

AGENDA

A SPECIAL MEETING OF THE BOARD OF INVESTMENTS

LOS ANGELES COUNTY EMPLOYEES RETIREMENT ASSOCIATION

300 N. LAKE AVENUE, PASADENA, CALIFORNIA 91101

9:00 A.M., MONDAY, MARCH 23, 2020

This meeting will be conducted by teleconference pursuant to the Governor's Executive Order N-29-20. The public may attend the meeting at LACERA's offices.

*The Board may take action on any item on the agenda,
and agenda items may be taken out of order.*

I. CALL TO ORDER

II. PLEDGE OF ALLEGIANCE

III. APPROVAL OF MINUTES

- A. Approval of the Minutes of the Regular Meeting of February 12, 2020

IV. EXECUTIVE SESSION

- A. Conference with Staff and Legal Counsel to Consider the Purchase or Sale of Particular, Specific Pension Fund Investments
(Pursuant to California Government Code Section 54956.81)

1. Polar Asset Management Partners
James Rice, Principal Investment Officer
Chad Timko, Senior Investment Officer
Quoc Nguyen, Investment Officer
(Memo dated February 28, 2020)
2. One Rock Capital Partners III, LP
Christopher Wagner, Principal Investment Officer
David Simpson, Investment Officer
(Memo dated March 3, 2020)

IV. EXECUTIVE SESSION (Continued)

3. Equity Factor-Based Investment Search
Ted Wright, Principal Investment Officer
Ron Senkandwa, Investment Officer
Jeff Jia, Senior Investment Analyst
(Memo dated February 27, 2020)

V. NON-CONSENT ITEMS

- A. Recommendation that the Board Temporarily invoke the provision in the Investment Policy Statement authorizing the CIO to have expanded delegated authority for the benefit of the Fund, subject to additional controls, until such time as the Board determines to discontinue these duties.

Jon Grabel, Chief Investment Officer
(Memo dated March 17, 2020)

- B. Recommendation that the Board:
 1. Accept the June 30, 2019, Actuarial Valuation of Retirement Benefits as submitted by the plan actuary.
 2. Adopt recommended employer contribution rates (all plan tiers) and employee contribution rates (all contributory plan tiers).
 3. Delegate authority to the Chief Executive Officer to communicate the results of the 2019 Actuarial Valuation of Retirement Benefits to the Board of Supervisors by May 15, 2020, with a recommendation to implement the employer and employee rates no later than September 29, 2020.

Santos H. Kreimann, Chief Executive Officer
Ted Granger, Interim Chief Financial Officer
Craig Glyde, Consulting Actuary – Milliman
Mark Olleman, Consulting Actuary – Milliman
Pat Beckham, Consulting Actuary – Cavanaugh Macdonald Consulting
Brent Banister, Consulting Actuary – Cavanaugh Macdonald Consulting
(Memo dated March 18, 2020)

VI. REPORT

- A. CIO Interim Report Regarding Market Environment and Fund Positioning
Jon Grabel, Chief Investment Officer
(Memo dated March 18, 2020) (For Information Only)

March 23, 2020

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VII. ITEMS FOR STAFF REVIEW

VIII. GOOD OF THE ORDER
(For information purposes only)

IX. ADJOURNMENT

Documents subject to public disclosure that relate to an agenda item for an open session of the Board of Investments that are distributed to members of the Board of Investments less than 72 hours prior to the meeting will be available for public inspection at the time they are distributed to a majority of the Board of Investments Members at LACERA's offices at 300 N. Lake Avenue, Suite 820, Pasadena, CA 91101, during normal business hours of 9:00 a.m. to 5:00 p.m. Monday through Friday.

Persons requiring an alternative format of this agenda pursuant to Section 202 of the Americans with Disabilities Act of 1990 may request one by calling the Board Offices at (626) 564-6000, Ext. 4401/4402, from 8:30 a.m. to 5:00 p.m. Monday through Friday, but no later than 48 hours prior to the time the meeting is to commence. Assistive Listening Devices are available upon request. American Sign Language (ASL) Interpreters are available with at least three (3) business days notice before the meeting date.

MINUTES OF THE REGULAR MEETING OF THE BOARD OF INVESTMENTS

LOS ANGELES COUNTY EMPLOYEES RETIREMENT ASSOCIATION

300 N. LAKE AVENUE, SUITE 810, PASADENA, CALIFORNIA 91101

9:00 A.M., WEDNESDAY, FEBRUARY 12, 2020

PRESENT: David Green, Chair

Herman B. Santos, Vice Chair

Wayne Moore, Secretary

Alan Bernstein

Elizabeth Greenwood

Shawn Kehoe

Keith Knox

David Muir

Gina V. Sanchez

STAFF ADVISORS AND PARTICIPANTS

Santos H. Kreimann, Chief Executive Officer

Jonathan Grabel, Chief Investment Officer

Steven P. Rice, Chief Counsel

Christine Roseland, Senior Staff Counsel

Christopher Wagner, Principal Investment Officer

Vache Mahseredjian, Principal Investment Officer

STAFF ADVISORS AND PARTICIPANTS (Continued)

Jude Perez, Principal Investment Officer

Ted Wright, Principal Investment Officer

David Chu, Senior Investment Officer

Ted Granger, Interim Chief Financial Officer

Mike Romero, Senior Investment Analyst

Trina Sanders, Investment Officer

Terra Elijah, Investment Analyst

Barry W. Lew, Legislative Affairs Officer

Derek Kong, Investment Officer

Meketa Investment Group

Leandro Festino, Managing Principal

Townsend Group

Jennifer Stevens, Partner

StepStone Group LP

Natalie Walker, Partner

I. CALL TO ORDER

The meeting was called to order by Chair Green at 9:10 a.m., in the Board Room of Gateway Plaza.

II. PLEDGE OF ALLEGIANCE

Mr. Knox led the Board Members and staff in reciting the Pledge of Allegiance.

III. APPROVAL OF MINUTES

A. Approval of the Minutes of the Regular Meeting of February 12, 2020

III. APPROVAL OF MINUTES (Continued)

Mr. Santos made a motion, Ms. Sanchez seconded, to approve the revised minutes of the regular meeting of February 12, 2020. The motion passed unanimously by all trustees present.

IV. REPORT ON CLOSED SESSION ITEMS

Steven Rice, Chief Counsel, reported that:

At its September 12, 2018 meeting, the Board took action to direct LACERA's separate account managers to sell select real estate assets. The vote has previously been reported, and individual transactions have been reported out at various times as appropriate under the Brown Act. Today, it is appropriate to report out that the Board at that time directed the sale of Garden City Shopping Center, a 530,629 square foot shopping center located in Cranston, RI. The sale was completed on January 23, 2020. The asset sold for a gross sales price of \$181 million. That completes today's report of prior Board actions.

V. PUBLIC COMMENT

There were no requests from the public to speak.

VI. CHIEF EXECUTIVE OFFICER'S REPORT (Memo dated January 30, 2020)

Mr. Kreimann provided a brief presentation on the Chief Executive Officer's Report.

VII. CHIEF INVESTMENT OFFICER'S REPORT

Mr. Grabel provided a brief presentation on the Chief Investment Officer's Report.

VIII. NON-CONSENT ITEMS

- A. Recommendation as submitted that the Board approve appointing Altus Group U.S. Inc. as the Appraisal Management Service Provider for LACERA's separate account real estate assets, including full service offering.

Mike Romero, Senior Investment Analyst
Trina Sanders, Investment Officer
Inga Tadevosyan, Investment Analyst
Terra Elijah, Investment Analyst
Jennifer Stevens, Principal – Townsend Group
(Memo dated January 27, 2020)

Mrs. Sanders and Mr. Romero and Mrs. Stevens of Townsend Group provided a presentation and answered questions from the Board.

Mr. Santos made a motion, Mr. Bernstein seconded, to approve staff recommendation. The motion passed unanimously by all trustees present.

- B. Recommendation as submitted that the Board adopt the revised emerging manager policy.

Ted Wright, Principal Investment Officer and Vache Mahseredjian, Principal Investment Officer and Stephen McCourt, Managing Principal – Meketa Investment Group
Leandro Festino, Managing Principal – Meketa Investment Group
Tim Filla, Senior Vice President – Meketa Investment Group
Alina Yuan, Investment Analyst – Meketa Investment Group
(Memo dated January 27, 2020)

Messrs. Wright and Mahseredjian and Mr. Festino of Meketa Investment Group provided a presentation and answered questions from the Board.

Mr. Moore made a motion, Mr. Muir, seconded, adopt the revised emerging manager policy. The motion passed unanimously by all trustees present.

VIII. NON-CONSENT ITEMS (Continued)

- C. Recommendation as submitted that the Board schedule the 2020 Board of Investments (BOI) offsite meeting on Tuesday, July 7 and Wednesday, July 8 at the Hilton Hotel in Glendale, California.
Jon Grabel, Chief Investment Officer
(Memo dated January 28, 2020)

Mr. Grabel was present and answered questions from the Board.

Mr. Santos made a motion, Ms. Greenwood seconded, to approve the staff recommendation. The motion passed unanimously by all trustees present.

- D. Recommendation as submitted that the Board provide further instruction to staff on the legislative proposal to provide for board self-evaluations in closed session.

Barry W. Lew, Legislative Affairs Officer
(Memo dated January 22, 2020)

This item was received and filed.

- E. Recommendation as submitted that the Board approve the attached ballot insert entitled “Powers and Duties of Investments Board Trustees,” which will be included with the ballot materials for the election of the Second and Eighth Members of the Board of Investments and posted on lacera.com.
Steven P. Rice, Chief Counsel
(Memo dated January 29, 2020)

Mr. Steven Rice was present and answered questions from the Board.

Mr. Kehoe made a motion, Mr. Santos seconded, to approve staff recommendation, except the word “trustee” will not be used as this time. The motion passed unanimously by all trustees present.

IX. REPORTS

- A. Investment Procedures Manual Update – Growth Assets
Jude Perez, Principal Investment Officer
Terra Elijah, Investment Analyst
(Memo dated January 30, 2020)

Mr. Perez and Ms. Elijah provided a presentation and answered questions from the Board.

- B. 2020 Board Election Process Update
Steven P. Rice, Chief Counsel
(Memos dated January 29, 2020 and February 4, 2020)

Mr. Rice was present and answered questions from the Board.

The following agenda items were received and filed:

- C. Meketa Investment Group Self-Evaluation
Stephen McCourt, Managing Principal – Meketa Investment Group
Leandro Festino, Managing Principal – Meketa Investment Group
Tim Filla, Senior Vice President – Meketa Investment Group
Alina Yuan, Investment Analyst – Meketa Investment Group
(For Information Only) (Memo dated January 31, 2020)
- D. Manager Resignation
John McClelland, Principal Investment Officer
(For Information Only) (Memo dated January 28, 2020)
- E. AB 2833 Reporting: Reimbursement of Costs
Barry W. Lew, Legislative Affairs Officer
(For Information Only) (Memo dated January 14, 2020)
- F. LACERA Quarterly Performance Book Update
Jude Perez, Principal Investment Officer
(For Information Only) (Memo dated January 30, 2020)
- G. Real Estate Consultant Change in Professional Staff
John McClelland, Principal Investment Officer
Jennifer Stevens, Principal – Townsend Group
Rob Kochis, Principal – Townsend Group
(For Information Only) (Memo dated January 28, 2020)

IX. REPORTS (Continued)

- H. OPEB Quarterly Performance Book
Jude Perez, Principal Investment Officer
(For Information Only) (Memo dated January 28, 2020)
- I. Update Regarding Employee Status of Trustees Following Recent
Legislation and State Court Decisions
Michael D. Herrera, Senior Staff Counsel
(For Information Only) (Memo dated January 23, 2020)
- J. Update on Windfall Elimination Provision and Government Pension
Offset
Barry W. Lew, Legislative Affairs Officer
(For Information Only) (Memo dated January 27, 2020)
- K. Monthly Status Report on Legislation
Barry W. Lew, Legislative Affairs Officer
(For Information Only) (Memo dated January 23, 2020)
- L. Semi-Annual Interest Crediting for Reserves as of
December 31, 2019 (UNAUDITED)
Ted Granger, Interim Chief Financial Officer
(For Information Only) (Memo dated January 21, 2020)
- M. Monthly Education and Travel Report for December 2019
Ted Granger, Interim Chief Financial Officer
(For Information Only) (Public Memo dated January 29, 2020)
(Confidential Memo dated January 29, 2020– Includes Anticipated Travel)
- N. Monthly Status Report on Board of Investments Legal Projects
Steven P. Rice, Chief Counsel
(For Information Only) (Memo dated January 31, 2020)
- O. January 2020 Fiduciary Counsel Contact and Billing Report
Steven P. Rice, Chief Counsel
(For Information Only) (Privileged and Confidential)
(Attorney-Client Communication/Attorney Work Product)
(Memo dated January 28, 2020)

X. ITEMS FOR STAFF REVIEW

The Board requested for staff to look into the Self- Evaluation Policy that was adopted.

The Board requested the CEO to have a discussion regarding the CIO's compensation at the next BOI meeting.

XI. GOOD OF THE ORDER
(For information purposes only)

Mr. Muir announced that the Retired Employees of Los Angeles County Annual Luncheon will be held on Thursday, January 23, 2020.

Mr. Kreimann and the Board congratulated Mr. Knox on his appointment to the Treasurer and Tax Collector and commented on his swearing in ceremony.

XII. EXECUTIVE SESSION

A. Conference with Staff and Legal Counsel to Consider the Purchase or Sale of Particular, Specific Pension Fund Investments
(Pursuant to California Government Code Section 54956.81)

1. Private Equity Secondary Sale Recommendation
Jonathan Grabel, Chief Investment Officer
(Memo dated January 28, 2020)

The Board met in closed session under Government Code Section 54956.81 to consider certain particular, specific pension investments.

2. Summit Partners Europe Growth Equity
Christopher Wagner, Principal Investment Officer
Derek Wong, Investment Officer
Natalie Walker, Principal – StepStone Group

XII. EXECUTIVE SESSION (Continued)

Mr. Santos made a motion, seconded by Mr. Muir, to approve a commitment of up to \$50 million to Summit Partners Europe Growth Equity Fund III, SCSp, which is a pan European small market growth private equity buyout investment targeting minority and majority stakes in founder-owned, sector leading companies primarily in technology, healthcare and life sciences, and other growth products and services. The motion passed (roll call) with Messrs. Bernstein, Green, Kehoe, Knox, Moore, Muir, Santos, Ms. Sanchez and Ms. Greenwood voting yes.

3. Clearlake Capital Partners Fund V.I., L.P.
Christopher Wagner, Principal Investment Officer
Didier Acevedo, Investment Officer
Natalie Walker, Principal – StepStone Group
(For Information Only) (Memo dated January 14, 2020)

The Board received an information only memo concerning are up commitment by the CIO under his authority under the Private Equity OPP of up to \$200 million to Clearlake Capital Partners Fund VI, LP, which will focus on acquisition of interests in North American middle market companies across various macroeconomic conditions.

4. Private Equity Secondary Purchase Update
Christopher Wagner, Principal Investment Officer
David Chu, Senior Investment Officer
Derek Kong, Investment Officer
(For Information Only) (Memo dated January 16, 2020)

The Board received an information only memo concerning the completion of a \$23.1 million secondary purchase of a minority interest in Access Foundation Partners Group II, LLC, which is a single asset fund in the human death care services

XII. EXECUTIVE SESSION (Continued)

industry. The purchase was completed in accordance with LACERA's secondary investment guidelines.

- B. Public Employee Performance Evaluation
(Pursuant to Paragraph (1) of Subdivision (b) of California Government Code Section 54957)

Title: Chief Investment Officer

The Board met in Executive Session pursuant to Paragraph (1) of Subdivision (b) of California Government Code Section 54957. There was nothing to report.

XIII. ADJOURNMENT

There being no further business to come before the Board, the meeting was adjourned at 12:18 p.m.

Green Folder Information (Information distributed in each Board Members Green Folder at the beginning of the meeting)

1. Item XII. B. – Closed Session/Chief Investment Officer Performance Evaluation (Privileged and Confidential)

WAYNE MOORE, SECRETARY

DAVID GREEN, CHAIR



Documents not attached are exempt from disclosure under the California Public Records Act and other legal authority.

**For further information, contact:
LACERA
Attention: Public Records Act Requests
300 N. Lake Ave., Suite 620
Pasadena, CA 91101**



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Pasadena, CA 91101**

March 18, 2020

TO: Trustees – Board of Investments

FROM: Jonathan Grabel 
Chief Investment Officer

FOR: March 23, 2020 Board of Investments Meeting

SUBJECT: **TEMPORARY DELEGATED AUTHORITY**

RECOMMENDATION

Temporarily invoke the provision in the Investment Policy Statement authorizing the CIO to have expanded delegated authority for the benefit of the Fund, subject to additional controls, until such time as the Board determines to discontinue these duties.

BACKGROUND

LACERA's investment making authority for new investments is centralized with the BOI. Private equity re-ups, secondary sales, co-investments and rebalancing are currently delegated to the CIO while considering performance criteria and certain percentage and/or dollar limits. The Investment Policy Statement (IPS) further details Chief Investment Officer Delegated Authority to include, "...actions not otherwise specifically delegated, in concurrence with the CEO and the Chair of the Board, when deemed necessary in the best interest of the Fund and when there is not enough time to take the action to the full Board. Such actions shall be reported as an informational item as soon as reasonably practicable to the full Board, and no later than the next scheduled meeting of the Board." (IPS, Appendix B, page 20.) This "best interest of the Fund" provision relates not only to decisions impacted by the inability to convene a public meeting in normal times but also to time critical events such as those presented in the current crisis. This recommendation addresses the unique aspects of the current situation during which the BOI may have limited capability to assemble and equally important when unique investment opportunities may present themselves, perhaps on short notice and with a limited window.

BOI leadership and LACERA's executive team have been in constant contact as the spread of the coronavirus has intensified. The BOI Chair and Vice Chair have emphasized that LACERA's approach to portfolio management needs to remain active, flexible, and nimble in this period of heightened market volatility. There is uncertainty as to when LACERA will be able to return to the normalcy associated with large public meetings (including those in which the BOI makes new investment decisions). Furthermore, the BOI's investment beliefs state, "...[m]arkets are largely efficient over the long term (10–20 years); however, during certain economic and financial environments markets may not be efficient in setting prices. Consequently, LACERA will allow for modest tactical asset allocation adjustments during times of disruption." (IPS, Section I.B.ii, page 4.)

Given LACERA's significant liquidity, we may have the ability to make opportunistic investments to take advantage of distress in certain markets, which could mitigate losses and potentially contribute to the Fund's future growth following the effects of the recent distress. Accordingly, notwithstanding any other provision of the IPS or any other policies, procedures and practices, the BOI should consider invoking the delegated investment authority provision in the IPS in the near term, subject to additional controls, until the BOI returns to its regular meeting schedule. Endorsing exercise of this authority will enable LACERA to be a proactive and intentional investor in these dynamic times. Staff proposes that, if approved, the CIO's exercise of this incremental investment authority will be subject to the following controls:

- 1) Concurrence from the CEO, BOI Chair and the BOI Vice Chair;
- 2) Support from the asset category consultant;

- 3) Consistency with the BOI approved strategic asset allocation and allocation ranges;
- 4) Adherence to initiatives established in the most recent asset category structure review;
- 5) Similarity in terms of dollars and/or allocation percentages with existing practice for the subject investment strategy/category that is under consideration;
- 6) In furtherance of the 2020 BOI work plan (i.e. RFPs in process), recognizing that some opportunistic illiquid investments may be identified;
- 7) Observance of LACERA's investment beliefs, corporate governance principles, and diversity and inclusion ideals;
- 8) Reporting to the BOI as an informational item as soon as reasonably practicable; and,
- 9) Documentation consistent with formats used for BOI recommendations.

This temporary authority would not allow the CIO to modify LACERA's strategic asset allocation, any investment policies, or to our investment model. For example, this temporary authority would not authorize the CIO to internalize trading of public equity securities. The CIO would adhere to LACERA's values as well as its established protocols and norms. Communication with the Board leadership would remain at its increased level, with reporting to the BOI as a whole. This authority is designed to be short-term in nature and allow LACERA to manage the investment portfolio throughout the COVID-19 pandemic.

A support memorandum from Meketa is attached.

Attachment

cc: Santos H. Kreimann
Steven Rice
Investments Staff
Legal Office - Investment Team

MEMORANDUM

TO: LACERA Board of Investments
FROM: Stephen McCourt, Leandro Festino, Tim Filla, Alina Yuan; Meketa Investment Group
DATE: March 18, 2020
RE: Delegated Authority

Background

In December 2019, a new coronavirus causing a potentially fatal pulmonary disease (later named COVID-19) began spreading within Wuhan, China. The coronavirus rapidly spread within Hubei province, and then across borders, as the number of cases of COVID-19 and deaths continued to grow in worrying proportions. The World Health Organization declared COVID-19 a global pandemic on March 11, 2020.

Outside of the human toll, economies have shown signs of heavy strain, as COVID-19, and the policy reactions to it, have impacted organizations around the world, including LACERA. LACERA canceled the most recent Board of Investments (BOI) meeting, Corporate Governance Committee meeting, and Joint Organizational Governance Committee meeting, to help protect the members and employees of LACERA, Trustees, and the public. It is unknown how long the pandemic will continue, how severe it will be, and, thus, how it will affect the BOI's ability to meet in a timely manner.

Recommendation

Meketa has reviewed staff's proposal to temporarily invoke provisions in LACERA's Investment Policy Statement (IPS) to expand the CIO's delegated authority for the benefit of the Fund. Meketa provided feedback during the drafting process. We have also reviewed the additional controls of the CIO's authority. Meketa believes temporarily delegating this level of authority to the CIO is a sound move that should provide operational advantages and efficiency, and an increased ability to make opportunistic investments (with the goals of reducing potential losses and/or enhancing potential returns). Increased communication with BOI leadership is intended to remain in place.

In short, Meketa supports the proposed recommended action. The controls in place for the temporary expanded delegated authority are reasonable. Finally, the BOI retains the authority to withdraw the CIO's expanded authority at will at any time in the future.

Meketa looks forward to continue working closely with staff and the CIO to provide support for any investment decisions to be considered during these volatile times. We look forward to discussing this matter with you at the March 23rd telephonic meeting.

SM/ LF/ TF/ AY/ srt



March 18, 2020

TO: Trustees – Board of Investments

FROM: Santos H. Kreimann *SHK*
Chief Executive Officer

Ted Granger *TG*
Interim Chief Financial Officer

FOR: Board of Investments Meeting on March 23, 2020

SUBJECT: **2019 ACTUARIAL VALUATION OF RETIREMENT BENEFITS**

RECOMMENDATION

It is recommended that the Board of Investments (BOI):

1. Accept the June 30, 2019, Actuarial Valuation of Retirement Benefits (Valuation) as submitted by the plan actuary (Milliman).
2. Adopt recommended employer contribution rates (all plan tiers) and employee contribution rates (all contributory plan tiers).
3. Delegate authority to the Chief Executive Officer to communicate the results of the 2019 Actuarial Valuation of Retirement Benefits to the Board of Supervisors by May 15, 2020, with a recommendation to implement the employer and employee rates no later than September 29, 2020.

EXECUTIVE SUMMARY

At the January 2020 meeting, LACERA's plan actuary (Milliman) presented the 2019 Investigation of Experience for Retirement Benefit Assumptions (Experience Study) report. The Board of Investments (BOI) Trustees adopted updated economic and demographic assumptions based upon this report, other information provided by Milliman, and in considering Milliman's recommendations. These assumptions and methods, some new and some carried forward, were used to prepare the 2019 Valuation report.

