar to the current gap.

We would recommend that this information be explored further by the state in assessing the risks the state faces related to the pensions and in particular from investment risks. This analysis would provide important information for assessing the asset allocation of the system assets.

### Stress Testing

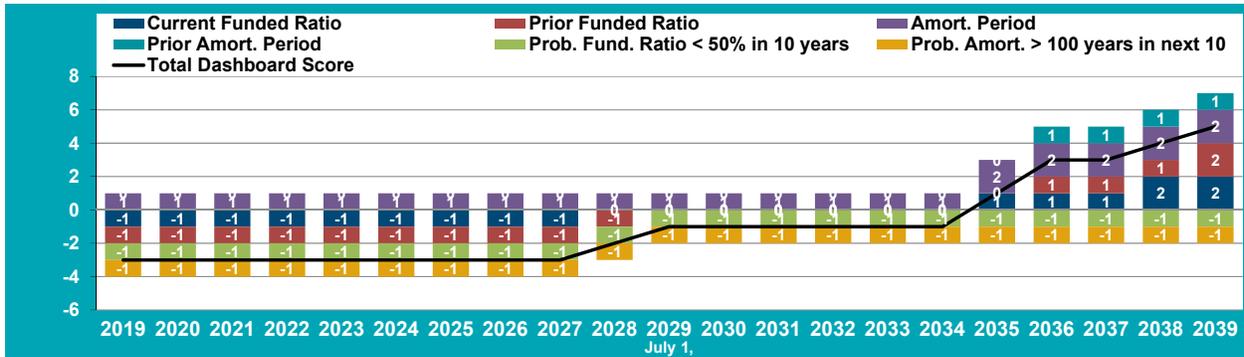
In addition to the deterministic scenarios and stochastic modeling performed by the system actuaries, we would recommend the development of interactive modeling tools for the State that allow looking at the forecasted status of the systems based on actual historical investment data. While it is unlikely that future returns exactly follow any prior pattern, the use of this historical data allows seeing the performance and risks of the systems under actual combinations of downturn and recovery that have actually occurred. In addition to being valuable for seeing the impact of the order of investment gains and losses, these realistic patterns are often of particular interest to decision makers who are experienced in dealing with revenue and budget forecasts.

Appendix E provides more information on our stress testing tools and modeling capacity. We can provide these tools either as tools that we run based on requests or as an online tool that can be accessed by the legislators and staff to directly examine scenarios. We discuss this online approach in the section of the City of Detroit in Appendix A.

### Dashboard Development

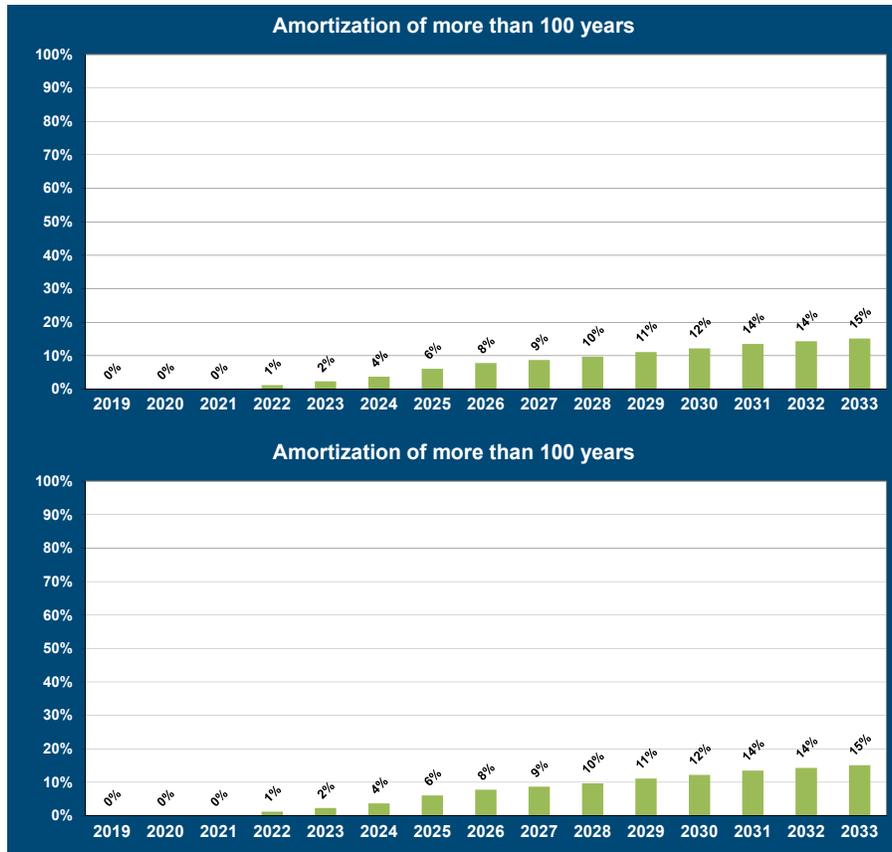
We find that developing a dashboard based on the risk and metrics that have been identified as most significant to particular systems and sponsors is of particular value for legislative decision makers responsible for retirement systems. We have included an example dashboard below to show how this can be used to quickly assess the current risk level based on these identified areas of concern, but note that the specific items contained within the dashboard should be tailored to the group using it. So for example, the Subcommittee might want to include items related to the growth in an actuarially determined contribution benchmark relative to forecasted revenue growth.

