

Questions & Answers  
Maine Public Employees Retirement System  
Request for Proposals RFP No. 2026-003 Actuarial Audit Services

1. Which of the plans/reports below are included in the audit? Has this scope changed from the previous audit?

*ANSWER:* The audit will include the most recent valuations and experience study reports for the plans listed below. This is the same scope as our previous audit.

- a. Judicial Retirement Program
- b. Legislative Retirement Program,
- c. Consolidated Plan for Participating Local Districts,
- d. State Employee and Teacher Retirement Program

2. Please provide a copy of the following reports:

- a. Most recent experience study
- b. Previous audit findings report

*ANSWER:* The experience study report that will be the subject of this audit is expected to be issued in June of 2026. The previous study report is available on our website, [www.mainebers.org](http://www.mainebers.org). The previous audit report is attached.

3. What were the fees charged for the previous audit engagement, by the auditing actuary?

*ANSWER:* \$45,000

4. Is MainePERS open to a virtual, i.e., WebEx, format for presentation to the Board in September?

*ANSWER:* MainePERS is open to virtual presentation of the report using the Board's platform, Zoom webinar.

5. Is MainePERS willing to accept amendments to the contract?

*ANSWER:* As stated in the RFP, your proposal should state that MainePERS' form of contract (Attachment B to the RFP) is acceptable or "specifically state any objections to any provisions." You may propose alternative language to objected-to provisions and may propose additional provisions. After a contract is executed, any proposed amendments would be considered based on the circumstances.

6. Are actuarial firms that provided these audit services previously permitted to bid?

*ANSWER:* Yes.

7. Section 10 of the RFP does not include a request for fees as part of the submission. Please let us know how fee proposals are to be submitted.

*ANSWER:* Section 10 includes a requirement that responses be provided to Attachment C, which requests "a complete schedule of fees and expenses" for the audit services.



# Maine Public Employees Retirement System Audit of the 2020 Actuarial Valuations

# Bolton

*Submitted by:*

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Employee Benefits, Actuarial & Investment Consulting

August 20, 2021

Board of Trustees  
Maine Public Employees Retirement System  
PO Box 349  
Augusta, ME 04332-0349

Re: *Audit of the 2020 Actuarial Valuations for the Maine Public Employees Retirement System*

Dear Members of the Board:

Attached is Bolton Partners' actuarial audit of Cheiron's 2020 actuarial valuations of the Maine Public Employees Retirement System. We are grateful to the Cheiron and MainePERS staff for their assistance and cooperation throughout the audit process. This is a "level two" sample life testing audit. The purpose of the audit is to:

- Validate the results of the June 30, 2020 actuarial valuations for the Maine Public Employees Retirement System using appropriate mathematical modeling and review of appropriate sample lives to conclude if the actuarial liabilities are valid. The review includes State Employee and Teacher Retirement Program, Legislative Retirement Program, Judicial Retirement Program, and Consolidated Plan for Participating Local Districts.
- Determine whether the actuarial valuation methods, assumptions and procedures used by the System's actuary, Cheiron, are reasonable and consistent with all applicable laws, Board policies, and generally accepted actuarial principles and practices; are appropriate for the plan structure and funding objectives; and are applied as stated by Cheiron.
- Assess whether the valuation results are complete and accurate, and the conclusions of the valuation reports accurately portray the actuarial status of the System.

The plan liabilities are the sum of the liabilities for all of the members. We audited the liability and normal cost calculations that are the heart of these valuations by replicating the results of 55 sample lives that we believe fairly represent the various plans and types of benefits offered by the System. The sample size was based on the concept that it was more important to cover a variety of situations (known as stratified sampling) than multiple common situations, since valuation system errors will often apply to all members with a common set of facts (e.g., in the same plan/tier). Therefore, the sample size and selection process is not the same as might be the case with a data audit, where errors would apply to a single individual.

As part of our review of methods, we have commented on how the funding methods compare to Actuarial Standards of Practice and the guidance provided by the Conference of Consulting Actuaries (CCA) and we have provided recommendations for changes where appropriate.

This audit report includes the following sections:

- I. *Executive Summary* – A summary of the key findings.
- II. *Purpose, Scope and Methodology of Audit* – A description of the purpose and limitations of the audit.
- III. *Data Review* – A discussion of the procedures used to validate the participant data.
- IV. *Review of Sample Lives* – A review of the test lives selected and a detailed review of the findings.
- V. *Analysis of Methods and Assumptions* – An analysis and benchmarking of the actuarial assumptions and a review of the actuarial methods utilized in determining the funded status and accrued liability as of July 1, 2020 for compliance with generally accepted actuarial principles and Actuarial Standards of Practice (ASOP).
- VI. *Comments on 2020 Actuarial Valuation Reports* – A review of the valuation reports and results for compliance with actuarial standards and required disclosures under the Actuarial Standards of Practice.
- VII. *Comments on Experience Studies* – A review of the most recent experience study.
- VIII. *Conclusions* – Our conclusions and a discussion of potential changes and future studies that the Board should consider.

In addition, Appendix I lists all of the findings, suggestions and recommendations found in the body of the report.

This review was conducted under the supervision of Ann M. Sturner FSA, EA, FCA, MAAA and Thomas Vicente, FSA, EA, FCA, MAAA. All of the undersigned actuaries meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. We are not aware of any direct or material indirect financial interest or relationship, including investments or other services, that could create a conflict of interest that would impair the objectivity of our work.

Respectfully submitted,

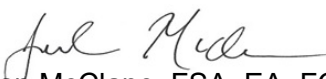
**BOLTON PARTNERS, INC.**



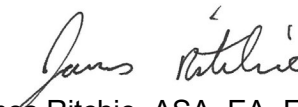
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## Section I. Executive Summary

The Maine Public Employees Retirement System (MainePERS) retained Bolton Partners, Inc. to conduct an independent review of the System's 2020 actuarial reports' calculations, assumptions and methods. Bolton reviewed actuarial reports for:

- State Employees and Teacher Retirement Program
- Consolidated Plan for Participating Local Districts
- Judicial Retirement Program
- Legislative Retirement Program

MainePERS requested an assessment of whether the valuations were complete and accurate; that the methods and procedures used are reasonable, appropriate and correctly applied and that the conclusions of the valuation reports reasonably portrayed the actuarial status of the plans. We also reviewed the validity of the data used in the valuation, provided our thoughts on the current funding methods and procedures, and commented on alternative methods that might be recommended. MainePERS also requested a review of the actuarial reports and most recent experience analysis and to determine if there is consistency in the presentation of the actuarial results and whether they are consistent with professional standards.

The objective of an actuarial audit (actuarial review) of any system is to provide validation that the liabilities and costs of the System are reasonable and being calculated as intended. What is "intended" means in part that it is in accordance with the assumptions stated in the valuation report and experience study. This audit is a partial replication of the actuarial valuation results and a review of the key components in the valuation process that encompass the derivation of the liabilities and costs for the System. These key components are the data, the benefits valued, the actuarial assumptions and funding method used, and the asset valuation method. The valuation report and the valuation output for the plan provide the detail necessary to provide an opinion on each of these key components.

We reviewed all information supplied to us. We also requested and reviewed additional information provided by Cheiron. Finally, we considered the reasonableness of the actuarial assumptions and methods in the context of our own experience, and those of other governmental pension systems. This report contains our findings, recommendations and suggestions from the review of the material.

### Statement of Key Findings

#### 1. Data

We reviewed the data files supplied by both MainePERS (the "raw" data) and by Cheiron (valuation data). We reviewed the data prepared by MainePERS to be used in the actuarial valuation. We tested the data for completeness and compared it to the summary information found in the Cheiron reports. We found that the steps taken were reasonable and that the overall accuracy of the data used is sufficient for determining the valuation liabilities except for the salary used to value the benefits.

The salary used to value benefits for the July 1, 2020 to June 30, 2021 plan years appears understated to us. This salary is also the basis for projecting salaries in future years. We understand that Cheiron is using the greater of the prior year's earnable compensation and Annual Salary. We understand that Annual Salary is based on a participant's payrate for their last pay period in June 2020 times their contracted working period. Annual Salary does not

include other types of remuneration that participants typically earn. For example, Annual Salary does not include overtime or additional pay above a participants expected contract service. We compared Annual Salary to the prior year's earnable compensation and found it to be less than earnable compensation for over 50% of the full time population. For these reasons, we find that the salary used for the July 1, 2020 to June 30, 2021 period is understated.

## **2. Validation of the Accuracy of the Sample Life Results**

We attempted to validate the accuracy of the sample life results. We chose 55 sample lives that we believed provided a reasonable test of all key plan provisions and assumptions. We calculated the present value of future benefits, the actuarial liability, and the normal cost and compared our results to those of Cheiron. In total the results for the key valuation metrics were reasonably similar to Cheiron's, but there were some individual samples for which our calculations differed from Cheiron's. Further details of the differences are discussed in Section IV of this report but have limited materiality for the plans as a whole.

## **3. Biennial Budgeting Process and Actual Contribution Determination**

The contribution rates for the four plans are based on the actuarial valuations from the odd numbered years. As a result, the 2020 valuations we are auditing are not used in the rate making process and we did not audit the development of the Actuarially Determined Contribution (ADC) for FY21 and FY22. We recommend that future audits include a review of the computations that develop the biennial contribution rates.

## **4. Assumptions and Methods**

We reviewed the methods and assumptions used in the valuations and concluded that the assumptions and methods are generally reasonable, appropriate for the valuations and appropriately applied in the actuarial models. In the body of the report, we note a few instances where the assumptions used in the actuarial models differed from the published actuarial valuation reports. We also suggest some modifications to the amortization and asset valuation methods. Finally, we note that the Board has a goal that each plan should strive to be 105% to 115% funded. Cheiron should work with the Board to ensure this goal is met, since the current methods do not support this goal.

## **5. Experience Study**

We reviewed the June 2021 experience study and concluded that the analysis performed in the study is thorough and reasonable and meets Actuarial Standards of Practice. We do, however, suggest some enhancements: include a discussion of the miscellaneous assumptions, review the actuarial methods, and provide the financial impact of assumption changes.

## **Conclusions**

Our audit validates the findings of the 2020 actuarial valuations except for the Salary issues discussed above. In addition, there are several findings and suggestions that we present to Maine for consideration that may improve the quality of the calculations and the valuation reports. These findings and suggestions are detailed throughout this report, and we summarize the most impactful items in the Conclusion section. For easy reference, we list all findings and suggestions in Appendix 1.



## Section II. Purpose, Scope and Methodology of the Audit

### Purpose of the Audit

MainePERS retained Bolton to conduct an independent review to determine if the System's current actuarial calculations are complete and accurate, and that the assumptions and methods used are reasonable and internally consistent.

The MainePERS requested Bolton to perform a level two independent audit and evaluation of the actuarial services provided by MainePERS's actuarial consultant, Cheiron, Inc. ("Cheiron"). The audit will include, for each of the plans administered by MainePERS, an evaluation of the reasonableness and accuracy of Cheiron's most recent valuations (including actuarial accrued liabilities), experience studies, and employer contribution rate recommendations. Because this will be a level two audit, the Bolton did not fully replicate Cheiron's valuations, but instead used appropriate sampling of participant data to test the valuation results. The audit also includes a review and analysis of the actuarial methods and assumptions recommended and used by Cheiron for appropriateness, internal consistency, and consistency with applicable professional standards.

MainePERS requested a written report that provides a detailed evaluation of the services provided by Cheiron; expresses an actuarial opinion regarding the reasonableness, accuracy, and actuarial soundness of the valuation and experience study results, actuarial assumptions, and actuarial methods; and makes any recommendations for improvements by MainePERS or its actuarial consultant.

### Scope of the Audit

This actuarial audit focuses first on the review of the application of the plans' benefit provisions, methods and assumptions and Cheiron's model reflecting these factors by first reviewing sample lives to ensure internal consistency and second by reviewing the use of the liability and normal cost values in determining the appropriate annual contribution amounts. Next, we focus on whether the assumptions and methods are appropriate, largely based on prior experience as reflected in the experience studies, actuarial standards of practice and the legislated provisions regarding plan funding. Then we focus on the actuarial communications of the results of the valuations from the presentation report, and the four valuation reports, and whether these communications accurately and completely communicate the actuarial status of the plans, including through the appropriate calculation of annual employer contribution rates. Finally, for the issues we identified, we analyzed the effect of the errors and discrepancies on the results of the valuations.

What this audit can provide is:

- Assurance that appropriate benefits are being valued;
- Confirmation that the valuation system is accurately calculating present value of benefits and appropriately dividing these present values into accrued liabilities and normal cost, by verifying a reasonable sampling of each plan;
- Confirmation that the program is valuing benefits as described in the valuation reports and consistent with applicable statutes;

- A review of the demographic actuarial assumptions for consistency with generally accepted actuarial practices and the specific experience of the plans, as documented in the last experience study;
- A measurement of economic actuarial assumptions against those used by other public plans and hence an assessment of their reasonableness;
- A review of the reasonableness of actuarial funding and asset valuation methods;
- An indication as to whether the liabilities and contribution rates shown are not reasonable or are incorrectly calculated; and
- Recommendations for changes in procedures, methods, assumptions and forecasts of expectations.

### Methodology of the Audit for the 2020 Actuarial Valuation

The purpose of this audit is to express an opinion regarding the reasonableness and accuracy of the actuarial assumptions, methods, and valuation results.

The measurement of the reasonableness of the funding levels encompasses three key analyses:

- A verification of the benefits being projected for future payment;
- A verification of the appropriateness of the actuarial assumptions that are used in calculating the liability; and
- A verification of the appropriateness of the funding and asset valuation methods.

### Benefits Analysis

Critical to projecting future benefits is receiving complete and accurate data. We reviewed the data prepared by MainePERS to be used in the actuarial valuation. We tested the data for completeness and compared it to the summary information found in the Cheiron reports.

We developed Excel models that enabled us to compare the results of our sample lives with Cheiron's results. These models also allowed us to confirm that the Cheiron valuation projects benefits in a manner consistent with the Benefit Provisions summary in the valuation report and that the summary is consistent with state statutes applicable to the Maine Public Employees Retirement System.

### Assumptions Analysis

The second critical component in assessing the reasonableness of the funding levels is in the selection and the application of the actuarial assumptions. With respect to the assumptions, we:

- Reviewed the recent Cheiron Experience Study report finalized in 2020;
- Benchmarked the economic assumptions against a survey of state and local employee retirement systems; and examined several individual test life calculations to make sure that the assumptions were properly applied.

### **Methods Analysis**

The third component in assessing funding levels is the selection and application of the actuarial cost method (including the method for amortizing the unfunded actuarial accrued liability) and the asset valuation method (including smoothing techniques). This includes items unique to a particular system, such as MainePERS. We compared the funding methods used with best practices, based on the Conference of Consulting Actuary's (CCA)s "white paper" (included in Appendix II) as well as our own experience, as well as the overall funding goals of the Board and Legislature.

## Section III Data Review

### Method of Data Review

We requested the following three sources of data from the retained actuary (Cheiron):

1. The raw data provided to Cheiron from MainePERS personnel,
2. The scrubbed data that Cheiron used in their valuation system, ProVal, to produce valuation liabilities, and
3. Documentation of any data manipulations or missing data plugs applied to the raw data by Cheiron before running through their valuation system.

We received multiple Excel data files through our secure file share portal from Cheiron, as well as a data manual instruction guide. We also followed up with MainePERS and Cheiron by email with a few questions that were not readily apparent in the valuation reports provided.

Our method of review was to work from the end back to the beginning. We began with (2) above, the ProVal data, determined statistics for each group, and compared those statistics to those reported in the valuation reports. This step is to confirm that the data used with the valuation software is the underlying basis for the resulting liabilities that were produced with the valuation software.

Our next steps were to review (3) above and roughly follow the data steps in that manual as they apply to the data provided in (1) above. The data manual itself is a robustly detailed instruction manual for how to process the raw client data. There is extensive detail on how to consolidate multiple service records and documentation provided indicating where data plugs are needed, generally related to missing beneficiary information. The manual also shows direction provided and acceptance of the methods used by the MainePERS staff. Our team reviewed this manual to determine if the steps taken were reasonable and followed the steps to approximate overall head counts.

Our final step was to compare this adjusted data with Cheiron's ProVal data to determine if there were any further differences in the information used for determining liabilities that weren't documented, and if those remediating steps were reasonable.

### Overview

Based on our review of the data process and the data used to determine the liabilities in the June 30, 2020 actuarial valuation reports, we are comfortable that the reconciliation and data scrubbing steps taken were reasonable and that the overall accuracy of the data used is sufficient for determining the valuation liabilities with one exception. We believe the salary used to value benefits for the July 1, 2020 to June 30, 2021 plan year is understated.

Cheiron's MainePERS 2020 Data Processing Instructions ("Data Manual") states that Cheiron used the field EstSal for compensation for the July 1, 2020 to June 30, 2021 plan year and that this salary was used to project future annual salaries. The Data Manual defines this field as the greater of the Salary field and the Annual\_Salary field. Salary is defined in the Data Manual as Earnable Compensation for the 12 month period preceding the last payroll filing, which for the 2020 valuation is earnable compensation for the July 1, 2019 to June 30, 2020 plan year. We were informed by MainePERS staff that earnable compensation is the compensation used to calculate actual benefits. Annual Salary is defined in the Data Manual as full time salary expected amount for service accrual for the last 12 months, which was initially confirmed by Cheiron.

Based on later conversations with Cheiron and Maine, we discovered that Annual Salary is not for the last 12 months but is equal to the rate of a participants' pay in last pay period of June 2020 annualized to a full time contract amount or the hourly/daily rate multiplied by standardized full-time hours/days for the position in a year. Furthermore, MainePERS staff explained that the Annual Salary field is what is expected to be earned as “regular” pay and does not include pay for additional remuneration like overtime or pay for additional duties above the contract rate. The Annual Salary field is primarily used to determine whether a participant earns a full year of service credit for the year. Therefore, Annual Salary is intended to either equal or understate what total earnable compensation would be for a full time employee.

Cheiron is estimating the pay for July 1, 2020 to June 30, 2021 by taking the greater of the earnable pay for July 1, 2019 to June 30, 2020 without any adjustment and the Annual\_Salary field described above. The earnable compensation for July 1, 2019 to June 30, 2020 is not a reasonable estimate of pay for the July 1, 2020 to June 30, 2021 plan year as evidenced by Cheiron’s latest experience study which demonstrates that salaries are expected to go up by 2.75% to 11.48% per year depending on a participant’s service. Therefore, assuming no increase, does not coincide with the results of the experience study. Furthermore, based on the explanation of Annual Salary provided to us, we do not believe this field is a reasonable estimate of earnable compensation for the July 1, 2020 to June 30, 2021 period because it does not include many types of additional remuneration that participants typically receive over their contract amounts. This is supported by the fact that Annual Salary for the 2020 valuation was less than July 1, 2019 to June 30, 2020 earnable compensation for over 50% of full time participants. **We recommend that Cheiron review this assumption and use an estimate of future pay that is more in line with the expected growth in earnable compensation as demonstrated by their experience study.**

We have the following additional suggestions related to the data for future improvement:

1. **Provide more transparency surrounding the Inactives Due Refunds:**
  - a. include the census movement in the data reconciliations
  - b. indicate how much liability is associated with these nonvested terminations.
2. **Correct minor service calculation error in data file for the Judicial members: Pre98Svc – Service 12/1/1984-7/1/1998**
3. **Provide more documentation in Appendix A for the Legislative members for determining the average valuation pay statistics in the second session years.**

## Review of ProVal Data

The tables that follow compare our replication of the ProVal data’s statistics (listed as Bolton) and the data statistics provided in the valuation reports (listed as Cheiron). In general, the comparisons are very close, as they relate to participant counts, payroll amounts, and benefit amounts. Certain recurring deviations are discussed in more detail after the summary tables.

### State Employee and Teacher Retirement Program State Program only

Active	Regular Plan Members		Special Plan Members		State Employees Total	
	Cheiron	Bolton	Cheiron	Bolton	Cheiron	Bolton
Count	11,132	11,132	1,698	1,698	12,830	12,830
Average Age	48.1	48.1	42.9	42.9	47.4	47.4
Average Benefit Service	11.6	11.5	12.6	12.6	11.7	11.7
Average Vesting Service	12.0	12.0	13.0	13.0	12.1	12.1
Average Valuation Pay	55,894	55,894	70,356	70,356	57,808	57,808

Regular and Special Plans Inactive Members	Count		Average Age		Total Annual Benefit		Avg Annual Benefit	
	Cheiron	Bolton	Cheiron	Bolton	Cheiron	Bolton	Cheiron	Bolton
Retired	10,927	10,906	72.8	72.7	250,732,227	250,794,043	22,946	22,996
Retired - Concurrent Bene	1,114	1,110	72.0	72.0	6,140,227	6,140,220	5,512	5,532
Disability- Section 1122	2	2	91.1	91.1	40,303	40,303	20,152	20,152
Disability- Sections 3&3A	904	905	66.6	66.6	22,783,601	22,806,760	25,203	25,201
Beneficiary	2,166	2,176	74.2 <sup>1</sup>	74.1	32,457,114	32,570,409	14,985	14,968
Pre-Ret Death Beneficiary	307	308	66.5	66.4	1,914,993	1,920,251	6,238	6,235
Terminated Vested	2,995	2,997	52.0	52.0	23,699,420	not calc'd <sup>2</sup>	7,913	not calc'd <sup>2</sup>

<sup>1</sup> Updated per Cheiron in August 12, 2021 letter.

<sup>2</sup> Did not estimate total or average benefits for terminated vested members since average final compensation is missing for over 25% of the records on the ProVal file. Another field, or historical pay, must be used in determining the valuation liabilities.

All other data summary statistics are reasonable.

### Teachers Program

Active	Cheiron	Bolton
Count	27,565	27,565
Average Age	46.0	46.0
Average Benefit Service	12.0	12.2
Average Vesting Service	12.3	12.3
Average Valuation Pay	47,849	47,849

Inactive Members	Count		Average Age		Total Annual Benefit		Avg Annual Benefit	
	Cheiron	Bolton	Cheiron	Bolton	Cheiron	Bolton	Cheiron	Bolton
Retired <sup>3</sup>	17,804	17,808	73.3	73.3	487,081,132	487,169,022	27,358	27,357
Retired - Concurrent Bene <sup>3</sup>	1,377	1,378	73.8	73.8	8,401,881	8,409,403	6,102	6,103
Disability <sup>3</sup>	683	683	68.9	68.9	20,463,614	20,463,614	29,961	29,961
Beneficiary <sup>3</sup>	1,590	1,591	73.6	73.6	28,019,800	28,047,349	17,623	17,629
Pre-Ret Death Beneficiary	<b>277</b>	<b>289<sup>4</sup></b>	63.1	63.3	1,752,738	1,823,320	6,328	6,266
Terminated Vested	5,162	5,167	52.7	52.7	45,381,152	not calc'd <sup>5</sup>	8,791	not calc'd <sup>5</sup>

<sup>3</sup> Included inactive records with less than \$12 annual benefit, unlike State and PLD groups. There were 130 such records that have been included.

<sup>4</sup> Pre-retirement death beneficiary head count are significantly different. Pre-retirement death beneficiary average age reflects partial year if there is stop date during the upcoming year.

<sup>5</sup> Did not estimate total or average benefits since estimated salary information is irregular for about 12% of the records. Another field, or historical pay, must be used in determining the valuation liabilities.

All other data summary statistics are reasonable.

The inactive records in the Teacher's group include 130 individuals with de minimis retirement benefits, less than \$1 per month. For the State and PLD Programs, these participants are excluded. There is no material implication for liabilities, but is an observed inconsistency noted between plans.

### Participating Local Districts

Active	Regular Plan Members		Special Plan Members		PLD Employees Total	
	Cheiron	Bolton	Cheiron	Bolton	Cheiron	Bolton
Count	8,600	8,600	3,238	3,238	11,838	11,838
Average Age	47.6	47.6	40.2	40.2	45.6	45.6
Average Benefit Service	8.6	8.4	10.3	10.3	9.0	8.9
Average Vesting Service	8.8	8.8	10.9	10.9	9.4	9.4
Average Valuation Pay	47,745	47,746	65,774	65,774	52,677	52,677



Regular and Special Plans Inactive Members	Count		Average Age		Total Annual Benefit		Avg Annual Benefit	
	Cheiron	Bolton	Cheiron	Bolton	Cheiron	Bolton	Cheiron	Bolton
Retired	7,222	7,236	72.0	72.1	138,959,321	139,653,500	19,239	19,300
Retired - Concurrent Bene	755	747	69.5	69.7	3,919,897	3,935,364	5,192	5,268
Disability- Section 1122	43	43	75.7	75.7	731,706	731,706	17,016	17,016
Disability- Sections 3&3A	347	345	65.3	65.2	8,342,143	8,342,137	24,040	24,180
Beneficiary	1,331	1,338	73.8	73.8	16,495,730	16,578,058	12,394	12,390
Pre-Ret Death Beneficiary	162	167	71.8	71.8 <sup>6</sup>	1,059,396	1,085,568	6,540	6,500
Terminated Vested	2,402	2,402	52.5	52.5	13,926,667	not calc'd <sup>7</sup>	5,798	not calc'd <sup>7</sup>

<sup>6</sup> Pre-retirement death beneficiary average age reflects partial year if there is stop date during the upcoming year.

<sup>7</sup> Did not estimate the total or average benefits for terminated vested members at a high level due to complexity of multiple retirement dates and multiple eligibilities among the regular and special plans.

All other data summary statistics are reasonable.

### Legislative Program

Active	Cheiron	Bolton
Count	179	179
Average Age	58.3	58.3
Average Benefit Service	5.8	5.8
Average Vesting Service	7.1	7.1
Average Valuation Pay	<b>15,721</b>	<b>10,849<sup>8</sup></b>

Inactive Members	Count		Average Age		Total Annual Benefit		Avg Annual Benefit	
	Cheiron	Bolton	Cheiron	Bolton	Cheiron	Bolton	Cheiron	Bolton
Retired	164	164	77.0	77.0	354,360	354,360	2,161	2,161
Retired - Concurrent Bene	6	6	74.2	74.2	2,451	2,451	409	409
Disability	2	2	65.4	65.4	15,335	15,335	7,668	7,668
Beneficiary	26	26	80.2	80.2	37,024	37,024	1,424	1,424
Pre-Ret Death Beneficiary	8	8	67.7	68.3 <sup>9</sup>	52,474	52,474	6,559	6,559
Terminated Vested	117	117	56.5	56.5	232,693	232,693	1,989	1,989

<sup>8</sup> Average valuation pay is based on odd fiscal year's salary with one year of assumed salary scale, 2.75%, and not the salary listed in the census data due to the shorter second session

<sup>9</sup> Pre-retirement death beneficiary average age reflects partial year if there is stop date during the upcoming year.