The new assumptions included decreasing in the investment return assumption to 7.0%, keeping the wage growth and consumer price index (CPI) assumptions the same, 3.25% and 2.75% respectively, shortening the amortization period for future changes in the Unfunded Actuarial Accrued Liability (UAAL) to a 20-year period, shortening existing

UAAL amortization periods to be no more than 22 years, increasing the rates of assumed merit salary increases (primarily for Safety members), and implementing new mortality tables that are more specific to public plan members. The 2019 Valuation results include increases in employer and member contribution rates, a reduction in the Plan's funded ratio, and an increase in the UAAL. LACERA is required to communicate the results to Los Angeles County (County) so the new contribution rates can be implemented by the beginning of the upcoming fiscal year.

In addition to the annual Valuation, the Board of Investments' Actuarial Audit policy requires actuarial reviews of the Investigation of Experience and Retirement Benefits Valuation at regular intervals consistent with the same cycle as LACERA's triennial reports are prepared. Cavanaugh MacDonald Consulting (CMC), LACERA's actuarial review consultant, performed review engagements for the 2019 Experience Study and the 2019 Valuation reports prepared by Milliman.

SUMMARY OF VALUATION RESULTS

| | June 30, 2019 Valuation | 2018 Valuation | 2017 Valuation | 2016 Valuation |
|--|------------------------------------|-------------------|-------------------|-------------------|
| Funded Ratio | 77.20% | 80.60% | 79.90% | 79.40% |
| Employer Normal Cost Rate | 10.86% | 9.92% | 9.94% | 9.97% |
| Employer UAAL Rate | 13.92% | 10.99% | 11.06% | 11.24% |
| Calculated Contribution Rate | 24.78% | 20.91% | 21.00% | 21.21% |
| Less cost phase-in | -2.19% | 0.00% | -0.96% | -1.51% |
| Total Employer Rate with cost phase-in | 22.59% | 20.91% | 20.04% | 19.70% |

The Unfunded Actuarial Accrued Liability (UAAL) as of June 30, 2019, is \$17.02 billion and requires the County to make additional payments to the Plan using closed 20-year layered amortization periods. The estimated annual employer contributions for fiscal year 2020/2021 is \$2.0 billion. The actuary is recommending changes to the employer and employee contribution rates at this time.

LEGAL AUTHORITY

Provisions contained in the County Employees Retirement Law (California Government Code, Sections 31450-31899.1) and the California Constitution (Article XVI, Section 17) govern the actuarial process at LACERA.

Section 31453 of the County Employees Retirement Law requires LACERA to obtain an actuarial valuation at least once every three years. The valuation shall be conducted under the supervision of an actuary, shall cover the mortality, service, and compensation experience of the members and beneficiaries, and shall evaluate the assets and liabilities of the retirement fund. Government Code Section 7504(a) additionally provides, for all California public pension systems, not less than every three years, the fund actuary “shall perform a valuation of the system utilizing actuarial assumptions and techniques established by the agency that are, in the aggregate, reasonably related to the experience and the actuary’s best estimate of anticipated experience under the system. Any differences between the actuarial assumptions and techniques used by the actuary that differ significantly from those established by the agency shall be disclosed in the actuary’s report and the effect of the differences on the actuary’s statement of costs and obligations shall be shown.”

The California Constitution, Article XVI, Section 17(a) of the Constitution provides that public pension trustees “shall discharge their duties with respect to the system solely in the interest of, and for the exclusive purposes of providing benefits to, participants and their beneficiaries, minimizing employer contributions thereto, and defraying reasonable expenses of administering the system. A retirement board’s duty to its participants and their beneficiaries shall take precedence over any other duty.” To comply with their fiduciary duty with respect to actuarial decisions, the Constitution requires that each of these three elements be considered and evaluated with the interests of members and beneficiaries being paramount.

Article XVI, Section 17(e), assigns “the sole and exclusive power to provide for actuarial services” to the governing body of the public employees’ retirement system. Such power is given by the Constitution in order to “assure the competency of the assets of the public pension or retirement system.”

Section 31543 further requires the Board of Investments to transmit its recommendations concerning assumptions, interest rates, and contributions to the Board of Supervisors at least 45 days prior to the beginning of the succeeding fiscal year. Section 31454 requires the Board of Supervisors to adjust contribution rates in accordance with LACERA’s recommendations no later than 90 days following the beginning of the immediately succeeding fiscal year, which means that the adjustments must be made no later than September 29, 2020. Section 31454.1 exempts the independent assumptions and calculations of LACERA’s actuary from “meet and confer” requirements. This same section also recognizes the “meet and confer” responsibility of the Board of Supervisors in implementing the recommendations contained in the actuarial valuation report.

LACERA’s RETIREMENT BENEFIT FUNDING POLICY

LACERA’s Retirement Benefit Funding Policy’s main goal is to provide benefit security for its members as well as achieving and maintaining stable employer contributions that are as low as possible. The policy requires annual actuarial valuations to review the

retirement system's funding progress, and to set the employer contribution and member contribution rates.

In addition to the annual valuations, LACERA requires its actuary to review the reasonableness of the economic and non-economic (demographic) actuarial assumptions every three years. This review, commonly referred to as the Investigation of Experience or Experience Study, is accomplished by comparing recent actual experience to what was expected to happen according to the actuarial assumptions. Additionally, forecasts are considered where available, particularly for the economic assumptions. On the basis of this review, the actuary recommends whether any changes in the assumptions or methodology would allow a more accurate projection of total benefit liabilities and asset growth. Based on the triennial investigation of experience results and the respective annual actuarial valuation, all employer and employee contribution rates are evaluated for reasonableness and adjusted as needed.

For plan tiers using age-based employee contribution rates (General Plans A, B, C and D and Safety Plans A and B), LACERA's actuary will recommend adjusted employee rates, as required, due to changes in the underlying assumptions and methodologies used to calculate the employee rates. Therefore, it is expected the age-based employee rates will change no more frequently than every three years when the actuary reviews the assumptions and methodologies as part of the Experience Study. As there was an Experience Study (Attachment II) conducted in connection with the June 30, 2019 Valuation and such Experience Study resulted in changes to assumptions adopted by the Board at the January 2020 meeting that affect the employee contribution rate, the actuary is recommending new employee rates, except for the non-contributory General Plan E.

For the plan tiers using single-rate employee contribution rates (plan tiers General Plan G and Safety Plan C), the employee is required to contribute one-half of the total normal cost rate for the plan. As there was a change in these plans' total normal cost, the actuary is recommending new employer and employee rates.

ACTUARIAL ASSUMPTIONS AND METHODS

The 2019 Investigation of Experience for Retirement Benefit Assumptions report (Attachment II) approved by the Board on January 8, 2020, includes economic and non-economic (demographic) assumptions and valuation methods. Milliman applied the following key methods and assumptions in calculating Valuation results for June 30, 2019.

Economic and Demographic Assumptions

The investment return assumption was lowered by 25 basis points to 7.00%. The price inflation assumption and general wage growth assumptions remained the same at 2.75%, and 3.25%, respectively. Asset gains and losses are smoothed over a five-year period. The mortality tables were updated to the public plan specific tables published in 2019, customized to fit LACERA's Plan experience.

Amortization Period

The unfunded portion of the actuarial accrued liability (or UAAL) was changed to apply a 20-year amortization period to all future amortization payment layers, as compared to a 30-year period previously used. For all existing amortization layers with a period longer than 22 years, a 22-year period was applied, such that these layers will be fully amortized by 2042.

Valuation Assets

The STAR Reserve represents money set aside for the payment of *future* STAR Program benefits that have not been determined nor vested. The Retirement Benefit Funding Policy requires the actuary to include the STAR Reserve as a retirement plan asset. If the \$614 million STAR Reserve was excluded from valuation assets, the funded ratio would decrease by 0.8% and the employer's UAAL contribution rate would be higher by 0.52%.

2019 VALUATION RESULTS

| | Fiscal Year Beginning | |
|--|-----------------------|--------------|
| | July 1, 2020 | July 1, 2019 |
| Employer Contribution Rate with Phase-in | 22.59% | 20.91% |
| Funded Ratio | 77.2% | 80.6% |

A valuation report is often described as a snapshot of a retirement Plan's funded status at a particular point in time. This year's snapshot finds LACERA funded ratio at 77.2%. That is, the estimated benefit liability is greater than the actuarial value of assets. However, this snapshot includes smoothing previous investment gains and losses over a five-year period. LACERA's actuary reports that using the actual market value of assets without an actuarial smoothing period results in a 77.3% funded ratio.

Since the June 2018 valuation, the Actuarial Accrued Liability (AAL) increased 8.9% to \$74.6 billion. The valuation measures how well the Plan's assumptions estimated the actual Plan experience. This increase is primarily attributable to the expected liability growth, and lowering the investment return assumption.

Plan demographics reported in the valuation indicate a 0.7% increase in the size of the active member population that totals approximately 99,186, with an overall average age of 46.6 years. The retired population increased by 2.5% and totals over 66,000. The average benefit payment increased by 3.6% to approximately \$4,385 per month. The retirees' average age increased by approximately one month to 72.9 years.

ACTUARIALLY REQUIRED EMPLOYEE CONTRIBUTION RATES

Employees participating in the closed plan tiers (General Plans A, B, C and D and Safety Plans A and B) contribute using age-based rates to fund a defined annuity at a specified

age and to fund one-half the cost-of-living benefit. Employee age-based annuity contribution rates are affected by changes made in the salary, investment, and life expectancy assumptions and will vary according to the employee's age at first membership. As this valuation includes revised salary, investment, and life expectancy actuarial assumptions, the actuary is recommending new employee contribution rates. A comparison of sample employee contribution rates compared to the previous employee contribution rates are presented in the 2019 Valuation report on page 29. The sample rates show the general plan employee rates at various ages increasing by approximately 1% of pay or less and the safety plan employee rates increasing approximately 2% of pay or less.

Employees participating in the open plan tiers (General Plan G and Safety Plan C) are required to contribute one-half of the plan's total normal cost rate. Because the total normal cost for Safety Plan C has changed since the 2018 valuation, the actuary recommends changing the corresponding employee contribution rate. The General Plan G employee rate is recommended to increase by 0.68% to 9.11% of pay and the Safety Plan C employee rate is recommended to increase by 0.85% to 14.54% of pay. Employee contribution rates for all plans at every entry age can be found in the Valuation report's Appendix D on page 108.

ACTUARIALLY REQUIRED EMPLOYER CONTRIBUTION RATES

Liabilities not funded through employee contributions and portfolio earnings are the responsibility of the employer. The employer is responsible to contribute the cost of benefits expected to be earned in the future in excess of those funded by employee contributions. These contributions are known as employer Normal Cost contributions. The actuary has calculated employer Normal Cost rates for all retirement plans. Comparing the recommended 2019 employer Normal Cost rates to the 2018 valuation rates currently in effect, the general plans' average increased by 0.77% of pay and the safety plans' average increased by 1.69% of pay, for an aggregate increase of 0.94%. A comparison by plan is presented in the Valuation report's Exhibit 10 on page 31. Overall, the actuary recommends raising the employer Normal Cost contribution rate from 9.92% to 10.86% of estimated payroll.

The employer is also responsible to contribute for funding shortfalls related to liabilities accrued in the past (which includes changes in the economic and non-economic assumptions affecting past service, if any). This portion of the employer's contribution is known as the UAAL contribution. Under the terms of the Retirement Benefit Funding Policy, contributions to retire an unfunded liability are calculated using a closed 20-year layered amortization period method when the funded ratio is below 100%. As the funded ratio as of June 30, 2019 is 77.2%, the employer is required to contribute an additional 13.92% of covered payroll towards the unfunded liability for the fiscal year beginning July 1, 2020. The Board of Investments provided direction to the Plan actuary to phase-in the cost of the 2019 Experience Study report's assumption changes over a three year period (2019–2021 valuations) using a smoothing method.

Together, the employer's 10.86% Normal Cost and 13.92% UAAL contribution rates equal 24.78% of covered payroll. After reflecting the cost phase-in, the total employer contribution rate is equal to 22.59% of covered payroll. For the fiscal year 2020-2021, the annual employer contribution is projected to increase approximately \$221 million compared to fiscal year 2019-2020, resulting in an approximate annual employer cost of \$2.0 billion.

ACTUARIAL ASSUMPTION CHANGE COST PHASE-IN

The Board's January 8, 2020 action to use "direct rate smoothing" to phase-in the actuarial assumption change cost impact on the employer contribution rate is an implicit adjustment increase of the UAAL amortization period. The phase-in approach initially results in a lower employer contribution rate. Future employer contribution rates after the phase-in period are projected to be greater by approximately 0.23% of covered payroll due to lower employer contributions received during the phase-in period. Applying the 0.23% cost factor to the \$9.3 billion estimated county payroll for fiscal year 2022 results in an approximate additional cost of \$21 million (based on a projected increase in the UAAL due to the cost phase-in of \$303 million) for the fiscal period beginning July 1, 2022. Without the phase-in of the increase, the total employer contribution rate would be 24.78% effective July 1, 2020. The remaining 2.19% increase due to the new assumptions and amortization method (24.78% minus 22.59%) will be phased-in equally effective July 1, 2021 and July 1, 2022. Employee contributions rates are not impacted by the cost phase-in approach.

ACTUARIAL RISK DISCUSSION

Under Actuarial Standard of Practice (ASOP) Number 51 (ASOP 51), effective with the current valuation, the report includes a risk discussion (see pages 43-44) in which Milliman assesses and discloses the main risks associated with measuring pension liabilities and the determination of pension plan contributions. This section is intended to identify significant risks, assess the risks, and disclose plan maturity measures and historical information necessary to understand the risks. This is an important new tool for the trustees to use in prudently managing the fund. In addition to the ASOP 51 discussion in the valuation, Milliman will prepare a separate ASOP 51 risk report, which will be placed on the Board agenda and discussed at a future meeting.

ACTUARIAL AUDITS

An actuarial audit was conducted by Cavanaugh MacDonald Consulting (CMC) on Milliman's 2019 Experience Study and valuation reports (Attachments III and IV). CMC concluded that "We find the June 30, 2019 actuarial valuation results to be reasonable and accurate, based on the assumptions and methods used. The valuation was performed by qualified actuaries and was performed in accordance with the principals

and practices prescribed by the Actuarial Standards Board.” The next triennial Experience Study and Valuation audit will be performed as of June 30, 2022.

CONCLUSION

The LACERA Board of Investments adopted the Retirement Benefit Funding Policy to require the employer contribution rates to be adjusted annually based on the LACERA actuary’s annual valuation. Member contribution rates are updated annually for plans established subsequent to January 2013 and triennially for all other legacy plans (or at such other times that valuation assumptions change). The Plan actuary, Milliman, completed the triennial Experience Study, performed the actuarial valuation, and recommends changes to the employer and employee contribution rates. California State Law requires LACERA to transmit the contribution rate recommendations to the Board of Supervisors prior to May 15 and for the Board of Supervisors to implement the recommended rates by July 1 but no later than September 29.

LACERA’s consulting actuaries, Nick Collier and Craig Glyde with Milliman and LACERA’s audit actuary, Pat Beckham with Cavanaugh MacDonald, will be attending the March 16, 2020 meeting to discuss the valuation report and audit report, respectively, and answer any questions you may have.

Attachments

- I. Milliman’s 2019 Pension Plan Valuation Report Final
- II. Milliman’s 2019 Pension Plan Experience Study Report Final
- III. Cavanaugh MacDonald’s 2019 Pension Plan Valuation Audit Report Final
- IV. Cavanaugh MacDonald’s 2019 Pension Plan Experience Study Audit Report Final
- V. Milliman’s Presentation Slides

SHK:tg
2019_Actuarial Valuation of Retirement Benefits.Finalv2.pdf

- c: Steven Rice, LACERA
Richard Bendall, LACERA
Bernie Buenaflor, LACERA
Sachi Hamai, Los Angeles County

Attachment I

Milliman's 2019 Pension Plan Valuation Report Final



Los Angeles County Employees Retirement Association

Actuarial Valuation of Retirement Benefits

June 30, 2019

Prepared by:

Mark C. Olleman, FSA, EA, MAAA
Consulting Actuary

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March 2, 2020

Board of Investments
Los Angeles County Employees Retirement Association
300 North Lake Avenue, Suite 820
Pasadena, CA 91101-4199

Re: **Los Angeles County Employees Retirement Association**

Dear Members of the Board:

As requested, we have performed an actuarial valuation of retirement benefits for the Los Angeles County Employees Retirement Association (LACERA) as of June 30, 2019 to be used in determining the contribution rates effective July 1, 2020. The major findings of the valuation are contained in this report. This report reflects the benefit provisions and contribution rates in effect as of June 30, 2019, and LACERA's Funding Policy that was adopted in December of 2009 and amended as of February 2013. It should be noted that under the amended Funded Policy, the reserve value for STAR benefits is included in the Valuation Assets for 2014 and future valuations; however, the liability for any potential STAR benefits that may be granted in the future is not included in this valuation.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by LACERA's staff. This information includes, but is not limited to, statutory provisions, employee data, and financial information. In our examination of these data, we have found them to be reasonably consistent and comparable with data used for other purposes. Since the valuation results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our calculations may need to be revised.

All costs, liabilities, rates of interest, and other factors for LACERA have been determined on the basis of actuarial assumptions and methods that are individually reasonable (taking into account the experience of LACERA and reasonable expectations); and that, in combination, offer a reasonable estimate of anticipated experience affecting LACERA. Further, in our opinion, each actuarial assumption used is reasonably related to the experience of the Plan and to reasonable expectations, which, in combination, represent a reasonable estimate of anticipated experience for LACERA.

This valuation report is only an estimate of LACERA's financial condition as of a single date. It can neither predict LACERA's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of benefits, only the timing of contributions. While the valuation is based on an array of individually reasonable assumptions, other assumption sets may also be reasonable and valuation results based on those assumptions would be different. No one set of assumptions is uniquely correct. Determining results using alternative assumptions is outside the scope of our engagement, although for informational purposes we have shown valuation results at +/- 0.5% on the investment return assumption at the end of the Executive Summary.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected

as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the Plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of future measurements. The Board of Investments has the final decision regarding the appropriateness of the assumptions and adopted them as indicated in Appendix A of this report.

Actuarial computations presented in this report are for purposes of determining the recommended funding amounts of LACERA. The calculations in the enclosed report have been made on a basis consistent with our understanding of LACERA's funding requirements as stated under their Funding Policy, with a modification to reflect the three-year phase-in of the employer contribution rate change due to the new assumptions. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this report. Accordingly, additional determinations may be needed for other purposes. Milliman will provide LACERA financial reporting results relevant to GASB Statements No. 67 and 68 in separate reports.

Milliman's work is prepared solely for the internal business use of LACERA. To the extent that Milliman's work is not subject to disclosure under applicable public records laws, Milliman's work may not be provided to third parties without Milliman's prior written consent. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. Milliman's consent to release its work product to any third party may be conditioned on the third party signing a Release, subject to the following exceptions:

- (a) LACERA may provide a copy of Milliman's work, in its entirety, to LACERA's professional service advisors who are subject to a duty of confidentiality and who agree to not use Milliman's work for any purpose other than to benefit LACERA.
- (b) LACERA may provide a copy of Milliman's work, in its entirety, to other governmental entities, as required by law.

No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

The consultants who worked on this assignment are retirement actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

The signing actuaries are independent of the plan sponsors. We are not aware of any relationship that would impair the objectivity of our work.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein.

We would like to express our appreciation to members of LACERA staff who gave substantial assistance in supplying the data on which this report is based.

We respectfully submit the following report, and we look forward to discussing it with you.

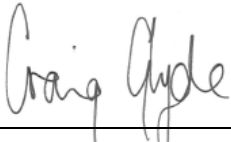
Sincerely,



Mark Olleman, FSA, EA, MAAA
Consulting Actuary



Nick Collier, ASA, EA, MAAA
Consulting Actuary



Craig Glyde, ASA, EA, MAAA
Consulting Actuary

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1. Summary of Findings

2019 Valuation Results

| | Fiscal Year Beginning | |
|--|-----------------------|-----------------------|
| | July 1, 2020 | July 1, 2019 |
| Employer Contribution Rate with phase-in | 22.59% ⁽¹⁾ | 20.91% ⁽²⁾ |
| Funded Ratio | 77.2% | 80.6% |

1. The FYB 2020 employer contribution rate was calculated in the June 30, 2019 valuation. The FYB 2020 employer contribution rate without phase-in is 24.78%.
2. The FYB 2019 employer contribution rate was calculated in the June 30, 2018 valuation.

This report presents the results of the June 30, 2019 actuarial valuation. This valuation determines the required contribution rates payable starting July 1, 2020. Several key points are summarized below:

Funding: The Funded Ratio decreased from 80.6% to 77.2% primarily due to the assumption changes (including a reduction in the investment return assumption) effective with the June 30, 2019 valuation, which caused a decrease of 2.8% in the Funded Ratio. Recognition of current and prior year asset losses caused a 0.7% decrease. On a market-value basis, the Funded Ratio decreased from 81.3% to 77.3%.

The “Analysis of Change” section that follows later in Section 1 provides an analysis of the sources of change in the Funded Ratio since last year.

Investment Returns: For the fiscal year ending in 2019, the fund returned 5.5% on a market-value basis (net of investment expenses). In total, there was an \$755 million loss on market assets relative to the assumed rate of return of 7.25%. Under the actuarial asset method, which recognizes investment gains and losses over a five-year period, the return on actuarial assets was 6.5%, equivalent to a loss of \$477 million relative to the assumed return of 7.25%.

Employer Contribution Rates: The total calculated employer contribution rate increased from the prior valuation by 1.68% (from 20.91% to 22.59%) of payroll. The increase in the employer contribution rate is primarily due to the assumption and amortization method changes effective June 30, 2019 and the recognition of current and prior year investment losses.

At the January 2020 Board of Investments (BOI) meeting, the BOI adopted a three-year phase-in of the increase in the employer contribution rate due to the new assumptions and amortization method. Without the phase-in of the increase, the total employer contribution rate would be 24.78% effective July 1, 2020. The remaining 2.19% increase due to the new assumptions and amortization method (24.78% minus 22.59%) will be phased-in equally effective July 1, 2021 and July 1, 2022.

The “Analysis of Change” section provides an analysis of the sources of change in employer contribution rates since last year. In addition, the section “Projected Future Employer Contribution Rates” below shows a 10-year projection of employer contribution rates.

Member Contribution Rates: New member contribution rates are recommended for all Plans effective July 1, 2020, based on the new assumptions adopted with the 2019 Investigation of Experience. Member contribution rates for all plans, except General Plans E and G and Safety Plan C, vary based on a member’s entry age to LACERA and the underlying actuarial assumptions. General Plan G and Safety Plan C member rates are required to be equal to 50% of the Gross Normal Cost of the respective plan.

The recommended member contribution rates are higher for all Plans and all members, except the non-contributory General Plan E. Member contribution rates are discussed in detail in Section 5 of this report.

Economic and Demographic Assumptions

The assumptions developed as a result of the 2019 Investigation of Experience study, described in our report dated January 28, 2020, were adopted by the BOI for use in this valuation. These changes include lowering the investment return assumption from 7.25% to 7.00%, increasing the rates of assumed merit salary increases (primarily for Safety members), and updating mortality tables to the public plan specific tables published in 2019 by the Society of Actuaries Retirement Plans Experience Committee (RPEC). Of these changes, the reduction in the investment return assumption had the greatest impact on the results of this valuation.

The net effect of all the assumption changes was an increase in the Unfunded Actuarial Accrued Liability (UAAL) of approximately \$2.5 billion effective June 30, 2019, a decrease in the Funded Ratio of 2.8%, and an increase in the employer contribution rate of 3.29% of payroll (without phase-in).

Member contribution rates for all Plans also increased due to the new assumptions.