## Attachment B – Highlighted Areas of Analysis for State



Having this sort of simple score based system helps to identify points at which actions are necessary to address the current or forecasted risk level related to the retirement systems.

The items in the dashboard would take information on the identified metrics and convert it to a score. For example, the item related to the probability that the funded ratio is less than 50% in 10 years takes that probability and converts it to a score. This allows the information to be assessed much more quickly than trying to understand the underlying data (as shown below).



## Attachment C

---

Cheiron is an independent national pension and healthcare actuarial consulting firm advising public employers, Taft-Hartley pension funds, nonprofit organizations and corporations. As you read our response, we hope the following distinguishing characteristics of Cheiron will stand out.

- **Extensive Public Sector Experience:** Our consultants have decades of experience advising several of the nation's largest retirement systems. A complete list of all the public plans we have worked with in the past five years is in Attachment D.
- **Creative:** Because of our creativity and expertise with high-tech tools, some of the most troubled pension plans in the country sought our help in navigating them safely through difficult times. Among them are the City of Detroit, the San Diego City Employees' Retirement System, the City of Philadelphia Board of Pensions and Retirement, the five large Illinois public employee retirement systems, and the Maine Public Employees Retirement System.

Cheiron's actuaries were among the first in the nation to adopt interactive pension modeling tools nearly two decades ago. Instead of looking backward, our proprietary projection tools, *P-Scan* and *R-Scan*, allow you to look ahead and be better prepared to handle adverse situations.

Recently, the Society of Actuaries recognized our CEO Gene Kalwarski and Sandy Matheson, the executive director of the Maine Public Employees Retirement System (MainePERS), for their paper describing the innovative multiple-employer risk-sharing model they created for MainePERS. The system's implementation of the model ensures the sustainability of the pension plan while lowering its risk.

- **Innovative:** Our interactive modeling skills, which are part of our regular valuation services, set us apart from other actuarial firms. Our founders began stress testing pension plans in the mid-1980s, decades before many state legislatures mandated regular stress testing of public plans to gauge their vulnerability to adverse conditions, and the Actuarial Standards Board's ASOP 51 required actuaries to better educate pension plans about risks. Stress testing is an integral element of our annual service for all our clients. Following this cover letter, I have attached my May 2018 commentary in *Pensions & Investments* on the importance for public pension plans to perform regular stress tests.

Our models are flexible, easy to understand, and can analyze the impact of changes in benefits, assumed rates of return, discount rates, contribution levels, life expectancies, planned layoffs, and dozens of other variables. Our models also project future costs, liabilities, assets, and funded ratios.

Working with our proprietary projection models lets us run hundreds of "what if" scenarios and demonstrate the impact of changes on your plan in real time at board meetings. These exercises enable clients to make prudent and informed decisions and manage financial risks associated with their plans. Our hands-on approach means all our actuaries create their own tools and are adept at modeling.

## Attachment C

---

- **Independent and Objective:** We are passionate about the quality of our work, and several actuaries are involved in every step of the valuation and review every project. We are employee-owned and unaffiliated with any other firm. We do not accept assignments or commissions from service providers or vendors. We have earned a strong reputation for unbiased consulting that best serves our clients and their members and retirees. We stand fully behind our work.
- **Highly Qualified:** Our talented actuaries back our commitment to quality. More than 40 percent of all our employees are Fellows of the Society of Actuaries or FSAs, the highest professional designation. We have a higher percentage of FSAs with public sector expertise than most other firms.

Our actuaries are very active in leadership positions in professional organizations such as the American Academy of Actuaries and the Conference of Consulting Actuaries. They also serve on the Pension Committee of the Actuarial Standards Board, the rule-making body for the actuarial profession. Because of our expertise, we've been asked to testify before Congress on pension issues.

## Attachment D

Cheiron has been providing consulting services to public sector retirement systems since its inception in November 2002. The experience of many of our consultants extends well before Cheiron's inception. Our consultants have experience advising statewide and local retirement systems. Over the period of 2015-2019, we have worked with:

Client	Nature of Contract
- Alameda County Employees Retirement Association	Actuarial Audit
- Alameda-Contra Costa Transit District Employees Retirement Plan	Pension Valuation Services
- Amalgamated Transit Union Local 900 Pension Plan	Pension Valuation Services
- Arlington County Retirement System	Pension Valuation Services
- California Public Employees Retirement System	Actuarial Audit
- California State Teachers Retirement System	Actuarial Audit
- Charles County MD HR Department	Actuarial Consulting
- Cincinnati Retirement System Pension	Pension Valuation Services
- City and County of San Francisco Employees Retirement System	Pension Valuation Services
- City of Alexandria Firefighters and Police Officers Pension Plan	Pension Valuation Services
- City of Allentown Pension Plans	Pension Valuation Services
- City of Baltimore Fire and Police Employees	Pension Valuation Services
- City of Detroit Office of the Chief Financial Officer	Actuarial Consulting
- City of Falls Church Pension Plans	Pension Valuation Services
- City of Kansas City	Actuarial Consulting
- City of Kansas City, Missouri Employees Retirement System	Pension Valuation Services
- City of Kansas City, Missouri Firefighters Pension System	Pension Valuation Services
- City of Norfolk Employees Retirement System	Pension Valuation Services
- City of Philadelphia Municipal Retirement System	Pension Valuation Services
- City of San Jose Federated City Employees Retirement System	Pension Valuation Services
- City of San Jose Police and Fire Department Retirement Plan	Pension Valuation Services
- City of Wilmington Pension System	Pension Valuation Services
- Contra Costa County Employees' Retirement Association	Actuarial Audit
- County of Los Angeles	Actuarial Audit
- DART Contributory Pension Plan	Pension Valuation Services
- Delaware Public Employees Retirement System	Pension Valuation Services
- Denver Employees Retirement Plan	Pension Valuation Services
- Educational Employees of Fairfax County	Actuarial Audit
- Employees Retirement System of the City of Baltimore	Pension Valuation Services
- Employees Retirement System of the City of St. Louis	Pension Valuation Services
- Fairfax County Retirement Systems	Pension Valuation Services
- Firefighters Retirement Plan of the City of St. Louis	Pension Valuation Services

## Attachment D

Client	Nature of Contract
- Golden Gate Transit-Amalgamated Retirement Plan	Pension Valuation Services
- Greater Palm Springs Convention & Visitors Bureau	Pension Valuation Services
- Hampton Employees Retirement System	Pension Valuation Services
- Illinois Office of the Auditor General	Designated as State Actuary
- Jackson County Revised Pension Plan	Pension Valuation Services
- Knoxville Utilities Board Pension Plan	Pension Valuation Services
- Maine Public Employees Retirement System	Pension Valuation Services
- Marin County Employees Retirement Association	Pension Valuation Services
- Maryland National Park and Planning Commission	Actuarial Audit
- Mendocino County Employees Retirement Association	Actuarial Audit
- Merced County Employees Retirement Association	Pension Valuation Services
- Metropolitan Relief Association Death Benefit Plan	Pension Valuation Services
- Metropolitan Washington Council of Governments	Pension Valuation Services
- New York State Teachers Retirement System	Pension Consulting Services
- Newport News Employees Retirement Fund	Pension Valuation Services
- Oakland Police and Fire Retirement System	Pension Valuation Services
- Orange County Employees Retirement System	Actuarial Audit
- Pasadena Fire Fighters Association Benefit Trust	Pension Valuation Services
- Pennsylvania Independent Fiscal Office	Actuarial Consulting
- Pennsylvania Municipal Retirement System	Pension Valuation Services
- Port Authority of Allegheny County Retirement and Disability Allowance Plan for Employees Represented by Local 85 of the Amalgamated Transit Union	Pension Valuation Services
- Retirement Plan for Pace West Division Employees	Pension Valuation Services
- Riverside Sheriffs Association	Pension Valuation Services
- Sacramento Regional Transit District	Pension Valuation Services
- San Bernardino County Employees Retirement Association	Actuarial Audit
- San Diego City Employees Retirement System	Pension Valuation Services
- San Diego Transit Corporation Pension Plan	Pension Valuation Services
- San Joaquin County Employees Retirement System	Pension Valuation Services
- Santa Barbara County Employees Retirement System	Pension Valuation Services
- Santa Clara Valley Transportation Authority ATU Pension Plan	Pension Valuation Services
- Santa Monica Fire Fighters Association Benefit Trust	Pension Valuation Services
- Stanislaus County Employees Retirement Association	Pension Valuation Services
- State of New Jersey Division of Pensions and Benefits	Pension Valuation Services
- State Teachers Retirement System of Ohio	Pension Valuation Services
- Sussex County Employee Pension Plan	Pension Valuation Services
- The Massachusetts Bay Transportation Authority	Actuarial Audit
- The Police Retirement System of St. Louis	Pension Valuation Services
- The Retirement System of Alabama	Actuarial Audit

## Attachment D

Client	Nature of Contract
- Tri-County Metropolitan Transportation District of Oregon	Pension Valuation Services
- Tulare County Employees	Pension Valuation Services
- U. S. Army Non-appropriated Fund Employee Retirement Plan	Pension Valuation Services
- U.S. Court of Appeals for Veterans Claims	Pension Valuation Services
- University of California Retirement System and Retiree Health Benefit Plan	Actuarial Audit
- Washington Metropolitan Area Transit Authority Retirement Plan	Pension Valuation Services
- Washington Metropolitan Area Transit Authority, Local 2 Retirement Plan	Pension Valuation Services
- Washington Metropolitan Area Transit Authority, Local 922 Retirement Plan	Pension Valuation Services
- Washington State Council of Fire Fighters Employee Benefit Trust	Pension Valuation Services
- Washington State Investment Board	Actuarial Consulting
- West Virginia Municipal Pensions Oversight Board	Actuarial Audit

### *Our P-Scan Interactive Model*

*P-Scan* is our proprietary software that provides long-term pension plan forecasting of assets and liabilities based on user-selected scenarios, both economic and demographic. In addition, we can enhance our standard product to include any other projections required, for example, GASB figures and model changes in benefits, assumptions, funding methods, and contributions. We can also add in information related to revenue forecasts to present contribution information in terms of the budget. *P-Scan* can also perform multiple stochastically based forecasts, enabling all our projections to incorporate probabilistic answers.