All other data summary statistics are reasonable.

For the average pay comparison, the data manual indicated that the salary field used in determining valuation liabilities for the second Legislative session will be based on the first session's salary field scaled with a year of pay increases. The second session is not a full 12 months. The final average compensation used in the benefit formula is based on the highest three years of compensation, and do not need to be consecutive years. Cheiron's approach appears reasonable; however, this approach should be documented in the valuation report.



While we did not request the first session’s salary information, we were able to approximate it based on the publicly available Overview of Legislators’ Compensation and Benefits information for Maine Legislators. For the last two-year term, the regular first session salary was \$14,862 in FYE 2019 and the regular second session salary was \$10,582 in FYE 2020. In the ProVal data file, there were 156 of the 179 active members who were reported with the \$10,582 amount. If all the active members in the plan were scheduled for the \$14,862 in the first session, a year of the actuary’s 2.75% salary increase assumption would bring the average salary one year later to \$15,271.

Certain members are reported with larger compensation, which could elevate the overall average closer to the \$15,721 reported in the valuation report. Overall, Cheiron’s approach appears reasonable for determining valuation liabilities.

### Judicial Program

Active	Cheiron	Bolton
Count	58	58
Average Age	61.2	61.2
Average Benefit Service	16.2	16.2
Average Vesting Service	16.4	16.4
Average Valuation Pay	134,547	134,547

Inactive Members	Count		Average Age		Total Annual Benefit		Avg Annual Benefit	
	Cheiron	Bolton	Cheiron	Bolton	Cheiron	Bolton	Cheiron	Bolton
Retired	61	61	75.2	75.0	3,843,715	3,843,715	63,012	63,012
Retired - Concurrent Bene	6	6	73.5	73.5	88,648	88,648	14,775	14,775
Disability	1	1	74.6	74.6	40,090	40,090	40,090	40,090
Beneficiary	15	15	83.4	83.4	629,896	629,896	41,993	41,993
Terminated Vested	3	3	61.9	61.9	96,832	94,975	32,277	31,659

All data summary statistics are reasonable.

### Pre-Retirement Death Beneficiary Ages

After discussing the beneficiary ages with Cheiron, our calculated average ages are reasonably close for all groups. Cheiron states the method is to sum the total ages as of the snapshot date and divide by the number of participants in that group, weighted for the portion of the year the participants occupy. This weighting reflects the Stop Date provided within the census file that is typically associated with the dependent children. This statistic has no impact on the liabilities or the contribution rate.

### Data Reconciliation Difficult to Interpret

One question surfaced regarding the data reconciliation tables that we discussed with Cheiron. Typically in a data reconciliation, the number of exits from one category with a vested benefit aligns with the number of additions to another category.

For example, the number of retiring records exiting the active and terminated vested statuses should align with the number of new records in the retirement status. Our concern was raised by the number of terminated vested records exiting the active status with considerably more records added to the terminated vested records. We understand that multiple records and transfers add complexity to these reconciliations, but the magnitude of the differences shown below caught our attention.

1. The following figures are from Appendix A for the State Employee and Teacher Plan and Appendix B for the Consolidated Plan for Participating Local Districts.

New Deferred Vested Members 6/30/2019-6/30/2020	Active Members	Terminated Vested Members
Teachers	(784)	844
State Regular and Special Groups	(212)	293
Participating Local Districts	(317)	368

2. The same dynamic also exists in the June 30, 2019 actuarial valuation reports:

New Deferred Vested Members 6/30/2018-6/30/2019	Active Members	Terminated Vested Members
Teachers	(882)	957
State Regular and Special Groups	(319)	357
Participating Local Districts	(328)	367

Cheiron indicates that the additional increase in terminated vested members is from prior nonvested terminations becoming vested during that year. These nonvested termination records are included with the Inactives Due Refunds, or with another program. Since non-vested inactives do not appear on the data reconciliation, it made it more difficult to confirm that movement. Based on the number of rehires also observed on this data reconciliation, this seems to be a reasonable explanation. We have no ongoing concern with the numbers of terminated vested members reported, but we recommend that the Inactives Due Refunds be reported here as well and that the reconciliation be more explicit.

### Review of Data Process

We made an approximate replication of the data process outlined in Cheiron’s data manual. This “scrubbing” of the data is typical of all client raw data to confirm the data is reasonable, consistent, and sufficient to use for purposes of determining plan liabilities. It is a standard procedure for any actuary to review changes in statuses, remove exits, add new entrants. Due to the complexity of the data, the process also outlines how to consolidate multiple service records. Further, the process outlines how to compensate for missing information. The data manual also outlines the nuances for each group (e.g., the Judicial service calculations 1984-1998 and before 1984).

Overall, we agree that the method outlined in the data manual is reasonable, is consistent with prior years, and would produce a sufficient data file for determining plan liabilities. We do note the following error and a few omissions:

1. The data manual misidentifies the field “Annual\_Salary” in the raw data as the pay rate for the preceding twelve months. Cheiron confirmed this should actually be defined as the rate of pay on the valuation date. The relationship of this figure to the actual total pay for the preceding twelve months creates some question as to whether this amount is actually the pay rate.
2. Service for the Judicial Program is provided as a total service field from MainePERS and is split by the actuary into three components:
  - a. *Post98Svc* – Service from 7/1/1998-6/30/2020 which will accrue with the 3% multiplier benefit level
  - b. *Pre98Svc* – Service 12/1/1984-7/1/1998 which will accrue with the 2% multiplier benefit level
  - c. *Pre84Svc* – Service before 12/1/1984 which will accrue with the 75% x 1984 pay benefit formula.

The service field described in (b) above should be no more than 13-7/12 years based on a straight elapsed time calculation. However, we noted that in the ProVal data file, this field included 14-5/12 years for those who worked that entire period. This overstates this portion of the benefit. Of the 58 actives, 12 participants had this overstatement. The service field described in (c) above is calculated as the total benefit service less (a) and (b). Thus, the overstated service in (b) is taken from the benefit for (c) such that this understates this pre-1984 portion of the benefit.

Since the pre-1984 portion of the benefit produces a smaller benefit than the 1984-1998 portion of the benefit for a member in 2020, the net effect of this error is a small overstatement of the June 30, 2020 liabilities. Due to the handful of people affected, this error does not produce a material impact on the liabilities produced for the plan.

- 3. The Special State Program for the Fire Marshalls (*Ben\_Plan = S FI SP*) contains 13 active members of which 10 were flagged as a Termination in the raw client files but are changed to an Active status in the ProVal data. Each of these 10 has a Stop Date of 12/31/2020 which is after the 6/30/2020 snapshot and may be why they were retained as actives. None of these 10 had a Termination Date so this treatment appears conservative. Further, this group was part of a recent plan change removing them from the 1998 Special Plan to their own special plan, thus the change in status to retain as Active would be appropriate. This is a point of clarification for the data manual, alluded to on page 6, and not an error in the liabilities.**
- 4. There are two situations which should be reviewed to see if clarification is needed in the data manual. They do not indicate any error in liabilities.**
  - a. The PLD group includes 31 members with Termination Date of 6/30/2020 but are retained as actives because they have a 12/31/2020 Stop Date. This is alluded to in the data manual on page 11 but only in the context of multiple active records. The data manual elsewhere says that the field Stop Date is based on contract extension, and not based on employment, so there may be an administrative window where these participants could be rehired. We note there are several dozen rehired members each year and agree that it is a reasonable approach to retain these members with an active status.**
  - b. This is similar to another approximately 30 members who appeared to have a prior active status but who were not located on the raw client data. It is conservative to retain these members with an active status. This approach is not documented in the data manual, however could have been the result of data questions, which is a documented step in the data manual.**

### Inactive Due Refunds

For all groups, the actuarial valuation reports designate a status for Inactives Due Refunds for nonvested terminations who retain a balance of employee contributions in the plan; however, nowhere in the reports does Cheiron indicate how much liability is associated with these participants. Both MainePERS and Cheiron confirmed that this participant data including account balances was located on the raw client data files.

Cheiron confirmed via email that the liability held for these participants is the sum of the employee contributions with interest contained in the raw client data files. We recommend the liability amounts should be listed separately (or footnoted) within the valuation reports.

As part of our validation we sought to match the participant counts listed in Table I-2 of each report and summarize the associated liability that would be included in Table IV-1 Terminated (Vested & Nonvested) Benefits of each report. While our counts may not match exactly, we determined that by excluding records with very small account balances the counts could closely match up and would not materially impact the associated liability.

	Valuation Report Member Counts	Member Counts of Non-Zero Member Accounts	Sum of Employee Balances to be Refunded	Comments
Teacher	29,609	29,621	58,225,260	20 records < \$3
State (Regular and Spec.)	8,044	8,188	26,887,018	150 records < \$13
Part. Local Districts	8,766	9,020	28,059,523	265 records < \$20
Legislative	94	94	424,854	Minimum \$1,500
Judicial	1	2	42,811	\$18k and \$24k
<b>Total</b>	<b>46,514</b>	<b>46,925</b>	<b>113,639,466</b>	

We recommend that Cheiron more transparently disclose this liability information in their future actuarial reports. We suggest this disclosure be included in the non-active member table in Appendix A (with a footnote indicating the amounts listed are the sum of account balances instead of total annual benefits) and/or as a footnote to Table IV-3 where the Actuarial Liabilities combine the Terminated Vested & Nonvested Members.

The number of nonvested terminated participants due refunds is large, but State law allows the system to provide automatic refunds for employees who have terminated without a vested benefit and who have not resumed employment within three years. After discussions with MainePERS, we understand that automatic refunds had ceased temporarily but their personnel have resumed refund issuance and they expect the number of participants due refunds to decrease.

### Actuarial Standards of Practice

The cover letter of each of the June 30, 2020 actuarial valuation reports states:

*In preparing our report, we relied of information, both oral and written, supplied by the System's staff. This information includes, but is not limited to, Program provisions, member data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standards of Practice No. 23.*

While ASOP 23 does not require the actuary to audit the census data, it does require the actuary to determine if the census data is appropriate, sufficient, and reasonable to use for the stated actuarial purpose. Cheiron does not indicate if they believe the data is sufficient to perform the actuarial work product. We recommend Cheiron provide a further statement in future actuarial valuation reports that indicates if they believe the data is sufficient.

Also required in ASOP 23, the actuary must disclosure the source of the data and the extent to which the actuary is relying on data supplied by others. The actuary notes that the source of the census data is the MainePERS personnel. The actuary should further note that the accuracy of the results presented in their reports are dependent on the completeness of the underlying information and that the plan sponsor is responsible for the validity and completeness of the information provided.

The actuary must also note any known significant limitations of the data. As noted in ASOP 23 Section 3.3(b) for inconsistent or missing data:

*If the actuary believes questionable or inconsistent data values could have a significant effect on the analysis, the actuary should consider taking further steps, when practical, to improve the quality of the data. The actuary should disclose in summary form any unresolved questionable data values that the actuary believes could have a significant effect on the analysis, in accordance with section 4.1(d). The actuary also should disclose any significant steps the actuary has taken to improve the data, in accordance with section 4.1(e).*

Cheiron prepared a robustly detailed data processing instruction manual. This manual provides thorough detail documenting what files are provided by MainePERS, how the actuary processes the census data, how they deal with duplicate records (i.e., consolidating multiple records), how they perform any adjustments needed for salary or service, and how they plug any missed data (e.g., beneficiary dates of birth) for valuation purposes. These methods and any assumptions applied to estimate missing or inconsistent data have been agreed upon by MainePERS.

This data manual achieves the above ASOP 23 requirement for documenting certain data concerns, improvements applied to the data, and any assumptions applied to the data to allow the actuary to perform the actuarial analysis. However, the actuarial valuation reports themselves make no mention of this manual or of any data manipulation applied to the census data provided.

Appendix A of each of the June 30, 2020 actuarial valuation reports provides a summary of the participant count and statistics broken out by various participant groupings as of the valuation date and a participant reconciliation from the prior valuation date for each plan by status. These data summaries disclosed in the June 30, 2020 actuarial valuation reports assist readers of the reports to gain some understanding of the appropriateness of the data.

Overall, we believe that Cheiron has appropriately followed the requirements of ASOP 23 regarding the quality of the data and performed a reasonable level of review of the data used to determine the June 30, 2020 liabilities; however, we recommend the following for future actuarial valuation reports:

- 1. Additional disclosure should be added to the actuarial valuation reports to either detail what data adjustments and assumptions were applied, or to note that a number of adjustments were determined to be necessary with a reference to the data processing manual for details of those adjustments. Further, the actuary should disclose how material these adjustments and assumptions were on the plan liabilities.**
- 2. The actuary should provide a statement to indicate if they believe the data provided and internally modified is sufficient for the actuarial analysis performed.**
- 3. The actuary should caveat that the accuracy of their results is dependent on the completeness of the underlying information and that the plan sponsor is responsible for the validity and completeness of the information provided**

## Section IV. Review of Sample Lives

### Background

This audit engagement includes a review of sample lives as a *level two* audit under the Government Finance Officers Association’s (GFOA’s) *Best Practices* guidelines for actuarial audits. Generally, samples for such an engagement should be selected such that they:

- Collectively encompass a broad spectrum of the various combinations of plan benefits, eligibilities, and valuation assumptions;
- Cover long service and recently hired members, as well as individuals that align with the average age, service, and salaries of the plans;
- Test a variety of coding *switches* within a valuation’s coding (such as gender, which is used as a lookup for mortality rates, and various service fields, which can be used for benefit eligibility and decrement lookups).

The number of samples selected should appropriately balance having enough samples to make an assessment on the reasonability of the valuation coding with the time and resources available during the audit period. Based on the above selection considerations, we requested the following number of samples lives from Cheiron:

	Count of Sample Lives					Total
	Teachers	Employees	Judicial	Legislative	Cons. PLD	
Active	4	6	2	2	12	26
TV	1	1	0	0	1	3
In Pay	5	6	2	2	11	26
<b>Total Count</b>	<b>10</b>	<b>13</b>	<b>4</b>	<b>4</b>	<b>24</b>	<b>55</b>

### Data Provided

In order for Bolton to perform the replication of the sample life results necessary for a level two audit, MainePERS and Cheiron provided Bolton multiple files, notably the following:

- Raw data sent to Cheiron for processing the valuations
- Final data used by Cheiron to produce the valuations
- 2020 Maine Data Processing Notebook outlining in detail Cheiron’s data processing procedures
- Tables containing decrement assumptions (termination rates, disability rates, retirement rates, and mortality rates/improvement scales) and salary scale assumptions used by Cheiron for the valuations
- The 2016 experience study report

### Methodology

When conducting a sample life audit, auditing actuaries are often initially interested in reconciling differences in the *present value of future benefits (PVFB)* between their audit results and the results produced by the valuation actuary. The PVFB is the total estimated value, in dollars as of the valuation date, of providing the benefits under the plan and represents the anticipated ultimate cost of the plan benefits.

Generally, matching the PVFB for inactive members (i.e. terminated vested, terminated nonvested, and in-pay individuals) is a relatively straightforward process since they are no longer accruing benefits and with already determined benefit amounts, there are far fewer unknowns (assumptions and permutations of possible events). As such, auditing actuaries often will use a fairly narrow threshold of what they deem acceptable for differences in inactive PVFB between the auditing actuary and valuation actuary. Coding the benefits for active members is a much more laborious process involving service and salary projection, decrements, and benefit projection and, consequently, actuaries may expand their acceptable deviation threshold for actives to account for such complexity.

Using an actuarial cost method, the PVFB is broken down into the *actuarial accrued liability (AAL)*, the *normal cost (NC)* and the *present value of future normal costs (PVFNC)*. The AAL is the value, in dollars as of the valuation date, that has been accrued as of the valuation date based on the actuarial cost method for providing the benefits under the plan; i.e. the portion of the PVFB that has been accrued through the valuation date. The NC is the value in dollars as of the valuation date assigned to accruing an additional year of service for active members. Under the *Entry Age Normal (EAN)* cost method employed for the MainePERS valuations, liability is accrued as a level percentage of salary. Typically, actuarially determined contributions are a function of an amortization of the unfunded AAL and the normal cost. Given their importance to valuations and contribution development, our sample life comparison in the *Results by Plan* and *Results by Participant* sections below display the differences between the PVFB, AAL, NC, and present value of future salary (PVFS).

It is important to note that pension valuation software has advanced over the years by adding functionality and user flexibility, which in turn has led to an increase in intricacy and complexity. As such, the exact methodology for breaking down the PVFB into its component units (AAL and NC) may differ between valuation systems, even if two actuaries use the same valuation software. Accordingly, actuaries often broaden their range of acceptable differences for the AAL and NC.

## Findings

Based on our review of the 55 sample lives, we have the following findings

- 1. The timing of the application of the assumed cost-of-living adjustment (COLA) to benefits could be improved**

### COLA timing

The benefit amounts contained in the valuation census data are the amounts in payment as of June 30, 2020. For members eligible for COLA, the adjustments to benefits occur effective September 1, which is two months after the valuation date. However, from our review of the sample lives and subsequent validation by Cheiron, we understand that Cheiron's programming assumes that benefits for individuals who are in pay will be adjusted for COLA on July 1, 2021, which is 10 months after when they would actually be applied to benefits. Said differently, 10 of the 12 annual payments assumed to be paid each fiscal year are missing an assumed COLA for members in plans that pay COLAs. Given that, generally, the COLA is applicable to only the portion of the benefit below the COLA cap for all Retirement Programs except the Consolidated Participating Local Districts Retirement Program, the 10 months of understatement are on only the portion of each individual's benefit amount that does not exceed the COLA cap. Partially offsetting the understatement of in-pay liabilities for COLA timing is the overstatement of active liabilities.

If incorporated into the valuation coding, using a September 1 payment date for actives will likely *decrease* active liability. Since members are generally assumed to decrement in the middle of the year (i.e. 12/31/XX), members who cannot receive a COLA until having been in payment for 12 months, for example, will not receive their first COLA until 9/1/XX+2. That equates to a delay of 20 months, whereas Cheiron's coding includes a delay of only 12 months.

We note that the process of coding valuation software is often a blend of both science and art. Not only are there limitations to the capabilities of valuation software, but there is also typically an actuarial judgement component relating to (1) the appropriate methodology to employ for capturing certain benefits and (2) the balance between the degree of accuracy desired and the simplicity of and available resources for the model.

Until recently, many valuation programs could not directly account for COLA payments during the year and the choice of COLA timing was either beginning or end of year. Before many of the valuation programs added a COLA timing feature, we would have recommended that, if the actuary used end-of-year COLA timing, that the actuary apply a load to the inactive valuation liability given that the COLA is assumed to occur only 2 months after the valuation date. However, many current pension valuation programs now have the capability to directly input the timing (i.e. September 1<sup>st</sup> each year) of the application of assumed future COLAs. This latter option may be both easier to implement and more accurate than the former, given the complexity of developing a load that appropriately reflects the COLA cap.

Given that valuation software is now capable of handling a September 1 COLA payment date, our coding used to generate results for the samples incorporates that timing. As such, a common theme in the *Results by Participant* section below is that the Bolton PVFB results are generally slightly lower than Cheiron's PVFB results for active samples but generally slightly higher for in-pay samples.

#### **Delayed COLA effective dates**

Based on the plan provisions for the newer plan tiers (generally, Tiers 2 and 3), many members will not be eligible for a COLA until 12-24 months after the later of actual retirement and normal retirement age. As such, members who retire prior to their normal retirement age may not receive a COLA until more than a year after commencement. While the number of in-pay individuals with delayed (to a date after the first anniversary of the valuation date) COLA effective dates represents a small percentage of the total in-pay population, that percentage will likely increase as the population of retirees shifts to participants who will retire with benefits under the newer plan tiers.

For the one sample in the Consolidated PLD Plan with a delayed COLA effective date, we were able to match Cheiron's liability exactly if we assumed no delay (i.e. the first COLA would be applied on the anniversary of the valuation date). When incorporating the COLA effective date into our valuation coding, the liability for the sample decreased by approximately 1.7%. The impact of incorporating the delayed COLA effective date will vary by individual, primarily differing by age, deferral period, benefit amount subject to COLA, and form of payment. However, few retirees currently are impacted.

In discussions with Cheiron, Cheiron's actuaries noted the following:

*The PLD provision for a 24-month delay in COLA eligibility has only been in place for retirements since 9/1/2019. There were so few members subject to this delay at the 7/1/2020 valuation that we did not code the retirees for this delay, but will do so with the 2021 valuation. The deferred COLA date is being used in the State, Teacher, Judicial, and Legislative valuations and will be added to the PLDs, which is somewhat complicated by the fact that there are 11 separate benefit programs and retirees generally have portions under more than one...*

We did not originally request any in-pay samples with delayed COLA effective dates in the State, Teacher, Judicial, or Legislative valuations to confirm Cheiron's above statement. We agree with Cheiron that the number of in-pay members with delayed COLA effective dates in the Consolidated PLD Plan is small. As such, Cheiron's decision to not value the delay for the few newer in-pay Consolidated PLD Plan members with delayed COLA dates is not material to the June 30, 2020 valuation. However, in future valuations, in-pay individuals with deferred COLA dates will make up a larger percentage of the in-pay population, and likewise, how the COLA timing is valued will have an increasing impact over the next several years. As such, Cheiron's commitment to update the coding for the 2021 valuation should be a positive change.

**2. The salary used to calculate benefits for members in the Legislative Retirement Program is generally understated in the June 30, 2020 valuation**

We understand that Maine has a biennium legislature. The second session is shorter than the first, so pay for legislators in the second session is approximately 8/12 that of the first session, prior to any indexing.

While the salary that Cheiron uses to allocate the present value of future benefits into accrued liability, normal cost, and present value of future normal costs under the EAN cost method is appropriately adjusted for the biennium legislature by ratioing up the payroll to a 12-month equivalent, the salary used for calculating benefits is not. Since the three years of earnable compensation used in the average final compensation determination do not need to be consecutive, the average final compensation for legislators who serve more than one term would incorporate the salaries from multiple first sessions. Without an upward adjustment to pay in the actuarial valuations following the second sessions, the valuations in the fiscal years ending in an even year will understate liability and normal cost.

In discussions with Cheiron, Cheiron's actuaries noted that the ratemaking process is based on valuations in the odd fiscal years (i.e., June 30, 2019), which align with payroll for the first legislative session, and thus, the benefits are based on a projection of the full year (12-month) salary rather than the partial year (8-month) salary. Cheiron's actuaries acknowledged that they see large annual actuarial gains when comparing even year valuations to a rollforward of the preceding odd year valuations and actuarial losses when comparing odd year valuations to a rollforward of the preceding even year valuations. Despite not impacting the ratemaking process and the developed contributions, we recommend that Cheiron use an upward pay adjustment for benefit determination purposes for active members in the Legislative Plan for even year actuarial valuations for consistency and to minimize actuarial gains/losses from year to year.

### 3. The liability due to the termination decrement for the sample lives in the Consolidated PLD plans that do not provide COLA is low

After reviewing the samples, Cheiron was able to identify the source of the difference:

*[W]e discovered that for the benefits related to noncola plans only, we were inadvertently applying an ERF to the deferred annuity... We also reran the valuation fixing this for all members, which resulted in an increase of 0.05% in the total contribution rate, less than the 0.1% rounding used by this plan.*

We suggest Cheiron review whether the same is true for Special Plan 4 as we noticed a similar discrepancy in the liability due to the termination decrement for the sample in that plan.

### 4. Minor coding discrepancies

The ordering of the following coding discrepancies aligns with the order in which they are presented in the footnotes of the *Results by Participant* section below. As a result, some of the *Findings 1. – 3.* above are repeated here to align with the footnotes. Generally, a footnote accompanies the samples for which the differences between Cheiron's and Bolton's results are larger than expected. When known, the primary cause(s) of the discrepancies are noted below.

- a. The salary scale in the Teacher sample lives provided does not match the salary scale assumption presented in the valuation report or the table provided by Cheiron at the beginning of this engagement. However, the salary scale used in the samples seems to align with the graph of the proposed salary scale assumptions in the September 2016 experience study.**

The results presented in the *Bolton* columns of the results sections that follow use the salary scale provided at the beginning of the engagement (which matches the table presented in the valuation report).

- b. The termination rates for the sample life in the State Employees Special 25 & Out Plan do not match the termination rate table presented in the valuation report, the table in the September 2016 experience study, or the table provided by Cheiron at the beginning of this engagement.**

The results presented in the *Bolton* columns of the results sections that follow use the termination rates provided at the beginning of the engagement (which match those presented in the valuation report and in the September 2016 experience study).

- c. The termination rates for the sample lives in the State Employees Special 1998 Plan do not match the termination rate table presented in the valuation report, the table in the September 2016 experience study, or the table provided by Cheiron at the beginning of this engagement.**

The results presented in the *Bolton* columns of the results sections that follow use the termination rates provided at the beginning of the engagement (which match those presented in the valuation report and in the September 2016 experience study).

**d. Cheiron is not comparing the employee contribution refund to the retirement annuity for current terminated vested members.**

Terminated vested members may elect to take a refund of their employee contributions with interest instead of a deferred retirement annuity. Cheiron notes in the assumption sections of the valuation reports that “[o]nce vested, the member is assumed to elect the greater of the deferred vested benefit or a refund of member contributions with interest-based on present value at the time of termination.”

While Cheiron may be valuing this comparison for the termination decrement for members who are active on the valuation date, Cheiron does not appear to be valuing the greater of these two benefits for vested terminated members in the valuation data. Instead, Cheiron is valuing only the retirement annuity deferred to normal retirement age. When the employee contribution refund exceeds the present value of the deferred annuity, it is generally for young, low service terminated vested members since they haven’t accrued a substantial retirement benefit and are several years away from attaining normal retirement age. In actuarial terms: the deferred annuity factor is not large enough to overcome the difference between the employee contribution rate and the lower pension accrual rate.