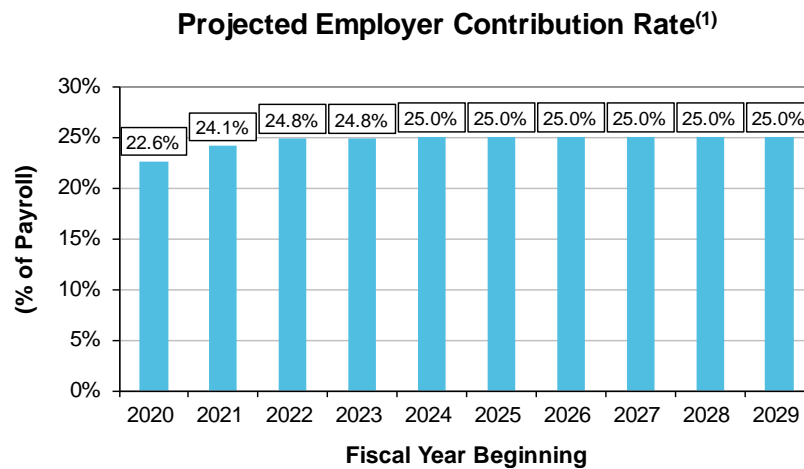
Amortization of the UAAL

LACERA employs a “layered” amortization method to pay off the UAAL. Under this method, the UAAL amount as June 30, 2009 was amortized over a closed 30-year period. Subsequent changes in the UAAL were amortized over new closed 30-year periods. Effective with the June 30, 2019 valuation, all existing layers with more than 22 years remaining were re-amortized over closed 22-year periods. All new UAAL layers are amortized over a 20-year period, beginning with the date the contribution is first expected to be made. Exhibit 12 of this report illustrates in detail the calculation of the total UAAL rate for the fiscal year beginning in 2020.

Projected Future Employer Contribution Rates

The employer contribution rate beginning July 1, 2020 is 22.59% of payroll, which is a weighted average for all LACERA plans. The actual percent of payroll to be contributed by the employers varies by plan as shown in Exhibit 11.

The new calculated employer contribution rate is effective for the fiscal year beginning July 1, 2020. Additional increases are projected over the next two years as the increase due to assumption and method changes is phased in. Even if all actuarial assumptions are met over the next few years, we project additional modest changes in the employer contribution rate as deferred asset gains and losses are recognized. To illustrate these impacts, we have performed a 10-year projection of the employer contribution rate that assumes all actuarial assumptions are met, and reflects the phase-in and the projected recognition of the remaining deferred asset gains and losses as of June 30, 2019. This projection is shown in the graph below.



1. Projections assume that all actuarial assumptions are met after June 30, 2019, and reflect the scheduled recognition of asset gains and losses currently being deferred. Actual results will vary.

Analysis of Change

The following table shows an analysis of the primary causes of the change in the employer contribution rate and the Funded Ratio over the last year. The impact of the assumption and amortization method changes was the most significant factor affecting the employer contribution rate, although this was somewhat mitigated by the three-year phase-in of this increase.

| Sources of Change | Employer Contribution Rate | Funded Ratio |
|--|----------------------------|--------------|
| June 30, 2018 Actuarial Valuation | 20.91% | 80.6% |
| Expected Year-to-Year Change | 0.00% | 0.7% |
| Assumption and Method Changes | 3.29% | -2.8% |
| <u>Recognized Asset Gain/Loss</u> | | |
| From Current Year | 0.17% | -0.3% |
| From Prior Years | 0.25% | -0.4% |
| Combined Asset Gain/Loss | 0.42% | -0.7% |
| Contributions > Assumed | -0.09% | 0.2% |
| Payroll Increase > Assumed | -0.14% | 0.0% |
| <u>Liability Gain / Loss</u> | | |
| Salary Increase > Assumed | 0.43% | -0.5% |
| Retiree COLAs > Assumed | 0.04% | -0.1% |
| Other | -0.08% | -0.2% |
| Combined Liability Gain/Loss | 0.39% | -0.8% |
| Deferred Recognition of 2019 Assumptions | -2.19% | 0.0% |
| Total Change | 1.68% | -3.4% |
| June 30, 2019 Actuarial Valuation | 22.59% | 77.2% |

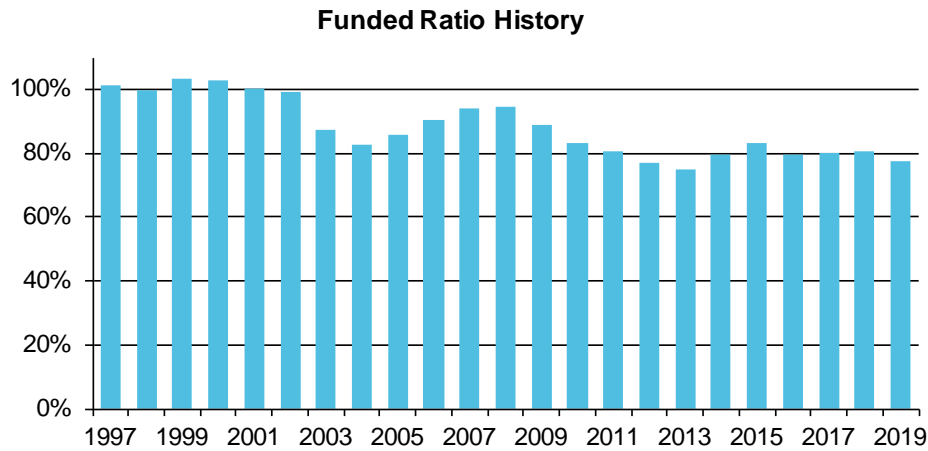
Based on the 2018 valuation, the expected UAAL as of June 30, 2019 was \$13.4 billion. The actual UAAL as of June 30, 2019 is \$17.0 billion. The additional UAAL is primarily due to the new assumptions adopted by the Board of Investments effective June 30, 2019 and the recognition of actuarial asset losses from the current and prior years. An analysis of the difference between expected and actual UAAL is shown in Exhibit 8a.

Funding Progress

One measure of the funding adequacy of the system is the Funded Ratio, which compares the Valuation Assets (the actuarial value of assets net of certain non-valuation reserves) to the Actuarial Accrued Liability (AAL). The Funded Ratio shown in this valuation is appropriate for assessing the future contributions needed. However, it is not appropriate for assessing the sufficiency of current system assets to cover the estimated cost of settling the system’s accrued benefit obligations. As shown in Exhibit 1, the Funded Ratio is different depending on whether the Market Assets or Valuation Assets is used.

As shown in the graph that follows, the Funded Ratio was 94.5% as of June 30, 2008, but decreased steadily over the five-year period following the economic downturn to a low of 75.0% as of June 30, 2013 as asset losses were gradually recognized. The Funded Ratio has gradually increased since that time, although this increase has been slow as the Board has strengthened the actuarial assumptions over the period, thereby increasing the AAL and offsetting some of the increase in the Funded Ratio from other sources.

A historical perspective of the Funded Ratio is shown in the following chart.



Assets

On June 30, 2019, the market value of the fund (including non-valuation reserves) was \$58.3 billion. The actuarial value of assets was \$58.2 billion, split between \$0.6 billion of Non-Valuation Assets and \$57.6 billion of Valuation Assets. The actuarial value of assets is approximately 100% of the market value of assets.

On a market-value basis, for the fiscal year ended June 30, 2019, LACERA earned 5.5% net of investment expenses, as reported by LACERA in the June 30, 2019 CAFR. The market value of assets is used in calculating the actuarial value of assets. Under the actuarial asset method, investment gains and losses are recognized (or smoothed in) over a five-year period. Due to the recognition of current and deferred net asset losses, the return on the actuarial valuation of assets is 6.5% net of investment and administrative expenses, and is less than the assumed return for the prior year of 7.25%.

Valuation Assets are used in the calculation of the UAAL contribution rate and Funded Ratio. Valuation Assets are equal to the actuarial value of assets less certain non-valuation reserves. The Valuation Assets of \$57.6 billion are equal to 77.2% of the \$74.6 billion AAL.

The non-valuation reserves are set aside for obligations or contingencies. They are not used to fund the retirement benefits unless explicitly stated. As of June 30, 2019, the non-valuation reserves include only the Contingency Reserve, which is equal to 1% of the market value of assets, or \$563 million. Note that the Contingency Reserve affects the assets used in the actuarial valuation and is not part of the accounting process used in creating the financial statements.

Under LACERA’s Funding Policy, the reserve value for STAR benefits is included in the Valuation Assets; however, the liability for any STAR benefits that may be granted in the future is not included in the valuation. Note that if the STAR reserve of \$614 million was excluded from the Valuation Assets, the UAAL would increase by this amount. Under this hypothetical scenario, the calculated employer contribution rate for the fiscal year beginning July 1, 2020 would increase by 0.52% of payroll, and the Funded Ratio would decrease by 0.8% to 76.4%.

Future Impact of Recognition of Deferred Gains/Losses

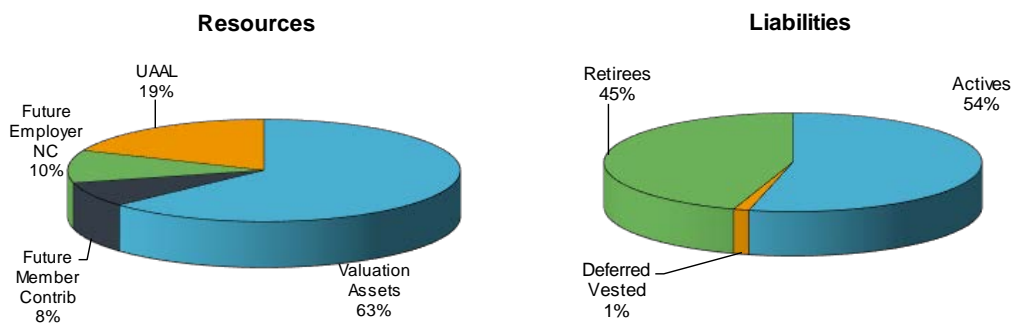
The smoothing method is currently deferring \$95 million in net asset gains. As the currently deferred gains and losses are recognized over upcoming valuations, it is projected there will be fluctuations in the calculated employer contribution rate.

The potential future impact of the recognition of these deferred gains and losses on the projected employer contribution rate is included in the graph on page 3.

Actuarial Balance Sheet

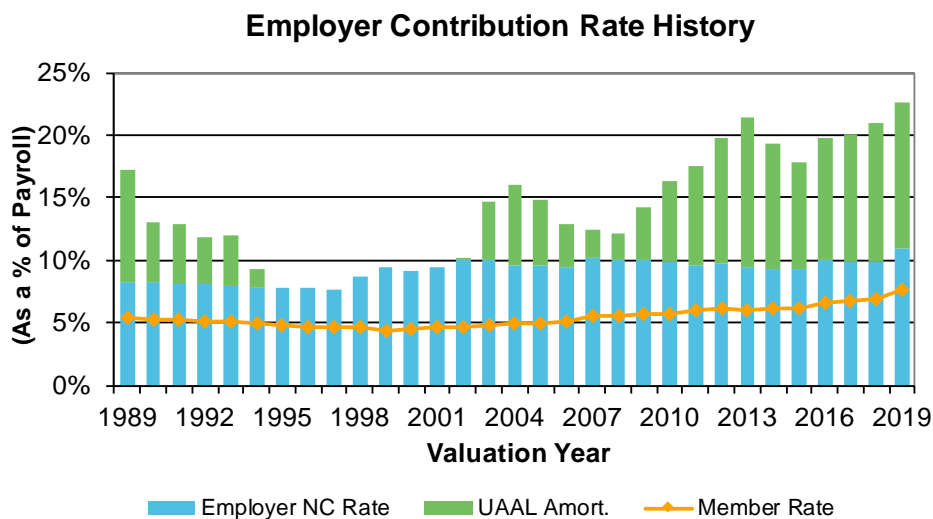
The first step in the valuation process is to compare the total actuarial assets of LACERA with its total liabilities for all plans. In this analysis, assets are those currently on hand at the actuarial value and also include expected future contributions by both the employers and members. Liabilities reflect benefits already earned in the past and those expected to be earned in the future by current members. This relationship is shown in the pie charts below. The AAL is the total of these liabilities less expected future Normal Cost contributions.

The 2019 actuarial valuation indicates that LACERA's Valuation Assets are less than its AAL. The difference between these two values is the UAAL. It is discussed, along with the effect of the experience gains and losses, in detail in Section 4, Actuarial Liabilities.



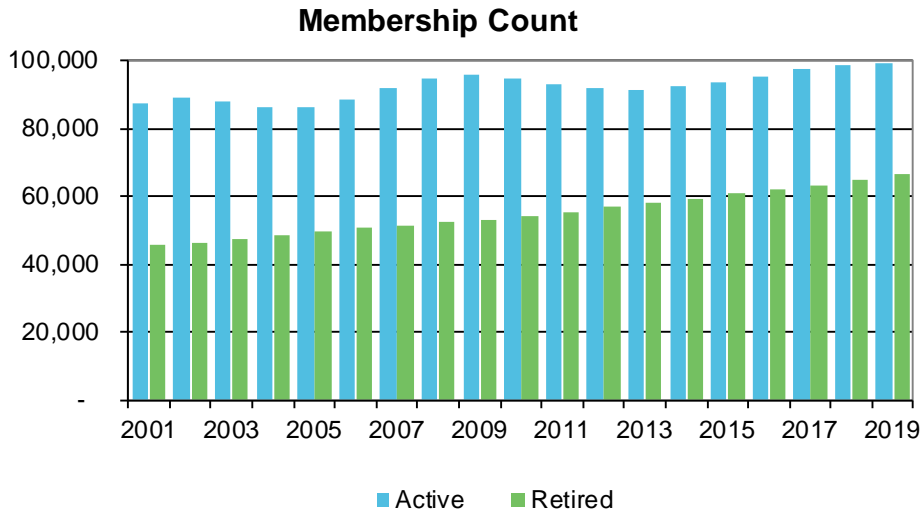
Employer Contribution Rate History

Based on the results of the valuation, the calculated employer contribution rate will increase for the fiscal year beginning in 2020 to a rate of 22.59% of pay. A historical perspective of the employer contribution rates is shown in the following graph.



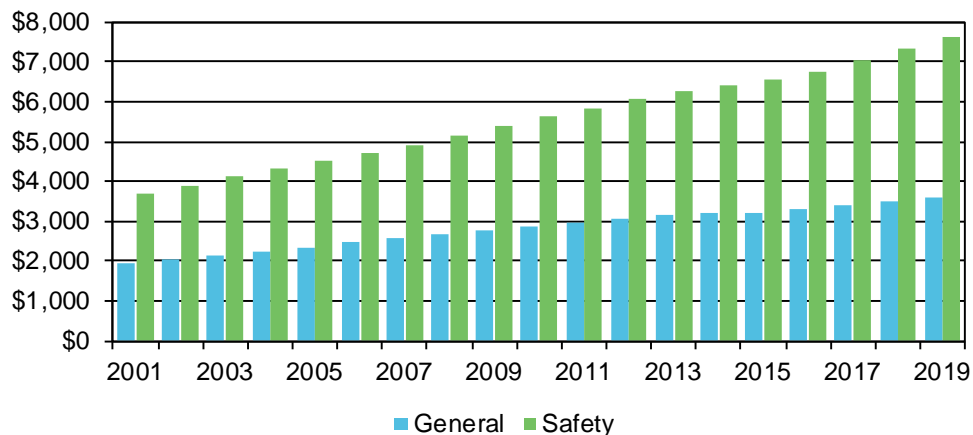
Member Information

Active membership and payroll have each increased since 2018. As of June 30, 2019, the annualized payroll is \$8.4 billion for 99,186 active members. This reflects a 3.5% increase in average member pay and a 0.7% increase in the number of active members.



Retired member counts and average retirement benefit amounts continue to increase steadily. For 2019, there were 66,507 retired members and beneficiaries with an average benefit of \$4,385 per month. This represents a 2.5% increase in count and a 3.6% increase in the average monthly benefit.

Average Monthly Retirement Benefit



Analysis of Change in Member Population

The following table summarizes the year-to-year change in member population.

| | Active Members | Inactive Members | Service Retired Members | Disabled Retired Members | Beneficiaries in Pay | Total |
|----------------------------|----------------|------------------|-------------------------|--------------------------|----------------------|----------------|
| As of June 30, 2018 | 98,474 | 14,906 | 46,296 | 9,707 | 8,877 | 178,260 |
| New Members | 5,417 | 178 | 18 | | 747 | 6,360 |
| Status Change: | | | | | | |
| to Active | 128 | (128) | | | | - |
| to Inactive | (1,476) | 1,476 | | | | - |
| to Service Retirement | (2,527) | (437) | 2,964 | | | - |
| to Disabled Retirement | (241) | (8) | (238) | 487 | | - |
| Refunds | (367) | (414) | | | | (781) |
| Terminated non-vested | (50) | | | | | (50) |
| Benefits Expired | | | (10) | | (6) | (16) |
| Deaths | (172) | (6) | (1,513) | (303) | (519) | (2,513) |
| As of June 30, 2019 | 99,186 | 15,567 | 47,517 | 9,891 | 9,099 | 181,260 |

Note: Inactive Members include non-vested former members who have not taken a refund of their contributions.

Sensitivity to Investment Return

The valuation results are projections based on the actuarial assumptions. Actual experience will differ from these assumptions, either increasing or decreasing the ultimate cost. Of the assumptions, the investment return generally has the biggest impact. The following table provides a simple analysis on how the short-term costs are affected by the investment return assumption. Note that the long-term cost of the Plan will be largely driven by actual investment returns and other experience; the assumptions used in the valuation impact the timing of the contributions over the long term.

| | Investment Return Assumption | | |
|-----------------------------------|------------------------------|----------------|----------------|
| | Current 7.00% | +0.5% 7.50% | -0.5% 6.50% |
| Employer Contribution Rate | 22.59% | 17.92% | 27.50% |
| Change | | -4.67% | 4.91% |
| Funded Ratio | 77.2% | 82.1% | 72.4% |
| Change | | 4.9% | -4.8% |

Summary Valuation Results

Exhibit 1 on the following page presents a summary of key valuation elements as of June 30, 2019 and June 30, 2018, and shows the relative change over the past year. More detail on each of these elements can be found in the following sections and exhibits of this report.

Exhibit 1
Summary of Significant Valuation Results

| | June 30, 2019 | June 30, 2018 | Percentage Change |
|---|---------------|---------------|-------------------|
| Total Membership | | | |
| A. Active Members | 99,186 | 98,474 | 0.7% |
| B. Retired Members & Beneficiaries | 66,507 | 64,880 | 2.5% |
| C. Vested Former Members ⁽¹⁾ | 15,567 | 14,906 | 4.4% |
| D. Total | 181,260 | 178,260 | 1.7% |
| Pay Rate as of June 30, 2019 | | | |
| A. Annual Total (\$millions) | \$ 8,423 | \$ 8,079 | 4.3% |
| B. Monthly Average per Active Member | 7,076 | 6,837 | 3.5% |
| Average Monthly Benefit Paid to Current Retirees and Beneficiaries | | | |
| A. Service Retirement | 4,334 | 4,200 | 3.2% |
| B. Disability Retirement | 5,856 | 5,579 | 5.0% |
| C. Surviving Spouse and Dependents | 3,052 | 2,934 | 4.0% |
| D. Total | 4,385 | 4,233 | 3.6% |
| Actuarial Accrued Liability (\$millions) | | | |
| A. Active Members | 32,400 | 29,335 | 10.4% |
| B. Retired Members | 41,021 | 38,087 | 7.7% |
| C. Vested Former Members | 1,214 | 1,105 | 9.9% |
| D. Total | 74,635 | 68,527 | 8.9% |
| Assets | | | |
| A. Market Value of Fund (\$millions) | 58,295 | 56,300 | 3.5% |
| B. Actuarial Value (\$millions) | | | |
| 1. Valuation Reserves | 57,617 | 55,233 | 4.3% |
| 2. Non-valuation Reserves | 583 | 563 | 3.5% |
| C. Annual Investment Return | | | |
| 1. Market Basis (Net Return) | 5.5% | 9.0% | n/a |
| 2. Valuation (Actuarial) Basis | 6.5% | 8.1% | n/a |
| Unfunded Actuarial Accrued Liability (\$ millions) | \$ 17,018 | \$ 13,294 | 28.0% |
| Employer contribution rate for all plans combined as a percent of total payroll | | | |
| A. Gross Normal Cost | 18.54% | 16.80% | 10.4% |
| B. Member Contributions ⁽²⁾ | (7.68)% | (6.88)% | 11.6% |
| C. Employer Normal Cost | 10.86% | 9.92% | 9.5% |
| D. UAAL Amortization | 13.92% | 10.99% | 26.7% |
| E. Calculated Contribution Rate | 24.78% | 20.91% | 18.5% |
| F. Deferred Recognition of new assumptions | (2.19)% | - | n/a |
| G. Employer Contribution Rate with phase-in | 22.59% | 20.91% | 8.0% |
| Funded Ratio | 77.2% | 80.6% | (4.2)% |
| Results Based on Market Value (Informational Purposes Only) | | | |
| Calculated Contribution Rate | 22.51% | 20.55% | 9.5% |
| Funded Ratio (excluding non-valuation reserves) | 77.3% | 81.3% | (4.9)% |

1. Includes non-vested former members with contributions on deposit.
2. Includes non-contributory members. The average rate for contributory plans increased from 8.32 % to 9.13%.

2. Scope of the Report

This report presents the actuarial valuation of the Los Angeles County Employees Retirement Association as of June 30, 2019. This valuation was requested by the Board of Investments. Section 31453 of the County Employees Retirement Law of 1937 (the '37 Act) requires an actuarial valuation to be performed at least every three years for the purpose of setting contribution rates. The 2019 valuation meets this requirement. Under LACERA's Funding Policy, annual valuations determine the employer contribution rates each year. Member contribution rates for all plans except General Plan G and Safety Plan C are set in years in which relevant actuarial assumptions are altered, such as 2019. For members of General Plan G and Safety Plan C, member contribution rates are recalculated each year, based on one-half of the Plan's normal cost rate.

A summary of the findings resulting from this valuation is presented in the previous section. Section 3 describes the assets and investment experience of the Plan. The assets and investment income are presented in Exhibits 2-4. Exhibit 5 develops the actuarial value of assets as of June 30, 2019. Exhibit 6 develops the Valuation Assets used for funding benefits.

Section 4 describes the benefit obligations of LACERA. Exhibit 7 is the Actuarial Balance Sheet and Exhibit 8a analyzes the change in UAAL. Exhibit 8b shows a history of these changes.

Section 5 discusses the member contribution rates.

Section 6 discusses the employer contributions rates.

Section 7 discloses supplemental information for use in the Comprehensive Annual Financial Report (CAFR). Milliman provides LACERA financial reporting information relevant to GASB Statements No. 67 and 68 in separate reports.

Section 8 shows the estimated cash flow of the Plan, including a projection of both contributions and benefit payments.

This report includes several appendices:

- Appendix A A summary of the actuarial procedures and assumptions used to estimate liabilities and contributions.
- Appendix B A summary of the current benefit structure, as determined by the provisions of governing law on June 30, 2019.
- Appendix C Schedules of valuation data classified by various categories of plan members.
- Appendix D Member contribution rates by plan.
- Appendix E Historical information.
- Appendix F A glossary of actuarial terms used in this report.

3. Assets

In many respects, an actuarial valuation can be thought of as an inventory process. The inventory is taken as of the actuarial valuation date, which for this valuation is June 30, 2019. On that date, the assets available for the payment of retirement benefits are appraised. These assets are compared with the actuarial liabilities (both accrued and future) for current members, which are generally in excess of the actuarial assets. The purpose of the valuation is to determine what future contributions by the members and employers are needed to pay all expected future benefits.

This section of the report looks at the assets used for funding purposes. In the next section, the actuarial liabilities will be discussed. Section 6 reviews the process for determining required contributions based on the relationship between the valuation assets and the actuarial liabilities.