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

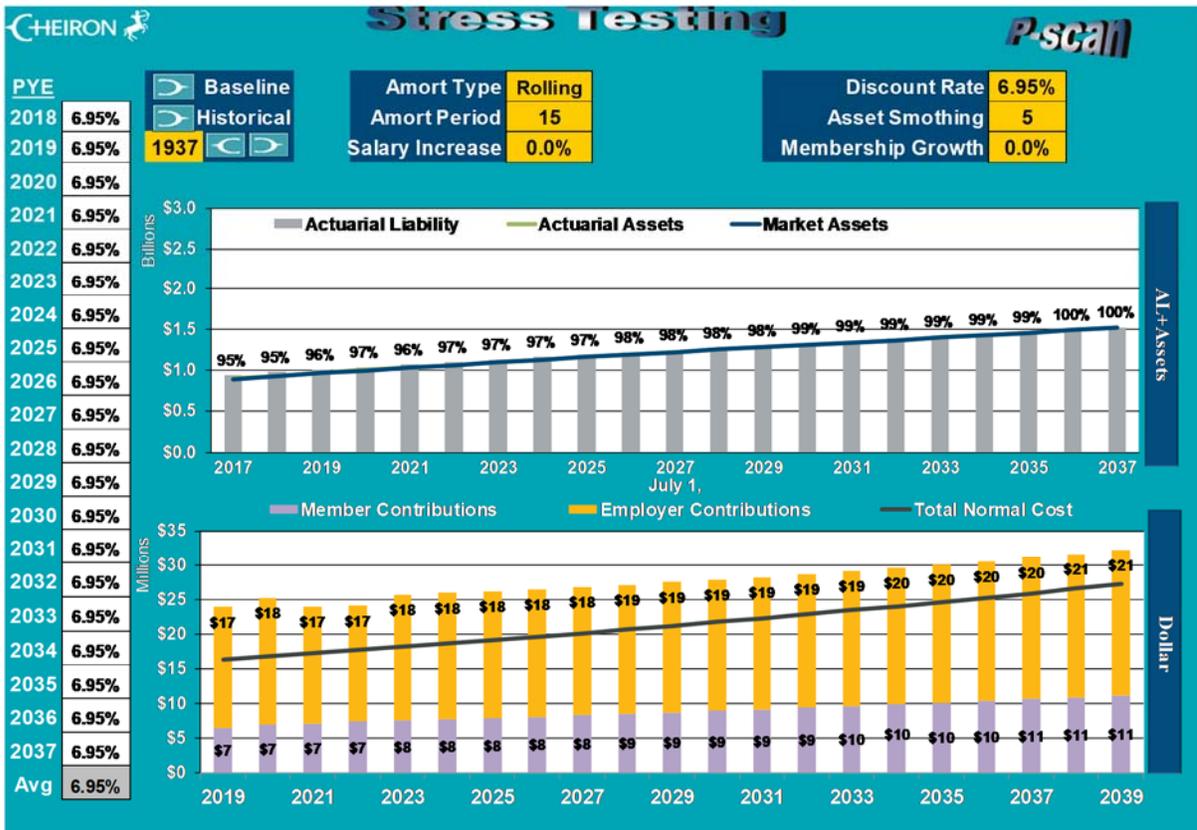
The following screenshot from *P-Scan* is intended to illustrate its capabilities and how using this tool in our consulting is different from what our competitors provide. We would be happy to demonstrate the interactive capabilities of this tool through a video conference call if that would be of value.

The boxes across the top represent variables tailored for the retirement system or benefit plan and programmed into the model that we update based on suggestions from trustees during the presentation. For example, we can program discount rate changes, salary scale changes, or benefit changes for current and/or future members. In this particular example, the variables available include the amortization methodology, the discount rate, asset smoothing method, and changes in expected membership growth.

The top graph shows the projected actuarial liability (the gray bars) and the actuarial and market value of assets (green and blue lines). The numbers at the top of the bars represent the projected funded status. The bottom graph shows the projected contributions for both the members and the employer. The line on this graph represents the contribution attributable to the normal cost of the System compared to the bars representing the actuarially determined contribution in total.