We note that the assumed member contribution interest rate of 5.00% is less than the 6.75% valuation discount rate. So, if terminated vested members are assumed (if validated by a review of past plan experience and the actuary’s best estimate of future experience) to keep their contributions in the plan, then valuing only the annuity may be appropriate. Such a scenario could be substantiated by studies (such as behavioral economic theory) in which individuals do not always make a decision (in this case whether to take a refund of employee contributions or defer annuity commencement to normal retirement age) based on what is in their financial best interest. However, generally we have seen behavioral economics explain the opposite decision: members choose to take a less valuable lump sum refund of employee contributions over the deferred annuity (rather than taking the less valuable annuity over the lump sum refund). Since Cheiron’s coding does not incorporate the max of the two options, if terminated vested members do take refunds of their employee contributions when they are more valuable than the deferred annuity, the plans may experience small actuarial losses.

**e. The liability due to the ordinary death decrement for one of the Judge samples seems low.**

For this engagement, we did not request full sample life output, but rather only the major results. As such, we were not able to identify the source of this difference.

**f. The salary used to project benefits for Legislators should be adjusted upward to reflect the higher pay in the first session of the biennium legislature.**

See *Finding 2* above for additional commentary.

**g. The liability due to the termination decrement for the sample lives in the Consolidated PLD plans that do not provide COLA is low.**

See *Finding 3* above for additional commentary.

**h. The service from the prior plan is not converted to service in the new plan for benefit eligibility and benefit determination purposes for a Consolidated PLD member with both Regular plan and Special plan service.**

Based on our review of the *2020 PLD Member Handbook*, our understanding is that service should be converted for both benefit and eligibility purposes when moving between a Regular Plan and a Special Plan. However, due to the complexity of the Consolidated PLD Plan, we acknowledge that plan operations may differ from our understanding.

When asked about members in these situations, Cheiron responded:

*The service is converted only for the purposes of the eligibility as provided by the provisions and confirmed through discussions with MainePERS staff. As such, the benefits are calculated using the service and benefit accrual percentages earned in each plan.*

**i. The service from the prior plan is not converted to service in the new plan for benefit eligibility purposes for a Consolidated PLD member with service in multiple Special plans.**

Similar to *h* above, our understanding of plan operations is based on a review of the *2020 PLD Member Handbook*; however, we acknowledge that plan operations may differ from our understanding due to the complexity of having service in multiple plans within the Consolidated PLD Plan.

When asked about members in these situations, Cheiron responded:

*The treatment for eligibility services is based on the data received rather than coding in the valuation. Active records FINAL CRD service amounts are included without adjustment for eligibility and benefit service in that plan. Terminated records that have Conv CRD service is included for eligibility purposes in the active plan but the FINAL CRD service is included in the plan in which it was earned. If a terminated record does not show Conv CRD, Pct Met should be used to determine how much service is included for eligibility purposes in the active record.*

We note that actuarial valuations contain a delicate balance of valuation coding complexity/limitations with the reliance of supplied data and actuarial judgement. As such, we do not object to the sentiment or content of Cheiron's response but suggest Cheiron's actuaries consider whether service conversion should occur within the valuation.

**j. The liability due to the termination decrement for the sample life in the Consolidated PLD Special Plan 4 is low.**

In *Finding 3* above, Cheiron noted that an ERF was being inadvertently applied to the deferred annuity for members in non-COLA granting plans. We suggest Cheiron review whether the same is true for Special Plan 4 as we noticed a similar discrepancy in the liability due to the termination decrement.

**k. The delayed COLA effective date for this member is not incorporated into the valuation**

See *Finding 1. Delayed COLA Effective Dates* above for additional commentary.

## Results by Plan

In Section III of our report, we discussed our concern about the salary used in the valuation model. However, it will be up to Cheiron to work with MainePERS to determine whether any adjustments need to be made. Thus, our sample life calculations use the same initial salaries as Cheiron.

Knowing that Cheiron's programming assumes that (see *Finding 1* above) COLAs are payable on July 1 rather than September 1, we coded a variation of our model to use the same methodology such that we could narrow in on any other discrepancies between our coding and Cheiron's without the distraction of that findings. The first section that follows, compares our results to Cheiron's using Cheiron's COLA timing methodology, while the second section uses our recommended COLA timing methodology (i.e. COLAs are paid on September 1).



## Using Cheiron's COLA Timing Methodology

Comparison of Results for Sample Lives															
(\$)	Teachers			Employees			Judicial			Legislative			Consolidated PLD		
	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff
<b>PVFB</b>															
-Active	1,963,307	1,967,680	0.2%	1,205,261	1,196,431	-0.7%	1,052,683	1,063,754	1.1%	62,405	69,472	11.3%	2,569,768	2,598,947	1.1%
-Inactive	1,521,995	1,521,458	0.0%	1,361,885	1,367,840	0.4%	1,047,706	1,047,706	0.0%	42,983	43,005	0.1%	1,629,624	1,626,035	-0.2%
<b>Total</b>	<b>3,485,302</b>	<b>3,489,138</b>	<b>0.1%</b>	<b>2,567,146</b>	<b>2,564,271</b>	<b>-0.1%</b>	<b>2,100,389</b>	<b>2,111,460</b>	<b>0.5%</b>	<b>105,388</b>	<b>112,477</b>	<b>6.7%</b>	<b>4,199,392</b>	<b>4,224,982</b>	<b>0.6%</b>
<b>AAL</b>															
-Active	1,745,450	1,758,237	0.7%	859,774	895,507	4.2%	725,988	730,535	0.6%	53,311	57,750	8.3%	1,811,499	1,799,823	-0.6%
-Inactive	1,521,995	1,521,458	0.0%	1,361,885	1,367,840	0.4%	1,047,706	1,047,706	0.0%	42,983	43,005	0.1%	1,629,624	1,626,035	-0.2%
<b>Total</b>	<b>3,267,445</b>	<b>3,279,695</b>	<b>0.4%</b>	<b>2,221,659</b>	<b>2,263,347</b>	<b>1.9%</b>	<b>1,773,694</b>	<b>1,778,241</b>	<b>0.3%</b>	<b>96,294</b>	<b>100,755</b>	<b>4.6%</b>	<b>3,441,123</b>	<b>3,425,858</b>	<b>-0.4%</b>
<b>NC</b>	<b>32,542</b>	<b>31,026</b>	<b>-4.7%</b>	<b>39,017</b>	<b>35,260</b>	<b>-9.6%</b>	<b>41,810</b>	<b>41,766</b>	<b>-0.1%</b>	<b>2,052</b>	<b>2,635</b>	<b>28.4%</b>	<b>98,325</b>	<b>99,215</b>	<b>0.9%</b>
<b>PVFS*</b>	<b>2,096,502</b>	<b>2,080,006</b>	<b>-0.8%</b>	<b>3,100,289</b>	<b>3,038,411</b>	<b>-2.0%</b>	<b>1,885,573</b>	<b>1,860,170</b>	<b>-1.3%</b>	<b>119,531</b>	<b>117,920</b>	<b>-1.3%</b>	<b>5,856,460</b>	<b>5,963,150</b>	<b>1.8%</b>

## Using Bolton's Recommended COLA Timing Methodology

Comparison of Results for Sample Lives															
(\$)	Teachers			Employees			Judicial			Legislative			Consolidated PLD		
	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff
<b>PVFB</b>															
-Active	1,963,307	1,958,910	-0.2%	1,205,261	1,187,021	-1.5%	1,052,683	1,058,448	0.5%	62,405	68,719	10.1%	2,569,768	2,578,786	0.4%
-Inactive	1,521,995	1,545,266	1.5%	1,361,885	1,386,531	1.8%	1,047,706	1,056,089	0.8%	42,983	43,794	1.9%	1,629,624	1,646,505	1.0%
<b>Total</b>	<b>3,485,302</b>	<b>3,504,176</b>	<b>0.5%</b>	<b>2,567,146</b>	<b>2,573,552</b>	<b>0.2%</b>	<b>2,100,389</b>	<b>2,114,537</b>	<b>0.7%</b>	<b>105,388</b>	<b>112,513</b>	<b>6.8%</b>	<b>4,199,392</b>	<b>4,225,291</b>	<b>0.6%</b>
<b>AAL</b>															
-Active	1,745,450	1,750,910	0.3%	859,774	888,314	3.3%	725,988	726,620	0.1%	53,311	57,098	7.1%	1,811,499	1,784,900	-1.5%
-Inactive	1,521,995	1,545,266	1.5%	1,361,885	1,386,531	1.8%	1,047,706	1,056,089	0.8%	42,983	43,794	1.9%	1,629,624	1,646,505	1.0%
<b>Total</b>	<b>3,267,445</b>	<b>3,296,176</b>	<b>0.9%</b>	<b>2,221,659</b>	<b>2,274,845</b>	<b>2.4%</b>	<b>1,773,694</b>	<b>1,782,709</b>	<b>0.5%</b>	<b>96,294</b>	<b>100,892</b>	<b>4.8%</b>	<b>3,441,123</b>	<b>3,431,405</b>	<b>-0.3%</b>
<b>NC</b>	<b>32,542</b>	<b>30,828</b>	<b>-5.3%</b>	<b>39,017</b>	<b>34,992</b>	<b>-10.3%</b>	<b>41,810</b>	<b>41,562</b>	<b>-0.6%</b>	<b>2,052</b>	<b>2,612</b>	<b>27.3%</b>	<b>98,325</b>	<b>98,494</b>	<b>0.2%</b>
<b>PVFS*</b>	<b>2,096,502</b>	<b>2,080,006</b>	<b>-0.8%</b>	<b>3,100,289</b>	<b>3,038,411</b>	<b>-2.0%</b>	<b>1,885,573</b>	<b>1,860,170</b>	<b>-1.3%</b>	<b>119,531</b>	<b>117,920</b>	<b>-1.3%</b>	<b>5,856,460</b>	<b>5,963,150</b>	<b>1.8%</b>

### \* Footnotes

For the active samples in the Judges Retirement Program and the Legislative Retirement Program, the salary used for the PVFS calculations appears to adjust salaries to middle of year whereas the same adjustment to salary is not used for benefits. While this likely does not have a material impact on the results used for contribution development (liability and normal cost), we have included it here to explain the difference between the PVFS calculated by Cheiron and by Bolton above. Bolton's PVFS results for those two plans would exactly match Cheiron's results if multiplied by  $(1.0275)^{(0.5)}$ .



## Results by Participant

State Employee And Teacher Retirement Program																		
Participant Information									PVFB			AAL			NC			
#	Plan	Status	Tier	Age	Svc	Salary	Sex	Pay Form	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	*
1	T Reg	A	1	59	37.2	178,232	M		1,368,460	1,374,183	0.4%	1,317,189	1,328,316	0.8%	13,426	12,011	-10.5%	a
2	T Reg	A	2	55	13.3	63,662	F		246,259	244,153	-0.9%	180,474	178,746	-1.0%	8,417	8,405	-0.1%	a
3	T Reg	A	2	48	19.0	83,350	F		325,994	318,944	-2.2%	247,787	243,848	-1.6%	7,976	7,795	-2.3%	a
4	T Reg	A	3	26	0.5	36,500	F		22,594	21,630	-4.3%	0	0	0.0%	2,723	2,617	-3.9%	a
5	T Reg	T	2	57			F		59,294	60,365	1.8%	59,294	60,365	1.8%	N/A	N/A	0.0%	
6	T Reg	Retiree	1	61			M	Option 2	543,341	550,072	1.2%	543,341	550,072	1.2%	N/A	N/A	0.0%	
7	T Reg	Retiree	1	70			F	Option 6	390,603	396,655	1.5%	390,603	396,655	1.5%	N/A	N/A	0.0%	
8	T Reg	Retiree	2	73			F	Option 1	133,909	136,426	1.9%	133,909	136,426	1.9%	N/A	N/A	0.0%	
9	T Reg	New Dis	3	40			F	Ordinary	363,384	370,047	1.8%	363,384	370,047	1.8%	N/A	N/A	0.0%	
10	T Reg	Survivor	3	12			F	Survivor Benefit	31,464	31,701	0.8%	31,464	31,701	0.8%	N/A	N/A	0.0%	
11	S Reg	A	1	56	37.7	58,885	F		476,919	473,650	-0.7%	447,944	447,259	-0.2%	5,336	4,860	-8.9%	
12	S Reg	A	2	38	14.9	82,068	M		197,721	199,934	1.1%	130,633	131,224	0.5%	5,906	6,049	2.4%	
13	S Reg	A	3	61	2.8	55,182	M		53,461	54,863	2.6%	31,917	30,539	-4.3%	4,318	4,875	12.9%	
14	S P >9/15/84	A	3	33	9.5	84,732	M		227,953	195,895	-14.1%	119,623	120,510	0.7%	10,748	7,568	-29.6%	b
15	S SP 98	A	3	21	1.5	49,171	M		50,333	40,342	-19.8%	4,789	5,164	7.8%	4,943	4,140	-16.2%	c
16	S SP 98	A	3	43	10.6	63,487	F		198,874	222,337	11.8%	124,868	153,618	23.0%	7,766	7,500	-3.4%	c
17	S Reg	T	2	52			M		13,466	20,233	50.3%	13,466	20,233	50.3%	N/A	N/A	0.0%	d
18	S Reg	Retiree	1	81			F	Option 3	104,877	106,800	1.8%	104,877	106,800	1.8%	N/A	N/A	0.0%	
19	S Reg	Retiree	2	74			M	Option 5	338,588	341,719	0.9%	338,588	341,719	0.9%	N/A	N/A	0.0%	
20	S Reg	Retiree	3	73			M	Full Benefit	402,384	406,520	1.0%	402,384	406,520	1.0%	N/A	N/A	0.0%	
21	S Reg	New Dis	3	41			M	Ordinary	273,885	278,906	1.8%	273,885	278,906	1.8%	N/A	N/A	0.0%	
22	S Reg	5	3	60			F	Option 2	150,164	152,917	1.8%	150,164	152,917	1.8%	N/A	N/A	0.0%	
23	S Reg	5CC	3	71			F	Option 5	78,521	79,436	1.2%	78,521	79,436	1.2%	N/A	N/A	0.0%	
<b>Total</b>									<b>6,052,448</b>	<b>6,077,728</b>	<b>0.4%</b>	<b>5,489,104</b>	<b>5,571,021</b>	<b>1.5%</b>	<b>71,559</b>	<b>65,820</b>	<b>-8.0%</b>	

Judicial Retirement Program																		
Participant Information									PVFB			AAL			NC			
#	Plan	Status	Tier	Age	Svc	Salary	Sex	Pay Form	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	*
24	J Reg	A	2	63	17.4	134,997	F		716,218	714,308	-0.3%	678,146	677,666	-0.1%	19,900	19,153	-3.8%	
25	J Reg	A	3	44	2.1	133,286	M		336,465	344,140	2.3%	47,842	48,954	2.3%	21,910	22,409	2.3%	e
26	J Reg	Retiree	2	72			F	Full Benefit	718,193	722,614	0.6%	718,193	722,614	0.6%	N/A	N/A	0.0%	
27	J Reg	Retiree	2	80			M	Option 2	329,513	333,475	1.2%	329,513	333,475	1.2%	N/A	N/A	0.0%	
<b>Total</b>									<b>2,100,389</b>	<b>2,114,537</b>	<b>0.7%</b>	<b>1,773,694</b>	<b>1,782,709</b>	<b>0.5%</b>	<b>41,810</b>	<b>41,562</b>	<b>-0.6%</b>	

**\* Footnotes**

- a The salary scale in the samples provided does not match the salary scale assumption presented in the valuation report or the table provided by Cheiron at the beginning of this engagement. However, the salary scale seems to align with the graph of the proposed salary scale assumptions in the September 2016 experience study.
- b The termination rates in the sample life for this member in the Special 25&Out Plan do not match the termination rate table presented in the valuation report, the table in the September 2016 experience study, or the table provided by Cheiron at the beginning of this engagement.
- c Similar to b above, the termination rates in the sample lives for these members in the Special 1998 Plan do not match the termination rate table presented in the valuation report, the table in the September 2016 experience study, or the table provided by Cheiron at the beginning of this engagement.
- d The Cheiron sample life values the deferred retirement annuity rather than the greater of the refund of employee contributions and the deferred retirement annuity.
- e The liability due to the ordinary death decrement is much lower in Cheiron's sample than in Bolton's sample. As we did not request or receive full sample life output, we were unable to identify the reason for this difference.

Legislative Retirement Program																		
Participant Information									PVFB			AAL			NC			
#	Plan	Status	Tier	Age	Svc	Salary	Sex	Pay Form	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	*
28	L Reg	A	2	62	14.0	10,582	F		49,641	55,118	11.0%	43,753	46,852	7.1%	1,299	1,824	40.4%	f
29	L Reg	A	3	36	8.0	13,227	M		12,764	13,601	6.6%	9,558	10,246	7.2%	753	788	4.6%	f
30	L Reg	Retiree	2	76			F	Full Benefit	21,985	22,388	1.8%	21,985	22,388	1.8%	N/A	N/A	0.0%	
31	L Reg	Retiree	2	78			M	Option 2	20,998	21,405	1.9%	20,998	21,405	1.9%	N/A	N/A	0.0%	
<b>Total</b>									<b>105,388</b>	<b>112,513</b>	<b>6.8%</b>	<b>96,294</b>	<b>100,892</b>	<b>4.8%</b>	<b>2,052</b>	<b>2,612</b>	<b>27.3%</b>	

Consolidated Plan for Participating Local Districts																		
Participant Information									PVFB			AAL			NC			
#	Plan	Status	Tier	Age	Svc	Salary	Sex	Pay Form	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	Cheiron	Bolton	% Diff	*
32	P Reg A	A	1	46	23.1	51,605	F		275,283	271,828	-1.3%	234,300	228,371	-2.5%	4,421	4,688	6.0%	
33	P Reg A	A	2	69	4.6	51,058	F		57,467	56,940	-0.9%	43,993	44,216	0.5%	13,474	12,724	-5.6%	
34	P Reg A-1	A	2	51	9.2	47,838	M		88,026	103,019	17.0%	52,780	58,349	10.6%	3,983	5,048	26.7%	g
35	P Reg B	A	1	48	10.9	59,953	M		98,421	97,520	-0.9%	65,222	64,154	-1.6%	3,697	3,715	0.5%	
36	P Spec 1	A	1	41	14.0	67,617	M		398,564	361,479	-9.3%	320,831	285,224	-11.1%	13,589	12,243	-9.9%	h
37	P Spec 1A	A	1	35	12.4	69,598	M		299,267	297,968	-0.4%	212,021	204,148	-3.7%	11,165	10,512	-5.8%	i
38	P Spec 2	A	1	41	11.6	75,207	M		286,399	285,425	-0.3%	197,881	195,315	-1.3%	10,495	10,684	1.8%	
39	P Spec 2A	A	1	43	8.5	51,418	F		126,983	129,937	2.3%	61,185	59,459	-2.8%	5,855	6,272	7.1%	g
40	P Spec 3	A	1	40	15.5	69,378	M		379,812	370,954	-2.3%	279,160	276,249	-1.0%	11,498	10,819	-5.9%	
41	P Spec 3A	A	1	37	15.4	66,865	M		328,500	346,494	5.5%	244,668	259,266	6.0%	9,550	9,937	4.1%	g
42	P Spec 4	A	2	33	4.9	59,284	M		126,151	133,075	5.5%	40,605	42,835	5.5%	6,857	7,234	5.5%	j
43	P Spec 4A	A	1	34	10.8	48,076	M		104,895	124,147	18.4%	58,853	67,314	14.4%	3,741	4,618	23.4%	g
44	P Reg A	T	1	52			M		49,022	49,580	1.1%	49,022	49,580	1.1%	N/A	N/A	0.0%	
45	P Reg A	Retiree	1	72			F	Full Benefit	93,937	95,432	1.6%	93,937	95,432	1.6%	N/A	N/A	0.0%	
46	P Reg A-1	Retiree	1	73			M	Option 1	24,609	24,863	1.0%	24,609	24,863	1.0%	N/A	N/A	0.0%	
47	P Reg A-1	Retiree	1	87			M	Option 3	29,610	30,150	1.8%	29,610	30,150	1.8%	N/A	N/A	0.0%	
48	P Reg B	Retiree	1	61			F	Full Benefit	75,925	75,788	-0.2%	75,925	75,788	-0.2%	N/A	N/A	0.0%	k
49	P Spec 1	Retiree	1	73			M	Option 2	256,992	260,014	1.2%	256,992	260,014	1.2%	N/A	N/A	0.0%	
50	P Spec 1A	Retiree	1	72			M	Option 5	145,526	147,369	1.3%	145,526	147,369	1.3%	N/A	N/A	0.0%	
51	P Spec 1A	Retiree	1	76			M	Option 6	461,049	462,509	0.3%	461,049	462,509	0.3%	N/A	N/A	0.0%	
52	P Spec 4	New Dis	3	70			M	Ordinary	294,171	298,853	1.6%	294,171	298,853	1.6%	N/A	N/A	0.0%	
53	P Reg A	New Dis	3	69			F	Ordinary	87,095	88,481	1.6%	87,095	88,481	1.6%	N/A	N/A	0.0%	
54	P Reg A	Survivor	3	70			F	Survivor Benefit	76,736	77,958	1.6%	76,736	77,958	1.6%	N/A	N/A	0.0%	
55	P Spec 1A	5CC	3	67			F	Option 5	34,952	35,509	1.6%	34,952	35,509	1.6%	N/A	N/A	0.0%	
<b>Total</b>									<b>4,199,392</b>	<b>4,225,291</b>	<b>0.6%</b>	<b>3,441,123</b>	<b>3,431,405</b>	<b>-0.3%</b>	<b>98,325</b>	<b>98,494</b>	<b>0.2%</b>	

\* Footnotes

- f The salary used to project benefits should be adjusted upward to account for higher pays during the first session of biennium legislature. See *Finding 2* for additional commentary.
- g For members in PLD plans that do not provide COLA, the liability due to termination decrement is much lower in Cheiron's samples than in Bolton's samples due to Cheiron inadvertently applying an ERF to the deferred annuity. See *Finding 3* for additional commentary.
- h This PLD member has both Regular plan and Special plan service. Our understanding of plan operations for individuals in these circumstances is that the service from the prior plan should be converted to service in the new plan for both benefit eligibility and benefit determination purposes.
- i This PLD member has service in multiple Special plans. Our understanding of plan operations for individuals in these circumstances is that the service from the prior plan should be converted to service in the new plan for benefit eligibility purposes.
- j For members in PLD Special plans, the liability due to termination decrement is much lower in Cheiron's samples than in Bolton's samples. See *Finding j* for additional commentary.
- k The deferred COLA effective date for this PLD member is not incorporated into the valuation. See *Finding 1. Delayed COLA Effective Dates* for additional commentary.

## Section V. Analysis of Methods and Assumptions

### Funding Methods

There are three key components to the funding methods that are part of any plan's funding policy:

1. An **actuarial cost method**, which allocates the total present value of future benefits into three categories: all past years (Actuarial Accrued Liability or AAL), this year (Normal Cost), and future years (Present Value of Future Normal Cost).
2. An **amortization policy**, which determines the length of time and the structure of the increase or decrease in contributions required to systematically fund any Unfunded Actuarial Accrued Liability or UAAL. In the unusual situation where assets are in excess of the AAL, the policy should state how the surplus assets will be recognized.
3. An **asset smoothing method**, which reduces the effect of short-term market volatility while still tracking the overall movement of the market value of plan assets. This is discussed below in the "Asset Valuation Method" section.

In addition to providing our own opinion on the three methods used by the plans, we compared these methods to the approaches contained in the CCA White Paper on funding methods. The CCA paper also contains rationale and objectives that we will sometimes refer to in this report.

In addition to discussing the funding method components, we have also provided a comment below about one aspect of the System's funding policy.

We generally find that the funding methods chosen are consistent with appropriate funding practices, except as noted below.

#### Actuarial Cost Method

The actuarial cost method for all MainePERS plans is the individual entry age normal method. This is a reasonable and common funding method, used by well more than half of all public plans. The individual entry age normal method (EAN) is attractive to public sector employers because the EAN Normal Cost is developed to be level with respect to salary. In other words, the EAN Normal Cost increases at the same rate as salary. Most public sector pension plan sponsors prefer to state their pension contribution as percent of active payroll. Thus, the entry age normal cost method is a natural fit for public sector plans.

Each MainePERS actuarial valuation report describes the calculation of the entry age normal cost rate for each Plan/Program. There are differences between the descriptions, but since we are only performing a level two audit, we cannot determine whether the normal cost rates for each Plan/Program are calculated in accordance with the descriptions. We were, however, informed by Cheiron that the reduction in the total normal cost rate attributable to employee contributions was applied outside the valuation model but that is not included in the descriptions.

Below are the descriptions for each plan.

#### State Employee and Teachers Program

For each Plan in the Program, an individual entry age normal cost rate is determined for each

active member. The normal cost is determined by the following steps. First, an individual normal cost rate is determined by taking the value, as of entry age into a Plan, of each active member's projected future benefit. Second, this value is then divided by the value, also at entry age, of the member's expected future salary. Finally, the rate is reduced by the member contribution rate to produce the employer normal contribution rate. These rates are then multiplied by each member's salary as of the valuation date to get the total normal cost dollars as of the valuation date for that Plan and then divided by the total payroll at the valuation for the Plan to get the normal cost rate for that Plan. This process results in specific normal cost rates for each of the Plans in the Program.

#### Consolidated Plan for PLD

For each of the Regular and Special Plans in the Consolidated Plan, an individual entry age normal cost rate is determined for each active member. The normal cost is determined by the following steps. First an individual normal cost rate is determined by taking the value, as of entry age into the Plan, of each active member's projected future benefits. Second, this value is then divided by the value, also at entry age, of the member's expected future salary. These rates are then multiplied by each member's salary at the valuation date to get the total normal cost dollars as of the valuation date for that Plan. These individual amounts for each Regular and Special Plan are then added to get the total normal cost dollars for the Plan and then divided by the total payroll for the Plan to get the Actuarially Determined Plan Normal Cost Rate.

#### Legislative and Judicial Programs

For each active, the normal cost is determined by taking the value, as of entry age into the Program, of the member's projected benefits, reduced by the value of future member contributions, and then dividing it by the value, also as of the member's entry age, of the member's expected future salary. This rate is then multiplied by the member's salary at the valuation date to produce the normal cost for each member, which are then aggregated across all members to get the total normal cost for the Program. This total normal cost is then divided by the total salary for the Program at the valuation date to get the normal cost rate for the Program.