A historical summary of the Plan's assets is presented below (dollar amounts in billions).

| | Market Value of Total Assets | | Actuarial Value | | | | |
|------|------------------------------------|------|---------------------------|---------------------|---|------|------|
| | | | Non-Valuation Reserves | Valuation Assets | Total Fund Return (%) ⁽¹⁾ | | |
| 2010 | \$ | 33.4 | \$ | 0.8 | \$ | 38.8 | 11.6 |
| 2011 | | 39.5 | | 0.9 | | 39.2 | 20.2 |
| 2012 | | 38.3 | | 0.9 | | 39.0 | 0.0 |
| 2013 | | 41.8 | | 0.4 | | 39.9 | 11.9 |
| 2014 | | 47.7 | | 0.5 | | 43.7 | 16.5 |
| 2015 | | 48.8 | | 0.5 | | 47.3 | 4.1 |
| 2016 | | 47.8 | | 0.5 | | 49.4 | 0.8 |
| 2017 | | 52.7 | | 0.5 | | 52.2 | 12.7 |
| 2018 | | 56.3 | | 0.6 | | 55.2 | 9.0 |
| 2019 | | 58.3 | | 0.6 | | 57.6 | 5.5 |

1. As reported in the Investment Section of LACERA's CAFR for the fiscal year ended June 30, 2019. All returns are shown net of investment expenses.

On June 30, 2019, the total market value of the fund, less current liabilities, was \$58.3 billion. The actuarial value of the fund was determined to be \$58.2 billion, including the non-valuation reserves. The average total fund return for the last 10 years is 9.0% net of fees, as reported by LACERA.

Financial Exhibits

Exhibit 2 presents a Statement of Fiduciary Net Position and Exhibit 3 presents a Statement of Changes in Fiduciary Net Position. Exhibit 4 describes the allocation of LACERA's assets by the various reserve values determined for accounting purposes as disclosed in the audited financial statements.

Exhibits 2-4 are taken directly from data furnished to us by LACERA in its annual financial report. We have accepted these tables for use in this report without audit, but we have reviewed them both for the prior year and the current year for reasonableness and consistency with previous reports.

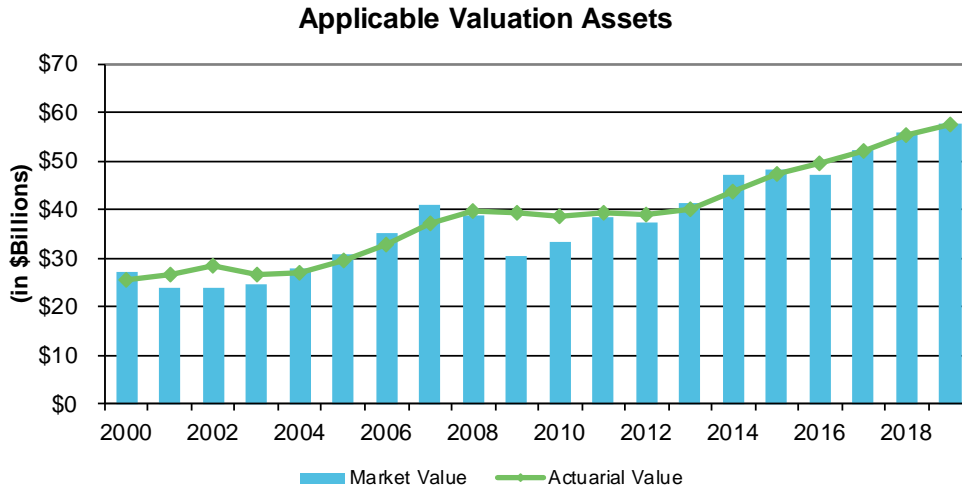
Actuarial Asset Method

The actuarial asset method computes the expected market value of assets based on the prior year's market value of assets, the actual cash flow of contributions and benefit payments, and the assumed investment rate of return.

For the previous year, the assumed rate of return was 7.25%, net of all expenses. The difference between the actual market value and the expected market value is recognized evenly (also referred to as “smoothing”) over a five-year period.

Actuarial Value of Assets

The development of the June 30, 2019 actuarial value of assets is shown in Exhibit 5. Note the smoothing process is deferring past investment gains and losses, and is currently in a net actuarial gain position. The result is an actuarial value of assets that is less than the June 30, 2019 market value by \$95 million. The following graph shows a historical comparison of the actuarial and market assets used for valuation purposes.



Funding Policy

Under the Board of Investments’ long-term Funding Policy, the following is the allocation of actuarial assets. A Funded Ratio equal to 100% is the Funding Goal. Note that although the allocation of assets used in the actuarial valuation is similar to the process LACERA uses for accounting purposes, there are some differences, including the earnings considered for interest crediting purposes.

For funding purposes and for setting contributions rates, recognized earnings for a plan year is the recognized investment income as determined by the Actuarial Asset Method and includes both unrealized income and net realized income, together with the prior balance in the Contingency Reserve. The allocation of recognized earnings is performed once a year as of the Valuation Date in the following order of priority:

- Priority 1: Allocate to the Member Reserve so the Actuarial Asset allocation to that Reserve equals the accounting value for that Reserve on the Valuation Date.
- Priority 2: Allocate to the Advanced Employer Contributions Reserve so the Actuarial Asset allocation to that Reserve equals the accounting value for that Reserve on the Valuation Date.
- Priority 3: Allocate to the Employer Reserve so the Actuarial Asset allocation to that reserve equals the accounting value for that Reserve on the Valuation Date.
- Priority 4: Allocate to the County Contribution Credit Reserve so the Actuarial Asset allocation to that reserve equals the accounting value for that Reserve on the Valuation Date. Note: This Reserve is not a Valuation Reserve.

- Priority 5: Allocate to the Employer Reserve so the total amounts allocated equal one-year's interest at the assumed interest rate used in the actuarial valuation as of the preceding Valuation Date to the extent there are positive recognized earnings to allocate.
- Priority 6: Allocate to the Contingency Reserve an amount equal to 1% of the Market Value of Assets as of the Valuation Date to the extent there are positive recognized earnings to allocate.
- Priority 7: Allocate to the Employer Reserve an amount, if necessary, when combined with other Valuation Reserves, to provide 100% funding of the AAL as of the Valuation Date to reach the Funding Goal. In the event there are negative recognized earnings, allocate the entire amount.
- Priority 8: The Board may consider additional actions as permitted under the County Employee Retirement Law (CERL) using funds in excess of the amount needed to meet the Funding Goal for funding discretionary benefits. "Excess Earnings" as defined in the County Employees Retirement Law (CERL) may be appropriated upon reaching the Funding Goal; however, the Board may consider adjustment to the employer's contributions only upon satisfying California Government Code Section 7522.52(b).

Valuation Assets

Valuation Assets are the actuarial value of the fund, less the value of any Non-Valuation Reserves. Non-Valuation Reserves include Contingency Reserves and other reserves that have been set aside for current liabilities and special benefits to be funded outside of the actuarially determined contribution rates. The Contingency Reserve is set at a minimum of 1.0% of the market value of the total assets.

The Funding Policy allows the STAR Reserve to be allocated to the Valuation Assets (subject to periodic review), if needed. The June 30, 2019 STAR Reserve accounting value of \$614 million was included in Valuation Assets and used to determine the employer contribution rates for the fiscal year beginning July 1, 2020. Although the STAR Reserve is included in the 2019 Valuation Assets, there is no liability included in this valuation for STAR benefits that may be granted in the future.

The Non-Valuation Reserves shown in Exhibit 6 for funding purposes are not the same as those shown in the audited financial statements and in Exhibit 4.

Exhibit 2
Statement of Fiduciary Net Position
As of June 30, 2019 and June 30, 2018

| | 2019 | 2018 |
|---|---------------------------------|---------------------------------|
| Assets | | |
| Cash and Short-Term Investments | \$ 1,310,026,598 | \$ 1,786,940,488 |
| Cash Collateral on Loaned Securities | 814,829,353 | 1,191,235,028 |
| Receivables | | |
| Contributions Receivable | 96,481,733 | 89,180,657 |
| Accounts Receivable - Sale of Investments | 1,046,945,184 | 707,664,801 |
| Accrued Interest and Dividends | 102,714,643 | 102,733,511 |
| Accounts Receivable - Other | 8,334,664 | 47,090,340 |
| Total Receivables | <u>1,254,476,224</u> | <u>946,669,308</u> |
| Investments at Fair Value | | |
| Equity | 25,836,066,007 | 25,661,002,621 |
| Fixed Income | 18,028,747,241 | 15,934,586,918 |
| Private Equity | 6,028,264,809 | 5,929,098,297 |
| Real Estate | 6,192,619,038 | 6,326,245,674 |
| Hedge Funds | 1,890,739,586 | 1,592,125,696 |
| Total Investments | <u>57,976,436,681</u> | <u>55,443,059,206</u> |
| Total assets | <u>61,355,768,857</u> | <u>59,367,904,030</u> |
| Liabilities | | |
| Accounts Payable - Purchase of Investments | 2,162,819,244 | 1,803,896,893 |
| Retiree Payroll and Other Payables | 921,886 | 912,029 |
| Accrued Expenses | 44,518,045 | 35,830,507 |
| Tax Withholding Payable | 35,504,456 | 32,848,312 |
| Obligations under Securities Lending Program | 814,829,353 | 1,191,235,028 |
| Accounts Payable - Other | 2,339,307 | 3,199,091 |
| Total liabilities | <u>3,060,932,291</u> | <u>3,067,921,859</u> |
| Fiduciary Net Position restricted for pension benefits | <u>\$ 58,294,836,565</u> | <u>\$ 56,299,982,171</u> |

Exhibit 3
Statement of Changes in Fiduciary Net Position
For the Fiscal Years Ended June 30, 2019 and 2018

| | 2019 | 2018 |
|---|--------------------------|--------------------------|
| Additions | | |
| Contributions | | |
| Employer | \$ 1,708,121,851 | \$ 1,564,284,149 |
| Member | 595,444,371 | 551,800,960 |
| Total Contributions | <u>2,303,566,222</u> | <u>2,116,085,109</u> |
| Investment Income | | |
| From Investing Activities: | | |
| Net Appreciation/(Depreciation) in Fair Value of Investments | 1,215,624,890 | 974,529,583 |
| Investment Income/(Loss) | <u>2,188,735,905</u> | <u>3,925,181,008</u> |
| Total Investing Activity Income | 3,404,360,796 | 4,899,710,590 |
| Less Expenses From Investing Activities | <u>(233,125,624)</u> | <u>(188,753,319)</u> |
| Net Investing Activity Income | 3,171,235,172 | 4,710,957,272 |
| From Securities Lending Activities: | | |
| Securities Lending Income | 26,146,035 | 18,795,978 |
| Less Expenses From Securities Lending Activities: | | |
| Borrower Rebates | (20,545,040) | (11,786,852) |
| Management Fees | <u>(1,112,831)</u> | <u>(1,326,534)</u> |
| Total Expenses from Securities Lending Activities | (21,657,871) | (13,113,386) |
| Net Securities Lending Income | 4,488,164 | 5,682,591 |
| Total Net Investment Income | <u>3,175,723,336</u> | <u>4,716,639,863</u> |
| Miscellaneous | <u>5,958,105</u> | <u>5,613,034</u> |
| Total Additions | <u>5,485,247,662</u> | <u>6,838,338,006</u> |
| Deductions | | |
| Retiree Payroll | 3,375,752,179 | 3,177,726,363 |
| Administrative Expenses | 70,800,052 | 67,490,603 |
| Investment Expenses | 12,105,588 | 10,690,610 |
| Refunds | 28,691,156 | 23,220,662 |
| Lump Sum Death Benefits | 2,711,348 | 2,428,048 |
| Miscellaneous | <u>332,945</u> | <u>450,521</u> |
| Total Deductions | <u>3,490,393,268</u> | <u>3,282,006,806</u> |
| Net increase/(decrease) | 1,994,854,395 | 3,556,331,199 |
| Fiduciary Net Position restricted for pension benefits | | |
| Beginning of Year | 56,299,982,171 | 52,743,650,971 |
| End of Year | <u>\$ 58,294,836,565</u> | <u>\$ 56,299,982,171</u> |

Exhibit 4
Allocation of Assets by Accounting Reserve Amounts

(Dollars in Thousands)

| | June 30, 2019 | June 30, 2018 |
|---|------------------------------------|------------------------------------|
| 1. Member Reserves | | |
| a. Active Members | \$ 22,363,377 | \$ 21,438,279 |
| b. Unclaimed Deposits | <u>-</u> | <u>-</u> |
| c. Total Member Reserves | 22,363,377 | 21,438,279 |
| 2. Employer Reserves | | |
| a. Actual Employer Contributions | 22,464,894 | 22,610,763 |
| b. Advanced Employer Contributions | <u>-</u> | <u>-</u> |
| c. Total Employer Contributions | 22,464,894 | 22,610,763 |
| 3. County Contribution Credit Reserve | - | - |
| 4. STAR Reserve | 614,011 | 614,011 |
| 5. Contingency Reserve | <u>-</u> | <u>-</u> |
| 6. Total Reserves at Book Value | 45,442,282 | 44,663,053 |
| 7. Unrealized Investment Portfolio Appreciation | <u>12,852,555</u> | <u>11,636,929</u> |
| 8. Total Reserves at Fair Value | <u><u>\$ 58,294,837</u></u> | <u><u>\$ 56,299,982</u></u> |

Note: These amounts were determined by LACERA for accounting purposes and are reported in the CAFR for the fiscal year ended June 30, 2019.

**Exhibit 5
 Five-Year Smoothing of Gains and Losses on Market Value**

(Dollars in Thousands)

| June 30, 2019 Valuation | | | | | |
|-------------------------|---------------|---------------------|--------------------------|------------------------|--|
| Plan Year Ending | Contributions | Benefit Payments | Expected Market Value | Actual Market Value | Phase-Out of Gain / (Loss) |
| 06/30/2019 | \$ 2,303,566 | \$ 3,407,155 | \$ 59,238,837 | \$ 58,294,837 | 80.00% x \$ (944,000) = \$ (755,200) |
| 06/30/2018 | 2,116,085 | 3,203,375 | 55,441,551 | 56,299,982 | 60.00% x 858,431 = 515,059 |
| 06/30/2017 | 1,857,938 | 3,029,633 | 50,102,154 | 52,743,651 | 40.00% x 2,641,497 = 1,056,599 |
| 06/30/2016 | 1,901,795 | 2,889,186 | 51,455,977 | 47,846,694 | 20.00% x (3,609,283) = (721,857) |
| 06/30/2015 | 1,936,233 | 2,768,410 | 50,438,628 | 48,818,350 | 0.00% x (1,620,278) = <u>0</u> |
| | | | | | (a) Total Phase-Out of Gain / (Loss) = \$ 94,601 |
| | | | | | (b) Total Market Value of Assets = \$ 58,294,837 |
| | | | | | (c) Total Actuarial Value of Assets [(b) - (a)] = \$ 58,200,236 |

Total Actuarial Value of Assets = Total Market Value of Assets less the Total Phase-Out amount
 Phase-Out amounts will be recognized in future years.

Projected Recognition of Actuarial Asset Gains / (Losses) in Future Valuations

| | 2020 Val | 2021 Val | 2022 Val | 2023 Val | Total |
|-------------------------|--------------|------------|-------------|--------------|-----------|
| Amount to be Recognized | \$ (210,671) | \$ 511,186 | \$ (17,114) | \$ (188,800) | \$ 94,601 |

**Exhibit 6
 Allocation of Valuation and Non-Valuation Assets**

(Dollars in Thousands)

| | June 30, 2019 | June 30, 2018 |
|--|-------------------|-------------------|
| 1. Total Market Value of Assets | \$ 61,355,769 | \$ 59,367,904 |
| 2. Current Liabilities | <u>3,060,932</u> | <u>3,067,922</u> |
| 3. Net Assets Held in Trust for Pension Benefits | 58,294,837 | 56,299,982 |
| 4. Market Stabilization Reserve ⁽¹⁾ | <u>94,601</u> | <u>503,874</u> |
| 5. Actuarial Value of Fund Assets | 58,200,236 | 55,796,108 |
| 6. Non-Valuation Reserves ⁽²⁾ | | |
| a. Unclaimed Deposits | - | - |
| b. Contingency Reserve | 582,948 | 563,000 |
| c. Advanced Employer Contributions | - | - |
| d. County Contribution Credit Reserve | - | - |
| e. Reserve for STAR Program | - | - |
| f. Total | <u>582,948</u> | <u>563,000</u> |
| 7. Valuation Assets ⁽²⁾ | | |
| a. Member Reserves | 22,363,377 | 21,438,279 |
| b. Employer Reserves for Funding Purposes | <u>35,253,911</u> | <u>33,794,829</u> |
| c. Total | 57,617,288 | 55,233,108 |

1. The Market Stabilization Reserve represents the difference between the Market Value of the fund less Current Liabilities, and the Actuarial Value of the fund as determined in Exhibit 5.

2. The values used for funding purposes for all reserves are based on the Board's Funding Policy. Amounts used for funding purposes may differ from those reported in the audited financial statements as shown in Exhibit 4.

4. Actuarial Liabilities

In the previous section, an actuarial valuation was compared with an inventory process, and an analysis was given of the inventory of LACERA's assets as of the valuation date, June 30, 2019. In this section, the discussion will focus on the commitments of LACERA for retirement benefits, which are referred to as its actuarial liabilities.

Actuarial Balance Sheet – Liabilities

Actuarial liabilities attributable to both past and future benefits are included on the actuarial balance sheet. The difference between the Valuation Assets and the total actuarial liabilities is the amount that needs to be funded by future member and employer contributions. Both the current and future assets (contributions) are included on the actuarial balance sheet and compared to the total actuarial liabilities. The determination of the level of future member and employer contributions needed is discussed in the next section.

Exhibit 7 contains an analysis of the actuarial present value of all future benefits for inactive members (both retired and vested former members) and active members. The analysis is given by class of membership, by plan and by type of benefit. Note that for purposes of this exhibit the Valuation Assets are shown allocated by plan in proportion to each plan's reserves (employer and member).

The actuarial liabilities include the actuarial present value of all future benefits expected to be paid with respect to each member. For an active member, this value includes measures of both benefits already earned and future benefits to be earned. For all members, active and inactive, the value extends over the rest of their lives and for the lives of any surviving beneficiaries.

The actuarial assumptions used to determine the liabilities are based on the results of the 2019 Investigation of Experience Report. New assumptions were adopted by the Board effective with the June 30, 2019 actuarial valuation. See Appendix A of this report for details.

All liabilities reflect the benefits effective through June 30, 2019. This includes permanent STAR COLAs that have been adopted through the valuation date, but does not include the value of any STAR benefits that may be granted in the future.

Exhibit 7
Actuarial Balance Sheet – June 30, 2019

(Dollars in Millions)

| | General | | | | | | Safety | | | All Plans |
|--|------------------|---------------|---------------|------------------|------------------|-----------------|-----------------|------------------|-----------------|------------------|
| | Plan A | Plan B | Plan C | Plan D | Plan E | Plan G | Plan A | Plan B | Plan C | |
| LIABILITIES | | | | | | | | | | |
| Present Value of Benefits - Inactives | | | | | | | | | | |
| - Retirees and Beneficiaries | \$ 11,576 | \$ 470 | \$ 274 | \$ 8,594 | \$ 4,080 | \$ 5 | \$ 7,304 | \$ 8,709 | \$ 9 | \$ 41,021 |
| - Vested Former | 9 | 2 | 1 | 596 | 450 | 29 | 0 | 125 | 2 | 1,214 |
| - Inactive Total | 11,585 | 472 | 275 | 9,190 | 4,530 | 34 | 7,304 | 8,834 | 11 | 42,235 |
| Present Value of Benefits - Actives | | | | | | | | | | |
| - Service Retirement | 107 | 39 | 42 | 20,969 | 6,268 | 4,820 | 9 | 8,763 | 995 | 42,012 |
| - Transfer Service (prior LACERA plan) | 0 | 0 | 0 | 235 | 451 | 4 | 0 | 13 | 0 | 703 |
| - Disability Retirement | 1 | 0 | 0 | 914 | N/A | 361 | 1 | 3,262 | 543 | 5,082 |
| - Death | 1 | 0 | 0 | 373 | N/A | 112 | 0 | 77 | 18 | 581 |
| - Termination | 0 | 0 | 0 | 198 | 84 | 289 | 0 | 46 | 53 | 670 |
| - Active Total | 109 | 39 | 42 | 22,689 | 6,803 | 5,586 | 10 | 12,161 | 1,609 | 49,048 |
| Total Actuarial Liabilities | \$ 11,694 | \$ 511 | \$ 317 | \$ 31,879 | \$ 11,333 | \$ 5,620 | \$ 7,314 | \$ 20,995 | \$ 1,620 | \$ 91,283 |
| ASSETS | | | | | | | | | | |
| Valuation Assets | (2,553) | 402 | 297 | 28,184 | 13,172 | 1,744 | (1,396) | 17,433 | 334 | 57,617 |
| PV Future Member Contributions | 1 | 1 | 1 | 2,974 | N/A | 2,434 | 0 | 1,109 | 731 | 7,251 |
| PV Future Employer Normal Cost Contributions | 4 | 1 | 0 | 3,405 | 1,171 | 2,202 | 0 | 1,938 | 676 | 9,397 |
| UAAL or (Surplus Funding) | 14,242 | 107 | 19 | (2,684) | (3,010) | (760) | 8,710 | 515 | (121) | 17,018 |
| Total Current and Future Assets | \$ 11,694 | \$ 511 | \$ 317 | \$ 31,879 | \$ 11,333 | \$ 5,620 | \$ 7,314 | \$ 20,995 | \$ 1,620 | \$ 91,283 |

Actuarial Balance Sheet – Assets

For the purpose of the Actuarial Balance Sheet, LACERA's assets are equal to the sum of:

- (a) Assets currently available to pay benefits and considered for funding purposes (the Valuation Assets);
- (b) The present value of future contributions expected to be made by current active members; and
- (c) The present value of future contributions expected to be made by the employer.

Actuarial Cost Method

The Actuarial Balance sheet determines the amount of future contributions that are needed, but the method used to determine when those future contributions will be made in future years is called the "actuarial cost method." For this valuation, the entry age actuarial cost method has been used. Under this method, the contributions required to meet the difference between current assets and current actuarial liabilities are allocated each year between two elements:

- A normal cost amount; and
- An amount to amortize the UAAL (Unfunded Actuarial Accrued Liability). Note that the UAAL may be negative (representing current assets greater than current actuarial liabilities).

The two items described above – the Normal Cost and UAAL – are the keys to understanding the actuarial cost method.

Normal Cost

The Normal Cost is the theoretical contribution rate that will meet the ongoing costs of a group of average new employees. Suppose that a group of new employees was covered under a separate fund from which all benefits and to which all contributions and associated investment returns were paid. Under the entry age actuarial cost method, the Normal Cost contribution rate maintains the funding of benefits as a level percentage of pay. If experience follows the actuarial assumptions precisely, the fund would be completely liquidated when the last payment to the last survivor of the group is made.

By applying the Normal Cost contribution rate to the present value of salaries expected to be paid in the future, we determine the present value of future Normal Cost contributions. Future contributions are expected to be made by both the members and the employer. The member contribution rates are determined based upon requirements established in the '37 Act and the actuarial assumptions. Based on these member contribution rates, we determine the present value of future member contributions. We subtract that value from the total future Normal Cost contributions expected, based on the entry age cost method. The remaining difference is the employer's portion of the future Normal Cost contributions.