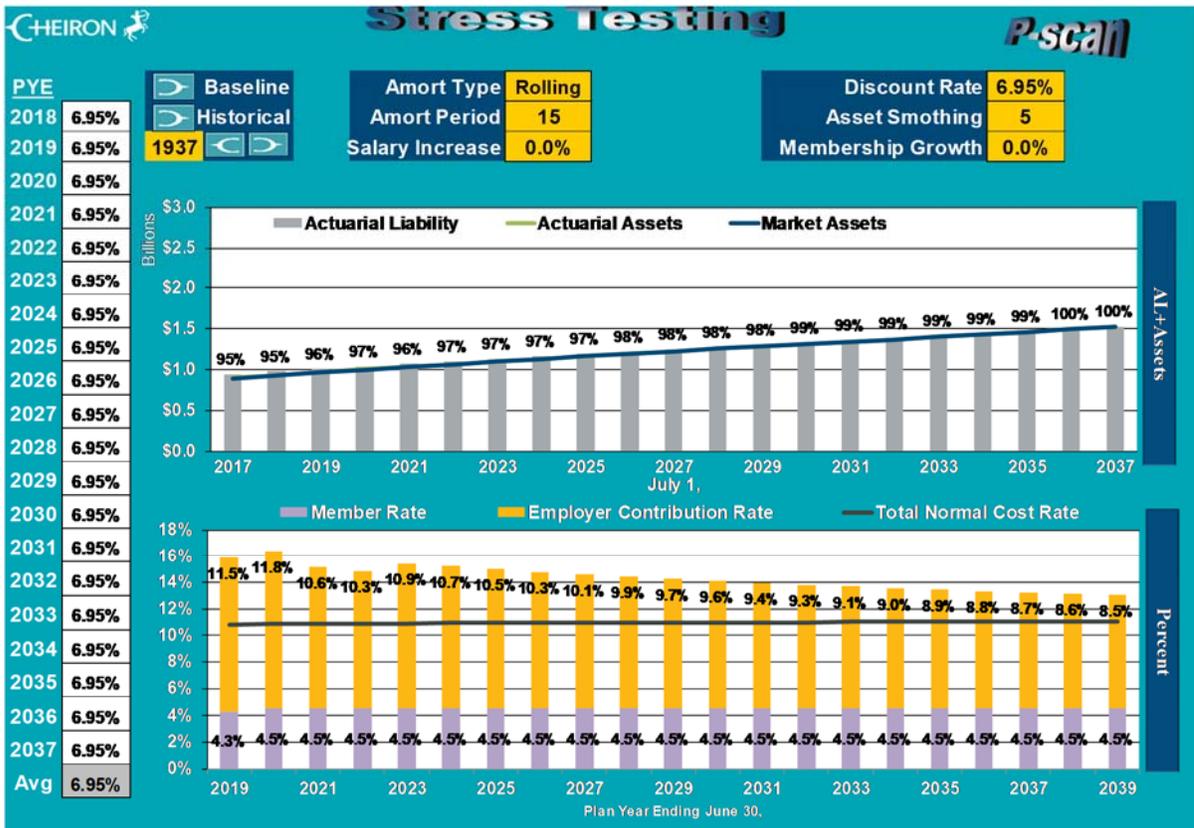
On the left side of the screen, the actual investment return is shown for each year of the projection. These returns can be changed to develop different economic scenarios. This particular scenario is the baseline projection using the assumed rate of return.

Attachment E



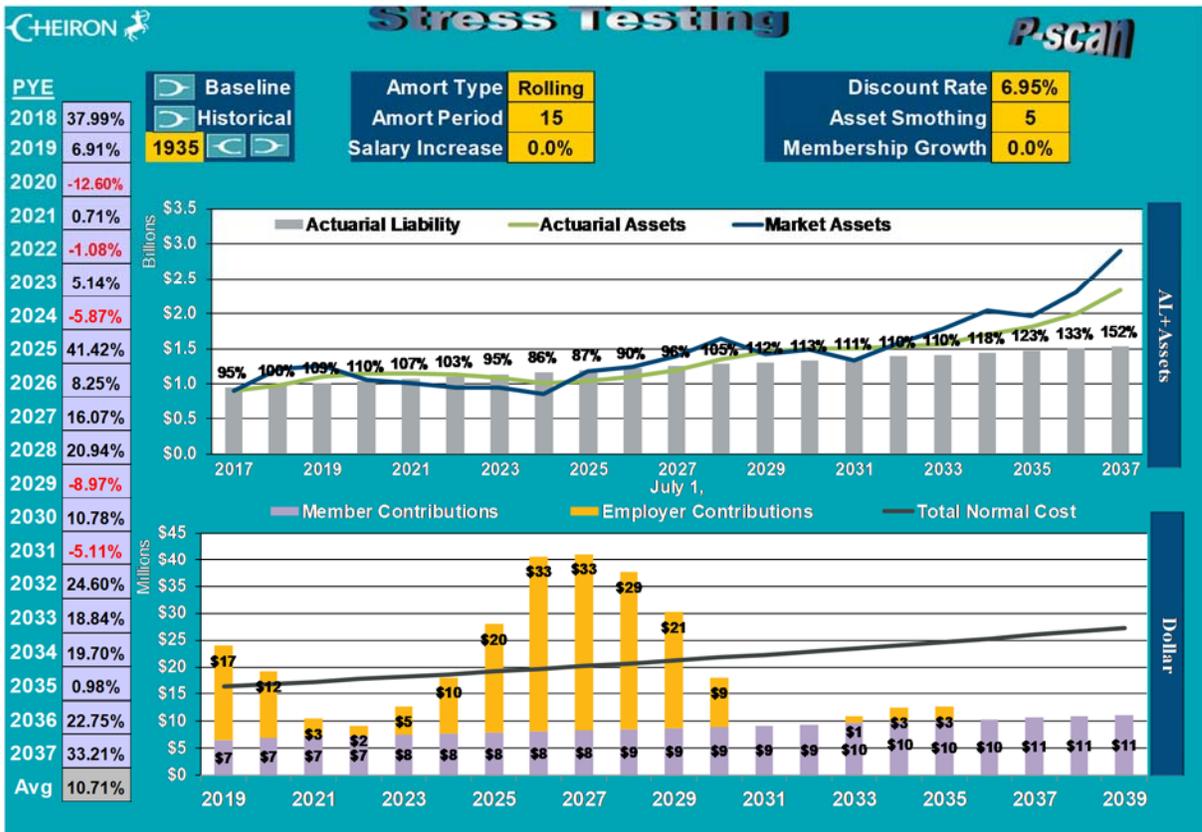
Using this same model, we can toggle between different key statistics of interest. For example, you may be more interested in seeing contributions as a percentage of payroll. This output is shown as follows:

Attachment E

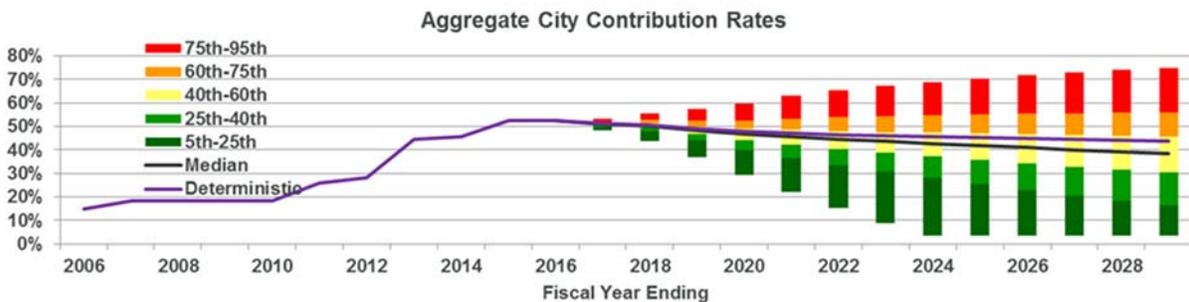


We believe that communicating the potential risks in a system to boards and sponsors is fundamental to our work. This includes demonstrating the sensitivity to investment returns. The screenshot that follows shows the same stress test, but using historical investment returns beginning in 1935. In other words, the investment return shown for FYE 2018 is actually the historical investment return for 1935 for a portfolio invested 70% in equities and 30% in bonds. This graphically demonstrates the sensitivity of both funded status and contribution benchmarks to varying return scenarios.

Attachment E

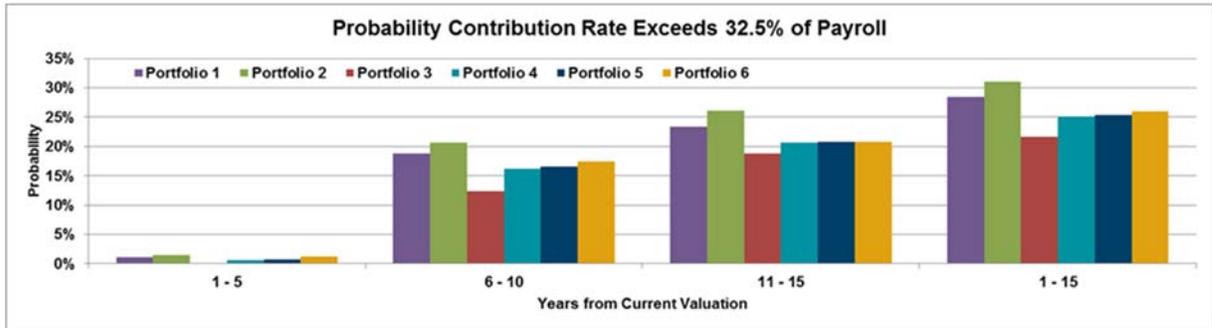


For boards or sponsors that are interested in seeing a full range of potential contribution rates based on varying investment returns, we can also present stochastic analyses using our *R-Scan* model. The *R-Scan* platform uses our base *P-Scan* model to demonstrate a likely range of potential future outcomes and how that picture changes if the funding, investment, or benefit policies are adjusted. This can be a critically important aspect in analyzing the likelihood of success of a funding solution and the level of additional commitment of resources needed to improve the probability of success. The colored bars in the graph below represent the percentiles of possible results of a plan sponsor’s future contribution rates for the next 13 years. The projection below is set in the context of historical contribution rates for the prior 10 years and projected results for the next 13 years. Any number of statistics such as funded percentages, contributions rates, or compounded returns that are of interest can quickly be shown by switching between each choice.



## Attachment E

In addition to exploring the range of potential future outcomes, *R-Scan* can also be used to assess the likelihood of an event, like exceeding certain affordability parameters. In the example below, the retirement system determined that a contribution rate in excess of 32.5% of pay was something it would prefer to avoid. The graph shows the probability of exceeding that rate over different time periods for six different investment portfolios.



This type of analysis can be customized to the particular measures that are important to the Subcommittee.

The strength of our approach to actuarial services for public sector clients is to empower our clients to understand and better manage their benefit programs and their resulting financial risks through innovative technological applications and unsurpassed professional expertise. We focus on developing technical innovations to illustrate complex actuarial items in easier to understand applications.