We recommend Cheiron confirm that the calculations performed for MainePERS align with the descriptions above and edit, if necessary, to accurately describe the calculations. In addition, we recommend providing definitions for "salary", "total salary" and "total payroll" used in these calculations to ensure that another actuary can replicate the calculations.

*We support Cheiron's current use of the individual entry age normal method.*

*We recommend (1) reviewing the description of the funding method in each valuation report to ensure it accurately describes the actual calculations and (2) providing further details on "salary" and "payroll" used in the calculations.*

#### **Amortization of Unfunded Actuarial Accrued Liability (UAAL)**

The plans' UAAL current amortization policies include these characteristics:

1. The UAAL is amortized as a level percentage of payroll for all plans,
2. The UAAL attributable to "all other gains and losses" (excluding the original UAAL) is amortized over closed, layered 20-year amortization periods for the State Employees and Teachers Program and the Consolidated Plan for PLD. While not stated directly, it appears the UAAL attributable to assumption changes is included as a gain or loss. As required by the Maine constitution, any changes in UAAL attributable to plan changes are paid for immediately and not amortized.

3. The UAAL (currently a surplus) for the Legislative and Judicial Programs is amortized over a 10-year open period.

We believe that each of the key amortization components listed below should be considered separately and not in the aggregate:

- The level percent of payroll method is the CCA LCAM Model Practice. We see no reason to change this practice. We do, however, recommend enhancing the valuation report for the State and Teachers Program to include the assumption that the amortization payments increase over the previous year at a rate of 2.75% (as already noted in the other valuation reports). Additionally, we recommend including a statement in all the valuation reports that the amortization payments are assumed to occur mid-year.
- “Closed”, layered amortization period is the CCA LCAM Model Practice. We see no reason to change this practice when the plan is not in a surplus position. We recommend expanding the language in the valuation reports to state the amortization period for assumption changes and describe the treatment of plan changes.
- Amortization period of 20 years for gains and losses and assumption changes is the CCA LCAM Model Practice (15-20 years for experience gains and losses and 15-25 years for assumption gains and losses). We see no reason to change this practice when the plan is not in a surplus position.
- Immediate payment for benefit changes is a more rapid amortization period than the CCA LCAM Model Practice (lesser of remaining active future service or 15 years for active plan amendments and lesser of retiree life expectancy or 10 years for inactive plan amendments). As an actuary, we would support the CCA LCAM Model Practice but since the State, in the constitution, decided to require immediate payment for benefit changes, we see no reason (or ability by the Board) to change this practice.

We do, however, recommend that the actuary recognize the immediate amortization of benefit changes in the contribution calculations and in the funding method description. For example, the 2020 State Employees and Teachers Program valuation included a change in the benefits for fire marshals. The increase in the UAAL due to this change was aggregated with the experience gains and losses and amortized over a 20-year period to determine the UAAL contribution percentage.

- Amortization period of less than 30 years for surplus is not a CCA LCAM Model Practice. Shorter amortization of surplus leads to partial or full contribution holidays which can result in unwanted requests for benefit improvements and the possibility that budgeting commitments to the plan will be rescinded since there is the appearance that the funds are not needed.

*We support the current use of the level percent of payroll amortization method and the closed, layered amortization periods.*

*We recommend enhanced descriptions in the valuation reports concerning the assumed annual increase in amortization payments, assumed payment timing and the amortization periods for assumption and plan changes.*

*We recommend reflecting the immediate payment for the cost of benefit changes in the contribution calculations.*

*We recommend considering a longer amortization period for surpluses.*

### **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. Bolton recognizes the importance of this requirement and assists clients in establishing reasonable methodologies for recognizing investment gains and losses and limiting the potential volatility that may result in increased contributions due to investment results.

Assets for all Defined Benefit Programs administered by MainePERS are invested together, but MainePERS does determine the market value of assets (MVA) attributable to each Program. The actuarial value of assets (AVA) for each Program is developed by first developing the AVA for the entire asset pool and then subsequently allocating that total AVA to each of the specific Programs by multiplying the Program MVA by the ratio of Total AVA to Total MVA.

The total AVA is developed by first developing an expected asset value starting with the prior year AVA and adjusting it by the actual contributions and disbursements plus interest at the assumed rate of return (6.75% in the 2020 valuation). The expected asset value is compared to the actual market value of assets (MVA). The total AVA is equal to the expected value of assets plus 33 $\frac{1}{3}$ % of the excess of MVA over the expected value of assets. MainePERS employs a 3-year rolling smoothing period. The MainePERS method does not limit the spread between actuarial value of assets (AVA) and market value of assets (MVA).

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. Bolton recognizes the importance of this requirement and assists clients in establishing reasonable methodologies for recognizing investment gains and losses and limiting the potential volatility that may result in increased contributions due to investment results.

The Actuarial Standard of Practice (ASOP) No. 44 (Selection and Use of Asset Valuation Methods for Pension Valuations) gives guidance for determining the reasonableness of an asset smoothing method. The following is an excerpt from ASOP 44 that establishes the qualities a reasonable asset smoothing method must exhibit.

From the Actuarial Standard of Practice No. 44

*3.3 Selecting Methods Other Than Market Value -- If the considerations in section 3.2 have led the actuary to conclude that an asset valuation method other than market value may be appropriate, the actuary should select an asset valuation method that is designed to produce actuarial values of assets that bear a reasonable relationship to the corresponding market values. The qualities of such an asset valuation method include the following:*

- a. The asset valuation method is likely to produce actuarial values of assets that are sometimes greater than and sometimes less than the corresponding market values.*
- b. The asset valuation method is likely to produce actuarial values of assets that, in the actuary's professional judgment, satisfy both of the following:*
  - 1. The asset values fall within a reasonable range around the corresponding market values. For example, there might be a corridor centered at market value, outside of which the actuarial value of assets may not fall, in order to assure that the*

*difference from market value is not greater than the actuary deems reasonable.*

2. *Any differences between the actuarial value of assets and the market value are recognized within a reasonable period of time. For example, the actuary might use a method where the actuarial value of assets converges toward market value at a pace that the actuary deems reasonable, if the investment return assumption is realized in future periods.*

*In lieu of satisfying both (1) and (2) above, an asset valuation method could satisfy section 3.3(b) if, in the actuary's professional judgment, the asset valuation method either (i) produces values within a sufficiently narrow range around market value or (ii) recognizes differences from market value in a sufficiently short period.*

To summarize ASOP 44, an acceptable asset smoothing method must create asset values that fall within a reasonable range around market value; and differences between the actuarial value of assets (AVA) and market value of assets (MVA) must be recognized in a reasonable period of time. In lieu of satisfying both 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.

The 3-year rolling smoothing period is an "open" amortization of any unrecognized losses or gains. As an open method, the AVA will never exactly equal the MVA (i.e., the gain or loss will never be fully recognized). In addition, there is no corridor that restricts the range between the AVA and MVA. The ASOP does allow for the actuary to use their judgement that the asset values fall within a reasonable range around the market value and that the actuarial value converges to the market value at a reasonable rate. However, we suggest the actuary consider making the 3-year recognition of gains or losses a closed period instead of the current open period. This will result in recognition of losses or gains on a more specific timetable and avoid long term unrecognized returns even while the expected returns are being met. For example, under the current method, a return above the assumed long term rate in one year followed by years of exactly meeting the assumed return will result in the AVA showing a return in excess of the assumed level over many years. Even after 10 years the return on the AVA will not have converged to the expected return level and will continue to result in actuarial gains each year.

The CCA LCAM Model Practice includes fixed smoothing periods and a corridor tied to the number of years in the smoothing period. Acceptable Practices include a rolling smoothing period plus a corridor tied to the number of years in the smoothing period.

*In our opinion the three-year rolling smoothing period is a reasonable method for calculating AVA, but we suggest the actuary consider changing to a closed period for recognizing gains and losses. In addition, we recommend adding a corridor around MVA.*

## **Policy Goals**

The Board meetings and policy indicate an overall goal of each plan being between 105% and 115% funded. The actuarial reports develop a contribution level that targets a 100% funded level.

*The actuarial reports and contribution development methods should support the Board policy and include how the plans will reach and maintain those target levels.*

## Actuarial Assumptions

A prerequisite to evaluating the reasonableness and accuracy of the June 30, 2020 actuarial valuation reports produced by Cheiron is a comprehensive review of the actuarial assumptions, methods, and data underlying the results. Since these three components represent the primary inputs to valuation software and contribution development models, any deviations from generally accepted actuarial practices and principles or from requirements specified in state laws and statutes could have a material impact on the results. The sections that follow present our findings based on a review of whether the assumptions, methods, and data are appropriate for the valuations, align with industry best practices through conformance with the relevant Actuarial Standards of Practice (ASOPs), and adhere to law.

### Summary

Based on our review of the assumptions used in the June 30, 2020 actuarial valuation reports, we have the following comments:

- The MainePERS policy of reviewing economic assumptions at least annually is a prudent and appropriate policy.
- The economic and demographic assumptions used in the June 30, 2020 are reasonable, appropriate, and consistent among themselves and among the plans and they comply with the ASOPs and law.
- There were several instances where the demographic assumptions used in the valuation were not the same as those disclosed in either the actuarial valuation or the experience reports. These assumptions should be documented and the reason for the differences provided.

### Overview

Assumptions are used in actuarial valuations for various approximations, including but not limited to expected future (1) economic activity impacting plan benefits (e.g. inflation and COLA), (2) investment activity (e.g. discount rate), (3) demographic experience (e.g. increases in salary, decrements from active employment, and mortality), and (4) unknown data elements (e.g. spouse and dependent information). They are generally long-term in nature due to the duration of pension plan liabilities and the extenuation of expected benefit payments decades beyond the valuation date; however, they are generally derived based on a consideration of expectations in both the near and long term.

Given the collective breadth of the numerous individual assumptions, actuaries often condense them into the following two broad categories for analysis:

- Economic Assumptions
- Demographic Assumptions

As the terminology implies, the economic assumptions are generally dependent on expected future economic activity, typically centering on inflation, whereas demographic assumptions attempt to capture the anticipated interaction of the plan population makeup and participant behavior with the employer and plan provisions. The table below lists the major economic and demographic assumptions reviewed for this actuarial audit along with the approximate impact that changes to each assumption could have on the plans' unfunded liability and contribution development.

Assumption	Impact on Unfunded Liability and Contributions
<b><i>Economic Assumptions</i></b>	
Inflation (Price and Wage)	*
Payroll Growth	Low
Cost-of-Living Adjustments	<b>High</b>
Discount Rate	<b>High</b>
<b><i>Demographic Assumptions</i></b>	
Service Retirement for Active Participants	Medium
Service Retirement for Inactive Participants	Low
Disability	Low
Employee Termination	Medium
Pre-Retirement Mortality	Low
Healthy Mortality (post-retirement)	<b>High</b>
Disabled Mortality	Low
Salary Scale	<b>High</b>
Other (gender blending, % married, etc.)	Low

\*The inflation assumption is the shared building block used in the development of the other economic assumptions. As such, our discussion of economic assumptions begins with commentary on the inflation assumption.

Highlighted in bold orange font as high impact, the discount rate is the most important assumption in the valuation of most public sector plans as even small changes (50 basis points or less) can have significant impacts on normal cost and liabilities. Changes to the normal cost impact the actuarially determined contribution dollar for dollar, whereas changes to the liability are amortized over a number of years in accordance with the funding policy.

Changes to the assumption for future post-retirement cost-of-living adjustments (COLA) may also have a substantial impact on liabilities. However, for most MainePERS plans that grant COLAs, the annual COLA is limited to 3.0% (2.5% for PLD) and is applied to the minimum of the benefit amount and the COLA cap (\$22,810.25 for September 1, 2020 for plans except PLD). The limit and cap dampen the impact to MainePERS as fluctuations in the CPI on which the COLA is based correspond to smaller percentage impacts to plan liabilities.

Furthermore, since the liability for healthy, retired (both current and future) participants (i.e., non-disabled liability) represents a large percentage of total liability, changes to healthy mortality also may have a large impact. Finally, the salary scale estimates the salary progression of a single active employee over the course of the member’s employment history. It is also labeled as high impact since it directly affects the projected benefit amounts for active participants, and therefore, can materially influence normal cost and active participants’ liabilities.

The impacts due to changes to the termination rates and active retirement rates fall in the middle of the spectrum, as these assumptions affect the timing and amount of benefits, including the eligibility for and magnitude of any early retirement subsidies offered by the plans.

However, disability rates are low and MainePERS includes mostly non-uniformed members; therefore, the liability for *healthy* participants' regular service retirement benefits encompasses nearly the entire liability for the plans.

Payroll growth, which represents the assumed rate at which the total payroll for all the active employees in the plan will increase year over year, is listed as a low impact assumption because it does not affect the liability or normal cost. In this AVR it is used only to develop the amortizations of unfunded liability bases for the contribution calculation. All other things equal, lower payroll growth assumptions result in higher amortization payment amounts.

Although we have assigned changes to the assumptions into high-, medium-, and low-impact tranches, we want to emphasize that assumptions do not determine the *cost* of the plans. The cost of the plans is a function of the benefits paid and those benefits are funded through investment return on the trusts' assets and contributions (employee and employer) offset by expenses. As stated previously, the assumptions are used to *estimate* future experience; therefore, although they impact liability and normal cost and consequently drive short-term contribution calculations, actual experience determines which benefits ultimately will be paid, when they will be paid, their magnitude and duration of payment. Thus, an appropriate assumption should be based on an actuary's best estimate of future experience and should be unbiased in nature.

Cheiron recently completed an experience study (covering experience from June 30, 2015 to June 30, 2020) but the assumptions adopted pursuant to that experience study report (dated June 2021) will not be implemented until the June 30, 2021 actuarial valuations and the ratemaking process for fiscal years ending 2024 and 2025. Since this actuarial audit pertains to the June 30, 2020 valuations, our assumptions analysis considers the assumptions in those reports, which are generally based on the prior experience study. The prior experience study report is dated September 2016 and covers experience from June 30, 2012 to June 30, 2015.

### Economic Assumptions

ASOP 27<sup>1</sup> (Selection of Economic Assumptions for Measuring Pension Obligations), section 3.6, provides the criteria for selecting a reasonable assumption:

- a. It is appropriate for the purpose of the measurement;
- b. It reflects the actuary's professional judgment;
- c. It takes into account historical and current economic data that is relevant as of the measurement date;
- d. It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and
- e. It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included and disclosed under section 3.5.1, or when alternative assumptions are used for the assessment of risk.

Unlike demographic assumptions which are generally specific to the plan population, economic assumptions are often broader in scope as they consider the state of the overall (local or broader) economy and, as such, they are generally consistent (often the same or very similar) for all plans within a pension plan system.

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<sup>1</sup> Revised versions of ASOP 27 and ASOP 35 will become effective August 1, 2021. However, the June 30, 2020 actuarial valuation reports were produced and published prior to that forthcoming effective date. As such, we have compared the assumptions in the reports to the versions of the ASOP prior to the August 1, 2021 revisions.

As a means of gathering an appropriate amount of information for setting these economic assumptions, ASOP 27 specifically mentions (section 3.5.6) the use of other experts:

*Economic data and analyses are available from a variety of sources, including representatives of the plan sponsor and administrator, investment advisors, economists, and other professionals...the actuary may incorporate the views of experts but the selection or advice should reflect the actuary's professional judgement.*

In the 2016 experience study report, Cheiron reviewed the following economic assumptions: price (and wage) inflation, COLA assumed rate, and the discount rate (investment return). Pursuant to the *Actuarial Soundness and Funding Policy* within the MainePERS Board of Trustees *Governance Manual*, the economic assumptions are reviewed at least annually and updated as necessary based on those reviews, rather than waiting to implement changes until the next experience study. Additionally, as is often appropriate for economic assumptions, Cheiron developed recommendations for each assumption and those recommendations applied to all plans within MainePERS.

Based on our review of the 2016 experience study report, we believe that Cheiron successfully completed their due diligence relating to assumption analysis as the MainePERS valuation actuary by considering all the components necessary to develop reasonable economic assumptions. The structure of the economic assumptions review section of their report, which includes the following subsections for each reviewed assumption, allows the reader to easily map the actuary's considerations to the criteria outlined in the ASOP:

1. Historical experience
2. Future expectations
3. Industry trends such as assumptions used by other large public sector pension plans
4. Regulatory/professional standards
5. Plan dynamics
6. The MainePERS Board's risk tolerance/preferences

Since these six considerations were the basis for the review of each of the economic assumptions, we do not comment on them individually for each assumption, but rather, emphasize a few key points for each.

Finally, an important final step in the assumption setting process is striking the appropriate balance among all the data and considerations to develop a best-estimate assumption. Cheiron appears to have achieved such a balance by "temper[ing] [the] historical look with future expectations" in conformance with section 3.4 of the ASOP:

*To evaluate relevant data, the actuary should review appropriate recent and long-term historical economic data. The actuary should not give undue weight to recent experience.*

### **Price inflation**

Price inflation is the increase in price over time of a standard basket of goods and services. It provides a basis, either as a direct input or indirect component, for the other economic assumptions (payroll growth, COLA, and discount rate). Despite not having an independent impact on the valuation results, the price inflation assumption has a significant impact on the valuations through its influence on the development of the other economic assumptions.

In developing the price inflation assumption recommendation in the 2016 experience study, Cheiron examined:

- CPI-U data – from 1950 to 2015, plus geometric average annual increases for the period ending 2015 for various lengths of time (ranging from last 10 years to last 50 years),
- Wage inflation data – plan specific (MainePERS) and 2003-2014 increase in average wages as reported by the Social Security Administration.
- Market proxy (difference in yields between conventional Treasury securities and Treasury Inflation-Protected Securities (TIPS)),
- Professional forecasters' expectations for inflation over the next 10 years (as of the third quarter of calendar 2015) as published by the Federal Reserve Bank of Philadelphia
- Assumptions from 139 large public pension plans in the Center for Retirement Research's Public Plans Database
- Social Security Administration's Trustee Reports
- Industry trends (National Conference on Public Employees Retirement Systems (NCPERS) November 2015 study and Boston College's Center for Retirement research 2013 database)
- Interaction of the inflation assumption on COLA and amortization payments

Cheiron concluded that a reasonable price inflation assumption would be between 2.50% and 3.50% per year and recommended an assumption of 2.75% per year. This same 2.75% inflation assumption is still used for the June 30, 2020 actuarial valuations.

A report titled *Survey of Capital Market Assumptions – 2020 Edition*, which was published in July 2020 by Horizon Actuarial Services, LLC and focuses on Taft-Hartley plans, summarizes the capital market and inflation expectation survey results of 39 different investment firms (21 investment firms provided only short-term [5-10 year] assumptions, while 18 provided both short- and long-term [20+ years] assumptions). Among the surveyed firms, the report shows an average inflation assumption of approximately 1.97% (short-term) and 2.16% (long-term).

The MainePERS assumption is approximately 59 basis points higher than the average long-term assumption among the Horizon survey respondents. However, the 2020 Social Security Trustee Report used CPI assumptions of 1.8%, 2.4%, and 3.0% for their low-, intermediate-, and high-cost scenarios, demonstrating that the 2.75% assumption for MainePERS is within the realm of reasonable assumptions.

When reviewing these assumptions, it is important to understand their significance and impact on the valuation results. For general inflation, a higher assumption may permit a higher discount rate assumption (decreases liability and normal cost) but also may necessitate a higher COLA assumption (increases liability and normal cost). Changes to the price inflation assumption would also impact the payroll growth assumption and, consequently, the unfunded liability amortization payment component of the developed contribution.

*We believe the price inflation assumption of 2.75% is reasonable. We agree with the Board's process of reviewing this assumption at least annually.*

### **Wage inflation**

A wage inflation assumption is used in actuarial valuations to estimate the amount by which the increase in average wages will exceed general price increases. This net difference is often referred to as the productivity component of wage inflation and is generally how we will address the wage inflation assumption in this section. Such an assumption is often warranted in actuarial valuations since, historically, national wages have accelerated faster than prices over the long-term.

Wage inflation impacts the valuations in two ways. First, wage inflation is a component of individual salary increases (salary scale). Larger salary increases over a member's career translate into higher projected retirement benefits which, in turn, result in higher accrued liability and normal cost. Secondly, wage inflation is a component of the payroll growth assumption, which is used to amortize the unfunded accrued liability.

Cheiron notes in the 2016 experience study that the productivity component of wage inflation in recent years (at the time of the study publication) had been zero or negative and that it was their belief that constrained government budgets may extend that trend into the foreseeable future. As such, the June 30, 2020 actuarial valuation includes zero margin for productivity and uses the same assumption for both the price and wage inflation.

However, Cheiron also notes that the lower rates from 2011 to 2014 for MainePERS were due to a three-year wage freeze.

*Given that the 2.75% price inflation assumption resides at the higher end of the spectrum of expectations among surveyed investment firms and other experts, we believe the proposed assumption of zero additional wage inflation above price inflation is reasonable.*

### **Payroll growth**

The payroll growth assumption is used for determining the annual increase in the unfunded liability amortization payment component of the developed contribution.

ASOP 27 states "the actuary should use an assumption that is consistent with but typically not identical to the compensation increase assumption. One approach to setting the payroll growth assumption may be to reduce the compensation increase assumption by the effect of any assumed merit increases." Such an assumption is appropriate for an open group projection and is consistent with the methodology employed by MainePERS: the compensation increase assumption = 2.75% inflation + merit increases. Setting the payroll growth assumption to 2.75% is consistent with the compensation increase assumption.

*We believe the assumption proposed is both reasonable and appropriate.*

### **Cost-of-living adjustment**

The State Employee and Teacher Retirement Program, as well as the Legislative Retirement Program and the Judicial Retirement Program, provide post-retirement benefit increases to individuals in payment. These increases, referred to as cost-of-living adjustments (COLA), are based on the increase in the Consumer Price Index (CPI), are subject to a maximum increase of 3%, cannot be negative (if CPI decreases, the decrease is recouped via a reduction in future CPI increases applied as COLAs), and are applicable on the minimum of the benefit amount and the COLA cap. The COLA cap for 2020 is \$22,810.25 and the cap amount is indexed using the same CPI basis as is used to increase benefits. As such, the COLA methodology is essentially equivalent to providing a compound COLA on the minimum of the benefit amount at the date of the first COLA and the COLA cap at that time. Finally, for members who had 10 years of service on July 1, 1993, the COLA is first payable on September 1<sup>st</sup> after 12 months in payment; while, for those that didn't have 10 years of service on July 1, 1993, the COLA is first payable on the September 1<sup>st</sup> after 12 months following the later of benefit commencement and normal retirement age.

Some of the regular and special plans within the Consolidated Plan for Participating Local Districts (PLD) also provide a COLA. The maximum COLA increase is 2.5% (rather than 3%) but the COLA is not limited by a dollar threshold cap.

To account for the maximum increases of 3.0% and 2.5%, the assumption for general price inflation is reduced by 55 and 59 basis points, respectively, to arrive at the COLA assumptions used in the June 30, 2020 valuations of 2.20% and 1.91% for (1) all plans except the PLD and (2) the PLD, respectively. Cheiron arrived at these specific assumptions based on a stochastic projection using the lognormal distribution.

*The basis point reductions to the price inflation assumption to develop the COLA assumptions are appropriate given that the maximum increases are 25 basis points above and 25 basis points below, respectively, the price inflation assumption.*

### **Discount rate**

The discount rate (often used synonymously with *investment return assumption*) is generally the most impactful assumption in an actuarial valuation. It is used to determine the value, in dollars as of the valuation date, of the estimated future pension benefits paid from the plan by discounting the expected payment amounts from their expected payment dates to the valuation date.

Public sector pension actuaries often use the terms *discount rate assumption* and *investment return assumption* interchangeably since, for many public sector pension plans, the discount rate assumption is set equal to the expected return assumption in order to minimize expected gains and losses and reduce contribution volatility. However, they are two distinct assumptions (covered in separate sections, 3.8 [Selecting an Investment Return Assumption] and 3.9 [Selecting a Discount Rate], of ASOP 27) and the application of such an equivalence in a valuation merely demonstrates that, for the purpose of the valuation, the pension payouts (plan liabilities) are valued in relation to the expected return on assets.

Section 3.8 of ASOP 27 (Selection of Economic Assumptions for Measuring Pension Obligations) lists a series of considerations when determining the investment return assumption, such as inflation, illiquidity, credit risk, macroeconomic conditions, investment volatility, investment manager performance, expenses, and others. Many of these considerations can be reviewed through an analysis of the expected return and volatility of returns for the plan's assets based on a target allocation of investments, which is often stated in the plan's investment policy.

Based on the target allocation stated in the MainePERS investment policy, which was most recently amended on January 14, 2021, MainePERS's investment advisor, Cambridge Associates, calculates an expected blended average annual compound return of 7.3%. We note that Cambridge Associates' capital market assumptions (CMAs) assume 3.0% annual inflation. If Cambridge Associates instead used MainePERS's general inflation assumption of 2.75%, the CMAs and blended portfolio return would be lower.

As an independent review of this assumption, we used the CMAs provided in Horizon Actuarial Services' *Survey of Capital Market Assumptions – 2020 Edition* to develop an expected portfolio geometric return based on the policy targets. Although this survey was developed for Taft-Hartley plans, the long-term investment approach and relative size of these funds is consistent with MainePERS.

MainePERS	Policy Target	Horizon Mapping
<b>Growth</b>		
Public Equity	30.0%	22.5% US Equity Large Cap 7.5% Us Equity Small/Mid Cap
Private Equity	15.0%	Private Equity
<i>Total Growth</i>	45.0%	
<b>Diversifiers</b>	7.5%	US Corporate Bond – Core
<b>Hard Assets</b>		
Infrastructure	10.0%	Infrastructure
Real Estate	10.0%	Real Estate
Natural Resources	5.0%	Commodities
<i>Total Hard Assets</i>	25.0%	
<b>Credit</b>		
Traditional Credit	7.5%	US Corporate Bond – Core
Alternative Credit	7.5%	US Corporate Bond – High Yield
<i>Total Credit</i>	15.0%	
<b>Monetary Hedge</b>	7.5%	

Using this mapping, we calculated MainePERS’s expected geometric return returns to be 6.15% and 7.02% for short-term [5-10 year] and long-term [20+ years] time horizons, respectively.