Actuarial Accrued Liability

The difference between the present value of all future obligations and the present value of the future Normal Cost contributions is referred to as the Actuarial Accrued Liability (AAL). The AAL is calculated and then compared to the value of assets available to fund benefits. The difference is referred to as the UAAL. The results for all LACERA plans in aggregate are summarized below:

| (Dollars in millions) | 2019 | 2018 | Percent Change |
|--|-----------|-----------|----------------|
| A. Actuarial present value of all future benefits for contributing members, former contributing members, and their survivors | \$ 91,283 | \$ 82,534 | 10.6% |
| B. Actuarial present value of total future normal costs for current members | 16,648 | 14,007 | 18.9% |
| C. Actuarial accrued liability [A-B] | 74,635 | 68,527 | 8.9% |
| D. Valuation Assets | 57,617 | 55,233 | 4.3% |
| E. UAAL or (Surplus Funding) [C-D] | 17,018 | 13,294 | 28.0% |
| F. Funded Ratio [D/C] | 77.2% | 80.6% | -4.2% |

Unfunded Actuarial Accrued Liability

The portion allocated to service already rendered or accrued is called the AAL. The difference between the AAL and the Valuation Assets is called the Unfunded AAL (UAAL). If a UAAL amount exists, it usually results from prior years' benefit or assumption changes and the net effect of accumulated gains and losses. If the employer had always contributed the current Normal Cost, and if there were no prior benefit or assumption changes, and if actual experience exactly matched the actuarial assumptions, then the present value of all future Normal Cost contributions would be sufficient to fund all benefits and there would be no UAAL.

Exhibit 7 shows how the UAAL was derived for each level of plan benefits. In the Actuarial Balance sheet, the total actuarial liability for all future benefits must be equal to the current and future assets.

The Actuarial Balance Sheet for each plan, as well as its UAAL, is based on an estimated allocation of the total LACERA Valuation Assets, as previously shown in Exhibit 7. The allocation is based on the relative value of each plan's employer and member reserves as reported to us by LACERA. These allocations are shown for illustrative purposes only, as the UAAL contribution rates are paid by the employer based on the valuation results in aggregate.

Funding Adequacy

A key consideration in determining the adequacy of the funding of LACERA is how the UAAL is being funded. Under LACERA's Funding Policy, a new UAAL "layer" is established each year when the Funded Ratio is less than 100% or greater than or equal to 120%. Effective with the June 30, 2019 valuation, all new UAAL layers are amortized over 20-year periods, compared to 30-year periods previously.

If future experience is significantly more favorable than expected based on the actuarial assumptions, then LACERA's UAAL may be eliminated. Conversely, if experience is less favorable, a larger UAAL will develop.

Analysis of Change in Unfunded Actuarial Accrued Liability

The UAAL, at any date after establishment of a retirement plan, is affected by any actuarial gains (decreases in UAAL) or losses (increases in UAAL) arising when the actual experience of the retirement plan varies from the experience anticipated by the actuarial assumptions. To the extent actual experience, as it develops, differs from that expected according to the assumptions used, so also will the emerging costs differ from the estimated costs.

The 2019 actuarial valuation reflects an increase in the UAAL of \$2,528 due to the new assumptions. In addition, there was an actuarial experience loss of \$1,171 million for the fiscal year just ended. This resulted in an approximate \$3.7 billion increase in the UAAL. The effect of the gains and losses on the UAAL is shown in Exhibit 8a. A summary of these factors is:

- Investment Returns: Returns on market assets were 5.5% (net of investment expenses) compared to the assumed return of 7.25%. This, combined with recognitions of gains and losses from prior periods, resulted in an actuarial asset loss of \$477 million.
- Active Member Experience (non salary): This includes gains and losses from termination, service retirement, disability retirement, and death different than assumed. This resulted in an actuarial loss of \$124 million.
- Salary Increases: Individual salaries for continuing active members increased at a rate greater than the valuation assumption. This resulted in an actuarial loss of \$486 million.
- Actual CPI versus Assumption: The actual CPI increase was greater than assumed for members of Plan A. This resulted in COLA increases more than the assumption, which generated an actuarial loss of \$44 million.
- Mortality Experience: An actuarial loss due to mortality generally indicates that retired members are living longer than the current assumption predicts. This year, there was an actuarial gain of \$6 million due to mortality, indicating retirees are currently living slightly shorter lives than assumed.
- Other Experience: Examples of this are gains and losses from retirement and mortality experience of inactive members, reciprocity, and transfers between plans. These factors combined resulted in an actuarial loss of \$46 million.

Change in Unfunded Actuarial Accrued Liability – History

Exhibit 8b shows the sources of change in the UAAL over the past five valuations. The single biggest source of annual change in most years, when there are no changes in the assumptions, is the return on investments being either greater than or less than the assumption.

**Exhibit 8a
 Analysis of Change in Unfunded Actuarial Accrued Liability**

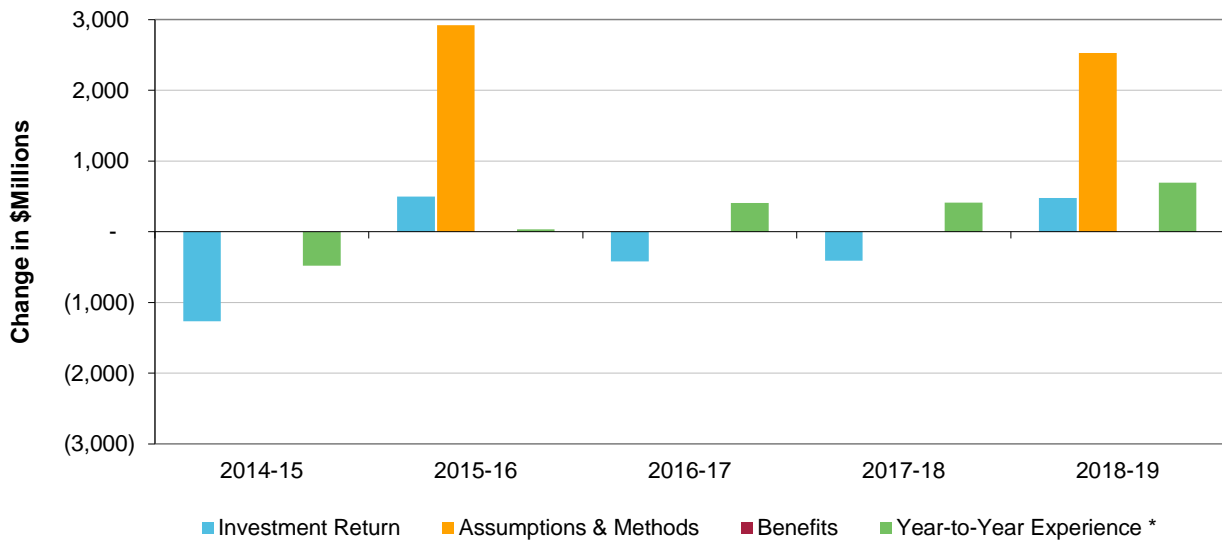
(Dollars in Millions)

| | Amount | As a Percent of June 30, 2019 Actuarial Accrued Liability |
|--|------------------|--|
| Unfunded Actuarial Accrued Liability - June 30, 2018 | \$ 13,294 | 17.81% |
| Interest Accrued | 976 | 1.31% |
| Benefits Accrued (Normal Cost) | 1,352 | 1.81% |
| <u>Contributions</u> | | |
| Employer - Cash | \$ (1,708) | -2.29% |
| Employer - Contribution Credit | - | 0.00% |
| Member | <u>(595)</u> | -0.80% |
| Total | <u>(2,303)</u> | -3.09% |
| Expected Unfunded Actuarial Accrued Liability - June 30, 2019 | \$ 13,319 | 17.85% |
| Sources of Change: | | |
| Increase in UAAL due to New Assumptions | 2,528 | 3.39% |
| <u>Asset (Gains) and Losses</u> | | |
| (Gain) / Loss due to Investment Income | 477 | 0.64% |
| <u>Liability (Gains) and Losses</u> | | |
| Active Member Experience (non salary) | \$ 124 | 0.17% |
| Salary Increases Greater than Expected | 486 | 0.65% |
| CPI Greater than Expected | 44 | 0.06% |
| Mortality Experience | (6) | -0.01% |
| All Other Experience | <u>46</u> | 0.06% |
| Total | <u>694</u> | 0.93% |
| Total Changes | \$ 3,699 | 4.96% |
| Unfunded Actuarial Accrued Liability - June 30, 2019 | \$ 17,018 | 22.80% |

Exhibit 8b
History of Changes in Unfunded Actuarial Accrued Liability

(Dollars in Millions)

| | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2014-19 |
|------------------------------------|----------------|--------------|--------------|--------------|--------------|--------------|
| Prior Valuation UAAL | \$ 11,288 | \$ 9,491 | \$ 12,841 | \$ 13,145 | \$ 13,294 | \$ 11,288 |
| Increase in UAAL due to: | | | | | | |
| Expected Increase / (Decrease) | (54) | (102) | 320 | 146 | 25 | 335 |
| ■ Asset (Gains) and Losses | (1,263) | 496 | (421) | (411) | 477 | (1,122) |
| ■ Changes in Benefits | - | - | - | - | - | - |
| ■ Changes in Assumptions | - | 2,922 | - | - | 2,528 | 5,450 |
| ■ Changes in Methods | - | - | - | - | - | - |
| ■ Salary Increases | 79 | 162 | 277 | 223 | 486 | 1,227 |
| ■ CPI Increases | (570) | (191) | (139) | 45 | 44 | (811) |
| ■ Mortality Experience | (59) | (4) | (51) | (20) | (6) | (140) |
| ■ All Other Experience | 70 | 67 | 318 | 166 | 170 | 791 |
| Total Increase / (Decrease) | (1,797) | 3,350 | 304 | 149 | 3,724 | 5,730 |
| Valuation UAAL | \$ 9,491 | \$ 12,841 | \$ 13,145 | \$ 13,294 | \$ 17,018 | \$ 17,018 |
| Funded Ratio | 83.3% | 79.4% | 79.9% | 80.6% | 77.2% | 77.2% |



* Year-to-Year Experience includes changes due to Salary, CPI, Mortality and Other Experience.

5. Member Contributions

Normal Contributions for non-PEPRA Plans

Member contributions are of two types: Normal contributions and cost-of-living contributions.

Normal contributions for each non-PEPRA plan (all plans except General Plan G and Safety Plan C) are defined in the following sections of the County Employees' Retirement Law:

| Plan | '37 Act Reference | Formula |
|-----------|-------------------|----------------------------|
| General A | 31621.3 | 1/240th of FAC at age 55 |
| General B | 31621.1 | 1/120th of FAC at age 55 |
| General C | 31621 | 1/120th of FAC at age 60 |
| General D | 31621 | 1/120th of FAC at age 60 |
| General E | N/A | Plan E is non-contributory |
| Safety A | 31639.5 | 1/200th of FAC at age 50 |
| Safety B | 31639.25 | 1/100th of FAC at age 50 |

Note: FAC = Final Average Compensation

Normal member contributions are determined using the Entry Age Normal Funding Method and the following actuarial assumptions:

1. Expected rate of return on assets.
2. Individual salary increase rate (wage growth + merit).
3. Mortality for members on service retirement.

Since new assumptions were adopted for the 2019 valuation, we are recommending changes to the member contribution rates for General Plans A to D and Safety Plans A and B, as shown in Appendix D. A sample of these recommended member contribution rates is shown in Exhibit 9.

Member contribution rates for General Plan G and Safety Plan C are discussed below.

Cost-of-Living Contributions for non-PEPRA Plans

The determination of the member cost-of-living (COLA) contributions is based on Section 31873 of the County Employees’ Retirement Law. This section requires that the cost of the COLA benefit be shared equally between members and the employer. Unlike the member normal contributions, these rates are based on the actuarial cost of the benefits and reflect all assumptions used in the valuation of liabilities.

Since new assumptions were adopted for the 2019 valuation we are recommending changes in the member cost-of-living contribution rates. The recommended cost-of-living contribution rates, expressed as a percentage of the normal member contribution rates, are as follows:

| Plan | Recommended COLA % | Current COLA % | Ratio (Recommended / Current) |
|-----------|--------------------|----------------|-------------------------------|
| General A | 84.46% | 79.37% | 106.4% |
| General B | 25.90% | 23.97% | 108.1% |
| General C | 26.81% | 25.46% | 105.3% |
| General D | 25.94% | 24.49% | 105.9% |
| General E | 0.00% | 0.00% | N/A |
| Safety A | 87.15% | 86.98% | 100.2% |
| Safety B | 33.03% | 31.63% | 104.4% |

The relative magnitude of these amounts reflects the differences in the normal contribution rates for each plan and the different cost-of-living benefits offered by the different plans. The rate for Plan E is 0.00%, since it is non-contributory.

A sample of the current member contribution rates (normal plus cost-of-living) can be found in Exhibit 9.

Full disclosure of the member rates, showing both the normal and the total (normal plus cost-of-living) contribution rates, can be found in Appendix D.

Member Contribution Rates for General Plan G and Safety Plan C (PEPRA Plans)

Members of the two plans developed in compliance with the California Public Employees’ Pension Reform Act of 2013 (PEPRA) contribute a flat rate (i.e., does not vary by entry age) based on whether they are in the General or Safety plan. This rate is set equal to one-half of the total Normal Cost rate. We are recommending changes to the member contribution rates for these plans, as shown below, to reflect the Plan’s Normal Cost rates for the 2019 valuation.

| | General Plan G | Safety Plan C |
|-------------------------------|----------------|---------------|
| All Ages: Recommended | 9.11% | 14.54% |
| All Ages: Current | 8.43% | 13.69% |
| Ratio (Recommended / Current) | 108.1% | 106.2% |

Note that the member contribution rates for these plans are further split for purposes of this report into a “Normal” and “Cost of Living” component. The cost-of-living component for these members, as shown in Exhibit 9 below, represents one-half of the cost of the COLA for these plans.

Average Member Rates

The average member contribution rate for only those members in contributory plans at June 30, 2019 is 9.13% of covered payroll. This number compares to 7.68% of covered payroll, which is the average member contribution rate among all members. The 7.68% offsets the gross normal cost to yield the employer normal cost rate. Note that covered payroll does not include pay for PEPRA plan members that is above the PEPRA compensation limit.

Exhibit 9
Sample Member Contribution Rates

| <u>Recommended Rates (Based on 2019 Valuation)</u> | | | | | | |
|--|-----------|--------|----------------|---------------------|----------------------|-----------------------|
| | Entry Age | Normal | Cost of Living | Total as a % of Pay | Current Rate (Total) | Ratio (New / Current) |
| General Members | | | | | | |
| Plan A | 25 | 3.24% | 2.74% | 5.98% | 5.33% | 112.2% |
| | 35 | 3.99% | 3.37% | 7.36% | 6.65% | 110.7% |
| | 45 | 4.83% | 4.08% | 8.91% | 8.18% | 108.9% |
| | 55 | 5.13% | 4.33% | 9.46% | 8.84% | 107.0% |
| Plan B | 25 | 6.47% | 1.68% | 8.15% | 7.35% | 110.9% |
| | 35 | 7.98% | 2.07% | 10.05% | 9.19% | 109.4% |
| | 45 | 9.66% | 2.50% | 12.16% | 11.32% | 107.4% |
| | 55 | 10.25% | 2.65% | 12.90% | 12.24% | 105.4% |
| Plan C | 25 | 5.52% | 1.48% | 7.00% | 6.32% | 110.8% |
| | 35 | 6.80% | 1.82% | 8.62% | 7.89% | 109.3% |
| | 45 | 8.33% | 2.23% | 10.56% | 9.86% | 107.1% |
| | 55 | 9.68% | 2.60% | 12.28% | 11.66% | 105.3% |
| Plan D | 25 | 5.52% | 1.43% | 6.95% | 6.27% | 110.8% |
| | 35 | 6.80% | 1.76% | 8.56% | 7.83% | 109.3% |
| | 45 | 8.33% | 2.16% | 10.49% | 9.78% | 107.3% |
| | 55 | 9.68% | 2.51% | 12.19% | 11.57% | 105.4% |
| Plan G | All Ages | 7.36% | 1.75% | 9.11% | 8.43% | 108.1% |
| Safety Members | | | | | | |
| Plan A | 25 | 4.74% | 4.13% | 8.87% | 7.82% | 113.4% |
| | 35 | 5.63% | 4.91% | 10.54% | 9.63% | 109.4% |
| | 45 | 6.70% | 5.84% | 12.54% | 11.50% | 109.0% |
| | 55 | 6.33% | 5.52% | 11.85% | 11.61% | 102.1% |
| Plan B | 25 | 9.48% | 3.13% | 12.61% | 11.00% | 114.6% |
| | 35 | 11.27% | 3.72% | 14.99% | 13.57% | 110.5% |
| | 45 | 13.40% | 4.43% | 17.83% | 16.20% | 110.1% |
| | 55 | 13.40% | 4.43% | 17.83% | 16.35% | 109.1% |
| Plan C | All Ages | 11.27% | 3.27% | 14.54% | 13.87% | 104.8% |

Note: A portion of some of the member contribution rates is paid for (“picked up”) by the employer and is not considered part of the member’s contribution account for refund purposes. Such contributions are referred to as the surcharge amount and are subject to change each year. The rates shown in the table above are prior to any surcharge payments.

6. Employer Contributions

Calculated Employer Contribution Rate

Contributions to LACERA are determined using the Entry Age Normal Cost Method. The portion of the actuarial present value of retirement benefits allocated to a valuation year by the Actuarial Cost Method is called the Normal Cost. These amounts are usually expressed as a percentage of payroll and called the Normal Cost Contribution Rate. Exhibit 10 illustrates the Normal Cost Contribution Rates by type of benefit and for each plan based on this valuation. A comparison with last year is also shown.

Under the Funding Policy, the total contribution rate is set equal to the Normal Cost contribution plus a payment by the employer towards the UAAL. The calculation of the UAAL contribution rate is shown in Exhibit 12. A portion of the Normal Cost contribution is funded by member contributions. The remainder is paid for by the employer.

The total calculated employer contribution rates for each plan, along with a comparison to the prior year's calculated rates, can be found in Exhibit 11. These results are expressed as a percentage of payroll and annual contribution dollars. Note that LACERA's UAAL contribution rate is not determined separately for each plan, but is funded evenly as a percentage of pay over salaries for all members.

For the fiscal year beginning in 2020, the total calculated employer contribution rate increases to 22.59% (after reflecting the phase in of the employer contribution rate). This is equal to the aggregate employer Normal Cost contribution rate of 10.86% based on the 2019 valuation, plus a layered amortization payment of the UAAL. The UAAL amortization layers are shown in Exhibit 12. Effective with the June 30, 2019 valuation, all new UAAL layers are amortized over a 20-year period, beginning with the date the contribution is first expected to be made.

(All values as a % of Payroll)

| | |
|---|----------------|
| Employer Normal Cost Contribution Rate | 10.86% |
| Layered Amortization of UAAL | <u>13.92%</u> |
| Calculated Employer Contribution Rate (before phase-in) | 24.78% |
| Deferred Recognition of 2019 Assumption Changes | <u>(2.19)%</u> |
| Calculated Employer Contribution Rate (with phase-in) | 22.59% |

The 1.68% increase from last year in the calculated employer contribution rate is primarily due to the assumption and method changes adopted by the Board of Investments effective June 30, 2019. These changes resulted in an increase of 3.29% in the employer contribution rate, which will be phased-in over three fiscal years effective with the fiscal year beginning July 1, 2020. Recognition of investment losses resulted in an increase of 0.42% in the employer contribution rate, and other sources, including salary increases greater than assumed, increased the employer contribution rate by about 0.16%.

Employer Contribution Rate with phase-in

At the January 2020 meeting, the Board of Investments adopted a three-year phase-in of the impact of the change in employer contribution rate resulting from the new assumptions adopted effective June 30, 2019. For the fiscal year beginning July 1, 2022, the impact of the June 30, 2019 assumption changes will be fully phased in.

Section II 1A(4) of the Funding Policy states: "In no case shall the total amount contributed by the employer be less than the Normal Cost Rate for the year, plus a 30-year amortization of the total UAAL." Based on discussion with LACERA staff, it is our understanding that that since the employer contribution rate, including future phased-in increases, is projected to amortize the UAAL in less than 30 years, the employer contribution rate is deemed to meet the requirements under Section II 1A(4) of the Funding Policy.

Exhibit 10
Calculated Normal Cost Contribution Rates – June 30, 2019

| | General | | | | | | | Safety | | | | Grand Total |
|--|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | Plan A | Plan B | Plan C | Plan D | Plan E | Plan G | Total | Plan A | Plan B | Plan C | Total | |
| A. Normal Cost Contribution Rate | | | | | | | | | | | | |
| Service Retirement | 21.48% | 16.82% | 13.89% | 14.74% | 10.13% | 15.59% | 14.06% | 19.45% | 18.23% | 17.50% | 18.10% | 14.81% |
| Disability Retirement | 1.15% | 0.93% | 0.76% | 1.16% | 0.00% | 1.29% | 0.97% | 9.15% | 9.07% | 10.28% | 9.28% | 2.52% |
| Death | 0.32% | 0.28% | 0.23% | 0.38% | 0.00% | 0.35% | 0.30% | 0.41% | 0.35% | 0.32% | 0.34% | 0.31% |
| Termination | 0.44% | 0.42% | 0.40% | 0.98% | 0.61% | 0.99% | 0.91% | 0.74% | 0.83% | 0.98% | 0.86% | 0.90% |
| Total | 23.39% | 18.45% | 15.28% | 17.26% | 10.74% | 18.22% | 16.24% | 29.75% | 28.48% | 29.08% | 28.58% | 18.54% |
| B. Member Contributions | (6.05)% | (9.05)% | (7.29)% | (8.05)% | 0.00% | (9.11)% | (6.74)% | (3.38)% | (11.21)% | (14.54)% | (11.78)% | (7.68)% |
| C. Net Employer Normal Cost as of June 30, 2019 (A) - (B) | 17.34% | 9.40% | 7.99% | 9.21% | 10.74% | 9.11% | 9.50% | 26.37% | 17.27% | 14.54% | 16.80% | 10.86% |
| D. Net Employer Normal Cost as of June 30, 2018 | 16.36% | 8.34% | 7.34% | 8.43% | 9.80% | 8.43% | 8.73% | 24.33% | 15.32% | 13.69% | 15.11% | 9.92% |
| E. Increase (Decrease) as a Percentage of Payroll (C) - (D) | 0.98% | 1.06% | 0.65% | 0.78% | 0.94% | 0.68% | 0.77% | 2.04% | 1.95% | 0.85% | 1.69% | 0.94% |
| F. Estimated Payroll for fiscal year beginning July 1, 2020* | \$ 11 | \$ 4 | \$ 4 | \$ 3,910 | \$ 1,393 | \$ 1,743 | \$ 7,065 | \$ 1 | \$ 1,349 | \$ 282 | \$ 1,631 | \$ 8,696 |
| G. Estimated Total Normal Cost Contribution in Dollars (A x F)** | \$ 3 | \$ 1 | \$ 1 | \$ 675 | \$ 150 | \$ 317 | \$ 1,147 | \$ - | \$ 384 | \$ 82 | \$ 466 | \$ 1,613 |

* Estimated Payroll based upon annualized salary rate as of June 30, 2019 increased by 3.25% wage inflation. Dollar figures in millions.