**Elizabeth Wiley, FSA, FCA, MAAA, EA**  
**Consulting Actuary**

**Elizabeth Wiley** joined Cheiron in March 2013 and has more than 17 years of actuarial consulting experience, almost exclusively with public pension and benefit plans. Prior to joining Cheiron, Elizabeth was a Consulting Actuary with Rudd and Wisdom in Austin, TX where she reviewed and certified actuarial valuations and experience studies for public pensions and public postretirement medical benefit plans. Her current clients include the Delaware State Employees' Retirement System, the Maine Public Employees Retirement System, and the City of Baltimore Fire & Police Employees' Retirement System.



Elizabeth's experience includes funding and accounting valuations for public plans, special studies for plans including benefit and funding changes, administrative support for system staff, and legislative support of clients. She also has performed actuarial audits of both state and local plans and provided support to state auditors.

She has given a variety of presentations and testimony, including conference presentations, legislative testimony, and presentations for clients. Her conference presentations include many national trustee educational conferences, such as the National Association of State Retirement Administrators, the National Council on Teacher Retirement, the National Conference on Public Employee Retirement Systems, and the International Foundation of Employee Benefit Plans as well as local conferences such as the Texas Association of Public Employee Retirement Systems. She has made presentations to trustees of both general public pension plans and public safety plans. Elizabeth has also given presentations and provided testimony for a number of legislative bodies, both state and local, as well as presented sessions for organizations such as the National Conference of State Legislatures and the National Association of State Treasurers. She has also given presentations for other actuaries at a wide variety of conferences.

Elizabeth also has extensive experience working with the Pension Review Board (PRB) of Texas, which provides oversight, governance, and legislative support related to the public pensions plans in the state of Texas. She has assisted the staff and Board of the PRB in developing funding guidelines, in reporting activities, in actuarial reviews, and other projects related to their mandate. In addition, she has taught actuarial sessions at trainings hosted by the PRB and presented information to the Board.

Elizabeth is a Fellow of the Society of Actuaries, a Fellow of the Conference of Consulting Actuaries, an Enrolled Actuary under ERISA, and a Member of the American Academy of Actuaries. She is a member of the American Academy of Actuaries Public Plans Subcommittee, the Society of Actuaries Retirement Plan Experience Committee, and a Director of the Conference of Consulting Actuaries (CCA) as well as serving on a number of CCA committees including the Public Plans Steering Committee. She has a Bachelor of Arts with majors in Economics and Psychology and a minor in Mathematics from Austin College in Sherman, TX, as well as a Master of Arts in Actuarial Mathematics from the University of Texas at Austin.

**Gene Kalwarski, FSA, FCA, MAAA, EA**  
**Principal Consulting Actuary**

**Gene Kalwarski** is CEO and co-founder of Cheiron Inc. and one of the most highly respected pension actuaries in the nation. He has advised multibillion public pension plans for more than 40 years.



His experience includes serving as the plan actuary to many of the nation's largest state, county, and city pension funds. He is often retained as an expert to help funds address complex financial issues. He was one of the first actuaries to encourage pension plans to conduct stress tests to manage risk and popularized the use of innovative interactive pension funding models to help public pension plans ensure their long-term sustainability.

He is noted for his ability to develop and present the big picture of creative and complex actuarial strategies in plain English. He has testified several times before congressional committees, and regularly addresses state legislatures and Boards of Trustees on behalf of numerous state pension fund clients.

Gene's experience with public sector pension funds includes:

- Serving as the ongoing actuary to the Maine Public Employees Retirement System, the San Diego City Employees' Retirement System, the State Teachers Retirement System of Ohio, the San José Police and Fire Department Retirement Plan, and the San José Federated Systems. He served as the ongoing actuary to the retirement systems of Maryland, Delaware, Florida, Kansas, Connecticut, and West Virginia. Additionally, he was the actuary to the Vermont Municipal Employees' Retirement System, and the retirement systems of the District of Columbia, Fairfax County, VA, and Arlington County, VA.
- He has also been retained for special projects by other state retirement systems including the California Public Employees' Retirement System, the nation's largest pension fund, as well as its sister fund, the California State Teachers' Retirement System; the Iowa Public Employees' Retirement System, the Massachusetts State Employee Retirement System, New York State Teachers, New York City, Oregon, and the Illinois Office of the Auditor General as the State Actuary.

Gene also has been involved in complex assignments including:

- Designing and developing interactive pension fund asset allocation tools for several public sector pension funds.
- At the request of the World Bank, creating a simulation strategy tool for Poland when the country was saddled with the mounting financial burden of honoring its Social Security obligations. After analyzing the options Gene presented, Poland confidently dissolved its Social Security system and moved to a defined contribution system that contributed to the country's improved financial stability.

## Attachment F - Biographies

---

- Designing a real-time Internet-based application for senior officials of the U.S. Department of Defense which allowed government executives to make strategic decisions on the creation of a Social Security-based retiree health insurance fund for all military personnel.
- As the first legislative authorized State Actuary for the State of Illinois, he reports to the Office of Auditor General annually with a review of and recommendations for all the State's retirement systems.

Gene began his career as an actuary at the Pension Benefit Guaranty Corporation where he first gained a detailed understanding not only of the pension insurer, but of all federal entities whose regulatory authority affects pension design and cost. Thanks to his extensive contacts within the federal government that began with his service at the PBGC, he can help his clients anticipate regulatory actions that will affect their funds.

He worked for more than two decades at Milliman, where he set up the firm's Washington office and served on its board of directors. He left Milliman in 2002 because of his concerns over policies capping liability limits on clients and co-founded Cheiron in November 2002.