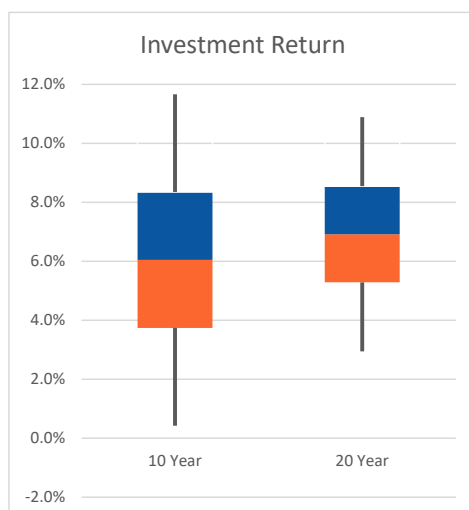
Some plan sponsors prefer a more conservative assumption for their funding valuations since contribution requirements increase following years in which investment returns do not meet the assumption. As such, they set the discount rate assumption lower than the expected investment return to increase the probability that the fund’s return will meet or exceed the discount rate. From a fiduciary standpoint, the number one goal of a pension system is to adequately and systematically fund the plan to ensure that promised benefits can be paid in full. Achieving this goal often entails the consideration of supporting, and sometimes competing, objectives, such as mitigating undo pressure on the sponsor, participants, or other stakeholders and balancing contribution development and volatility with intergenerational equity.

The table below summarizes Horizon’s CMAs and our derivation of MainePERS portfolio return. In our calculations, to convert between the portfolio arithmetic (A) and geometric (G) return, we used the formula (mentioned in ASOP 27)  $G \approx A - V/2$ , where V is the portfolio variance.

Horizon Asset Class	Target Allocation	Arithmetic Return		
		10 Year	20 Year	St. Dev
US Equity - Large Cap	22.5%	7.40%	8.36%	16.22%
US Equity – Small/Mid Cap	7.5%	8.76%	9.54%	20.22%
US Corp Bonds - Core	15.0%	2.75%	3.74%	5.47%
US Corp Bonds – High Yield	7.5%	5.36%	6.14%	9.75%
US Treasuries (Cash Equiv)	5.0%	1.59%	2.28%	1.78%
TIPS	2.5%	2.16%	2.94%	6.05%
Real Estate	10.0%	7.15%	7.91%	16.84%
Commodities	5.0%	4.70%	5.60%	17.60%
Infrastructure	10.0%	7.97%	8.45%	14.58%
Private Equity	15.0%	11.42%	12.54%	21.9%
<b>Total</b>	<b>100.00%</b>			
<b>Portfolio Arithmetic Return</b>		<b>6.73%</b>	<b>7.60%</b>	
Portfolio Variance				1.17%
Portfolio Standard Deviation				10.81%
<b>Portfolio Geometric Return (Net of Investment expenses)</b>		<b>6.15%</b>	<b>7.02%</b>	
<b>Administrative Expenses*</b>		0.10%	0.10%	
<b>Portfolio Return Gross of Administrative Expenses</b>		<b>6.05%</b>	<b>6.92%</b>	

\*Estimated using the administrative expenses over the past several years.

Using the calculated portfolio standard deviation of 10.81%, we estimated the 25<sup>th</sup>, 35<sup>th</sup>, 50<sup>th</sup>, 65<sup>th</sup>, and 75<sup>th</sup> percentiles for the portfolio geometric return for both the 10-year and 20-year investment horizons.



While the return assumption is based on forward-looking capital market assumptions and the target asset allocation, a review of actual asset performance in comparison to the expected rate of return provides additional context. In the experience study, Cheiron graphed the historical returns from 1992 to 2015 against the assumed return on page 6 of the 2016 experience study.

Cheiron also highlighted the evolution of the risk premium (the amount by which the assumed return exceeds the yield on 10-year Treasuries), benchmarked MainePERS against peers using the *NASRA Public Pension Plan Investment Return Assumptions - February 2016*, and analyzed the impact of cash flows on returns.

*The rate of return used for the June 30, 2020 valuation is 6.75%, net of investment and administrative expenses. Based on the above analysis, we believe that the discount rate assumption is both reasonable and appropriate.*

### **Demographic Assumptions**

We compared the June 30, 2020 actuarial valuation assumptions for each plan to the assumptions derived in the June 30, 2015 experience study (2016 experience study) and determined that the demographic assumptions used for the valuations match the corresponding assumptions.

Generally, actuarial assumptions should reflect expected future experience. Consequently, unless the employer wishes to implement a conservative funding strategy which includes a contingency for adverse deviation the assumptions should reflect the actuary's best estimate of future experience. Given that Cheiron's assumption recommendations in the 2016 experience study are "best estimates" developed from recent experience (2012-2015), they do not contain significant bias and are appropriate for the purpose of the valuation measurements.

The 2016 experience study reviewed the following demographic assumptions:

- Merit salary increases
- Retirement rates
- Termination rates
- Disability rates
- Pre-retirement mortality
- Post-retirement healthy mortality
- Post-retirement disabled mortality

The recommendations of the experience study are based on experience in conjunction with the actuary's professional judgement. For instance, determining (1) an appropriate number of years of data to include in the study for each decrement, (2) the minimum number of decrements<sup>2</sup> per number of exposure units for credibility<sup>3</sup> and (3) reasonable Actual/Expected (A/E) and r-squared thresholds, which, when surpassed, warrant consideration of a change to the assumption, are left to the actuary's judgement. Additionally, trends or results that appear to be correlated to specific events are analyzed in the overall context of the decrement experience.

The salary increases and retirement, disability, and termination decrements differ by plan as each plan has different pay scales and eligibility and benefit provisions. The mortality decrements are determined separately for Teachers and non-Teachers, for males and females, for healthy and disabled retirees, and for active (and terminated vested) employees.

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<sup>2</sup> A decrement, such as termination, retirement, disability, or death, defines how an individual leaves active employment.

<sup>3</sup> ASOP 25 (Credibility Procedures) defines credibility as "[a] measure of the predictive value in a given application that the actuary attaches to a particular set of data (*predictive* is used here in the statistical sense and not in the sense of predicting the future)."

The 2016 experience study, however, did not provide any insight into the selection of the 10% Workers Compensation offset used in determining the disability benefits, the 5% and 20% work-related death assumption, the 80% percent marriage assumption, the 3-year age difference of the participant and spouse, the assumed payment options upon retirement, or the vacation and sick leave crediting. While not every assumption needs to be studied, these are discussed further under disability, pre-retirement death, and at the end of this section.

We believe that the methodologies applied for reviewing assumptions (using A/E ratios and r-squared statistics) and recommending assumptions (based on best estimates) are reasonable and appropriate. A review of assumptions should also consider other factors which are specific to each type of assumption and are addressed by the ASOPs.

ASOP 35 (Selection of Demographic and other Non-Economic Assumptions), section 3.3.5, provides the criteria for a reasonable assumption:

- a. It is appropriate for the purpose of the measurement;
- b. It reflects the actuary's professional judgment;
- c. It takes into account historical and current demographic data that is relevant as of the measurement date;
- d. It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data (if any), or a combination thereof; and
- e. It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included (as discussed in section 3.10.1) and disclosed under section 4.1.1 or when alternative assumptions are used for the assessment of risk.

*We believe that the primary demographic assumptions noted above that are used in the June 30, 2020 actuarial valuation reports are reasonable as defined by ASOP 35 (Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations). A review of each demographic assumption and our commentary is provided below.*

*In two instances (salary scale for Teachers and termination rate for State Special groups) the rates used in the calculations were not the same as those disclosed in one or both of the actuarial valuation or the experience study reports. These assumptions should be documented and the reason for the differences provided.*

### **Merit salary increases**

The salary scale assumption is generally made up of the following components:

- Price inflation
- Wage inflation in excess of price inflation, or productivity
- Merit increases

Since we reviewed the first two components in the *Economic Assumptions* section above, the focus for this section will be the merit increase assumption.

In conducting its September 2016 experience study, Cheiron examined historical merit increases for 2012-2015 by backing off from the total salary increase the deemed productivity increase. Cheiron calculated the deemed productivity increase as the increase in the average wage for all of the plans combined. Cheiron's approach of using a single productivity assumption for all plans is reasonable given that productivity increases are influenced by broad economic conditions.

Cheiron's review of historical merit increases excluded periods prior to 2012 due to (1) the lack of available consistent data prior to that time and (2) the implementation of the state employee pay freeze in earlier years, an outlier that could misrepresent future payroll.

In general, merit increases often differ by job classification (i.e. teachers generally have different merit/promotion scales than other general state employees, judges, and legislatures) and are often a function of age, service, or a combination of both. Cheiron analyzed data separately for teachers, state employees, and Consolidated PLD employees and examined age and service separately as predictors of merit increases. In the text, Cheiron notes that they "found age to be a better fit than service for these plans" but, given that the graphs and recommended scales are based on service, we believe the text is a typo.

Cheiron's proposed merit increase assumptions for teachers and state employees, which were later adopted by MainePERS, generally fell between the prior assumption and actual experience, while the proposed assumption for Consolidated PLD employees was generally lower than both the prior assumption and actual experience. The experience study does not provide any commentary on the assumption for the Judicial Retirement Program or Legislative Retirement Program presumably because the salaries for judges and legislators are set by law and generally indexed for inflation. As such, annual salary increase assumptions for judges and legislators are based solely on price inflation (2.75%) and do not include any additional increases for merit.

We find that the approach taken, considerations given, and resulting rates developed by Cheiron for the salary scale are appropriate for the valuations. For all four plans, the assumptions used are based on those recommended in the 2016 experience study adopted by the Board.

*Note, however, that salary scale for Teachers used in the calculations does not match the valuation report but does match the 2016 experience study. The valuation report should be updated.*

*Also, we recommend that Cheiron consider future expectations (i.e., current or proposed step increases) in addition to historical experience in future experience studies.*

### **Retirement rates for active participants**

The retirement rates assumption used for determining liabilities for active members differs by plan and is generally based on age and service. For all four plans, the assumptions used are based on those recommended in the 2016 experience study adopted by the Board.

The Teachers and Regular State Employees share combined retirement rates for each of the three Tiers. The retirement rates for Special State Employees under the 1998 Special Plan and the 25 & Out Plan are determined separately due to their early retirement timing provisions.

The other Special State Employees (Inland Fisheries and Wildlife Officers, Forest Rangers, and Fire Marshalls) share simplified rates of 50% per year once eligible for unreduced benefits and ultimately 100% at age 75; this is a reasonable approach for such a small group where there is no credible basis to establish more customized rates.

The PLD Plan also separated the retirement rates for the Regular Employees and the Special Employees. Each of the groups are credible enough to set customized rates. The retirement rates for the Regular Plans are age-based for Tier 1 and 2 with an ultimate rate of 100% at age

70. The retirement rates for the Special Plans are service-based generally beginning at 20 years of service with an ultimate 100% at 35 years of service.

The Legislative Plan has a unique complexity that all members are up for reelection every two years and that there is a term limit of four consecutive terms. First, the retirement rates are applied only on the biennial years, with 0% in the other years. Second, the term limit allows for more simplified retirement rates such as the 25% per year rate starting at age 57 and ultimately 100% at age 70.

The Judicial Plan has a unique population from the other plans due to their older age at becoming a judge and their ability to remain actively employed longer. There are many fewer participants in this plan, and it is reasonable to have simplified retirement rates such as the 100% per year over age 60 for Tier 1, 50% per year over age 62 for Tier 2, and 50% per year over age 65 for Tier 3, ultimately with 100% assumed at age 75 (instead of age 70).

In accordance with ASOP 35, the retirement rates take into account occupation (the rates are each designed around an occupation or a similar group of occupations), plan design (e.g., reflecting unreduced early retirement, length of service and/or Tiers), and nuances of the covered populations (e.g., Legislative election periods, older judges remaining on the bench). We believe the selected retirement rates for each of the Plans is reasonably supported and follows ASOP 35.

#### **Retirement rates for terminated vested participants**

The provisions of the Plans do not allow for commencement prior to Normal Retirement for those who terminate prior to Early Retirement eligibility. There is no allowance for growing into early retirement provisions. Thus, all deferred vested benefits are assumed payable at Normal Retirement. This assumption is consistent and appropriate with the provisions of the plans.

#### **Termination Rates**

Termination rates have a medium impact on the plans' liabilities.

The Teacher and State (Regular and Special) Employees were combined to determine their termination rates. Particularly with Teachers, there is ample support that there is very high turnover in the first five years of employment, and evidence that this tapers off after about 10 years. For this plan, there is a 33.5% assumed termination per year in the first five years, lowering to a still-high 10.5% for the next five years, and then tapering rapidly down to 4% per year until retirement eligibility. The 2016 experience study supports this.

*Note, however, that the initial termination rate (31.5%) used in the calculations for participants in the Special 25&Out Plan and Special 1998 Plan is not documented in the 2016 experience study or the valuation report.*

The PLD Regular Plan employees show evidence of moderately high turnover in the first five years (25% in the first year, reducing to 10% by the fifth year), but then tapering down to 2.5% once obtaining 20 years of service.

The PLD Special Plan shows a similar pattern but tapering more quickly in the first five years (25% in the first year, reducing to 5% by the fifth year). Participants are generally only eligible to participate in the Special Plans through "named positions" which imply longer service incentives due to higher status jobs.

Legislative Plan employees, as noted previously, follow a biennial pattern of employment. Termination rates are assumed zero for the first two years and are then service-based applicable only in the odd fiscal years and zero in even fiscal years. As a result, there is high turnover assumed each year from two years of service through five (25%-30%).

Due to the nature of the term limit of four consecutive terms, there is a noticeable increase in terminations at the 8 year mark (50% termination assumed). Since experience shows that many legislators have non-consecutive terms or carried over service from another Plan, there is continued high termination (25%) each year thereafter.

Judicial Plan employees are a much older population to begin with, and since judgeship is often considered the pinnacle of one's career, members tend to stay in the position beyond typical retirement ages for other occupations. The termination rates used for the employees of this plan are age-based and are very low. Since the group is small, there is no credible experience to further customize the rates.

In all plans, nonvested terminations are assumed to take a refund of their contributions with interest. These refunds are assumed to occur immediately on the valuation date. Based on the number of Inactives Due Refunds in each of the plans and the high level of rehires, a significant number of terminations are not paid out immediately after termination. From a liability standpoint, assuming later distributions of these refunds, with credited interest into the future and then discounting back to the valuation date, would not produce materially different valuation results. If one were to review expected cash flows for investment studies, the immediate refund assumption would not be a reasonable assumption. Following ASOP 35, for the purposes of these annual valuations, we believe this assumption is reasonable.

### **Disability rates**

The two largest plans have an assumption for disability which is based on age. Teachers, State Regular Employees, State Special Plan Employees, and PLD participants were each reviewed separately within their groups. For plans of this size, it is reasonable to use different rates for each plan and for each subgroup that has credible experience.

The Legislative and Judicial Plans have small enough groups that there is no credible experience to set disability rates. The retained actuary took the simplifying assumption that there would be no disability rates for these two plans. This is a reasonable assumption for these plan sizes.

For Teachers, the incidence of disability is very low under age 40 (less than 0.05% per year) then accelerates up to age 60 near 0.2%. The two State Employees groups begin higher (0.05%-0.15%) through age 40 then accelerate up to age 60 near 0.45%. The PLD group is much more variable, starting low similar to Teachers at less than 0.05% per year up through age 40, but then accelerating up to age 60 to 0.65%. To keep perspective, even at the worst years this is still less than 1% incidence per year.

The MainePERS disability retirement benefits are generous, at either 2/3 or 59% multiplied by final average compensation, less any amounts paid by Workers Compensation or Social Security. This benefit is payable immediately and continues until the participant's continued accrual retirement benefit would surpass it, taking over at the higher amount for the rest of their lifetime.

The actuary includes an additional assumption to approximate the Workers Compensation offset. The actuary assumes that 10% of the disability benefits will be covered by Workers Compensation.

It is prudent of the actuary to reflect an assumption for this offset. However, we see no supportive evidence of the 10% selection in the valuation reports or the 2016 experience study. Since the incidence of disability is so small, fine tuning of the Workers Compensation assumption will have no material impact. We recommend the actuary (perhaps with assistance from the plan administrator) document the establishment of the 10%.

In general, we believe the disability assumptions for the large groups, including an assumption for the Workers Compensation offset, and the omission of disability assumptions for the small groups are both reasonable and appropriate.

### **Mortality**

A mortality assumption is comprised of two parts: the base rate gives the probability of death for each age as of a base year, the mortality improvement scale quantifies how mortality will improve in the future. The concept is a person age 65 now has a higher probability of death than a person who is age 65 in the year 2030, for example. Due to advances in medicine and better nutrition, the probability of death (for each age) is expected to decrease each successive year. The rate at which the probability of death decreases is quantified by the mortality improvement scale.

Very large plans can develop their own base mortality tables using the plan's own experience and combine that with a mortality improvement scale. The amount of data needed for this experience review to be credible is exceedingly large. Only the largest plans can attempt this granular level of detail. Even with a population the size of all the MainePERS plans combined, full credibility would be difficult to achieve. The retained actuary of the MainePERS plans took the approach of comparing the experience of the MainePERS to various industry standard mortality tables created by the Society of Actuaries.

There are three types of mortality that the actuary applies:

- Healthy annuitant mortality, for men and women
- Disabled annuitant mortality, for men and women
- Pre-retirement (employee) mortality, for men and women

The actuary prepared a robust amount-weighted analysis in their 2016 experience study and settled on the RP-2014 Total Dataset generational mortality tables and the MP-2015 mortality improvement scale, separate for males and females.

### **Base mortality rates**

The MainePERS mortality experience available did show that annuitants of the Teachers group did have slightly lower mortality than the standard table, and that the non-Teacher annuitants had somewhat higher mortality than the standard table. The actuary applied loads to the standard mortality rates to customize for the nuances of each group without needing to provide a fully credible mortality data set. For the disabled annuitants, the actuary combined all groups and only separated for gender.

Since there was less experience to review for the active populations, the actuary applied the same annuitant load factors to the non-annuitant (pre-retirement/employee) rates. We think this is a reasonable approach.

The following table summarizes the base mortality rates used for all classes of participants for the June 30, 2020 actuarial valuation reports:

	Male	Female
<b>Teachers</b>		
Healthy Annuitants	99% of RP-2014 Total Dataset Healthy Annuitant	99% of RP-2014 Total Dataset Healthy Annuitant
Disabled Annuitants	108% of RP-2014 Total Dataset Disabled Annuitant	105% of RP-2014 Total Dataset Disabled Annuitant
Non-Annuitants	99% of RP-2014 Total Dataset Employee	99% of RP-2014 Total Dataset Employee
<b>Non-Teachers*</b>		
Healthy Annuitants	104% of RP-2014 Total Dataset Healthy Annuitant	120% of RP-2014 Total Dataset Healthy Annuitant
Disabled Annuitants	108% of RP-2014 Total Dataset Disabled Annuitant	105% of RP-2014 Total Dataset Disabled Annuitant
Non-Annuitants	104% of RP-2014 Total Dataset Employee	120% of RP-2014 Total Dataset Employee

\*Non-Teachers include State (Regular and Special Plan) Employees, PLD, Legislative, and Judicial Plans

These base rates are supported by the 2016 experience study and are, therefore, reasonable for the valuations.

### Improvement scale

The mortality improvement scale uses the MP-2015 table. This was selected during the 2016 experience study, as it was the most recently published improvement scale at the time. While it may not have been known when the 2016 experience study was published that the Society of Actuaries was going to provide updated improvement scales every year, the actuary should have considered reflecting updated improvement scales for each year's valuation in the years that followed when that information became understood. However, if the assumptions require Board approval, then the need for this annual update could be diminished. Based on similar retirement benefit plans, from 2016 through 2020 each year's updated mortality improvement scale has lowered each year's liabilities about 0.5%.

### Work-related mortality

For the active lives, there is a further assumption of mortality to approximate work-place deaths. The plans have alternate provisions for pre-retirement accidental death while active or disabled from an injury received in the line of duty.

- For Teachers, State Regular, PLD Regular, Legislative, and Judicial: 5% of the deaths are assumed to occur in the course of employment
- For State Special and PLD Special: 20% of the deaths are assumed occur in the course of employment

Since there is a more generous death benefit provision for work-related mortality, it is prudent for the actuary to make an assumption to capture this benefit. The selection of the 5% and 20%, however, does not have any supportive evidence provided in the valuation reports or in the 2016 experience study. While pre-retirement death benefits are not a substantial liability, and fine tuning of this assumption will not produce any material impact, we still recommend the actuary review this assumption in the next experience study to validate or update.

Overall, we believe each of the mortality assumptions, including improvement scale and work-related death apportionment, are reasonable for the purposes of these annual valuations.

### **Family composition**

The percent married and age difference assumptions are used to value the likelihood of a member having a spouse at retirement, and, along with the dependency assumption, to estimate the additional payment stream for pre and post retirement survivor benefits after the death of the member.

#### **Percent married**

The 80% marriage assumption applies across all plans. The 80% doesn't have any supportive evidence provided in the valuation reports or in the 2016 experience study. Based on the June 30, 2020 census data, there are roughly 60% of the in pay lives with survivor benefits. From the liability standpoint of a pension plan, the percent married isn't an overly material assumption, but should still reflect a reasonable expectation of the covered population. Availability of designating non-spouse beneficiaries for survivor benefits should also be reflected in this assumption. We recommend reviewing this assumption in the next experience study to validate or update.

#### **Spousal age difference**

The assumed age difference between a participant and their spouse has even more limited materiality on the benefit liability. A three-year age difference (husbands older than wives) is a common assumption and is sometimes considered a default to use if no credible experience can be reviewed. Reviewing this assumption for this size group (all plans combined) can be performed at the same time as reviewing the marriage assumption.

#### **Dependents**

As noted in the last section, there is a separate benefit for the pre-retirement death due to a work-related incident. This benefit is tiered based on whether there are dependent children and whether there is a spouse. The actuary provides very detailed assumptions that the dependents are children born when the participant was 24 and 28 and that they are assumed to continue to be deemed as dependents until age 18. This specificity is unusual, but due to the immateriality of the liability driven from this benefit, the assumption does not affect the validity of the overall results. We see no evidence to support this selection and assume it is based on actuarial judgement.

### **Payment form assumptions**

The normal form of benefit under all the plans is a single life annuity. However, assuming all future retirees will elect a single life annuity is not internally consistent with an assumption of 80% married. The optional forms of payment are determined to be actuarial equivalent to each other, so this difference creates no material impact on the liabilities developed.

Based on the June 30, 2020 census data across all plans, there are 36,230 inactive records denoted as "retiree" of which 16,669 have a "full benefit" single life annuity payment option selected, about 46%. Recognizing that many other in pay records are current beneficiaries and survivors of already deceased retirees, the overall percent of current retirees with a single payment option is closer to 40% (the compliment of the 60% noted as married in the previous section).

MainePERS has many available optional forms for a retiree to select, most of which have survivor continuation. We think a more reasonable assumption would be to designate a percent will elect a 50% (or 100%) joint and survivor option and the remainder selecting a single life annuity. It is generally not necessary or efficient to set an assumption for each available payment form, but the most representative one or two should be considered.

The percent married and age difference assumptions become more material when expanding the form of payment assumption.

- For example, the Teachers active group is roughly 80% female; introducing a joint and survivor payment form would spread the reduced benefit over the female participant's life and then over an older male spouse's remaining lifetime.
- The opposite example would be the Judicial active group that is roughly 70% male; introducing a joint and survivor payment form would spread the reduced benefit over the male participant's life and then over a younger female spouse's remaining lifetime which could be many more years.

In general, each of the optional forms are determined to be actuarially equivalent to each other. Thus, adding complexity to this assumption has a very small impact on each of the plans' liabilities, and would likely lower the liabilities a small amount.

It is a best practice to consider assumptions that are reasonable individually and in aggregate to ensure internal consistency.

### **Vacation and sick leave credits**

Participants in the State Employee and Teacher Plan who worked at least ten years of service as of July 1, 1993 have unused vacation and sick leave included in the determination of their final average compensation; no other State Employee or Teacher, or participant of the PLD, Legislative, or Judicial Plans have this pay included in their retirement benefits. In valuing liabilities, the retained actuary approximates this alternate compensation provision by increasing applicable projected retirement benefits by 0.48% for State Regular Employees and by 0.75% for Teachers.

While there is no documentation in the valuation report or the 2016 experience study as to where these figures come from, it appears to be an increase of approximately 2-3 days of additional compensation. This provision is only available to a closed group of participants and we presume the assumption was based on actual experience of how much of an increase is typically applied to the benefits of these participants.

Since this is essentially an additional benefit, it is prudent for the actuary to reflect a small liability load to approximate the provision. Since fine tuning of the assumption will have no material impact, we believe the assumed loads are reasonable unless actual experience proves otherwise. We recommend the actuary (with assistance from the plan administrator) review the actual financial implication of a sampling of retirement calculations to confirm that these approximations don't materially increase over time.

## Section VI. Comments on 2020 Actuarial Valuation Reports

The reports are highly detailed and provide a thorough review of the computations and methodology being used. They contain details on all of the key aspects of the valuations.

We found that the four reports were consistent in the presentation and ordering of information for primary results making them easy for a reader to follow. The information was clear and the results and tables in each report were internally consistent. The ADC amounts and rates determined in the reports followed the methodology and procedures described in the reports. The risk analysis is thorough and provides a good deal of historical information (for PLD and State). We reviewed the reports for compliance with the applicable ASOPs and made the following conclusions:

- ASOP 4 Measuring Pension Plan Obligations – in compliance
- ASOP 23 Data Quality – the report addresses ASOP 23 and meets the standards set by this ASOP (see Data Review section of this report for more detail).
- ASOP 27 Economic Assumptions – in compliance
- ASOP 35 Demographic Assumptions – in compliance
- ASOP 41 Actuarial Communications – the report meets the requirements for actuarial communications set out in ASOP 41.
- ASOP 44 Selection and Use of Asset Valuation Methods – Section III of each report discloses and describes the computation of the Asset Valuation method. We believe the Asset Valuation method complies with ASOP 44 (see the Funding Methods of the report for more detail).
- ASOP 51 Assessment and Disclosure of Risk – Section II of each report provides a risk assessment and disclosure. The reports provide disclosures that we believe are within the scope of ASOP 51 and would be deemed to meet the Standard.
- ASOP 56 Modeling – This ASOP requires a disclosure of certain aspects of any modeling used in the development of the figures and results shown in the report. The ASOP was effective for any reports published on or after October 1, 2020. The current reports are dated October 15, 2020. As a result, we would have expected to see a disclosure and description of the modeling used in the valuation process. **We recommend this disclosure be added to future reports to comply with this ASOP.** (We do note, however, that the 2021 Experience Study dated June 8, 2021 does contain the necessary ASOP 56 disclosures.)