** The timing of the Normal Cost shown in this exhibit is spread over the entire year and corresponds to payroll timing.

Exhibit 11
Total Employer Contributions

| | General | | | | | | | Safety | | | | All Plans |
|---|---------------|---------------|---------------|---------------|---------------|---------------|-----------------|---------------|---------------|---------------|---------------|-----------------|
| | Plan A | Plan B | Plan C | Plan D | Plan E | Plan G | Total | Plan A | Plan B | Plan C | Total | |
| A. Net Employer Normal Cost | | | | | | | | | | | | |
| 1. Basic Benefits | 13.82% | 7.54% | 6.45% | 7.57% | 8.88% | 7.36% | 7.79% | 19.13% | 13.70% | 11.27% | 13.85% | 8.80% |
| 2. Cost-of-Living Benefits | 3.52% | 1.86% | 1.54% | 1.64% | 1.86% | 1.75% | 1.71% | 7.24% | 3.57% | 3.27% | 2.95% | 2.06% |
| 3. Total June 30, 2019 | 17.34% | 9.40% | 7.99% | 9.21% | 10.74% | 9.11% | 9.50% | 26.37% | 17.27% | 14.54% | 16.80% | 10.86% |
| B. UAAL Contribution Rate | 13.92% | 13.92% | 13.92% | 13.92% | 13.92% | 13.92% | 13.92% | 13.92% | 13.92% | 13.92% | 13.92% | 13.92% |
| C. Calculated June 30, 2019 Contribution Rate (A) + (B) | 31.26% | 23.32% | 21.91% | 23.13% | 24.66% | 23.03% | 23.42% | 40.29% | 31.19% | 28.46% | 30.72% | 24.78% |
| D. Deferred Recognition of new assumptions | (2.19)% | (2.19)% | (2.19)% | (2.19)% | (2.19)% | (2.19)% | (2.19)% | (2.19)% | (2.19)% | (2.19)% | (2.19)% | (2.19)% |
| E. Total June 30, 2019 Contribution Rate with phase-in (C) + (D) | 29.07% | 21.13% | 19.72% | 20.94% | 22.47% | 20.84% | 21.23% | 38.10% | 29.00% | 26.27% | 28.53% | 22.59% |
| F. Total June 30, 2018 Contribution Rate with phase-in | 27.35% | 19.33% | 18.33% | 19.42% | 20.79% | 19.42% | 19.72% | 35.32% | 26.31% | 24.68% | 26.10% | 20.91% |
| G. Estimated Payroll for fiscal year beginning July 1, 2020* | \$ 11 | \$ 4 | \$ 4 | \$ 3,910 | \$ 1,393 | \$ 1,743 | \$ 7,065 | \$ 1 | \$ 1,349 | \$ 282 | \$ 1,631 | \$ 8,696 |
| H. Estimated Annual Contribution (E x G) | \$ 3 | \$ 1 | \$ 1 | \$ 819 | \$ 313 | \$ 363 | \$ 1,500 | \$ - | \$ 391 | \$ 74 | \$ 465 | \$ 1,965 |
| I. Last Year's Estimated Annual Contribution | \$ 4 | \$ 1 | \$ 1 | \$ 753 | \$ 302 | \$ 278 | \$ 1,338 | \$ - | \$ 353 | \$ 53 | \$ 406 | \$ 1,744 |
| J. Increase / (Decrease) in Annual Contribution | \$ (1) | \$ - | \$ - | \$ 66 | \$ 11 | \$ 85 | \$ 162 | \$ - | \$ 38 | \$ 21 | \$ 59 | \$ 221 |

* Estimated Payroll based upon annualized salary rate as of June 30, 2019 increased by 3.25% wage inflation. Dollar figures in millions.

Exhibit 12
Unfunded Actuarial Accrued Liability Detail

(Dollars in Millions)

| Unfunded Actuarial Accrued Liability - Amortization Detail | | | | | | | |
|--|------------------------------|-----------------------------|---|--|--|---|-----------------------------------|
| Date Established | Description | Balance as of June 30, 2019 | Interest on Balance | Amort. Payment on June 30, 2020 ⁽¹⁾ | Balance as of June 30, 2020 ⁽²⁾ | Remaining Period as of June 30, 2020 ⁽⁵⁾ | July 1, 2020 Amortization Payment |
| June 30, 2009 | Initial UAAL | \$ 5,630.4 | \$ 394.1 | \$ 423.0 | \$ 5,601.5 | 19 Years | \$ 406.6 |
| June 30, 2010 | (Gain) / Loss ⁽³⁾ | 3,067.0 | 214.7 | 223.1 | 3,058.6 | 20 Years | 214.3 |
| June 30, 2011 | (Gain) / Loss ⁽³⁾ | 1,517.3 | 106.2 | 107.1 | 1,516.4 | 21 Years | 102.8 |
| June 30, 2012 | (Gain) / Loss ⁽³⁾ | 2,476.5 | 173.4 | 170.0 | 2,480.0 | 22 Years | 162.9 |
| June 30, 2013 | (Gain) / Loss ⁽³⁾ | 1,397.7 | 97.8 | 93.4 | 1,402.1 | 22 Years | 92.1 |
| June 30, 2014 | (Gain) / Loss | (2,584.0) | (180.9) | (168.5) | (2,596.3) | 22 Years | (170.6) |
| June 30, 2015 | (Gain) / Loss | (2,015.7) | (141.1) | (128.4) | (2,028.4) | 22 Years | (133.3) |
| June 30, 2016 | (Gain) / Loss ⁽³⁾ | 3,867.7 | 270.7 | 241.1 | 3,897.3 | 22 Years | 256.1 |
| June 30, 2017 | (Gain) / Loss | (18.7) | (1.3) | 1.1 | (21.1) | 22 Years | (1.4) |
| June 30, 2018 | (Gain) / Loss | 60.4 | 4.2 | 3.6 | 61.0 | 22 Years | 4.0 |
| June 30, 2019 | (Gain) / Loss ⁽³⁾ | 3,619.2 | 253.3 | (77.1) ⁽⁴⁾ | 3,949.7 | 20 Years | 276.7 |
| Total Amortization Payment July 1, 2020: | | | | | | | \$ 1,210.1 |
| Projected Payroll July 1, 2020: | | | | | | | \$ 8,696.2 |
| UAAL as of June 30, 2019: | | \$ 17,018.0 | UAAL Contribution Rate (as a % of Payroll) FYB July 1, 2020: | | | | 13.92% |

Explanatory Notes:

1. Amortization Payments are based on a fixed schedule that increases by the payroll assumption each year.
2. The assets and liabilities used in the calculation of the UAAL are as of June 30, 2019, whereas, the contribution rates are not effective until July 1, 2020. Therefore, the UAAL is adjusted to June 30, 2020 based on the actual contribution rate for the period.
3. (Gain) / Loss layers include impact of assumption changes in these years.
4. The amortization of UAAL does not begin until July 1, 2020; therefore, the UAAL amount is adjusted by one year to reflect the actual July 1, 2019 contribution rate.
5. Effective with the June 30, 2019 valuation, all new UAAL layers will be amortized over a 20-years period, beginning with the date the contribution is first expected to be made.

7. Supplemental Information

Governmental Accounting Standards Board (GASB) Statement No. 67 sets out requirements for defined benefit pension plan reporting and disclosures. GASB Statement No. 68 sets out requirements for accounting by state and local government employers.

Milliman provides LACERA with results relevant to Statements No. 67 and 68 in separate stand-alone financial reporting valuation reports.

For informational purposes, we have provided the following exhibits in this report that LACERA may use in the audited financial statements:

- Exhibit 13: Schedule of Funding Progress
- Exhibit 14: Schedule of Employer Contributions
- Exhibit 15: Solvency Test
- Exhibit 16: Actuarial Analysis of Financial Experience
- Exhibit 17: Retirants and Beneficiaries added to / removed from Retiree Payroll

Exhibit 13, Schedule of Funding Progress, compares actuarial assets and liabilities of the Plan, based on the actuarial funding method used.

Exhibit 14, Schedule of Employer Contributions, compares the employer contributions required based on the actuarial valuation with the employer contributions actually made. Information shown in this exhibit comes from LACERA's audited financial statements.

Exhibit 15 compares the Actuarial Value of Valuation Assets to the types of Actuarial Accrued Liabilities, applying them first to Active Member contributions, then to retirees and beneficiaries, and then the remaining amount to the Active Members benefits. This is referred to as the Solvency Test.

Exhibit 16 shows the changes in actual versus expected UAAL from year to year.

Exhibit 17 reconciles the retired members and beneficiaries who have been added to and removed from the retiree payroll.

Exhibit 13
Schedule of Funding Progress

(Dollars in Thousands)

| Actuarial Valuation Date | (a) Actuarial Value of Valuation Assets | (b) Actuarial Accrued Liabilities | (b-a) Unfunded Actuarial Accrued Liabilities (UAAL) | (a/b) Funded Ratio | (c) Covered Payroll ⁽¹⁾ | [(b-a)/c] UAAL as a Percentage of Covered Payroll |
|------------------------------|--|--------------------------------------|--|-----------------------|---------------------------------------|--|
| June 30, 2010 ⁽²⁾ | \$ 38,839,392 | \$ 46,646,838 | \$ 7,807,446 | 83.3% | \$ 6,695,439 | 116.6% |
| June 30, 2011 ⁽²⁾ | 39,193,627 | 48,598,166 | 9,404,539 | 80.6% | 6,650,674 | 141.4% |
| June 30, 2012 ⁽²⁾ | 39,039,364 | 50,809,425 | 11,770,061 | 76.8% | 6,619,816 | 177.8% |
| June 30, 2013 ⁽²⁾ | 39,932,416 | 53,247,776 | 13,315,360 | 75.0% | 6,595,902 | 201.9% |
| June 30, 2014 | 43,654,462 | 54,942,453 | 11,287,991 | 79.5% | 6,672,228 | 169.2% |
| June 30, 2015 | 47,328,270 | 56,819,215 | 9,490,945 | 83.3% | 6,948,738 | 136.6% |
| June 30, 2016 ⁽²⁾ | 49,357,847 | 62,199,214 | 12,841,367 | 79.4% | 7,279,777 | 176.4% |
| June 30, 2017 | 52,166,307 | 65,310,803 | 13,144,496 | 79.9% | 7,637,032 | 172.1% |
| June 30, 2018 | 55,233,108 | 68,527,354 | 13,294,246 | 80.6% | 7,957,981 | 167.1% |
| June 30, 2019 ⁽²⁾ | 57,617,288 | 74,635,840 | 17,018,552 | 77.2% | 8,370,050 | 203.3% |

1. Covered Payroll includes compensation paid to all active employees on which contributions are calculated, as reported by LACERA. Covered Payroll differs from the Active Member Valuation Payroll shown in Table C-1, which is an annualized compensation of only those members who were active on the actuarial valuation date.

2. Assumption changes.

Exhibit 14
Schedule of Contributions from the Employer

(Dollars in Thousands)

| Fiscal Year Ending | Actuarially Determined Employer Contribution | Actual Employer Contributions | | | Percentage of Actuarially Determined Contribution Contributed |
|---------------------------|--|-------------------------------|--------------------------------|------------|---|
| | | Cash Payment | Transfer from Reserve Accounts | Total | |
| 06/30/2010 | \$ 843,704 | \$ 843,703 | \$ - | \$ 843,703 | 100% |
| 06/30/2011 | 944,174 | 944,174 | - | 944,174 | 100% |
| 06/30/2012 | 1,078,929 | 1,078,929 | - | 1,078,929 | 100% |
| 06/30/2013 | 1,172,014 | 723,195 | 448,819 | 1,172,014 | 100% |
| 06/30/2014 | 1,320,442 | 1,320,442 | - | 1,320,442 | 100% |
| 06/30/2015 | 1,494,975 | 1,494,975 | - | 1,494,975 | 100% |
| 06/30/2016 | 1,443,130 | 1,443,130 | - | 1,443,130 | 100% |
| 06/30/2017 ⁽¹⁾ | 1,392,813 | 1,370,922 | 21,891 | 1,392,813 | 100% |
| 06/30/2018 | 1,564,284 | 1,564,284 | - | 1,564,284 | 100% |
| 06/30/2019 | 1,708,122 | 1,708,122 | - | 1,708,122 | 100% |

1. The County Contribution Reserve was used to offset the contribution required from the Courts in the fiscal year ended June 30, 2017. Exhibit 14 in the June 30, 2017 actuarial valuation report did not reflect this transfer amount.

**Exhibit 15
 Solvency Test**

(Dollars in Millions)

| Actuarial Valuation Date | Actuarial Value of Valuation Assets | Actuarial Accrued Liabilities for | | | Portion of Actuarial Accrued Liabilities Covered by Assets | | |
|-----------------------------|--|---------------------------------------|---|--|--|------|-----|
| | | Active Member Contributions (A) | Retirees and Beneficiaries ⁽¹⁾ (B) | Active Members (Employer Financed Portion) (C) | (A) | (B) | (C) |
| June 30, 2010 | \$ 38,839 | \$ 6,278 | \$ 26,220 | \$ 14,148 | 100% | 100% | 45% |
| June 30, 2011 | 39,194 | 6,529 | 27,559 | 14,511 | 100% | 100% | 35% |
| June 30, 2012 | 39,039 | 6,961 | 29,118 | 14,730 | 100% | 100% | 20% |
| June 30, 2013 | 39,932 | 7,837 | 30,980 | 14,430 | 100% | 100% | 8% |
| June 30, 2014 | 43,654 | 8,354 | 31,882 | 14,706 | 100% | 100% | 23% |
| June 30, 2015 | 47,328 | 8,805 | 32,734 | 15,280 | 100% | 100% | 38% |
| June 30, 2016 | 49,358 | 8,767 | 35,316 | 18,116 | 100% | 100% | 29% |
| June 30, 2017 | 52,166 | 9,482 | 37,077 | 18,752 | 100% | 100% | 30% |
| June 30, 2018 | 55,233 | 9,882 | 39,192 | 19,453 | 100% | 100% | 32% |
| June 30, 2019 | 57,617 | 10,210 | 42,235 | 22,190 | 100% | 100% | 23% |

1. Includes vested and non-vested former members.

Exhibit 16
Actuarial Analysis of Financial Experience

(Dollars in Millions)

| | Valuation as of June 30 | | | | | | |
|--|-------------------------|-----------------|----------------|-----------------|-----------------|-----------------|-----------------|
| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Unfunded Actuarial Accrued Liability | \$11,770 | \$13,315 | \$11,288 | \$9,491 | \$12,841 | \$13,145 | \$13,294 |
| Expected Increase/(Decrease) from Prior Valuation | 869 | 338 | (54) | (102) | 320 | 146 | 25 |
| Salary Increases Greater/(Less) than Expected | (563) | (291) | 79 | 162 | 277 | 223 | 486 |
| CPI Less than Expected | (190) | (427) | (570) | (191) | (139) | 45 | 44 |
| Change in Assumptions | 511 | - | - | 2,922 | - | - | 2,528 |
| Asset Return Less/(Greater) than Expected | 893 | (1,664) | (1,263) | 496 | (421) | (411) | 477 |
| All Other Experience | 25 | 17 | 11 | 63 | 267 | 146 | 164 |
| Ending Unfunded Actuarial Accrued Liability | \$13,315 | \$11,288 | \$9,491 | \$12,841 | \$13,145 | \$13,294 | \$17,018 |

Exhibit 17
Retirants and Beneficiaries added to and removed from Retiree Payroll

(Dollars in Thousands)

| Valuation Date | Added to Rolls | | Removed from Rolls | | Rolls at End of Year | | % Increase in Retiree Allowance | Average Annual Allowance |
|----------------|----------------|---------------------------------|--------------------|---------------------------------|-----------------------|---------------------------------|---------------------------------|--------------------------|
| | Member Count | Annual Allowance ⁽¹⁾ | Member Count | Annual Allowance ⁽¹⁾ | Member Count | Annual Allowance ⁽¹⁾ | | |
| June 30, 2010 | 2,947 | \$ 188,724 ⁽²⁾ | (1,820) | \$ (54,105) | 54,196 ⁽³⁾ | \$ 2,220,344 | 6.45% | \$ 41.0 |
| June 30, 2011 | 3,134 | 185,204 ⁽²⁾ | (1,959) | (62,923) | 55,371 | 2,342,625 | 5.51% | 42.3 |
| June 30, 2012 | 3,194 | 193,865 ⁽²⁾ | (1,795) | (61,588) | 56,770 ⁽³⁾ | 2,474,902 | 5.65% | 43.6 |
| June 30, 2013 | 3,373 | 205,659 ⁽²⁾ | (2,057) | (69,494) | 58,086 ⁽³⁾ | 2,611,067 | 5.50% | 45.0 |
| June 30, 2014 | 3,128 | 172,743 ⁽²⁾ | (1,985) | (71,730) | 59,229 ⁽³⁾ | 2,712,080 | 3.87% | 45.8 |
| June 30, 2015 | 3,501 | 180,549 ⁽²⁾ | (2,124) | (80,028) | 60,606 ⁽³⁾ | 2,812,601 | 3.71% | 46.4 |
| June 30, 2016 | 3,479 | 220,632 ⁽²⁾ | (2,171) | (80,881) | 61,914 ⁽³⁾ | 2,952,352 | 4.97% | 47.7 |
| June 30, 2017 | 3,721 | 245,915 ⁽²⁾ | (2,311) | (89,624) | 63,324 ⁽³⁾ | 3,108,643 | 5.29% | 49.1 |
| June 30, 2018 | 3,826 | 276,118 ⁽²⁾ | (2,270) | (89,033) | 64,880 ⁽³⁾ | 3,295,728 | 6.02% | 50.8 |
| June 30, 2019 | 3,978 | 302,022 ⁽²⁾ | (2,351) | (97,840) | 66,507 ⁽³⁾ | 3,499,910 | 6.20% | 52.6 |

1. Annual allowance is the monthly benefit allowance annualized for those members counted as of June 30.

2. Includes COLAs that occurred during the fiscal year and therefore were not included in the previous years' Annual Allowance totals.

3. For the actuarial valuation year, Member Count includes retirees who due to timing at year end, are not yet included in the total Retired Members count disclosed in Note A - Plan Description of LACERA's CAFR for the fiscal year ended June 30, 2018.

8. Cash Flow History and Projections

Exhibits 18a and 18b contain tables and graphs that illustrate both the cash flow history for the past 10 years and a projection on the valuation basis for the next 10 years.

Contributions include both employer and member contributions. Exhibit 18a shows that net cash outflow has gradually increased over the last five years. In future years, after the phase-in of the rate increase due to assumption changes and methods, the cash flow is expected to become increasingly negative. This is a typical pattern for a mature retirement plan where it is expected that contributions will be less than benefits and that the plan will begin drawing on the fund that has been built up over prior years.

Note that the actual cash contributions do not reflect the transfers made between reserve funds, but only cash coming into the Plan. We are assuming no further transfers, only full cash contributions. In addition, LACERA will receive dividends and interest payments from its investments. These types of payments are not considered for this analysis, which focuses solely on comparing contributions with benefit payments and administrative expenses.

The projected cash flows include contributions, statutory benefits, and administrative expenses only. They are based on the actuarial assumptions as stated in Appendix A of this valuation report. The total employer contribution rate is assumed to be 20.91% for the first year and 22.59% for the second year; total employer contributions for the remainder of the period reflect the expected recognition of asset gains currently being deferred and the phase-in of the increase due to the assumption and method changes. The aggregate member rate is assumed to stay at the calculated rate for June 30, 2019 of 7.68% of payroll. Expenses are based on the expenses for the year ended June 30, 2019, increased annually with the actuarial inflation assumption of 2.75%.

Any increases or reductions in future contribution rates will increase or decrease the net cash flow. The projected cash flows do not include:

- Projected STAR benefits that have not yet been granted. STAR benefits that were vested as of January 2019 are included.
- Projected benefits payable under certain insurance contracts for a group of retired members. These payments are netted against the total expected retiree benefits.

Exhibit 18a
Cash Flow History and Projections – Dollars

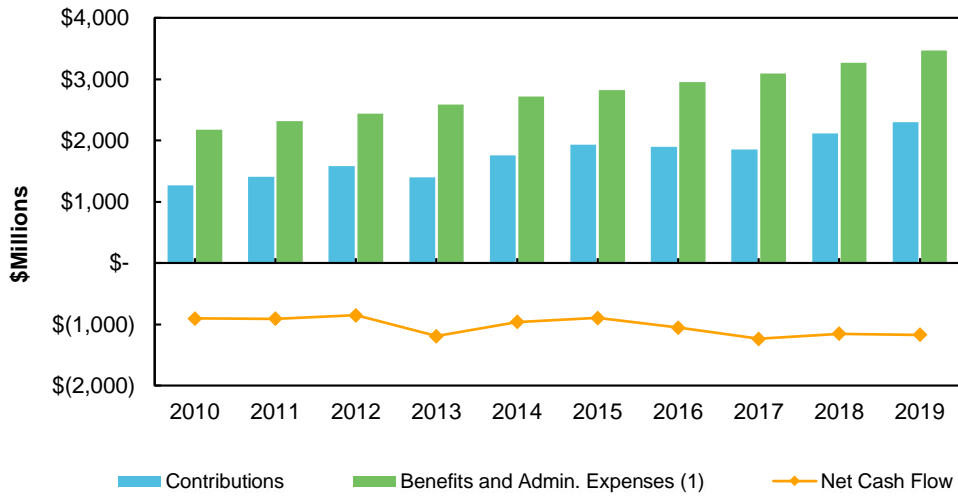
| Plan Year Ending | Cash Flow History | | |
|------------------------|------------------------|---|------------------|
| | Total Contributions | Benefits & Administrative Expenses ⁽¹⁾ | Net Cash Flow |
| 2010 | \$ 1,273 | \$ 2,177 | \$ (904) |
| 2011 | 1,408 | 2,318 | (910) |
| 2012 | 1,586 | 2,439 | (853) |
| 2013 | 1,403 | 2,593 | (1,190) |
| 2014 | 1,759 | 2,719 | (960) |
| 2015 | 1,936 | 2,829 | (893) |
| 2016 | 1,902 | 2,954 | (1,052) |
| 2017 | 1,858 | 3,094 | (1,236) |
| 2018 | 2,116 | 3,268 | (1,152) |
| 2019 | 2,304 | 3,475 | (1,171) |

| Plan Year Ending | Cash Flow Projections ⁽²⁾ | | |
|------------------------|--------------------------------------|---|------------------|
| | Total Contributions | Benefits & Administrative Expenses ⁽¹⁾ | Net Cash Flow |
| 2020 | \$ 2,378 | \$ 3,803 | \$ (1,424) |
| 2021 | 2,675 | 3,910 | (1,235) |
| 2022 | 2,898 | 4,101 | (1,204) |
| 2023 | 3,062 | 4,299 | (1,238) |
| 2024 | 3,163 | 4,509 | (1,346) |
| 2025 | 3,282 | 4,727 | (1,445) |
| 2026 | 3,387 | 4,953 | (1,565) |
| 2027 | 3,498 | 5,183 | (1,686) |
| 2028 | 3,611 | 5,417 | (1,805) |
| 2029 | 3,729 | 5,654 | (1,925) |

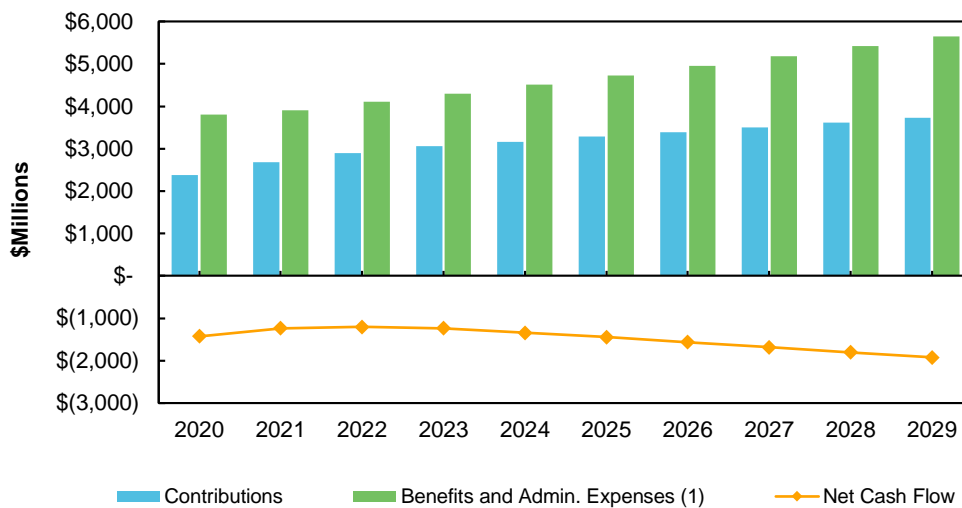
1. Investment expenses are assumed to be covered by investment return.
2. Future contributions reflect the expected impact of asset gains and losses currently being deferred.