He has written many articles about pension plans and is frequently quoted by the press.

Gene is a Fellow of the Society of Actuaries, the highest professional accreditation, a Fellow of the Conference of Consulting Actuaries, a Member of the American Academy of Actuaries, and an Enrolled Actuary under ERISA. He graduated with a B.S. degree in Mathematics from St. Bonaventure University.

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

**William Hallmark** is a nationally respected public sector retirement consultant who joined Cheiron in September of 2009, opening Cheiron's office in Portland, Oregon. He has 34 years of actuarial experience providing consulting services for all types of retirement programs. He specializes in the financial management of retirement programs, plan design, and the accounting and financial reporting requirements for public pension and OPEB plans. Bill has met the standards of a qualified actuary under the provisions of the Employees' Retirement Income Security Act of 1974.



Bill served as Vice President of Pensions for the American Academy of Actuaries (2015-2017) and served on the Academy's Board and Executive Committee. For the prior four years he was chair of the Public Plans Subcommittee of the American Academy of Actuaries and a member of the Academy's Pension Practice Council and Pension Committee, serving as vice chair of the Academy's Pension Practice Council from 2013-2015. He served on the Governmental Accounting Standards Board's advisory committee for the implementation of GASB 67 and 68. In addition, Bill serves on the steering committee of the Public Pension Committee of the Conference of Consulting Actuaries. He is also a frequent speaker at industry conferences and webinars on topics including principles of funding, risk metrics, disclosures, and financial reporting. Most recently, he spoke on an NCTR webinar on "The Impact of the COVID-19 Crisis on Public Pension Funding."

Before joining Cheiron, Bill was a Principal for Mercer where he led its West unit center of expertise for public sector retirement system consulting located in Portland and was the lead actuary for the Oregon Public Employees Retirement System.

His experience includes the state retirement systems in Oregon, Washington, Utah, Arizona, California (CalPERS and CalSTRS), Illinois, New Mexico as well as the retirement systems in San Francisco, San Diego, San José, Phoenix, Marin County, the County of Santa Barbara, and the County of Fresno.

Bill has also written various articles on pension issues, including "Mature Pension Plans are Sensitive - Manage with Care." (California State Association of County Retirement Systems Fall 2018), "The Sustainability Puzzle" (Contingencies, September/October 2016), "How Much Investment Risk Can a Government Sponsored Pension Plan Afford?" (Society of Actuaries Public Pension Finance Symposium, 2009), and "New Retirement Designs for the 21st Century" (Society of Actuaries Retirement 20/20 Conference, 2006).

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

**Graham Schmidt, ASA, FCA, MAAA, EA**  
**Consulting Actuary**

**Graham Schmidt** has more than 20 years of extensive experience with actuarial valuations and related studies for large, complex systems. Graham joined Cheiron as a result of EFI Actuaries merging with Cheiron in January 2013. He is recognized as a leader in actuarial issues related to California public pension plans and currently serves on the State's Actuarial Advisory Panel.



Graham is the lead actuary for the California Counties of Marin, Merced, Santa Barbara, Stanislaus and Tulare. In addition, he is the lead or co-lead on many of Cheiron's actuarial audits, including recent studies for the City of Los Angeles, New Mexico PERA, CalSTRS and San Diego County. He oversees Cheiron's practice in retiree medical benefit trusts – leading in the development of over a dozen tax-advantaged union-run trusts that provide pooled lifetime benefits under a fixed contribution.

In 2011, Graham was named as the SACRS representative to the California Actuarial Advisory Panel. He has been a member of the Academy of Actuaries Public Plans Subcommittee and the Conference of Consulting Actuaries Public Plans Committee, the primary actuarial committees dealing with public sector retirement issues in the US. Graham also served on the Society's Retirement Plans Experience Committee (RPEC), the Committee responsible for developing the mortality tables used by all US pension actuaries, from 2006-2012 and rejoined the Committee in 2019.

Among Graham's recent presentations are the following:

- Conference of Consulting Actuaries – The State of Mortality
- National Council on Teacher Retirement – Pension Fund Economics
- National Conference of State Legislatures – Measuring Risk in Pension Plans
- SACRS / UC Berkeley – Building an Investment Portfolio; Actuarial Issues

Graham recently co-authored an article for The State Association of County Retirement Systems Winter 2019 magazine entitled, "Mature Pension Plans are Sensitive - Manage with Care."

Graham is an Associate of the Society of Actuaries, a Fellow of the Conference of Consulting Actuaries, a Member of the American Academy of Actuaries, and an Enrolled Actuary under ERISA. Graham received a B.A. in Mathematics and B.S. in Mathematical Science with Departmental Honors from the Johns Hopkins University.

## Attachment G - Hourly Billing Rates

---

Cheiron's current hourly billing rates are:

Category/Consultant	2020 Hourly Rate*
Principal Consulting Actuaries	\$372-\$510
Consulting Actuaries	\$285-\$450
Associate Actuaries	\$190-\$295
Senior Actuarial Analysts	\$180-\$225
Actuarial Analysts	\$150-\$195
Administrative Staff	\$106-\$116

\* These rates are expected increase annually based on CPI-U to cover the increase in inflation.