*Our primary finding is that the reports meet the actuarial standards and are suitable for the purposes defined. However, ASOP 56 disclosure should be added to future reports.*

We did have several secondary findings that should be taken as suggestions for possible improvements in future years:

1. **Enhance reports to include biennial actuarial contribution rate development:** The actual biennial contribution rates used to determine the actual contributions deposited in the trust are not determined in any of the reports. All are under “separate cover” (based on the prior valuation adjusted and using preliminary assets).

This reduces the relevancy of the annual valuation reports. Consider adding those computations to the reports. Also, the connection between the PLD report and the ADC is unclear. Inclusion of the Risk Sharing methodology for this plan should be considered.

2. **Clarify usage of Entry Age Actuarial Liabilities and Present Value of Accrued Benefits:** The reports all included both the Entry Age Actuarial Liability (EA AL) and the Present Value of Accrued Benefits (PVAB) in displays. For funding and GASB accounting purposes, generally only the EA AL is applicable. Consider moving the PVAB to a separate section so it will not create confusion. Alternatively consider a more in-depth explanation of the purpose of showing the PVAB.
3. **Provide more detail on the source of gains and losses.** All four plans had charts showing the annual gains or losses. However, all the non-investment gains/losses were lumped together each year and no or very limited description of the source of any deviations was provided. This makes it difficult to ascertain how the plan is doing on a year-to-year basis. It also obscures whether there are offsetting gains and losses that may be worth discussing. For example, for the State plan the loss for the year is very small (\$162,000) but that is because there was a gain for the Teacher's group of \$51,874,000 and a loss for the State Employee's group of \$52,036,000. The payroll levels for the State Employees, Regular plan, group were up 11% implying a loss that may or may not have been offset by other demographic experience.
4. **Enhance the description and disclosure of the Initial Unpooled Unfunded Actuarial Liabilities (IUUAL) in the PLD report.** The report mentions that some of the PLD are still paying on these but does not provide any information as to amounts or timing. Page 29 of the report says that the payments are on a separate side schedule and are not shown as part of the contribution rate. Rather, they are included as a receivable contribution that is already included in the plan assets. The asset information in Section II and in Section VI does not contain any reference to the IUUAL payments. Since the assets are pooled across all four plans, it is unclear whether this mean that the receivable contribution is potentially a credit for the other three plans or is it restricted to the PLD.
5. **Enhancements for Judicial and Legislative reports:** Section II of each report provides a detailed description of risks. The reports for the State and PLD also provide historical risk measures and benchmarking against peer organizations. However, the reports for the two smaller plans (Judicial and Legislative) do not provide any historical or benchmarking references. The ASOP allows the actuary to make judgments as to the level of disclosure needed. We believe including several years of comparative information for the two smaller plans would help improve the overall disclosure and understanding of each plan's risk status.

In addition, the Net Cash Flow ratio was described for all four plans but the ratio itself was only provided for the two larger plans. We recommend this be added. While the Net Cash Flow on the overall pooled assets is likely not overly impacted by the two smaller plans, we believe the reports will be more complete and self-supporting if this metric is included.

The Judicial and Legislative reports describe the use of an amortization schedule but do not show the table. To be consistent with the other reports, the table should be shown.



Finally, in the Appendix (Membership Information), the Judicial and Legislative reports do not include many of the tables and charts shown in the PLD and State reports. Consider including them for cohesiveness and full disclosure of information

## Section VII. Comments on Experience Studies

### Overview

We received a copy of the two most recent experience studies:

1. Study of June 30, 2012 to June 30, 2015 MainePERS experience prepared by Cheiron dated September 14, 2016
2. Study of June 30, 2015 to June 30, 2020 MainePERS experience prepared by Cheiron dated June 8, 2021

The September 2016 experience study supports the assumptions used in the June 30, 2020 actuarial valuations of the plans. The June 2021 experience study will support the assumptions used in the June 30, 2021 actuarial valuations of the plans. The scope of work for this audit requested focus on the most recent study, however, in our review of the actuarial assumptions in the 2020 valuation we have included some commentary on the 2016 experience study (see Section V).

Overall, the analysis performed in the study is thorough and reasonable and meets Actuarial Standards of Practice. It addresses many of the findings from the prior actuarial audit such as including exposures and considering gender-based termination assumptions and headcount weighted vs. benefits weighted experience analysis.

However, there is one section of the June 2021 study that is not clear. The Employee Mortality rates discussion contains no justification for the adjustment percentages shown in this section (91.9% and 93.1% for teachers and 86.6% and 83.5% for non-teachers). We contacted Cheiron during our audit asking for clarification. Cheiron indicated they will update this section of the report to clarify how the application and derivation of the adjustment percentages for Employee Mortality rates.

We also suggest the actuary consider making the following enhancements to the next experience study.

1. **Review of “miscellaneous” assumptions:** The body of the experience study report does not discuss analysis of the Family Composition Assumptions, Vacation/Sick Leave Credits assumption, the Technical and Miscellaneous Assumptions. The study also did not discuss the assumption for Workers Compensation benefits offsetting disability benefits or line of duty death assumptions. The Summary of Assumptions in Appendix A of the study indicate that there were no changes proposed to these assumptions except for the Member Contribution Interest Rate, but there is no discussion supporting the recommendation for no changes. We recognize that the Actuarial Standards of Practice do not require rationale for assumptions that do not have a significant effect on the measurement of liabilities but suggest that some discussion of each assumption would be informative.
2. **Review of actuarial methods:** Many experience studies include a discussion of actuarial methods (cost method, amortization methods and asset method), but the Cheiron studies (2021 and prior) do not include this review. We will mention this in our report but perhaps MainePERS could comment on the requirements in the experience study scope of work and whether this analysis was purposely excluded.

- 3. Financial impact of assumption changes:** Changes in assumptions typically change the plan's liabilities and the contribution requirements. We suggest enhancing the report to include the impact of the changes on the Plan/Program liabilities and contribution rates.

*We found Cheiron's experience study report thorough and in compliance with Actuarial Standards of Practice.*

*We suggest several enhancements to provide further support for the assumptions and methods as well as the financial impact of the assumption changes.*

## Section VIII. Conclusions

This partial replication audit reviewed the data used, the benefits valued, and the actuarial methods and assumptions employed in the June 30, 2020 actuarial valuations. With a few exceptions, the 55 sample lives provided by the actuary reflect the plan provisions of the applicable plans as stated in the 2020 actuarial valuation reports. Similarly, these sample lives also demonstrate, with a few exceptions, the appropriate application of the actuarial assumptions to the benefits as stated in the valuation report. Using the 55 samples, we were able to produce a *relatively* close match for key valuation metrics in total among the samples, but our model results deviated more than anticipated from Cheiron's for several samples. In the *Results by Participant* subsection of *Section IV. Review of Sample Lives*, we note the sources of deviation (if known). Overall, the actuarial assumptions, methods, and procedures are reasonable and reflect the benefit promises made to the System members.

The primary finding of the audit of the four MainePERS 2020 actuarial reports is that they meet all applicable standards and are reasonable and complete. However, throughout this report we provided detailed suggestions for your consideration. Below we summarize these suggestions.

### Data Review

1. Review the salary used in the valuation model. The salary used to value benefits for the July 1, 2020 to June 30, 2021 plan years appears to be understated to us. This salary is also the basis for projecting salaries in future years. We understand that Cheiron is using the greater of the prior year's earnable compensation and Annual Salary. We understand that Annual Salary is based on a participant's payrate for their last pay period in June 2020 times their contracted working period. Annual Salary does not include other types of remuneration that participants typically earn. For example, Annual Salary does not include overtime or additional pay above a participants expected contract service. We compared Annual Salary to the prior year's earnable compensation and found it to be less than earnable compensation for over 50% of the full time population. For these reasons, we believe the salary used for the July 1, 2020 to June 30, 2021 period is understated.
2. Provide more transparency surrounding the Inactives Due Refunds.
3. Correct minor service calculation error in data file for the Judicial members.
4. Provide additional documentation for Legislative members for determine the average valuation pay statistics in the second session years.
5. Review the average age for beneficiaries in the State Program and the average age for pre-retirement death beneficiaries in the Teachers Program, Consolidated PLD Plan, and Legislative Program.
6. Consider enhancing the data reconciliation tables to explain the difference in the numbers on the "New deferred vested members" line. The number of active members leaving active service is less than the total number of new terminated vested members.

We presented additional minor observations and suggestions for improvement in Section III of the report, however, we understand that with large plans the data will not be perfect.

## Review of Sample Lives

7. Consider enhancing the valuation model to reflect the actual timing of the application of the assumed cost-of-living adjustment (COLA) to benefits.
8. Consider revising the salary used in the valuation model for the Legislative Retirement Program. The salary used to calculate benefits for members in the Legislative Retirement Program is generally understated in the June 30, 2020 valuation as it is based on the lower pay associated with the second session of the biennium legislature rather than the higher pay associated with the first session.
9. Update the valuation model coding to address the fact that the liability due to the termination decrement for the sample lives in the Consolidated PLD plans that do not provide COLA is low due to the inadvertent application of early retirement factors to deferred annuities.

We have identified other, generally minor, coding discrepancies such as termination rates and salary scales that do not match those disclosed in the valuation reports and suggest that Cheiron review those findings to determine whether changes to the valuation coding and/or changes to the valuation reports are warranted.

## Funding Methods

10. Amortization of Unfunded Actuarial Accrued Liability
  - a. Enhance descriptions in the valuation reports concerning the assumed annual increase in amortization payments, assumed payment timing and the amortization periods for assumption and plan changes.
  - b. Reflect the immediate payment for the cost of benefit changes in the contribution calculations.
  - c. Consider longer amortization period for surpluses.
11. Asset valuation method
  - d. Consider changing the rolling smoothing period to a closed period.
  - e. Add a corridor around market value of assets.
12. Ensure that actuarial reports and contribution development methods support the Board's goal of each plan being between 105% and 115% funded.

## Assumptions

13. Ensure that all salary scale and decrement rates used in the calculations are the same as those approved in the experience study and disclosed in the actuarial valuation report.
14. Review the percent married and spouse age different assumptions.
15. Update the calculations to take into consideration the fact that a portion of the members will elect an optional form of payment that includes a survivor benefit.

## Actuarial Valuation Reports

16. Add ASOP 56 disclosure.
17. Enhance reports to include biennial actuarial contribution rate development.
18. Clarify the usage of the Entry Age Actuarial Liabilities and the Present Value of Accrued Benefits.
19. Provide more detail on the source of gains and losses.
20. Enhance the description and disclosure of the Initial Unpooled Unfunded Actuarial Liabilities (IUUAL) in the PLD report.
21. Enhance the Judicial and Legislative reports to include historical risk measures and benchmarking, the Net Cash Flow ratio, an amortization schedule, and additional membership charts.

## Experience Study

22. Include a discussion of the “miscellaneous” assumptions not detailed in the June 2021 experience study.
23. Include a review of actuarial methods in the experience study.
24. Include the financial impact of the assumption changes in the experience study.

We are available to discuss any aspect of our review with MainePERS or the MainePERS retained actuary.

## Appendices

### Appendix I – Complete Summary of Findings

This partial replication audit reviewed the data used, the benefits valued, and the actuarial methods and assumptions employed in the June 30, 2020 actuarial valuations. The primary findings of the audit are summarized in the Executive Summary and Conclusion sections of the report. Other, less impactful findings are discussed in the body of the report. This appendix lists out all of the findings, recommendations and suggestions found throughout the report. It is important to read the discussion in the report for each of these items in order to have the proper background and ensure a full understanding of the finding or recommendation.

#### Future Audits

1. As noted in item 3 of the Executive Summary, we recommend that future audits include a review of the computations that develop the biennial contributions rates.

#### Data Review

2. Review the salary used in the valuation model. The salary used to value benefits for the July 1, 2020 to June 30, 2021 plan years appears to be understated to us. This salary is also the basis for projecting salaries in future years. We understand that Cheiron is using the greater of the prior year's earnable compensation and Annual Salary. We understand that Annual Salary is based on a participant's payrate for their last pay period in June 2020 times their contracted working period. Annual Salary does not include other types of remuneration that participants typically earn. For example, Annual Salary does not include overtime or additional pay above a participants expected contract service. We compared Annual Salary to the prior year's earnable compensation and found it to be less than earnable compensation for over 50% of the full time population. For these reasons, we believe the salary used for the July 1 ,2020 to June 30, 2021 period is understated.
3. Correct the definition of the "Annual Salary" field found in the data manual.
4. Provide more transparency surrounding the Inactives Due Refunds.
5. Monitor resumption of issuing refunds to nonvested terminated employees if not rehired within three years.
6. Correct minor service calculation error in data file for the Judicial members.
7. Provide additional documentation for Legislative members for determine the average valuation pay statistics in the second session years.
8. Consider reviewing the consistency of including or excluding inactive records with less than \$12 annual benefit. State and PLD programs exclude these de minimis inactive records whereas the Teachers program includes them.

9. Consider updating wording in the data manual for handling of Fire Marshalls in the 1998 Special Plan section after the recent plan change.
10. Consider adding clarification in the data manual for those with a December 31 Stop Date following a June 30 Termination Date of the same year but who do not have multiple records. This particularly occurs with PLD. For the June 30, 2020 actuarial valuation, these participants were retained as active employees. This may be a reasonable approach in light of several dozen rehired members each year.
11. Consider enhancing the data reconciliation tables to explain the difference in the numbers on the “New deferred vested members” line. The number of active members leaving active service is less than the total number of new terminated vested members.
12. Recommend expanding the ASOP 23 certification.

## Review of Sample Lives

13. Consider enhancing the valuation model to reflect the actual timing of the application of the assumed cost-of-living adjustment (COLA) to benefits.
  - a. For September 1 COLA effective dates
  - b. For delayed COLA effective dates for inactive members (in particular, for the Consolidated PLD Plan)
14. Consider revising the salary used in the valuation model for the Legislative Retirement Program. The salary used to calculate benefits for members in the Legislative Retirement Program is generally understated in the June 30, 2020 valuation as it is based on the lower pay associated with the second session of the biennium legislature rather than the higher pay associated with the first session.
15. Update the valuation model coding to address the fact that the liability due to the termination decrement for the sample lives in the Consolidated PLD plans that do not provide COLA is low due to the inadvertent application of early retirement factors to deferred annuities.
16. We have identified other, generally minor, coding discrepancies for individual participants (see the detailed results by participant in Section IV). We suggest that Cheiron review the findings to determine whether changes to the valuation coding and/or changes to the valuation reports are warranted.
  - a. The salary scale in the Teacher sample lives provided does not match the salary scale assumption presented in the valuation report or the table provided by Cheiron at the beginning of this engagement. However, the salary scale used in the samples seems to align with the graph of the proposed salary scale assumptions in the September 2016 experience study.
  - b. The termination rates for the sample life in the State Employees Special 25 & Out Plan do not match the termination rate table presented in the valuation report, the table in the September 2016 experience study, or the table provided by Cheiron at the beginning of this engagement.

- c. The termination rates for the sample lives in the State Employees Special 1998 Plan do not match the termination rate table presented in the valuation report, the table in the September 2016 experience study, or the table provided by Cheiron at the beginning of this engagement.
- d. Consider valuing the greater of the employee contribution refund and retirement annuity, rather than just the retirement annuity, for current terminated vested members.
- e. Review the liability due to the ordinary death decrement for one of the Judge samples as it appears to be low.
- f. Legislative salary [see 14 above].
- g. Consolidated PLD liability due to the termination decrement [see 15 above].
- h. Consider whether service from the prior plan should be converted to service in the new plan for benefit eligibility and benefit determination purposes for a Consolidated PLD member with both Regular plan and Special plan service.
- i. Consider whether the service from the prior plan should be converted to service in the new plan for benefit eligibility purposes for a Consolidated PLD member with service in multiple Special plans.
- j. Review the liability due to the termination decrement for the sample life in the Consolidated PLD Special Plan 4 as it appears to be low (potentially due to a similar reason as the reason noted in 15 above).
- k. Delayed COLA effective date [see 13.b. above].

## Funding Methods

### 17. Actuarial Cost Method

- a. Review the description of the entry age normal funding method in each valuation report to ensure it accurately describes the actual calculations.
- b. Consider providing further details on “salary” and “payroll” used in the calculations.

### 18. Amortization of Unfunded Actuarial Accrued Liability

- a. Enhance descriptions in the valuation reports concerning the assumed annual increase in amortization payments, assumed payment timing and the amortization periods for assumption and plan changes.
- b. Reflect the immediate payment for the cost of benefit changes in the contribution calculations.
- c. Consider longer amortization period for surpluses.

### 19. Asset valuation method

- a. Consider changing the rolling smoothing period to a closed period.
- b. Consider adding a corridor around market value of assets.

### 20. Ensure that actuarial reports and contribution development methods support the Board’s goal of each plan being between 105% and 115% funded.

## Assumptions

- 21. Ensure that all salary scale and decrement rates used in the calculations are the same as those approved in the experience study and disclosed in the actuarial valuation report.

22. When reviewing the salary scale in future experience studies, consider future expectations (i.e., current or proposed step increases) in addition to historical experience.
23. Review the percent married and spouse age difference assumptions.
24. Considering updating the calculations to take into consideration the fact that a portion of the members will elect an optional form of payment that includes a survivor benefit.

### Actuarial Valuation Reports

25. Add ASOP 56 disclosure.
26. Enhance reports to include biennial actuarial contribution rate development.
27. Clarify the usage of the Entry Age Actuarial Liabilities and the Present Value of Accrued Benefits.
28. Provide more detail on the source of gains and losses.
29. Enhance the description and disclosure of the Initial Unpooled Unfunded Actuarial Liabilities (IUUAL) in the PLD report.
30. Enhance the Judicial and Legislative reports to include historical risk measures and benchmarking, the Net Cash Flow ratio, an amortization schedule, and additional membership charts.

### Experience Study

31. Include a discussion of the “miscellaneous” assumptions not detailed in the June 2021 experience study.
32. Include a review of actuarial methods in the experience study.
33. Include the financial impact of the assumption changes in the experience study.



## Appendix II – CCA Public Pension Plans White Paper



**Conference of Consulting Actuaries  
Public Plans Community (CCA PPC)**

# **Actuarial Funding Policies and Practices for Public Pension Plans**

October 2014



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*Paul Angelo*



*Tom Lowman*

## An Open Letter

**From: Paul Angelo, Chair and  
Tom Lowman, Vice Chair Conference of  
Consulting Actuaries Public Plans Community**

**To: Interested Parties in the Public Pension Arena**

**Re: Public Plans Community White Paper on  
Public Pension Funding Policy**

On behalf of the Conference of Consulting Actuaries' Public Plans Community (CCA PPC), the following "White Paper" is presented to provide guidance to policymakers and other interested parties on the development of actuarially based funding policies for public pension plans. The CCA PPC includes over 50 leading actuaries whose firms are responsible for the actuarial services provided to the majority of public-sector retirement systems in the US. All of the major actuarial firms serving the public sector are represented in the CCA PPC as well as in-house actuaries from several state plans. As a result, the CCA PPC represents a broad cross section of public-sector actuaries with extensive experience providing valuation and consulting services to public plans, and it is that experience that provides the knowledge base for this paper.

The White Paper is based on over two years of extensive and detailed funding policy discussions among the members of the CCA PPC, and reflects the experience of those members in providing actuarial consulting services to state and local public pension plans throughout the US. While there were naturally disagreements and compromises during those discussions, the White Paper reflects the resulting majority opinions of the CCA PPC as developed through those discussions. We believe this White Paper reflects a substantial consensus among the actuaries who provide valuation and consulting services to public pension plans.

This White Paper represents groundbreaking actuarial research in that it develops a principles based, empirically grounded Level Cost Allocation Model (LCAM) for use as a basis for funding policies for public pension plans throughout the US. In particular, we believe that the funding policies developed herein could serve as a rigorously defensible basis for an "actuarially determined contribution" under Statements 67 and 68 of the Governmental Accounting Standards Board.

The distinguishing feature of this approach is that it begins with stated policy objectives and then develops specific policy guidance consistent with those objectives. One of the main results is that an effective funding policy often represents a balancing of policy objectives. Another is that adherence to the policy objectives may lead to a narrower range of acceptable practices than is sometimes found in current practice.

The LCAM White Paper is intended to provide guidance not just in the evaluation of particular current policy practices but also in the development of actuarially based funding policies in a consistent and rational manner. For that reason, the reader is strongly encouraged to focus not only on the specific practice guidance but also on the detailed discussions and rationales that lead to that guidance. Also note that while this discussion is comprehensive it is not all-inclusive. There is a list of "items for future discussion" at the end of the paper. In addition, there may be other "level cost allocation models" that are appropriate in some circumstances.

The CCA PPC would like to acknowledge and thank the California Actuarial Advisory Panel for their seminal work in developing the principles-based level cost allocation model on which this White Paper is based. We also thank all the members of the Conference of Consulting Actuaries Public Plans Community who helped in the development of this paper.

# Introduction

This “white paper” is based on funding policy discussions among the members of the Conference of Consulting Actuaries Public Plans Community (CCA PPC) and reflects the majority opinions the CCA PPC members<sup>1</sup>. Those discussions relied heavily upon and generally concurred with the funding policy white paper prepared by the California Actuarial Advisory Panel (CAAP) and the level cost allocation model developed therein<sup>2</sup>. For that reason, the CCA PPC has chosen to build directly on the CAAP document in developing its own funding policy guidance.

The CCA PPC wishes to express its sincere appreciation to the CAAP for its seminal work in preparing a principles-based funding policy development. However, while much of the text of this CCA PPC white paper comes directly from the CAAP document, this white paper is presented solely as the majority opinions of the CCA PPC.

This CCA PPC white paper is intended for a national audience, as part of a nation-wide review and discussion of funding policies for public pension plans. Our hope is that the principles and policies developed herein may provide an actuarial basis for others developing funding practices and that legislative, regulatory and other industry groups may build these concepts into their guidance.

This white paper develops the principal elements and parameters of an actuarial funding policy<sup>3</sup> for US public pension plans. It includes the development of a Level Cost Allocation Model (LCAM) as a basis for setting funding policies. This white paper does not address policy issues related to benefit plans where a member’s benefits are not funded during the member’s

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*1 These comments were developed through the coordinated efforts of the Conference of Consulting Actuaries’ (CCA) Public Plans Steering Committee. However, these comments do not necessarily reflect the views of the CCA, the CCA’s members, or any employers of CCA members, and should not be construed as being endorsed by any of those parties.*

*2 See “Actuarial Funding Policies and Practices for Public Pension and OPEB Plans and Level Cost Allocation Model” at [http://www.sco.ca.gov/caap\\_resources.html](http://www.sco.ca.gov/caap_resources.html)*

*3 As used in this paper, an “actuarial funding policy” has the same meaning as a “Contribution Allocation Procedure” as defined in the Actuarial Standards of Practice (ASOPs). We further note that the actuarial policies that determine the level and timing of contributions must also include policies related to setting the actuarial assumptions. As noted at the end of this section, this paper does not address policies and practices related to setting actuarial assumptions.*

working career, e.g., plans receiving “pay-as-you-go” funding or “terminal” funding.

While this white paper develops guidance primarily for pension plans, we believe the general policy objectives presented here are applicable to the funding of OPEB plans as well. However, application of those policy objectives to OPEB plans may result in different specific funding policies based on plan design, legal status and other features distinctive to OPEB plans. We encourage those involved in the valuation and funding of OPEB plans to consider the applicability to those plans of the policy guidance developed here.

Some pension plans have contributions rates that are set on a fixed basis, rather than being regularly reset to a specific, actuarially determined rate. The CCA PPC believes that such plans should develop an actuarially determined contribution rate for comparison to the fixed rate. However, this white paper does not address procedures for evaluating that comparison, or for determining whether the fixed rate is sufficient or when and how the fixed rate should be changed. The CCA PPC intends to prepare a separate white paper on fixed rate plans including these considerations.

As developed here the LCAM is a level cost actuarial methodology<sup>4</sup>, which is consistent with well-established actuarial practice. The LCAM is a principles-based mathematical model of pension cost. The model policy elements are developed in a logical sequence based on stated general policy objectives, and in a manner consistent with primary factors that affect the cost of the pension obligation.

The particular model that we develop is based on a combination of policy objectives and policy elements that has been tested over many years and, we believe, is well understood and broadly applicable. However, there are other models and policy objectives that

practitioners may use that are internally consistent and may be as appropriate in some circumstances as the model that is developed herein, and it is not our intention to discourage consideration of such other policies<sup>5</sup>. Furthermore, there are situations where the policy parameters developed herein may require additional analysis to establish the appropriate parameters for each such situation<sup>6</sup>. It is up to the actuary to apply professional judgment to the particulars of the situation and recommend the most appropriate policies for that situation, including considerations of materiality.

Our approach begins with identifying the policy objectives of such a funding policy, and then evaluating the structure and parameters for each of the particular policy elements in a manner consistent with those objectives, as well as with current and emerging actuarial science and governing actuarial standards of practice.

This white paper is intended as advice to actuaries and retirement boards<sup>7</sup> in the setting of funding policy. While the analysis is somewhat restrictive in the categorization of practices, this guidance is not intended to supplant or replace the applicable Actuarial Standards of Practice (ASOPs). Like all opinions of the CCA PPC, this guidance is nonbinding and advisory only. Furthermore, it is not intended as a basis for litigation, and should not be referenced in a litigation context.

Given the wide range of such policies currently in practice in the U.S., this development also acknowledges that plan sponsors and retirement boards may require some level of policy flexibility

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<sup>4</sup> Here a “level cost actuarial methodology” is characterized by economic assumptions based on the long term expected experience of the plan and a cost allocation designed to produce a level cost over an employee’s active service. This is in contrast to a “market-consistent” actuarial methodology where economic assumptions are based on observations of current market interest rates, and costs are allocated based on the (non-level) present value of an employee’s accrued benefit.

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<sup>5</sup> In particular, the LCAM developed here incorporates the widely prevalent practice of managing asset volatility directly through the use of an asset smoothing policy element. Some practitioners are developing direct contribution rate smoothing techniques as an alternative to asset smoothing. The CCA PPC is considering development of a separate white paper on direct smoothing as an alternative to asset smoothing.

<sup>6</sup> For example, plans that are closed to new entrants may require additional analyses and forecasts to determine whether the policy parameters herein provide for adequate funding.