Exhibit 18b
Cash Flow History and Projections – Graphs

Cash Flow History



Cash Flow Projections⁽²⁾



1. Investment expenses are assumed to be covered by investment return.
2. Future contributions reflect the expected impact of asset gains and losses currently being deferred.

9. Risk Discussion

Overview

The results of any actuarial valuation are based on one set of reasonable assumptions. Although we believe the current assumptions provide a reasonable estimate of future expectations, it is almost certain that future experience will differ from the assumptions to some extent. It is therefore important to consider the potential impacts of these likely differences when making decisions that may affect the future financial health of the Plan, or of the Plan's members.

Actuarial Standard of Practice No. 51 (ASOP 51, Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions) addresses these issues by providing actuaries with guidance for assessing and disclosing the risk associated with measuring pension liabilities and the determination of pension plan contributions. Specifically, it directs the actuary to:

- Identify risks that may be significant to the Plan.
- Assess the risks identified as significant to the Plan. The assessment does not need to include numerical calculations.
- Disclose plan maturity measures and historical information that are significant to understanding the Plan's risks.

ASOP 51 states that if in the actuary's professional judgment, a more detailed assessment would be significantly beneficial in helping the individuals responsible for the Plan to understand the risks identified by the actuary, then the actuary should recommend that such an assessment be performed. The standard is first effective for certain actuarial work products with a measurement date on or after November 1, 2018, so for LACERA it was first effective with the June 30, 2019 actuarial valuation.

In addition, the California Actuarial Advisory Panel (CAAP) has adopted a set of model disclosure elements for actuarial valuation reports of public retirement systems in California. Most of these elements are included in other areas of this report. The remaining CAAP-recommended disclosures are as follows:

| Disclosure Element | Description | Value |
|--|---|------------|
| Gross Normal Cost \$ ¹ | Normal Cost allocated to valuation year, paid at mid-year. | \$ 1,586.7 |
| Statutory Contribution \$ ¹ | Expected Employer Contribution paid at mid-year. | \$ 1,789.5 |
| Asset Smoothing Ratio | Actuarial Value of Assets divided by Market Value of Assets | 99.8% |
| Asset Volatility Ratio | Market Value of Assets divided by Payroll | 6.9 |
| Liability Volatility Ratio | Actuarial Accrued Liability divided by Payroll | 8.9 |

1. Amounts shown in millions of dollars

This Section 9 uses the framework of ASOP 51 and the Asset and Liability Volatility Ratios shown above to communicate important information about: significant risks to the Plan, the Plan's maturity, and relevant historical plan data.

Asset and Liability Volatility Ratios

Asset and Liability Volatility Ratios are a measure of the level of assets (or liabilities) to payroll. In general, a higher ratio means that the employer contribution rates (ECR) are more sensitive to changes in levels of assets or liabilities. Historical Asset and Liability Volatility Ratios are shown in Exhibit E-4.

As shown above, in the current valuation LACERA has an Asset Volatility Ratio of 6.9 and a Liability Volatility Ratio of 8.9. As shown in Exhibit E-4, these ratios have increased over time as LACERA has matured.

Factors Affecting Future Results

There are a number of factors that affect future valuation results. To the extent actual experience for these factors varies from the assumptions, this will likely cause either increases or decreases in the plan's future funding level and ECR. The factors that can have the most significant impact on LACERA's valuation results are:

- Investment returns

To the extent that actual investment returns differ from the assumed investment return, the Plan's future assets, ECR, and funded status may differ significantly from those presented in this valuation. Additional discussion of the impact of variance of investment returns is included below.

- Compensation increases

Individual member retirement benefits are linked to that member's compensation. As such, assumptions need to be made as to a member's future compensation increases. Higher future compensation increases will generally result in larger retirement benefits, liabilities, ECRs, and a lower funded status. Conversely, lower compensation increases than assumed will generally result in smaller retirement benefits, liabilities, ECRs, and a higher funded status.

- Payroll variation

In the valuation, an assumption is made for the overall rate of payroll growth of LACERA from year-to-year. To the extent that the overall rate of payroll growth is greater than assumed, the ECR may decrease since the UAAL will be amortized over a larger payroll base. The opposite will occur if the overall rate of payroll growth is lower than assumed.

This effect often will offset somewhat with individual compensation increases, discussed above.

- Longevity and other demographic risks

The liabilities reported in this valuation have been calculated by assuming that members will follow specific patterns of demographic experience (e.g., mortality, retirement, termination, disability) as described in Appendix A. To the extent that actual demographic experience is different than is assumed to occur, future liabilities, ECRs, and funded status may differ from that presented in this valuation.

All of these assumptions are reviewed in detail during the triennial Investigation of Experience study, and are also reviewed annually during the valuation process. Changes in assumptions are generally recommended as part of the triennial Investigation of Experience if actual experience has been materially different than assumed or forecasts have changed significantly. Additionally, changes may be recommended and discussed at each valuation if they are deemed to be appropriate at that time.

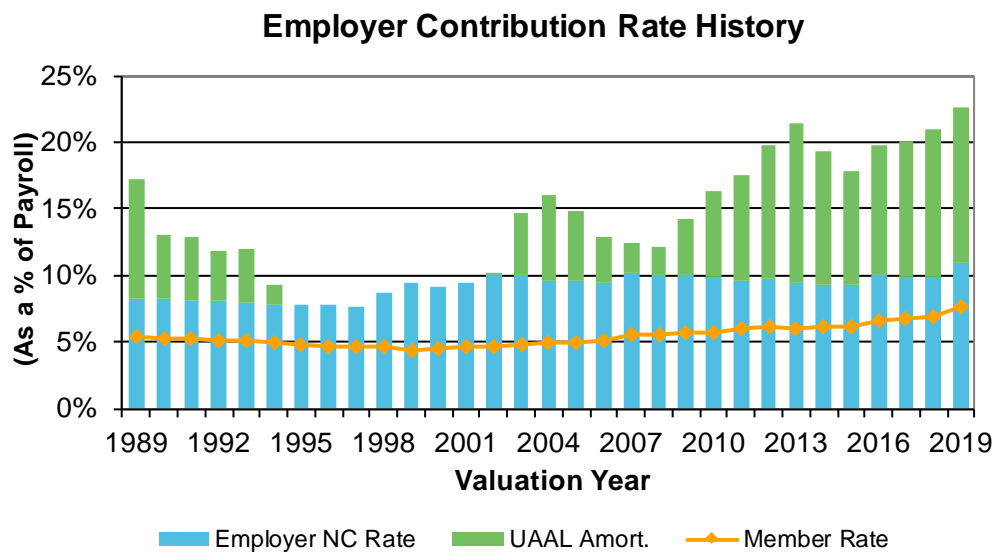
Discussion of Investment Return Risk

Of these factors, we believe the factor with the greatest potential risk to impact future valuation results for LACERA is future investment returns. For example, if actual returns fall short of the current assumption of 7.0% per year, this will cause an increase in the ECR and a decrease in the Funded Ratio, all other things being equal. Conversely, if actual returns exceed the current assumption of 7.0% per year, this will cause a decrease in the ECR and an increase in the Funded Ratio.

The magnitude of the increase or decrease in the ECR is affected by the maturity level, and specifically, the asset volatility ratio. LACERA has accumulated a significant amount of assets relative to its payroll and by several measures is considered a mature plan. Accumulating assets to pay for future benefit obligations is responsible funding, but it does mean that changes in the investment markets can have a significant impact on the ECR.

Historical Variation in Employer Contribution Rate

One way to assess future risks is to look at historical measurements. The following graph shows how the ECR has varied over the last 30 years under various investment return and assumption environments.



Appendix A Actuarial Procedures and Assumptions

The actuarial procedures and assumptions used in this valuation are described in this section. The assumptions were reviewed and changed for the June 30, 2019 actuarial valuation as a result of the 2019 triennial Investigation of Experience Study.

The actuarial assumptions used in the valuations are intended to estimate the future experience of the members of LACERA and of LACERA itself in areas that affect the projected benefit flow and anticipated investment earnings. Any variations in future experience from that expected from these assumptions will result in corresponding changes in the estimated costs of LACERA's benefits.

Table A-1 summarizes the assumptions. The mortality probabilities are taken from the sources listed.

Tables A-2 and A-3 show how members are expected to leave retired status due to death.

Table A-4 presents the probability of refund of contributions upon termination of employment while vested.

Table A-5 presents the expected annual percentage increase in salaries.

Tables A-6 to A-13 were developed from the experience as measured by the 2019 Investigation of Experience Study. These are the probability that a member will leave the System for various reasons.

Actuarial Cost Method

The actuarial valuation is prepared using the entry age actuarial cost method (CERL 31453.5). Under the principles of this method, the actuarial present value of the projected benefits of each individual included in the valuation is allocated as a level percentage of the individual's projected compensation between entry age and assumed exit (until maximum retirement age).

For members who transferred between plans, entry age is based on original entry into the System.

The portion of this actuarial present value allocated to a valuation year is called the normal cost. The portion of this actuarial present value not provided for at a valuation date by the sum of (a) the actuarial value of the assets, and (b) the actuarial present value of future normal costs is called the Unfunded Actuarial Accrued Liability (UAAL). The original UAAL as of June 30, 2009 is amortized as a level percentage of the projected salaries of present and future members of LACERA over a closed 30-year period. As of the June 30, 2019 valuation, all amortization layers with periods greater than 22 years as of July 1, 2020 were amortized over a 22-year period. Future gains and losses are amortized over new closed 20-year periods, beginning with the date the contribution is first expected to be made. This is referred to as "layered" amortization.

For General Plan G and Safety Plan C, the normal cost rate is rounded up to the nearest 0.02%.

Records and Data

The data used in this valuation consists of financial information and the age, service, and income records for active and inactive members and their survivors. All of the data were supplied by LACERA and are accepted for valuation purposes without audit.

Replacement of Former Members

The ages and relative salaries at entry of future members are assumed to follow a new entrant distribution based on the pattern of current members. Under this assumption, the normal cost rates for active members will remain fairly stable in future years unless there are changes in the governing law, the actuarial assumptions, or the pattern of the new entrants.

Growth in Membership

For benefit determination purposes, no growth in the membership of LACERA is assumed. For funding purposes, if amortization is required, the total payroll of covered members is assumed to grow due to the combined effects of future wage increases of current active members and the replacement of the current active members by new employees. No growth or decline in the total number of active members is assumed.

Internal Revenue Code Section 415 Limit

The Internal Revenue Code Section 415 maximum benefit limitation is not reflected in the valuation for funding purposes. Any limitation is reflected in a member's benefit after retirement.

Internal Revenue Code Section 401(a)(17)

The Internal Revenue Code Section 401(a)(17) maximum compensation limitation is not reflected in the valuation for funding purposes. Any limitation is reflected in a member's benefit after retirement.

Employer Contributions

The employer contribution rate is set by the Board of Investments based on actuarial valuations.

Member Contributions

The member contribution rates vary by entry age (except for PEPRAs) and are described in the law. Code references are shown in Appendix B of the valuation report. The methods and assumptions used are detailed later in this section.

The individual member rates by entry age, plan, and class are illustrated in Appendix D of the valuation report.

Valuation of Assets

The assets are valued using a five-year smoothed method based on the difference between the expected market value and the actual market value of the assets as of the valuation date. The expected market value is the prior year's market value increased with the net increase in the cash flow of funds, all increased with interest during the past fiscal year at the expected investment return rate assumption. The five-year smoothing valuation basis for all assets was adopted effective June 30, 2009.

Investment Earnings and Expenses

The future investment earnings of the assets of LACERA are assumed to accrue at an annual rate of 7.00% compounded annually, net of both investment and administrative expenses. This rate was adopted June 30, 2019.

Postretirement Benefit Increases

Postretirement increases are assumed for the valuation in accordance with the benefits provided as described in Appendix B. These adjustments are assumed payable each year in the future as they are not greater than the expected increase in the Consumer Price Index of 2.75% per year. This rate was adopted June 30, 2016.

Interest on Member Contributions

The annual credited interest rate on member contributions is assumed to be 7.00% compounded semi-annually for an annualized rate of 7.12%. This rate was adopted effective June 30, 2019.

Future Salaries

The rates of annual salary increase assumed for the purpose of the valuation are illustrated in Table A-5. In addition to increases in salary due to promotions and longevity, this scale includes an assumed 3.25% per annum rate of increase in the general wage level of the membership. These rates were adopted June 30, 2019.

Increases are assumed to occur mid-year (i.e., January 1st) and only apply to base salary, excluding megaflex compensation. The mid-year timing reflects that salary increases occur throughout the year, or on average mid-year.

For plans with a one-year final average compensation period, actual average annual compensation is used. For Plan E, Plan G and Safety Plan C, the monthly rate as of June of the valuation year was annualized. Due to irregular compensation payments now included as pensionable earnings, actual annual pay is preferred over annualizing a single monthly payment amount.

Social Security Wage Base

Plan E members have their benefits offset by an assumed Social Security Benefit. For valuation funding purposes, we need to project the Social Security Benefit. We assume the current Social Security provisions will continue and the annual Wage Base will increase at the rate of 3.25% per year. Note that statutory provisions describe exactly how to compute the offset for purposes of determining a member's offset amount at time of termination or retirement. This rate was adopted June 30, 2016.

Note also, that it is assumed all Plan E members born after 1950 have less than 10 years of Social Security-covered service and, therefore, do not have their benefit offset.

General Plan G and Safety Plan C members have their compensation limited to approximately 120% of the Social Security Wage Base. The limit for 2019 is \$149,016 (after applying the 120% factor) and is projected to increase at the CPI rate of 2.75%. This rate of future increase was adopted effective June 30, 2016.

Retirement

Members in General Plans A-D may retire at age 50 with 10 years of service, or any age with 30 years of service, or age 70 regardless of the number of years of service. General Plan G members are eligible to retire at age 52 with 5 years of service, or age 70 regardless of the number of years of service. Non-contributory Plan E members may retire at age 55 with 10 years of service. Members of Safety Plans A and B may retire at age 50 with 10 years of service, or any age with 20 years of service. Safety Plan C members are eligible to retire at age 50 with 5 years of County service. Retirement probabilities vary by age and are shown by plan in Tables A-6 through A-13.

All general members who attain or have attained age 75 in active service and all safety members who attain or have attained age 65 in active service are assumed to retire immediately (except for Safety Plan C members who have not yet attained 5 years of service).

Vested former members are assumed to retire at the later of their current age and the assumed retirement age specified as follows:

| Assumption for Deferred Commencement | |
|--------------------------------------|---------------------|
| Plan | Age at Commencement |
| GA | 62 |
| GB | 62 |
| GC | 62 |
| GD | 59 |
| GE | 62 |
| GG | 57 |
| SA | 55 |
| SB | 50 |
| SC | 50 |

The assumptions regarding termination of employment, early retirement, and unreduced service retirement are treated as a single set of decrements in regards to a particular member. For example, a General Plan D member hired at age 30 has a probability of withdrawing from LACERA due to death, disability or other termination of employment until age 50. After age 50, the member can withdraw due to death, disability, or retirement. Thus, in no year during the member's projected employment would the member be eligible for both a probability of other termination of employment and a probability of retirement.

The retirement probabilities were adopted June 30, 2019.

Disability

The probabilities of disability used in the valuation are also illustrated in Tables A-6 through A-13. These probabilities were adopted June 30, 2019.

Postretirement Mortality – Other Than Disabled Members

The same postretirement mortality probabilities are used in the valuation for members retired for service and beneficiaries. These probabilities are illustrated in Table A-2. Current beneficiary mortality is assumed to be the same as for healthy members of the same sex. Future beneficiaries are assumed to be of the opposite sex and have the same mortality as General members. The amount-weighted Pub-2010 mortality tables are used.

Note that these assumptions include a projection for expected future mortality improvement. These probabilities were adopted June 30, 2019.

Males General members: PubG-2010 Healthy Retiree Mortality Table for Males, with MP-2014 Ultimate Projection Scale.

 Safety members: PubS-2010 Healthy Retiree Mortality Table for Males multiplied by 85%, with MP-2014 Ultimate Projection Scale.

Females General members: PubG-2010 Healthy Retiree Mortality Table for Females multiplied by 110%, with MP-2014 Ultimate Projection Scale.

 Safety members: PubS-2010 Healthy Retiree Mortality Table for Females, with MP-2014 Ultimate Projection Scale.

Postretirement Mortality – Disabled Members

For members retired for disability, the mortality probabilities used in the valuation are illustrated in Table A-3. The amount-weighted Pub-2010 mortality tables are used.

Note that these assumptions include a projection for expected future mortality improvement. These probabilities were adopted June 30, 2019.

Males General members: Average of PubG-2010 Healthy Retiree Mortality Table for Males and PubG-2010 Disabled Retiree Mortality Table for Males, both projected with MP-2014 Ultimate Projection Scale.

Safety members: PubS-2010 Healthy Retiree Mortality Table for Males, with MP-2014 Ultimate Projection Scale.

Females General members: Average of PubG-2010 Healthy Retiree Mortality Table for Females and PubG-2010 Disabled Retiree Mortality Table for Females, both projected with MP-2014 Ultimate Projection Scale.

Safety members: PubS-2010 Healthy Retiree Mortality Table for Females, with MP-2014 Ultimate Projection Scale.

Mortality while in Active Status

For active members, the mortality probabilities used in the valuation are illustrated in Tables A-6 through A-13. The amount-weighted Pub-2010 mortality tables are used. These probabilities were adopted June 30, 2019.

| Class | Gender | Proposed Table |
|---------|--------|---|
| General | Male | PubG-2010 (120%) Employee Male ⁽¹⁾ |
| General | Female | PubG-2010 (130%) Employee Female ⁽¹⁾ |
| Safety | Male | PubS-2010 (100%) Employee Male ⁽¹⁾ |
| Safety | Female | PubS-2010 (100%) Employee Female ⁽¹⁾ |

1. Projected using the MP-2014 Ultimate projection scale.

Note that Safety members have an additional service-connected mortality probability of 0.01% per year.

Other Employment Terminations

Tables A-6 to A-13 show, for all ages, the probabilities assumed in this valuation for future termination from active service other than for death, disability, or retirement. These probabilities do not apply to members eligible for service retirement. These probabilities were adopted June 30, 2019.

Terminating employees may withdraw their contributions immediately upon termination of employment and forfeit the right to further benefits, or they may leave their contributions with LACERA. Former contributing members whose contributions are on deposit may later elect to receive a refund, may return to work, or may remain inactive until becoming eligible to receive a retirement benefit under either LACERA or a reciprocal retirement system. All terminating members who are not eligible for vested benefits are assumed to withdraw their contributions immediately. It is assumed that all terminating members will not be rehired in the future.

Table A-4 gives the assumed probabilities that vested members will withdraw their contributions and elect a refund immediately upon termination and the probability that remaining members will elect a deferred vested benefit. All non-vested members are assumed to elect a refund and withdraw their contributions. These probabilities were adopted June 30, 2019.

Probability of Eligible Survivors

For members not currently in pay status, 77% of all males and 50% of all females are assumed to have eligible survivors (spouses or qualified domestic partners). Survivors are assumed to be four years younger than male members and two years older than female members. Survivors are assumed to be of the opposite gender as the member. There is no explicit assumption for children's benefits. We believe the survivor benefits based on this assumption are sufficient to cover children's benefits as they occur.

Valuation of Vested Former Members

The deferred retirement benefit is calculated based on the member's final compensation and service at termination. The compensation amount is projected until the assumed retirement age for members who are assumed to be employed by a reciprocal agency. For members who are missing compensation data, Final Compensation is estimated as the average amount for all members who terminated during the same year and had a valid compensation amount. The greater of the present value of the calculated benefit and the employee's current contribution balance is valued for future deferred vested members.

Reciprocal Employment

16% of General and 35% of Safety current and future vested former members are assumed to work for a reciprocal employer.

Current vested reciprocal members are assumed to receive annual salary increases of 4.25%. Future reciprocal vested members are assumed to receive the same salary increases they would have received if they had stayed in active employment with LACERA and retired at the assumed retirement age.

Valuation of Annuity Purchases

Over 30 years ago, LACERA purchased single life annuities from two insurance companies for some retired members (currently less than 1% of the retired population). The total liability for these members is calculated and then offset by the expected value of the benefit to be paid by the insurance companies.

For affected members, the insurance companies are responsible for:

1. Straight life annuity payments
2. Statutory COLAs

LACERA is responsible for:

1. Benefit payments payable to any beneficiary
2. STAR COLAs

Member Contribution Rate Assumptions

The following assumptions summarize the procedures used to compute member contribution rates based on entry age:

In general, the member rate is determined by the Present Value of the Future Benefit (PVFB) payable at retirement age, divided by the present value of all future salaries payable between age at entry and retirement age. For these purposes, per the CERL:

- A. The Annuity factor used for general members is based on a 35% / 65% blend of the male and female valuation mortality tables and projection scale, with a static projection to 2041. For Safety members, it is based on a 85% / 15% blend of the male and female annuity factors determined using the same mortality tables as used for service-retired members.
- B. The annuity factor used in determining the present value of future benefits (PVFB) at entry age is equal to the life only annuity factor at 7.00%.
- C. The Final Compensation is based on the salary paid in the year prior to attaining the retirement age.

Example: For a General Plan C Member who enters at age 59 or earlier, the Final Compensation at retirement (age 60) will be the monthly average of the annual salaries during age 59.
- D. Member Rates are assumed to increase with entry age. There are a few exceptions at the higher entry ages where the calculated rate is less than the previous entry age. In these cases the member contribution rate is adjusted so that it is no less than the value for the previous entry age.