<sup>7</sup> Here “retirement boards” is meant to refer generally to whatever governing bodies have authority to set funding policy for public sector plans.

to reflect both their specific policy objectives and their individual circumstances. To accommodate that need for reasonable flexibility and yet also provide substantive guidance, this development evaluates various policy element structures and parameters or ranges according to the following categories:

- LCAM Model practices (i.e., practices most consistent with the LCAM developed herein)
- Acceptable practices
- Acceptable practices, with conditions
- Non-recommended practices
- Unacceptable practices.

These categories are best understood in the context of the different elements that comprise an actuarial funding policy and the various policy alternatives for each of those policy elements. They are intended to assist in the evaluation of specific policy elements and parameters relative to the general policy objectives stated herein, and are developed separately for each of the three principal policy elements discussed in this white paper (cost methods, asset smoothing methods and amortization policy). They are not intended as a grading or scoring mechanism for a system's overall actuarial funding policy.

Generally, throughout this discussion, "model practices" means those practices most consistent with general policy objectives and the LCAM as developed here based on those policy objectives<sup>8</sup>. Acceptable practices are generally those that while not fully consistent with the LCAM as developed here, are well established in practice and typically do not require additional analysis to demonstrate their consistency with the general policy objectives. Practices that are acceptable with conditions may be acceptable in some circumstances, on the basis of additional analysis to show consistency with the general policy objectives or to address risks or concerns associated with the practices. Systems that adopt practices that under this

model analysis are not recommended should consider doing so with the understanding that they reflect policy objectives different from those on which this LCAM is based or should consider the policy concerns identified herein.

This evaluation of practice elements and parameters was developed in relation to the LCAM and its general policy objectives, based on experience with the many independent public plans sponsored by states, counties, cities and other local public employers in the US, and is intended to have general applicability to such plans. However, for some plans, special circumstances or situations may apply. The specific applicability of the results developed here should be evaluated by their governing boards based on the advice of their actuaries.

Note that while the selection of actuarial assumptions is an essential part of actuarial policy for a public sector pension plan, the selection of actuarial assumptions is outside the scope of this discussion. For example, a pension plan should perform a comprehensive review of both economic and demographic assumptions on a regular basis as part of its actuarial policies. Another important consideration in determining a plan's funding requirements is the plan's investment policy and related investment portfolio risks. While actuarial assumptions, plan investments and even benefit design are all elements that affect funding requirements, they are beyond the scope of this paper.

This white paper is also not intended to address the measurement of liabilities for purposes other than funding, e.g., settlement obligations or other market-consistent measures<sup>9</sup>.

Finally note that some retirement systems have features that may require funding policy provisions and analyses that are not specifically addressed herein. One example is systems with "gain sharing" provisions whereby favorable investment experience is used as the basis for increasing member benefits and/or reducing employer and/or member contributions. The policies developed here should not be interpreted as being adequate to address these plan features without additional analysis specific to those features.

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<sup>8</sup> Some commentators have interpreted "model practices" as synonymous with "best practices." That is not the intent of this categorization of practices. Given their circumstances retirement boards may find that other practices, particularly those categorized and acceptable or acceptable with conditions, are considered both appropriate and reasonably consistent with the policy objectives stated herein.

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<sup>9</sup> See footnote 4

## **Transition Policies**

In order to avoid undue disruption to a sponsor's budget, it may not be feasible to adopt policies consistent with this white paper without some sort of transition from current policies. For example, a plan using longer than model amortization periods could adopt model periods for future unfunded liabilities while continuing the current (declining) periods for the current unfunded liabilities. Such transition policies should be developed with the advice of the actuary in a manner consistent with the principles developed herein. We have included in our discussion transition policies appropriate to each of the principal policy elements.

# General Policy Objectives

The following are policy objectives that apply generally to all elements of the funding policy. Objectives specific to each principal policy element are identified in the discussion of that policy element.

1. The principal goal of a funding policy is that future contributions and current plan assets should be sufficient to provide for all benefits expected to be paid to members and their beneficiaries when due.
2. The funding policy should seek a reasonable allocation of the cost of benefits and the required funding to the years of service (i.e. demographic matching). This includes the goal that annual contributions should, to the extent reasonably possible, maintain a close relationship to the both the expected cost of each year of service and to variations around that expected cost.
3. The funding policy should seek to manage and control future contribution volatility (i.e., have costs emerge as a level percentage of payroll) to the extent reasonably possible, consistent with other policy goals.
4. The funding policy should support the general public policy goals of accountability and transparency. While these terms can be difficult to define in general, here the meaning includes that each element of the funding policy should be clear both as to intent and effect, and that each should allow an assessment of whether, how and when the plan sponsor is expected to meet the funding requirements of the plan.
5. The funding policy should take into consideration the nature of public sector pension plans and their governance. These governance issues include (1) agency risk issues associated with the desire of interested parties (agents) to influence the cost calculations in directions viewed as consistent with their particular interests, and (2) the need for a sustained budgeting commitment from plan sponsors.

Policy objective 1 means that contributions should include the cost of current service plus a series of amortization payments or credits to fully fund or recognize any unfunded or overfunded past service costs (note that the latter is often described as "Surplus").

Policy objectives 2 and 3 reflect two aspects of the general policy objective of interperiod equity (IPE). The "demographic matching" goal of policy objective 2 promotes intergenerational IPE, which seeks to have each generation of taxpayers incur the cost of benefits for the employees who provide services

## GENERAL POLICY OBJECTIVES

to those taxpayers, rather than deferring those costs to future taxpayers. The “volatility management” goal of policy objective 3 promotes period-to-period IPE, which seeks to have the cost incurred by taxpayers in any period compare equitably to the cost for just before and after.

These two aspects of IPE will tend to move funding policy in opposite directions. Thus the combined effect of policy objectives 2 and 3 is to seek an appropriate balance between intergenerational and period-to-period IPE, that is, between demographic matching and volatility management.

Policy objective 3 (and the resulting objective of balancing policy objectives 2 and 3) depends on the presumed ongoing status of the public sector plan and its sponsors. The level of volatility management appropriate to a funding policy may be less for plans where this presumption does not apply, e.g., plans that are closed to new entrants.

Policy objective 4 will generally favor policies that allow a clear identification and understanding of the distinct role of each policy component in managing both the expected cost of current service and any unexpected variations in those costs, as measured by any unfunded or overfunded past service costs. Such policies can enhance the credibility and objectivity of the cost calculations, which is also supportive of policy objective 5.

Policy objective 5 seeks to enhance a retirement board’s ability to resist and defend against efforts to influence the determination of plan costs in a manner or direction inconsistent with the other policy objectives. This favors policies based on a cost model where the parameters are set in reference to factors that affect costs rather than the particular cost result. This separation between the selection of model parameters and the resulting costs enhances the objectivity of the cost results. As a result, any attempt to influence those results must address the objective parameters rather than the cost result itself.

A common example of agency risk is that, because plan sponsors may be more aware of and responsive to the interests of current versus future taxpayers, there

may be incentives to defer necessary contributions to future periods. This may be countered by avoiding policy changes that selectively reduce contributions.

For plans with an ongoing service cost for active members, policy objective 5 also reflects a policy objective to avoid encumbering for other uses the budgetary resources necessary to support that ongoing service cost. This introduces an asymmetry between funding policies for unfunded liabilities versus surpluses, which is discussed in the policy development for surplus amortization.

Note that the model funding policies developed here are substantially driven by these policy objectives. In some situations other plan features or policies (e.g., investment policy, reserving requirements, and plan maturity) may also be a consideration in setting funding policy. Such considerations are not addressed in this analysis.

# Principal Elements of Actuarial Funding Policy

The type of comprehensive actuarial funding policy developed here is made up of three components:

1. An **actuarial cost method**, which allocates the total present value of future benefits to each year (Normal Cost) including all past years (Actuarial Accrued Liability or AAL).
2. An **asset smoothing method**, which reduces the effect of short term market volatility while still tracking the overall movement of the market value of plan assets.
3. An **amortization policy**, which determines the length of time and the structure of the increase or decrease in contributions required to systematically (1) fund any Unfunded Actuarial Accrued Liability or UAAL, or (2) recognize any Surplus, i.e., any assets in excess of the AAL.

An actuarial funding policy can also include some form of "direct rate smoothing" in addition to both asset smoothing and UAAL/Surplus amortization. Two types of this form of direct rate smoothing policies were evaluated for this development:

1. Phase-in of certain extraordinary changes in contribution rates, e.g., phasing-in the effect of assumption changes element over a three year period.
2. Contribution "collar" where contribution rate changes are limited to a specified amount or percentage from year to year.

As noted earlier, it is also possible to use direct contribution rate smoothing techniques as an *alternative* to asset smoothing, rather than in addition to asset smoothing. While that approach is outside the scope of this discussion, the CCA PPC is considering development of a separate white paper on direct rate smoothing as an alternative to asset smoothing.

# Actuarial Cost Method

The Actuarial Cost Method allocates the total present value of future benefits to each year (Normal Cost) including all past years (Actuarial Accrued Liability<sup>1</sup> or AAL).

## Specific policy objectives and considerations

1. Each participant's benefit should be funded under a reasonable allocation method by the expected retirement date(s), assuming all assumptions are met.
2. Pay-related benefit costs should reflect anticipated pay at anticipated decrement.
3. The expected cost of each year of service (generally known as the Normal Cost or service cost) for each active member should be reasonably related to the expected cost of that member's benefit.
4. The member's Normal Cost should emerge as a level percentage of member compensation<sup>2</sup>.
5. No gains or losses should occur if all assumptions are met, except for:
  - a. Investment gains and losses deferred under an asset smoothing method consistent with these model practices, or
  - b. Contribution losses or gains due to a routine lag between the actuarial valuation date and the date that any new contributions rates are implemented, or
  - c. Contribution losses or gains due to the phase-in of a contribution increase or decrease.
6. The cost method should allow for a comparison between plan assets and the accumulated value of past Normal Costs for current participants, generally known as the Actuarial Accrued Liability (AAL).

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<sup>1</sup> Here "liability" indicates that this is a measure of the accrued (normal) cost while "actuarial" distinguishes this from other possible measures of liability: legal, accounting, etc.

<sup>2</sup> This objective applies most clearly to benefits (like, for example, most public pension benefits) that are determined and budgeted for as a percentage of individual and aggregate salary, respectively. For benefits that are not pay related it may be appropriate to modify this objective and the resulting policies accordingly.

## Discussion

1. Any actuarial cost model for retirement benefits begins with construction of a series or array of Normal Costs that, if funded each year, under certain stability conditions will be sufficient to fund all projected benefits for current active members. The following considerations serve to specify the cost model developed here.
  - a. The usual stability conditions are that the current benefit structures and actuarial assumptions have always been in effect, the benefit structures will remain in effect, and future experience will match the actuarial assumptions. Special considerations apply if in the past the benefit structure has been changed for current active members changing the benefits for members with service after some fixed date.
  - b. Consistent with Cost Method policy objective #3 and with the general policy objective of transparency, the Normal Cost for each member is based on the benefit structure for that member. This means that a separate Normal Cost array is developed for each tier of benefits within a plan. This argues against Ultimate Entry Age, where Normal Cost is based on an open tier of benefits even for members not in that open tier.
  - c. Consistent with Cost Method policy objective #4, the Normal Cost is developed as a level percentage of pay for each member, so that the Normal Cost rate for each member (as a percentage of pay) is designed to be the same for all years of service. This provides for a more stable Normal Cost rate for the benefit tier in case of changing active member demographics. This argues against Projected Unit Credit.
    - d. Also consistent with Cost Method policy objective #4, the Normal Cost for all types of benefits incurred at all ages is developed as a level percentage of the member's career compensation. This argues against funding to decrement. For plans with a DROP (Deferred Retirement Option Program) this also argues for allocating Normal Cost over all years of employment, including those after a member enters a DROP.
    - e. Consistent with Cost Method policy objective #6, the Normal Cost is developed independent of plan assets, and the Actuarial Accrued Liability (and so also the UAAL) is based on the Normal Costs developed for past years. This argues against Aggregate and FIL as model practices.
      - i. These methods should be considered as a fundamentally different approach to the determination and funding of variations from Normal Cost.
      - ii. Plans using these methods should also measure and disclose costs and liabilities under the Entry Age method, similar to the requirements of current accounting standards.
    - f. Historical practice includes the use of a variation of the Entry Age method (an "Aggregated" Entry Age method) where the Normal Cost and AAL are first determined for each member in a tier of benefits under the usual Entry Age method. However, the actual Normal Cost for the tier is then determined as the Normal Cost rate for the tier applied to the compensation for the tier, where the Normal Cost rate for the tier of benefits is determined as the present value of future Normal Costs for all active members in the tier, divided by the present value of compensation for all members in the tier.
      - i. This variation introduces an inconsistency between the Normal Cost that is funded and the Normal Cost on which the AAL is based.
      - ii. This inconsistency can be shown to produce small but systematic gains or losses, generally losses.

## ACTUARIAL COST METHOD

2. Consistent with all the above, under the cost model developed here the Normal Cost rate would change only when the projected benefits for the tier change either in amounts or in present value.
  - a. The Normal Cost rate (both in total and by member) will vary from valuation to valuation due to demographic experience and assumption changes.
  - b. The Normal Cost rate will not change when an individual member reaches an age or service where, under the consistent benefit structure for the member's tier, the member's benefit eligibility or accrual rate changes. This is because that event was anticipated in the projected benefits for the tier, so that the projected benefits are substantially unaffected by such predictable changes in eligibility or benefit accrual.
  - c. Similarly the Normal Cost rate for a member should be unaffected by the closing of the member's tier and the creation of a new tier for future hires, as discussed under item 1.b above.
  - d. However, if the benefit structure of a continuing, open tier is changed for members with service after some fixed date, then the Normal Cost rate should change to reflect the unanticipated change in projected benefits for members in the tier<sup>3</sup>. This calls for an extension or variation of the Entry Age method in order to value this type of benefit change.
    - i. There are two methods in practice to adjust the Normal Cost rate for this type of plan change. While a detailed analysis of these two variations is beyond the scope of this discussion, our summary conclusions are:
      - A. The "replacement life" Entry Age method would base the Normal Cost on the new benefit structure as though it had always been in place, thereby producing a consistent Normal Cost rate for all members in the tier. This has the advantages of a change in Normal Cost (both individual and total) more consistent with what would be expected for a change in future benefit accruals, a stable future Normal Cost rate for the tier and a relatively smaller (compared to the alternative) change in Actuarial Accrued Liability. Its disadvantages are that it may be more complicated to explain and to implement.
      - B. The "averaged" Entry Age method would base each member's Normal Cost on the new projected benefit for that member, thereby producing a different Normal Cost rate for different members in the tier, based generally on their service at the time of the change in benefit structure. The advantages and disadvantages are essentially the reverse of those for the replacement life version of Entry Age. The change in Normal Cost is less than what would be expected for a change in future benefit accruals, the future Normal Cost rate for the tier will be unstable (as it eventually reaches the same rate as under the replacement life variation) and there is a relatively larger (compared to the alternative) change in Actuarial Accrued Liability. Its advantages are that it may be less complicated to explain and to implement (where the latter may depend on the valuation software used).
3. While not recommended for funding, the Normal Cost under the Ultimate Entry Age method discussed above may nonetheless be useful when a new open tier is adopted for future hires. The combined normal cost rate for the open and closed tiers (as determined under the LCAM Entry Age method) will change over time as members of the closed tier are replaced by members in the new tier. This will result in an increasing or decreasing

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<sup>3</sup> Note that, as of this writing, for public sector pension plans this is relatively uncommon because of legal protections that are understood to apply both to accrued benefits and to future benefit accruals for current members.

## ACTUARIAL COST METHOD

combined normal cost rate (depending on whether the new tier has higher or lower benefits), consistent with the transition of the workforce over time to the new benefit level. However, the Ultimate Entry Age method Normal Cost for the combined tiers will reflect the expected long term Normal Cost for the entire workforce (unlike the LCAM Normal Cost which reflects only the recent hires in the new tier). For that reason, Normal Cost under Ultimate Entry Age may be useful for projecting longer-term costs or for evaluating a fixed contribution rate.

### Practices

Based on the above discussion, and consistent with the policy objectives, actuarial cost methods and parameters are categorized as follows:

#### LCAM Model Practices

- Entry Age cost method with level percentage of pay Normal Cost.
  - Normal Costs are level even if benefit accrual or eligibility changes with age or service.
  - All types and incidences of benefits are funded over a single measure of expected future service<sup>4</sup>.
  - The Normal Cost for a tier of benefits is the sum of the individually determined Normal Costs for all members in that tier.
  - Exception: for plans with benefits unrelated to compensation the Entry Age method with level dollar Normal Cost may be more appropriate.
- For multiple tiers:
  - Normal Cost is based on each member's benefit.
- For benefit formula or structure changes within a tier (generally after a fixed date):

- Normal Cost is based on current benefit structure (replacement life Entry Age<sup>5</sup>).

#### Acceptable Practices

- Aggregate cost method: Plans using the Aggregate method should disclose costs and liabilities determined under the Entry Age method.
  - Calculate Normal Cost and UAAL under Entry Age method.
  - Determine single amortization period for the Entry Age UAAL that, combined with the Entry Age Normal Cost, is equivalent to Aggregate method Normal Cost.
- Frozen Initial Liability cost method: This method should disclose costs and liabilities under the Entry Age method.
  - Calculate Normal Cost and UAAL under Entry Age method.
  - Deduct the FIL amortization bases from the Entry Age UAAL.
  - Determine single amortization period for the remaining Entry Age UAAL that, combined with the Entry Age Normal Cost, is equivalent to FIL method Normal Cost.
- Funding to Decrement Entry Age method, where each type and incidence of benefit is funded to each age at decrement.
  - This method may be appropriate for some plan designs or for plans closed to new entrants<sup>6</sup>.
- For benefit formula or structure changes within a tier (generally after a fixed date):

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<sup>4</sup> Under the LCAM model practice, Normal Cost is allocated over service that continues until the member is no longer working. For active members in or expected to enter a DROP (Deferred Retirement Option Program) this includes service through the expected end of the DROP period. This is not the method adopted by GASB in Statements 67 and 68, where service cost is allocated only through the beginning of the DROP period. The GASB method for DROPs is categorized as an Acceptable Practice for funding.

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<sup>5</sup> Note that this is not the method used in GASB's Statements 67 and 68. The GASB method is categorized as an Acceptable Practice.

<sup>6</sup> For example, a Plan that provides very valuable early career-benefits (such as heavily subsidized early retirement or disability benefits) may prefer to have the higher early-career Normal Costs associated with the Funding to Decrement Entry Age method.

## ACTUARIAL COST METHOD

- Normal Cost is based on each member's composite projected benefit (averaged Entry Age<sup>7</sup>).

### Acceptable Practices, with Conditions

- Projected Unit Credit cost method.
- Entry Age method variation ("Aggregated" Entry Age method) where the Normal Cost for a tier of benefits is determined as the Normal Cost rate for the tier applied to the compensation for the tier, and where the Normal Cost rate for the tier of benefits is determined as the present value of future Normal Costs for all active members in the tier, divided by the present value of compensation for all members in the tier.
- Aggregate or Frozen Initial Liability methods without the disclosures of costs and liabilities determined under the Entry Age method discussed above.

### Non-recommended Practices

- Normal Cost based on open tier of benefits even for members not in that open tier (Ultimate Entry Age).
  - Ultimate Entry Age Normal Cost may be useful to illustrate the longer-term Normal Cost for combined tiers or to evaluate fixed contribution rates.

### Unacceptable Practices

- Traditional (non-Projected) Unit Credit cost method for plans with pay-related benefits as the primary benefit.
- Note that while this white paper does not address policy issues related to pay-as-you-go funding or terminal funding, such practices would be unacceptable if the policy intent is to fund the members' benefits during the members' working careers.

### Transition Policies

- There are no transition policies that apply to funding methods. For substantial method changes (e.g., changing from Projected Unit Credit to Entry Age) special amortization periods could apply. These are discussed in the section on Amortization Policy.

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<sup>7</sup> Note that this is the version of the Entry Age method required for financial reporting under GASB Statements 67 and 68 for plans with benefit formula or structure changes within a tier.

# Asset Smoothing Methods

An asset smoothing method reduces the effect of short term market volatility while still tracking the overall movement of the market value of plan assets.

## Specific policy objectives and considerations

1. The funding policy should specify all components of asset smoothing method:
  - a. Amount of return subject to deferred recognition (smoothing).
  - b. The smoothing period or periods.
  - c. The range constraints on smoothed value (market value corridor), if any.
  - d. The method of recognizing deferred amounts: fixed or rolling smoothing periods.
2. The asset smoothing method should be unbiased relative to market.
  - a. The same smoothing period should be used for gains and for losses.
  - b. Any market value corridor should be symmetrical around market value.
3. The asset smoothing method should not be selectively reset at market value only when market value is greater than actuarial value.
  - a. Bases may be combined but solely to reduce future, non-level recognition of relatively small net unrecognized past gains and losses (i.e., when the smoothed and market values are already relatively close together).
4. The asset smoothing method should be unbiased relative to realized vs unrealized gain loss.
  - a. Base deferrals on total return gain/loss relative to assumed earnings rate.
5. The asset smoothing method should incorporate the ASOP 44 concepts of:
  - a. Likely to return to market in a reasonable period and likely to stay within a reasonable range of market, or
  - b. Sufficiently short period to return to market or sufficiently narrow range around market.
6. The policy parameters should reflect empirical experience from historical market volatility.
7. The asset smoothing method should support the policy goal of

## ASSET SMOOTHING METHODS

demographic matching (the intergenerational aspect of interperiod equity) described in general policy objective 2. This leads to a preference for smoothing methods that provide for full recognition of deferred gains and losses in the UAAL by some date certain.

- a. Note that this objective is also consistent with the accountability and transparency goals described in general policy objective 4.

### Discussion

1. Longer smoothing periods generally reduce contribution volatility. A discussion of smoothing periods could include the following considerations:
  - a. To the extent that smoothing periods are considered as being tied to economic or market cycles, those cycles may be believed to be longer or shorter than in past years.
  - b. If markets are more volatile, then longer smoothing would be needed even if only to maintain former levels of contribution stability.
  - c. Better funded plans, more mature plans and higher benefit plans (i.e., plans with a higher "volatility index") have inherently more volatile contribution rates, so may justify longer smoothing.
  - d. Sponsors may be more sensitive to contribution volatility.
2. However, ASOP 44 implies that longer smoothing periods call for narrower market value corridors.
  - a. In effect, the corridor imposes a demographic matching style constraint on the use of longer smoothing periods which otherwise would obtain greater volatility management.
3. The model interpretation is that five year smoothing is "sufficiently short" under ASOP 44.
  - a. This reflects long and consistent industry practice, as well as GASB Statement 68.
  - b. This implies that five year smoothing with no market value corridor is ASOP compliant.
  - c. It still may be useful to have a market value corridor as part of the asset smoothing policy.
    - i. This avoids having to introduce the corridor structure in reaction to some future discussion of longer smoothing periods.
4. Consider the extensive data available on the impact of smoothing periods and market value corridors after large market downturn (such as occurred in 2008).
  - a. The smoothing method manages the transition from periods of lower cost to periods of higher cost.
    - i. The level of those higher costs is determined primarily by size of the market loss and UAAL amortization period, not the asset smoothing policy.
  - b. The smoothing period determines length of the transition period.
  - c. The market value corridor determines cost pattern during the transition.
    - i. A wide corridor or no corridor produces a straight line transition.
    - ii. "Hitting the corridor" accelerates the cost increases or decreases in early years of transition.
      - A. In effect the corridor inhibits the smoothing method after years of large losses (or gains).
    - iii. There are various possible policy justifications for such an accelerated transition.
      - A. Market timing: get more contributions in while the market is down.
      - B. Cash flow management: low market values may impair plan liquidity.
      - C. Employer solvency: if the employer eventually is going to default on making contributions, then get as much contribution income as possible before that happens.
      - D. Employer preference: employers may prefer to have the higher costs in their rates as soon as possible.

## ASSET SMOOTHING METHODS

- iv. Following the 2008 market decline, these justifications were generally not found to be compelling.
  - A. The normal lag in implementing new contributions rates defeats iii. A and B.
  - B. Employers are presumed solvent and if not, accelerating contributions would make things worse.
  - C. Many employers clearly preferred more time to absorb the contribution increases.
- v. Absent these considerations, 2008 experience argues for permitting a wide corridor with a five year smoothing period, based on the fact that five year smoothing produced actuarial value to market value ratios that exceeded 140%.
  - A. Projections in early 2009 actually showed these ratios could have been as high as 150% if markets had not recovered some before the June 30, 2009 valuations.
- 5. Other industry indicators for market corridor selection with long smoothing periods
  - a. CalPERS 2005 policy: 15 year rolling smoothing with 20% corridor.
- 6. Structural issue: Fixed, separate smoothing periods vs. a single, rolling smoothing period
  - a. Fixed, separate smoothing periods for each year of market gain or loss insure that all deferred gains and losses are included in the UAAL (and so in the contribution rates) by a known date. This is consistent with accountability and with demographic matching.
  - b. A single rolling smoothing period avoids "tail volatility" where contributions are volatile not only when gains and losses first occur but also when (under a layered approach) each year's gain or loss is fully recognized.
    - i. Rolling smoothing is consistent with volatility management but substantially extends the recognition period for deferred investment gains and losses.
      - A. This will extend the time when the actuarial value of assets is consistently above or below the market value of assets.
      - B. That argues for narrower corridors than are appropriate for fixed (layered) smoothing periods.
    - ii. In effect, rolling smoothing recognized a fixed percentage of deferred investment gains and losses each year.
      - A. For example, 5 year rolling amortization recognizes 20% of the deferred amount.
      - B. Base corridors on this deferral recognition percentage.
    - c. With fixed, separate smoothing periods, tail volatility due to alternating periods of market gains and losses can be controlled by limited active management of the separate deferral amounts.
      - i. One such adjustment involves combining the separate deferral amounts when the net deferral amount is relatively small (i.e., the smoothed and market values are very close together) but the recognition pattern of that net deferral is markedly non-level.
        - A. The net deferral amount is unchanged as of the date of the adjustment.
        - B. The period over which the net deferral amount is fully recognized is unchanged as of the date of the adjustment.
      - ii. Other uses of active management of the deferral amounts may add complexity to the application of the policy and may reduce transparency.
      - iii. Restarts of fixed, separate smoothing periods should not be used:
        - A. Too frequently, as this would produce a de facto rolling smoothing period, or

## ASSET SMOOTHING METHODS

- B. To selectively restart smoothing at market value only when market value is greater than smoothed value. This would violate General Policy Objective 5, since it would selectively change the policy only when the effect is to reduce contributions.

### Practices

Based on the above discussion, and consistent with the policy objectives, asset smoothing methods and parameters are categorized as follows:

#### LCAM Model Practices

- Deferrals based on total return gain/loss relative to assumed earnings rate.
- Deferrals recognized in smoothed value over fixed smoothing periods not less than 3 years.
- Maximum market value corridors for various smoothing periods:
  - 5 or fewer years, 50%/150% corridor.
  - 7 years, 60%/140% corridor.
- Combine smoothing periods or restart smoothing only to manage tail volatility.
  - Appropriate when the net deferral amount is relatively small (i.e., the actuarial and market values are very close together).
    - The net deferral amount is unchanged as of the date of the adjustment.
    - The period over which the net deferral amount is fully recognized is unchanged as of the date of the adjustment.
  - Avoid using frequent restart of smoothing to achieve de facto rolling smoothing.
  - Avoid restarting smoothing only accelerate recognition of deferred gains, i.e., only when market value is greater than actuarial value.
- Additional analysis, such as solvency projections, is likely to be appropriate for closed plans.

#### Acceptable Practices

- Maximum market value corridors for various smoothing periods:

- 10 years, 70%/130% corridor.
- Five year (or shorter) smoothing with no corridor (including use of market value of assets without smoothing).
- Rolling smoothing periods with the following maximum market value corridors for various smoothing periods:
  - Express rolling smoothing period as a percentage recognition of deferred amount and set corridor at that same percentage. For example:
    - 3 year rolling smoothing means 33% recognition, with a 33% corridor.
    - 4 year rolling smoothing means 25% recognition, with a 25% corridor.
    - 5 year rolling smoothing means 20% recognition, with a 20% corridor.
    - 10 year rolling smoothing means 10% recognition, with a 10% corridor.
  - Perform additional analysis including projections of when the actuarial value is expected to return to within some narrow range of market value.

#### Acceptable Practices, with Conditions

- Maximum market value corridors for various smoothing periods:
  - 15 years, 80%/120% corridor.

#### Non-recommended Practices

- Longer than 5 year smoothing with no corridor.
- 15 years or shorter smoothing with corridors wider than shown above.

#### Unacceptable Practices

- Smoothing periods longer than 15 years

#### Transition Policies

Generally, transition policies for asset smoothing would allow current layered smoothing to continue subject to the appropriate model corridors (as determined by the future smoothing periods, if changed from the past/current layers). Transition from rolling asset smoothing would fix the rolling layer at its current period.

# Amortization Policy

An amortization policy determines the length of time and the structure of the increase or decrease in contributions required to systematically (1) fund any Unfunded Actuarial Accrued Liability or UAAL, or (2) recognize any Surplus, i.e., any assets in excess of the AAL.

## Specific policy objectives and considerations

1. Variations in contribution requirements from simply funding the Normal Cost will generally arise from gains or losses, method or assumption changes or benefit changes and will emerge as a UAAL or Surplus. As discussed in the general policy objectives, such variations should be funded over periods consistent with an appropriate balance between the policy objectives of demographic matching and volatility management.
2. As with the Normal Cost, the cost for changes in UAAL should emerge as a level percentage of member compensation<sup>8</sup>.
3. The amortization policy should reflect explicit consideration of these different sources of change in UAAL, even if the resulting policy treats different changes in the same way:
  - a. Experience gains and losses.
  - b. Changes in assumptions and methods.
  - c. Benefit or plan changes.
4. The amortization policy should reflect explicit consideration of the level and duration of negative amortization, if any.
  - a. This consideration should not necessarily preclude some negative amortization that may occur under an amortization policy that is otherwise consistent with the policy objectives.
  - b. Amortization periods developed in consideration of negative amortization (along with other policy goals) may be relevant for level dollar amortization (where negative amortization does not occur).
5. The amortization policy should support the general policy objectives of

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<sup>8</sup> As with the Normal Cost, this amortization policy objective applies most clearly to benefits (like, for example, most public pension benefits) that are determined and budgeted for as a percentage of individual and aggregate salary, respectively. For benefits that are not pay related, or when costs are budgeted on a basis other than compensation it may be appropriate to modify this objective and the resulting policies accordingly.

## AMORTIZATION POLICY

accountability and transparency. This leads to a preference for:

- a. Amortization policies that reflect a history of the sources and treatment of UAAL.
  - b. Amortization policies that provide for a full amortization date for UAAL.
    - i. Note that this objective is also consistent with the demographic matching aspect of general policy objective 2.
6. The amortization of Surplus requires special consideration, consistent with general policy objective 5 (nature of public plan governance).
- a. Amortization of Surplus should be considered as part of a broader discussion of Surplus management techniques, including:
    - i. Excluding some level of Surplus from amortization.
    - ii. "Derisking" some portion of plan liabilities by changing asset allocation.
  - c. Multiple layer amortization is also more transparent, since it tracks the UAAL by source. However, layered amortization is more complicated and can require additional policy actions to achieve stable contribution rates (including active management of the bases).
  - d. Discussion of periods will assume multiple, fixed amortization and then revisit the use of rolling periods to manage volatility.
3. For gains and losses, balancing demographic matching and volatility control leads to an ideal amortization period range of 15 to 20 years.
- a. Lesson learned from the 1990s is that less than 15 years gives too little "volatility control", especially for gains.
    - i. Short amortization of gains led to partial contribution holidays (contributions less than Normal Cost) and even full contribution holidays (no contribution required).
    - ii. This is inconsistent with general policy objective 5, in that it led to insufficient budgeting for ongoing pension costs and to pressure for benefit increases.
  - b. Longer than 20 years becomes difficult to reconcile with demographic matching, the intergenerational aspect of interperiod equity described in general policy objective 2.
    - i. 20 years is substantially longer than either average future service for actives or average life expectancy for retirees.
  - c. Periods longer than 20 years also entail negative amortization (which starts at around 16 to 18 years for many current combinations of assumptions)<sup>9</sup>.
    - i. Here negative amortization is an indicator for not enough demographic matching but based on economic rather than demographic assumptions.

### Discussion

1. The policy objectives lead to a general preference for level percentage of pay amortization.
  - a. Consistent with policy objectives and with the Normal Cost under the Model Actuarial Cost Method.
  - b. This discussion of amortization periods presumes level percentage amortization. Level dollar amortization is discussed separately as an alternative to level percentage amortization.
2. The policy objectives lead to a general preference for multiple, fixed amortization layers.
  - a. Fixed period amortization is clearly better for accountability, since UAAL is funded as of a date certain.
  - b. Single layer, fixed period amortization is not a stable policy, since period would have to be restarted when remaining period gets too short.

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<sup>9</sup> Note that for emerging lower investment return and salary increase assumptions even twenty year amortization may entail no negative amortization.

## AMORTIZATION POLICY

- ii. Consider observed consistency between the period of onset of negative amortization and the periods related to member demographics.
- iii. As discussed later in this section, negative amortization is a much greater concern when using open or rolling amortization periods.
- d. Two case studies — CalPERS and GASB:
  - i. CalPERS 2005 analysis focused on volatility management. Resulting funding policy uses exceptionally long periods for gain and loss amortization (as well as for asset smoothing.)
  - ii. GASB Statements 67 and 68 focus on demographic matching. Resulting expensing policy uses very short recognition periods. (This is cited for comparison only, as the GASB statements govern financial reporting and not funding.)
  - iii. Our general policy objectives indicate a balance between these two extremes.
- 4. For assumption changes, while the amortization periods could be the same, a case can be made for longer amortization than for gain/loss, since liabilities are remeasured to anticipate multiple years of future gains or losses.
  - a. A similar or even stronger case for longer periods could be made for changing cost method (such as from Projected Unit Credit to Entry Age), or for the initial liability for a newly funded plan.
  - b. However longer than 25 years entails substantial (arguably too much) negative amortization.
- 5. For plan amendments that increase liabilities, volatility management is not an issue, only demographic matching.
  - a. Use actual remaining active future service or retiree life expectancy.
  - b. Could use up to 15 years as an approximation for actives.
- i. Any period that would entail negative amortization is inconsistent with general policy goals 2 (demographic matching) and 5 (nature of public plan governance).
- c. Could use up to 10 years as an approximation for inactives.
  - i. Particularly for retiree benefit increases, amortization period should control for negative cash flow where additional amortization payments are less than additional benefit payments.
- d. For Early Retirement Incentive Programs use a period corresponding to the period of economic savings to the employer.
  - i. Shorter than other plan amendments, typically no more than five years<sup>10</sup>
- e. For benefit improvements with accelerated payments (e.g. one time “13th check” or other lump sum payments) amortization may not be appropriate as any amortization will result in negative cash flows.
- 6. Plan amendments that reduce liabilities require separate considerations so as to avoid taking credit for the reduction over periods shorter than the remaining amortization of the original liabilities.
  - a. Reductions in liability due to such benefit reductions should not be amortized more rapidly than the pre-existing unfunded liabilities, as measured by the average or the longest current amortization period.
  - b. Benefit “restorations<sup>11</sup>” should similarly be amortized on a basis consistent with the pre-existing unfunded liabilities or with the “credit” amortization base established when the benefits were reduced.
- 7. For Surplus, similar to short amortization of

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*10 For example, a Government Finance Officers Association (GFOA) 2004 recommended practice states that “the incremental costs of an early retirement incentive program should be amortized over a short-term payback period, such as three to five years. This payback period should match the period in which the savings are realized.”*

*11 A benefit restoration occurs when a previous benefit reduction has been fully or partially restored for a group of members who were subject to the earlier benefit reduction.*

## AMORTIZATION POLICY

- gains, the lesson from the 1990s is that short amortization of surplus leads to partial or full contribution holidays (contributions less than Normal Cost, or even zero).
- a. This is inconsistent with general policy objective 5, and led to insufficient budgeting for ongoing pension costs and to pressure for benefit increases.
  - b. General consensus is that this is not good public policy.
    - i. See for example Recommendation 7 by California's 2007 Public Employee Post-Employment Benefits Commission, and also CalPERS 2005 funding policy.
  - c. Because of both the ongoing nature of the Normal Cost and the nature of public plan governance, amortization of UAAL and Surplus should not be symmetrical.
    - i. It may be appropriate to amortize surplus over a period longer than would be acceptable for UAAL.
    - ii. Such an asymmetric policy would reduce the magnitude and/or likelihood of partial or full contribution holidays.
    - iii. One approach would be to disregard the Surplus and always contribute at least the Normal Cost. However if Surplus becomes sufficiently large then some form of Surplus management may be called for.
  - d. Note that long amortization of Surplus does not preclude other approaches to Surplus management that are beyond the scope of this discussion, including:
    - i. Treating some level of Surplus as a non-valuation asset.
    - ii. Changing asset allocation to reflect Surplus condition.
8. Separate Surplus related issue: When plan first goes into Surplus, should existing UAAL amortization layers be maintain or eliminated?
- a. Could maintain amortization layers and have minimum contribution of Normal Cost less 30 year amortization of Surplus.
    - b. However, maintaining layers can result in net amortization charge even though overall plan is in Surplus.
    - c. Alternative is to restart amortization of initial surplus, and any successive Surpluses.
      - i. In effect, this is 30 year rolling amortization of current and future Surpluses.
      - ii. Restart amortization layers when plan next has a UAAL.
9. Level dollar amortization is fundamentally different from level percent of pay amortization.
- a. No level dollar amortization period is exactly equivalent to a level percent period.
  - b. Level dollar is generally faster amortization than level percent of pay, so longer periods may be reasonable.
  - c. Plan and/or sponsor circumstances could determine appropriateness of level dollar method.
    - i. Level dollar would be appropriate for plans where benefits are not pay related and could be appropriate if the plan is closed to new entrants.
    - ii. Level dollar could be appropriate for sponsors and plans that are particularly averse to future cost increases, e.g., utilities setting rates for current rate payers.
    - iii. Level dollar could be appropriate for sponsors and plans that want an extra measure of conservatism or protection against low or no future payroll growth.
    - iv. Level dollar could be useful as a step in developing amortization payments in proportion to some basis other than payroll.
10. Multiple, fixed period layers vs. single, rolling period layer for gains and losses.
- a. Multiple, fixed amortization periods for each year's gain or loss ensures that all gains and losses are funded by a known date. This is consistent with accountability and with demographic matching.

## AMORTIZATION POLICY

- b. A single rolling smoothing period avoids tail volatility where contributions are volatile not only when gains and losses occur but also when each year's gain or loss is fully amortized. This is consistent with volatility management.
  - c. With fixed, separate smoothing periods, tail volatility can be controlled by limited active management of the amortization layers, including combining consecutive gain and loss layers as necessary to reduce tail volatility.
    - i. As with asset smoothing, active management should be used to manage the pattern of future UAAL funding and not to accomplish a short-term manipulation of contributions.
    - ii. In particular the net remaining amortization period should be relatively unaffected by any combination of offsetting UAAL amortization layers.
    - iii. The use of active management of the amortization layers may add complexity to the application of the policy and may reduce transparency.
11. Plans with layered amortization of an unfunded liability should consider actions to achieve a minimum net amortization charge that is not less than the payment required under a single 25 year amortization layer. This may be accomplished through active management of the amortization layers or through other means.
12. Rolling amortization periods for a single layer of gains and losses or for the entire UAAL.
- a. Similar to level dollar, acknowledge that rolling amortization is fundamentally different from fixed period amortization.
    - i. Rolling amortization will have a substantial unamortized UAAL at the end of the nominal amortization period.
  - b. Argument can be made for a single, rolling amortization layer for gains and losses if the actuarial valuation assumptions are expected to be unbiased so that there is an equal likelihood of future gains and losses that will offset each other.
    - i. Such rolling amortization also requires that there are no systematic sources of future actuarial losses from plan design features, such as a subsidized service purchase option.
    - ii. Extraordinarily large gains or losses that are not reasonably expected to be offset by future losses or gains should be isolated from the single rolling gain/loss amortization layer and amortized over separate, fixed periods.
    - iii. Plans with a significant single rolling gain/loss amortization layer should affirmatively show that policy objectives will be achieved, without substantial violation of intergenerational equity.
- c. This argument is substantially weaker for rolling amortization for assumption changes (especially if consistently in a single direction, such as mortality assumption adjustments or recent changes in investment earnings assumptions.)
- i. Inconsistent with policy objective of intergenerational equity, as well as accountability and transparency.
  - ii. Similar concerns for rolling amortization of gains and losses in the presence of biased assumptions or other systematic sources of actuarial losses.
- d. It is very difficult to reconcile rolling amortization of plan amendments with intergenerational equity, as well as with accountability and transparency objectives.
- e. Specific exception for rolling, lengthy amortization of Surplus, since as described earlier this helps meet general policy objective 5
13. Rolling amortization and the Aggregate cost method.
- a. The Aggregate cost method produces contribution levels and patterns similar to using the Entry Age method with a single rolling level percent of pay amortization layer for the entire UAAL and a relatively short rolling amortization period.

## AMORTIZATION POLICY

- i. Effective rolling amortization period reflects average future service of active members.
- b. However, the Aggregate cost method is fundamentally different from Entry Age (and from Projected Unit Credit) in that Aggregate does not measure an AAL or a UAAL.
  - i. Aggregate combines a high level of tail volatility management (policy objective #3) with high levels of demographic matching and accountability (policy objectives 2 and 4).
  - ii. Aggregate also provides no policy flexibility in the selection of an amortization period (since no UAAL is calculated) which provides protection from some agency risk issues, consistent with policy objective #5.
- c. Retirement boards desirous of the high level of tail volatility management and computational simplicity associated with rolling amortization of the entire Entry Age UAAL should consider adopting the Aggregate cost method.
  - i. If a UAAL is measured (as under the Entry Age or Projected Unit Credit cost methods) then, as discussed above, the policy objectives indicate layered amortization with the possible exception of a single rolling amortization layer for gains and losses.

### Practices

Based on the above discussion, and consistent with the policy objectives, amortization methods and parameters are categorized as follows:

### LCAM Model Practices

- Layered fixed period amortization by source of UAAL
- Level percent of pay amortization
- Amortization periods

Source	Period
Active Plan Amendments <sup>12</sup>	Lesser of active demographics <sup>13</sup> , or 15 years
Inactive Plan Amendments	Lesser of inactive demographics <sup>13</sup> , or 10 years
Experience Gain/Loss	15 to 20 years
Assumption or Method Changes <sup>14</sup>	15 to 25 years
Early Retirement Incentives	5 years or less

- 30 year amortization of surplus (for plans with ongoing Normal Cost and/or plan expenses)
  - Eliminate all prior UAAL layers upon going into Surplus
- Combine gain/loss (and other) layers or restart amortization only to avoid tail volatility.
  - Combining layers should result in substantially the same current amortization payment.
  - Avoid using restart of amortization to achieve de facto rolling amortization.
  - Restart amortization layers when moving from Surplus to UAAL condition.
- Additional analysis, such as solvency projections, is likely to be appropriate for closed plans.

<sup>12</sup> The effect of assumption changes integral to the measurement of the cost of plan amendments (e.g., change in rates of retirement to anticipate the effect of new benefit levels) should be included in the UAAL change associated with the plan amendment.

<sup>13</sup> Demographics based periods include remaining active future service or retiree life expectancy. Amortization period should also control for negative cash flow where additional amortization payments are less than additional benefit payments.

<sup>14</sup> Method change includes the initial liability for a newly funded plan.

## AMORTIZATION POLICY

### Acceptable Practices

- Up to 15 years for inactive plan amendments.
- Level dollar fixed period layered amortization by source of UAAL, using the same model amortization periods as above.
  - Ideally, some rationale should be given if used with pay related benefits.

### Acceptable Practices, with Conditions

- Up to 25 year layered fixed period amortization by source, for all sources of UAAL.
  - Ideally with some rationale given for using periods outside the model ranges.
- Rolling amortization of a single combined gain/loss layer with an amortization period that does not entail any negative amortization.
  - With model periods for other sources of UAAL.
  - Use separate, fixed period layers for extraordinary gain or loss events.
  - Plans with a significant single rolling gain/loss amortization layer should demonstrate that policy objectives will be achieved.
- Up to 30 year fixed amortization of change in funding method (e.g. from PUC to Entry Age) or initial liability for a newly funded plan (i.e. an existing plan previously funded on a pay-as-you-go basis but not a new plan creating new past service benefits.)
  - Ideally some rationale should be given for using periods outside the model ranges.

### Non-recommended Practices

- Fixed period amortization of the entire UAAL as a single combined layer, with periodic reamortization over a new (longer) starting amortization period.
- Layered fixed period amortization by source of UAAL over longer than 25 years (i.e., 26 to 30 years).
- Rolling amortization of a single combined gain/loss layer with an amortization period that does entail any negative amortization, but no longer than 25 years.
  - Same three conditions that apply to Acceptable with Conditions rolling gain/loss amortization.

- Rolling/open amortization of entire UAAL as a single combined layer (exclusive of plan amendments but inclusive of gain/loss, assumption and method changes) even where the amortization period does not entail negative amortization.

### Unacceptable Practices

- Layered fixed period amortization by source of UAAL over longer than 30 years.
- Rolling/open amortization over longer than 25 years of a single combined gain/loss layer.
- Rolling/open amortization of entire UAAL as a single combined layer (exclusive of plan amendments) where the amortization period entails negative amortization.
- Rolling/open amortization of entire UAAL as a single combined layer (including plan amendments) even where the amortization period does not entail negative amortization.

### Transition Policies

Transition policies are particularly applicable to amortization policy. Generally, transition policies for amortization would allow current fixed period amortization layers (with periods not to exceed 30 years) to continue, with new amortization layers subject to these guidelines. Transition from rolling amortization would fix any rolling layer at its current period, with future liability changes amortized in accordance with these guidelines. During the transition (i.e., as long as the remaining period for the formerly rolling base is longer than model or acceptable periods) any new credit layers (e.g., due to actuarial gains or less conservative assumptions) should be amortized over no longer than that same remaining period.

# Direct Rate Smoothing

An actuarial funding policy may include some form of direct rate smoothing, where the contribution rates that result from applying the three principal elements of funding policy (including asset smoothing) are then directly modified.

As noted in the Introduction, some practitioners are developing direct contribution rate smoothing techniques as an alternative to asset smoothing. At this time, there are no widely accepted practices established for this type of direct rate smoothing. This discussion does not address the use of direct rate smoothing techniques as an alternative to asset smoothing. The CCA PPC is considering development of a separate white paper on direct rate smoothing as an alternative to asset smoothing.

The balance of this discussion pertains only to direct rate smoothing when used in conjunction with asset smoothing. Two types of such direct rate smoothing policies that are known to be in current practice were evaluated for this development:

1. Phase-in of certain changes in contribution rates, specifically, phasing-in the effect of assumption changes element over short period, consistent with the frequency of experience analyses.
2. Contribution collar where contribution rate changes are limited to a specified amount or percentage from year to year.

## Discussion

1. Contribution rate phase-in can be an effective and reasonable way to address the contribution rate impact of assumption changes.
  - a. Ideally the phase-in period should be no longer than the time period until the next review of assumptions (experience analysis).
    - i. This approach is most appropriate when experience analyses are performed on a regular schedule.
    - ii. For systems with no regular schedule for experience analyses, the phase-in period would ideally be chosen so as to avoid overlapping phase-in periods.

## DIRECT RATE SMOOTHING

- a. The plan and its sponsors should be clearly aware of the additional time value of money cost (or savings) of the phase-in, due to the plan receiving less (or more) than the actuarially determined contributions during the phase-in.
  - b. Any ongoing policy to phase-in the effect of assumption changes should be applied symmetrically to both increases and decreases in contribution rates.
  - c. Ongoing policy may be to phase-in only significant cost increases or decreases.
  - d. Note that the phase-in of the contribution rate impact of an assumption change is clearly preferable to phasing in the assumption change itself. While a detailed discussion is outside the scope of this discussion, phasing in an assumption change may be difficult to reconcile with the governing actuarial standards of practice.
2. Contribution collars have the policy drawback that the collar parameters arbitrarily override the contribution results produced by the other funding policy parameters (including asset smoothing), each of which have a well-developed rationale.
    - a. If contribution collars are used they should be supported by analysis and projections to show the effect on future funded status and future policy based contribution requirements (prior to the application of the contribution collar).
    - b. There may also need to be a mechanism to ensure adequate funding following extraordinary actuarial losses.
  3. Using either form of direct rate smoothing for other than assumption changes (i.e., for actuarial experience or plan amendments) appears inconsistent with the development of parameter ranges for the other elements of the funding policy.

### Practices

Based on the above discussion, and consistent with the policy objectives, parameters are categorized as follows:

#### LCAM Model Practices

- None

### Acceptable Practices

- For systems that review actuarial assumptions on a regularly scheduled basis, phase-in of the cost impact of assumption changes over a period no longer than the shorter of the time period until the next scheduled review of assumptions (experience analysis) or five years.
  - Phase-in should be accompanied by discussion and illustration of the impact of the phase-in on future contribution rates.
  - Phase-in may be applied only to cost impacts deemed material, but should be applied consistently to both cost increases and decreases.

### Acceptable Practices, with Conditions

- For systems that do not review actuarial assumptions on a regularly scheduled basis, phase-in of the cost impact of assumption changes over a period of up to five years.
  - Phase-in of the cost impact of any prior assumption changes must be completed before commencing another phase-in period.
  - Phase-in should be accompanied by discussion and illustration of the impact of the phase-in on future contribution rates.
  - Phase-in may be applied only to cost impacts deemed material, but should be applied consistently to both cost increases and decreases.

### Non-recommended Practices

- Phase-in of the cost impact of assumption changes over a period greater than five years.
- Phase-in of the cost impact of actuarial experience, in conjunction with model or acceptable practices for asset smoothing and UAAL amortization.
- Contribution collars in conjunction with model or acceptable practices for asset smoothing and UAAL amortization.
- Phase-in or contribution collars for the cost impact of plan amendments.

## Items for Future Discussion

This white paper is intended to address the principal elements of an actuarial funding policy as applicable in most but not all situations. Other issues related to funding policy that may be of varying significance are listed in this section, including some of a more technical nature. These items may be the subjects of future guidance.

**Impact of Risk/Employer ability to pay/Level of benefit protection**—These are three considerations that could affect the development of an actuarial funding policy. While this white paper notes that these factors should be considered, it does not develop policies or procedures for doing so. This paper also does not address appropriate disclosure items, including disclosures related to risk. These considerations (and interrelationships) are outside of our current scope but are important items for future discussion.

**OPEB Plans** – As noted earlier, while we believe the general policy objectives developed here apply to OPEB plans as well, application of those policy objectives to OPEB plans may result in different specific funding policies based on plan design, legal status and other features distinctive to OPEB plans. Many of the actuaries who participated in developing this paper work on both pension and OPEB funding. We may address funding policies specific to OPEB plans in a later document. That process would also draw on experts in the design, underwriting and valuation of OPEB plans.

**Self Adjusting System**—We expect that an increasing number of plans will have self adjusting provisions (in this context we are referring to benefit adjustments). These provisions could impact the selection of funding methods.

**Transfers of Service Credit**—New entrants (or even current member) are sometimes eligible to transfer service credit for employment prior to plan membership. This generally creates actuarial losses, which is inconsistent with our policy objectives. Later we may discuss whether and how this should be anticipated in the valuation.

**Purchase of Service**—This can raise the same type of issues as Transfers of Service Credit since unfunded actuarial liabilities often increase when employees purchase service credit.

**Actuarially determined contribution as a dollar amount or percentage of pay**—Sometimes the contribution requirement is determined prior to the year it is due and shown as a dollar amount or a percentage of payroll. Either can be

used to determine the contribution amount required.

**Role for Open/Stochastic Valuations and risk disclosures**—Our guidelines are developed in the context of a closed group, deterministic valuation. This is in part due to the belief that such a valuation best achieves our policy objectives. However, there are also advantages associated with other valuation practices.

**Lag time between valuation date and fiscal year –**  
Because of the time needed to produce the valuation and to budget for rate changes, the contribution made for a given fiscal year is often based on an earlier valuation date. This will generate contribution gains or losses when rates decrease or increase, respectively. Some systems adjust for these gains or losses in setting the rates but many do not.