Table A-1
Summary of Valuation Assumptions as of June 30, 2019

- I. Economic assumptions
 - A. General wage increases 3.25%
 - B. Investment earnings 7.00%
 - C. Growth in membership 0.00%
 - D. Postretirement benefit increases (varies by plan) Plan COLA not greater than CPI assumption.
 - E. CPI inflation assumption 2.75%
- II. Demographic assumptions
 - A. Salary increases due to service Table A-5
 - B. Retirement Tables A-6 to A-13
 - C. Disability Tables A-6 to A-13
 - D. Mortality during active employment Tables A-6 to A-13
 - E. Mortality for active members after termination and service retired members⁽¹⁾ Table A-2

| Class | Gender | |
|---------|--------|---|
| General | Male | PubG-2010 (100%) Healthy Retiree Male |
| General | Female | PubG-2010 (110%) Healthy Retiree Female |
| Safety | Male | PubS-2010 (85%) Healthy Retiree Male |
| Safety | Female | PubS-2010 (100%) Healthy Retiree Female |

- F. Mortality among disabled members⁽¹⁾ Table A-3

| Class | Gender | |
|---------|--------|---|
| General | Male | Avg of: PubG-2010 (100%) Healthy Retiree Male PubG-2010 (100%) Disabled Retiree Male |
| General | Female | Avg of: PubG-2010 (100%) Healthy Retiree Female PubG-2010 (100%) Disabled Retiree Female |
| Safety | Male | PubS-2010 (100%) Healthy Retiree Male |
| Safety | Female | PubS-2010 (100%) Healthy Retiree Female |

- G. Mortality for beneficiaries⁽¹⁾ Table A-2
 Basis – Beneficiaries are assumed to have the same mortality as a general member of the opposite gender who has taken a service retirement.
- H. Other terminations of employment Tables A-6 to A-13
- I. Refund of contributions on vested termination Table A-4

1. All mortality probabilities are projected using the MP-2014 Ultimate projection scale.

Table A-2
Mortality for Members Retired for Service⁽¹⁾

| <u>Age</u> | <u>Safety Male</u> | <u>Safety Female</u> | <u>General Male</u> | <u>General Female</u> |
|------------|--------------------|----------------------|---------------------|-----------------------|
| 20 | 0.0520% | 0.0210% | 0.0740% | 0.0380% |
| 25 | 0.0470% | 0.0260% | 0.0560% | 0.0260% |
| 30 | 0.0520% | 0.0350% | 0.0720% | 0.0440% |
| 35 | 0.0590% | 0.0470% | 0.0940% | 0.0680% |
| 40 | 0.0750% | 0.0640% | 0.1320% | 0.1060% |
| 45 | 0.1037% | 0.0870% | 0.1960% | 0.1650% |
| 50 | 0.1632% | 0.1490% | 0.2980% | 0.2442% |
| 55 | 0.2601% | 0.2580% | 0.4310% | 0.3146% |
| 60 | 0.4318% | 0.4460% | 0.6150% | 0.4224% |
| 65 | 0.7489% | 0.7700% | 0.9130% | 0.6743% |
| 70 | 1.3328% | 1.3290% | 1.5260% | 1.1693% |
| 75 | 2.4021% | 2.2950% | 2.6710% | 2.0713% |
| 80 | 4.3376% | 3.9620% | 4.7740% | 3.6960% |
| 85 | 7.7648% | 6.8420% | 8.5910% | 6.8255% |
| 90 | 13.4810% | 11.8150% | 14.6720% | 12.6357% |

Annual Projected Mortality Improvement

| <u>Age</u> | <u>All Groups</u> |
|------------|-------------------|
| 65 & Less | 1.000% |
| 70 | 1.000% |
| 75 | 1.000% |
| 80 | 1.000% |
| 85 | 1.000% |
| 90 | 0.930% |
| 95 | 0.850% |
| 100 | 0.640% |
| 105 | 0.430% |
| 110 | 0.210% |
| 115 | 0.000% |

1. Mortality probabilities are those applicable for the fiscal year beginning in 2010. Annual projected improvements are assumed in the following years under the schedule shown. For example, the annual mortality probability for an 85-year old Safety male in fiscal year beginning in 2019 is 7.0933% calculated as follows:

$$\begin{aligned}
 \text{Age 85 probability in 2019} &= \text{Age 85 probability in 2010 with 9 years improvement} \\
 &= 7.7648\% \times (100.0\% - 1.0\%)^9 \\
 &= 7.0933\%
 \end{aligned}$$

Table A-3
Mortality for Members Retired for Disability⁽¹⁾

| Age | Safety Male | Safety Female | General Male | General Female |
|------------|------------------------|--------------------------|-------------------------|---------------------------|
| 20 | 0.0610% | 0.0210% | 0.2430% | 0.1340% |
| 25 | 0.0550% | 0.0260% | 0.1670% | 0.0940% |
| 30 | 0.0610% | 0.0350% | 0.2130% | 0.1485% |
| 35 | 0.0700% | 0.0470% | 0.2760% | 0.2315% |
| 40 | 0.0880% | 0.0640% | 0.3885% | 0.3625% |
| 45 | 0.1220% | 0.0870% | 0.6015% | 0.5675% |
| 50 | 0.1920% | 0.1490% | 0.9515% | 0.8525% |
| 55 | 0.3060% | 0.2580% | 1.2725% | 1.0140% |
| 60 | 0.5080% | 0.4460% | 1.5590% | 1.1700% |
| 65 | 0.8810% | 0.7700% | 1.9785% | 1.4345% |
| 70 | 1.5680% | 1.3290% | 2.7135% | 1.9625% |
| 75 | 2.8260% | 2.2950% | 3.9315% | 2.9430% |
| 80 | 5.1030% | 3.9620% | 6.0610% | 4.6835% |
| 85 | 9.1350% | 6.8420% | 9.7030% | 7.7680% |
| 90 | 15.8600% | 11.8150% | 15.4625% | 12.5760% |

1. Mortality probabilities are those applicable for the fiscal year beginning in 2010. Annual projected improvements are assumed in the following years under the schedule shown on the preceding page.

Table A-4
Immediate Refund of Contributions upon Termination of Employment
(Excludes Plan E)

| Years of Service | General | Safety |
|-------------------------|----------------|---------------|
| 0 | 100% | 100% |
| 1 | 100% | 100% |
| 2 | 100% | 100% |
| 3 | 100% | 100% |
| 4 | 100% | 100% |
| 5 | 32% | 30% |
| 6 | 32% | 30% |
| 7 | 32% | 30% |
| 8 | 32% | 28% |
| 9 | 31% | 26% |
| 10 | 31% | 24% |
| 11 | 30% | 22% |
| 12 | 30% | 20% |
| 13 | 29% | 18% |
| 14 | 28% | 16% |
| 15 | 26% | 14% |
| 16 | 25% | 12% |
| 17 | 24% | 10% |
| 18 | 22% | 9% |
| 19 | 21% | 8% |
| 20 | 19% | 7% |
| 21 | 18% | 6% |
| 22 | 16% | 5% |
| 23 | 14% | 4% |
| 24 | 12% | 3% |
| 25 | 10% | 2% |
| 26 | 8% | 2% |
| 27 | 6% | 2% |
| 28 | 4% | 2% |
| 29 | 2% | 2% |
| 30 & Above | 0% | 0% |

Table A-5
Annual Increase in Salary⁽¹⁾

| Years of Service | General | Safety |
|-------------------------|----------------|---------------|
| <1 | 6.00% | 9.00% |
| 1 | 5.25% | 8.50% |
| 2 | 4.75% | 8.00% |
| 3 | 4.10% | 6.00% |
| 4 | 3.50% | 4.50% |
| 5 | 3.00% | 3.25% |
| 6 | 2.50% | 2.50% |
| 7 | 2.00% | 2.00% |
| 8 | 1.60% | 1.50% |
| 9 | 1.30% | 1.35% |
| 10 | 1.15% | 1.20% |
| 11 | 1.00% | 1.05% |
| 12 | 0.85% | 0.95% |
| 13 | 0.75% | 0.85% |
| 14 | 0.70% | 0.75% |
| 15 | 0.65% | 0.70% |
| 16 | 0.60% | 0.65% |
| 17 | 0.55% | 0.60% |
| 18 | 0.50% | 0.55% |
| 19 | 0.45% | 2.25% |
| 20 | 0.40% | 0.50% |
| 21 | 0.35% | 0.50% |
| 22 | 0.30% | 0.50% |
| 23 | 0.25% | 0.50% |
| 24 | 0.25% | 3.00% |
| 25 | 0.25% | 0.50% |
| 26 | 0.25% | 0.50% |
| 27 | 0.25% | 0.50% |
| 28 | 0.25% | 0.50% |
| 29 | 0.25% | 3.00% |
| 30 & Above | 0.25% | 0.50% |

* The total expected increase in salary includes both merit (shown above) and the general wage increase assumption of 3.25% per annum increase. The total result is compounded rather than additive. For example, the total assumed increase for General members for service less than one year is 9.45%.

**Appendix A: Probabilities of Separation from Active Service
Tables A-6 to A-13**

A schedule of the probabilities of termination of employment due to the following causes can be found on the following pages:

| | |
|----------------------|---|
| Service Retirement: | Member retires after meeting age and service requirements for reasons other than disability. |
| Withdrawal: | Member terminates and elects a refund of member contributions, or a deferred vested retirement benefit. |
| Service Disability: | Member receives disability retirement; disability is service related. |
| Ordinary Disability: | Member receives disability retirement; disability is not service related. |
| Service Death: | Member dies before retirement; death is service related. |
| Ordinary Death: | Member dies before retirement; death is not service related. |

Each of these represents the probability that a member will separate from service at each age due to the particular cause. For example, a probability of 0.0300 for a member's service retirement at age 50 means we assume that 30 out of 1,000 members who are age 50 will retire at that age.

Each table represents the detailed probabilities needed for each LACERA plan by gender:

| | |
|--|--------------------------------------|
| Table A-6: General Plan A, B & C – Males | A-10: General Plan E – Males |
| A-7: General Plan A, B & C – Females | A-11: General Plan E – Females |
| A-8: General Plan D & G – Males | A-12: Safety Plan A, B & C – Males |
| A-9: General Plan D & G – Females | A-13: Safety Plan A, B & C – Females |

Table A-6
Probability of Separation from Active Service for General Members
Plans A, B & C – Male

| Age | Service Retirement | Other Terminations | Service Disability | Ordinary Disability | Service Death | Ordinary Death |
|-----|--------------------|--------------------|--------------------|---------------------|---------------|----------------|
| 18 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00043 |
| 19 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00046 |
| 20 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00044 |
| 21 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00043 |
| 22 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00040 |
| 23 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00037 |
| 24 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00035 |
| 25 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00034 |
| 26 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00036 |
| 27 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00037 |
| 28 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00040 |
| 29 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00041 |
| 30 | 0.00000 | 0.00500 | 0.00010 | 0.00020 | N/A | 0.00043 |
| 31 | 0.00000 | 0.00500 | 0.00010 | 0.00020 | N/A | 0.00046 |
| 32 | 0.00000 | 0.00500 | 0.00010 | 0.00020 | N/A | 0.00048 |
| 33 | 0.00000 | 0.00500 | 0.00016 | 0.00020 | N/A | 0.00050 |
| 34 | 0.00000 | 0.00500 | 0.00022 | 0.00020 | N/A | 0.00053 |
| 35 | 0.00000 | 0.00500 | 0.00028 | 0.00020 | N/A | 0.00056 |
| 36 | 0.00000 | 0.00500 | 0.00034 | 0.00020 | N/A | 0.00060 |
| 37 | 0.00000 | 0.00500 | 0.00040 | 0.00020 | N/A | 0.00064 |
| 38 | 0.00000 | 0.00500 | 0.00048 | 0.00020 | N/A | 0.00068 |
| 39 | 0.00000 | 0.00500 | 0.00056 | 0.00020 | N/A | 0.00073 |
| 40 | 0.03000 | 0.00500 | 0.00064 | 0.00020 | N/A | 0.00079 |
| 41 | 0.03000 | 0.00500 | 0.00072 | 0.00020 | N/A | 0.00085 |
| 42 | 0.03000 | 0.00500 | 0.00080 | 0.00020 | N/A | 0.00092 |
| 43 | 0.03000 | 0.00500 | 0.00084 | 0.00024 | N/A | 0.00100 |
| 44 | 0.03000 | 0.00500 | 0.00088 | 0.00028 | N/A | 0.00108 |
| 45 | 0.03000 | 0.00500 | 0.00092 | 0.00032 | N/A | 0.00118 |
| 46 | 0.03000 | 0.00500 | 0.00096 | 0.00036 | N/A | 0.00128 |
| 47 | 0.03000 | 0.00500 | 0.00100 | 0.00040 | N/A | 0.00139 |
| 48 | 0.03000 | 0.00500 | 0.00104 | 0.00044 | N/A | 0.00152 |
| 49 | 0.03000 | 0.00500 | 0.00108 | 0.00048 | N/A | 0.00166 |
| 50 | 0.03000 | 0.00500 | 0.00112 | 0.00052 | N/A | 0.00179 |
| 51 | 0.03000 | 0.00500 | 0.00116 | 0.00056 | N/A | 0.00194 |
| 52 | 0.03000 | 0.00500 | 0.00120 | 0.00060 | N/A | 0.00210 |
| 53 | 0.03000 | 0.00500 | 0.00156 | 0.00064 | N/A | 0.00227 |
| 54 | 0.06000 | 0.00500 | 0.00192 | 0.00068 | N/A | 0.00244 |
| 55 | 0.10000 | 0.00500 | 0.00228 | 0.00072 | N/A | 0.00263 |
| 56 | 0.12000 | 0.00500 | 0.00264 | 0.00076 | N/A | 0.00283 |
| 57 | 0.17000 | 0.00500 | 0.00300 | 0.00080 | N/A | 0.00306 |
| 58 | 0.26000 | 0.00500 | 0.00330 | 0.00084 | N/A | 0.00330 |
| 59 | 0.26000 | 0.00500 | 0.00360 | 0.00088 | N/A | 0.00355 |
| 60 | 0.32000 | 0.00500 | 0.00390 | 0.00092 | N/A | 0.00383 |
| 61 | 0.32000 | 0.00500 | 0.00420 | 0.00096 | N/A | 0.00413 |
| 62 | 0.32000 | 0.00500 | 0.00450 | 0.00100 | N/A | 0.00445 |
| 63 | 0.32000 | 0.00500 | 0.00450 | 0.00104 | N/A | 0.00481 |
| 64 | 0.32000 | 0.00500 | 0.00450 | 0.00108 | N/A | 0.00520 |
| 65 | 0.32000 | 0.00500 | 0.00450 | 0.00112 | N/A | 0.00562 |
| 66 | 0.25000 | 0.00500 | 0.00450 | 0.00116 | N/A | 0.00607 |
| 67 | 0.24000 | 0.00500 | 0.00450 | 0.00120 | N/A | 0.00658 |
| 68 | 0.24000 | 0.00500 | 0.00450 | 0.00124 | N/A | 0.00713 |
| 69 | 0.24000 | 0.00500 | 0.00450 | 0.00128 | N/A | 0.00775 |
| 70 | 0.24000 | 0.00500 | 0.00450 | 0.00132 | N/A | 0.00844 |
| 71 | 0.24000 | 0.00500 | 0.00450 | 0.00136 | N/A | 0.00920 |
| 72 | 0.24000 | 0.00500 | 0.00450 | 0.00140 | N/A | 0.01004 |
| 73 | 0.24000 | 0.00500 | 0.00450 | 0.00144 | N/A | 0.01098 |
| 74 | 0.24000 | 0.00500 | 0.00450 | 0.00148 | N/A | 0.01201 |
| 75 | 1.00000 | 0.00000 | 0.00000 | 0.00000 | N/A | 0.01315 |

Table A-7
Probability of Separation from Active Service for General Members
Plans A, B & C – Female

| Age | Service Retirement | Other Terminations | Service Disability | Ordinary Disability | Service Death | Ordinary Death |
|-----|--------------------|--------------------|--------------------|---------------------|---------------|----------------|
| 18 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00017 |
| 19 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00017 |
| 20 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00017 |
| 21 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00016 |
| 22 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00014 |
| 23 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00013 |
| 24 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00012 |
| 25 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00012 |
| 26 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00013 |
| 27 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00014 |
| 28 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00016 |
| 29 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00017 |
| 30 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00020 |
| 31 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00021 |
| 32 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00023 |
| 33 | 0.00000 | 0.00500 | 0.00020 | 0.00010 | N/A | 0.00025 |
| 34 | 0.00000 | 0.00500 | 0.00025 | 0.00010 | N/A | 0.00027 |
| 35 | 0.00000 | 0.00500 | 0.00030 | 0.00010 | N/A | 0.00030 |
| 36 | 0.00000 | 0.00500 | 0.00035 | 0.00010 | N/A | 0.00033 |
| 37 | 0.00000 | 0.00500 | 0.00040 | 0.00010 | N/A | 0.00036 |
| 38 | 0.00000 | 0.00500 | 0.00042 | 0.00014 | N/A | 0.00039 |
| 39 | 0.00000 | 0.00500 | 0.00044 | 0.00018 | N/A | 0.00043 |
| 40 | 0.03000 | 0.00500 | 0.00046 | 0.00022 | N/A | 0.00047 |
| 41 | 0.03000 | 0.00500 | 0.00048 | 0.00026 | N/A | 0.00052 |
| 42 | 0.03000 | 0.00500 | 0.00050 | 0.00030 | N/A | 0.00056 |
| 43 | 0.03000 | 0.00500 | 0.00060 | 0.00032 | N/A | 0.00061 |
| 44 | 0.03000 | 0.00500 | 0.00070 | 0.00034 | N/A | 0.00066 |
| 45 | 0.03000 | 0.00500 | 0.00080 | 0.00036 | N/A | 0.00073 |
| 46 | 0.03000 | 0.00500 | 0.00090 | 0.00038 | N/A | 0.00079 |
| 47 | 0.03000 | 0.00500 | 0.00100 | 0.00040 | N/A | 0.00086 |
| 48 | 0.03000 | 0.00500 | 0.00110 | 0.00042 | N/A | 0.00092 |
| 49 | 0.03000 | 0.00500 | 0.00120 | 0.00044 | N/A | 0.00100 |
| 50 | 0.03000 | 0.00500 | 0.00130 | 0.00046 | N/A | 0.00108 |
| 51 | 0.03000 | 0.00500 | 0.00140 | 0.00048 | N/A | 0.00117 |
| 52 | 0.03000 | 0.00500 | 0.00150 | 0.00050 | N/A | 0.00126 |
| 53 | 0.03000 | 0.00500 | 0.00156 | 0.00052 | N/A | 0.00137 |
| 54 | 0.06000 | 0.00500 | 0.00162 | 0.00054 | N/A | 0.00147 |
| 55 | 0.10000 | 0.00500 | 0.00168 | 0.00056 | N/A | 0.00160 |
| 56 | 0.12000 | 0.00500 | 0.00174 | 0.00058 | N/A | 0.00173 |
| 57 | 0.17000 | 0.00500 | 0.00180 | 0.00060 | N/A | 0.00187 |
| 58 | 0.26000 | 0.00500 | 0.00194 | 0.00064 | N/A | 0.00203 |
| 59 | 0.26000 | 0.00500 | 0.00208 | 0.00068 | N/A | 0.00221 |
| 60 | 0.32000 | 0.00500 | 0.00222 | 0.00072 | N/A | 0.00242 |
| 61 | 0.32000 | 0.00500 | 0.00236 | 0.00076 | N/A | 0.00264 |
| 62 | 0.32000 | 0.00500 | 0.00250 | 0.00080 | N/A | 0.00289 |
| 63 | 0.32000 | 0.00500 | 0.00250 | 0.00084 | N/A | 0.00317 |
| 64 | 0.32000 | 0.00500 | 0.00250 | 0.00088 | N/A | 0.00350 |
| 65 | 0.32000 | 0.00500 | 0.00250 | 0.00092 | N/A | 0.00385 |
| 66 | 0.25000 | 0.00500 | 0.00250 | 0.00096 | N/A | 0.00425 |
| 67 | 0.24000 | 0.00500 | 0.00250 | 0.00100 | N/A | 0.00471 |
| 68 | 0.24000 | 0.00500 | 0.00250 | 0.00104 | N/A | 0.00520 |
| 69 | 0.24000 | 0.00500 | 0.00250 | 0.00108 | N/A | 0.00575 |
| 70 | 0.24000 | 0.00500 | 0.00250 | 0.00112 | N/A | 0.00636 |
| 71 | 0.24000 | 0.00500 | 0.00250 | 0.00116 | N/A | 0.00703 |
| 72 | 0.24000 | 0.00500 | 0.00250 | 0.00120 | N/A | 0.00777 |
| 73 | 0.24000 | 0.00500 | 0.00250 | 0.00124 | N/A | 0.00859 |
| 74 | 0.24000 | 0.00500 | 0.00250 | 0.00128 | N/A | 0.00950 |
| 75 | 1.00000 | 0.00000 | 0.00000 | 0.00000 | N/A | 0.01050 |

Table A-8
Probability of Separation from Active Service for General Members
Plan D & G – Male

| Age | Service Retirement Plan D | Service Retirement Plan G | Service Disability | Ordinary Disability | Service Death | Ordinary Death | Years of Service | Other Terminations |
|-----|---------------------------|---------------------------|--------------------|---------------------|---------------|----------------|------------------|--------------------|
| 18 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00043 | 0 | 0.07000 |
| 19 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00046 | 1 | 0.05500 |
| 20 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00044 | 2 | 0.04000 |
| 21 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00043 | 3 | 0.03250 |
| 22 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00040 | 4 | 0.02500 |
| 23 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00037 | 5 | 0.02330 |
| 24 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00035 | 6 | 0.02170 |
| 25 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00034 | 7 | 0.02000 |
| 26 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00036 | 8 | 0.01900 |
| 27 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00037 | 9 | 0.01800 |
| 28 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00040 | 10 | 0.01700 |
| 29 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00041 | 11 | 0.01600 |
| 30 | 0.00000 | 0.00000 | 0.00010 | 0.00020 | N/A | 0.00043 | 12 | 0.01500 |
| 31 | 0.00000 | 0.00000 | 0.00010 | 0.00020 | N/A | 0.00046 | 13 | 0.01400 |
| 32 | 0.00000 | 0.00000 | 0.00010 | 0.00020 | N/A | 0.00048 | 14 | 0.01300 |
| 33 | 0.00000 | 0.00000 | 0.00016 | 0.00020 | N/A | 0.00050 | 15 | 0.01200 |
| 34 | 0.00000 | 0.00000 | 0.00022 | 0.00020 | N/A | 0.00053 | 16 | 0.01100 |
| 35 | 0.00000 | 0.00000 | 0.00028 | 0.00020 | N/A | 0.00056 | 17 | 0.01000 |
| 36 | 0.00000 | 0.00000 | 0.00034 | 0.00020 | N/A | 0.00060 | 18 | 0.00920 |
| 37 | 0.00000 | 0.00000 | 0.00040 | 0.00020 | N/A | 0.00064 | 19 | 0.00840 |
| 38 | 0.00000 | 0.00000 | 0.00048 | 0.00020 | N/A | 0.00068 | 20 | 0.00760 |
| 39 | 0.00000 | 0.00000 | 0.00056 | 0.00020 | N/A | 0.00073 | 21 | 0.00680 |
| 40 | 0.01500 | 0.00000 | 0.00064 | 0.00020 | N/A | 0.00079 | 22 | 0.00600 |
| 41 | 0.01500 | 0.00000 | 0.00072 | 0.00020 | N/A | 0.00085 | 23 | 0.00560 |
| 42 | 0.01500 | 0.00000 | 0.00080 | 0.00020 | N/A | 0.00092 | 24 | 0.00520 |
| 43 | 0.01500 | 0.00000 | 0.00084 | 0.00024 | N/A | 0.00100 | 25 | 0.00480 |
| 44 | 0.01500 | 0.00000 | 0.00088 | 0.00028 | N/A | 0.00108 | 26 | 0.00440 |
| 45 | 0.01500 | 0.00000 | 0.00092 | 0.00032 | N/A | 0.00118 | 27 | 0.00400 |
| 46 | 0.01500 | 0.00000 | 0.00096 | 0.00036 | N/A | 0.00128 | 28 | 0.00400 |
| 47 | 0.01500 | 0.00000 | 0.00100 | 0.00040 | N/A | 0.00139 | 29 | 0.00400 |
| 48 | 0.01500 | 0.00000 | 0.00104 | 0.00044 | N/A | 0.00152 | 30 & Above | 0.00000 |
| 49 | 0.01500 | 0.00000 | 0.00108 | 0.00048 | N/A | 0.00166 | | |
| 50 | 0.01500 | 0.01200 | 0.00112 | 0.00052 | N/A | 0.00179 | | |
| 51 | 0.01200 | 0.00960 | 0.00116 | 0.00056 | N/A | 0.00194 | | |
| 52 | 0.01200 | 0.00960 | 0.00120 | 0.00060 | N/A | 0.00210 | | |
| 53 | 0.01500 | 0.01200 | 0.00156 | 0.00064 | N/A | 0.00227 | | |
| 54 | 0.02000 | 0.01600 | 0.00192 | 0.00068 | N/A | 0.00244 | | |
| 55 | 0.02500 | 0.02000 | 0.00228 | 0.00072 | N/A | 0.00263 | | |
| 56 | 0.02500 | 0.02000 | 0.00264 | 0.00076 | N/A | 0.00283 | | |
| 57 | 0.03000 | 0.02400 | 0.00300 | 0.00080 | N/A | 0.00306 | | |
| 58 | 0.03500 | 0.02800 | 0.00330 | 0.00084 | N/A | 0.00330 | | |
| 59 | 0.05000 | 0.04000 | 0.00360 | 0.00088 | N/A | 0.00355 | | |
| 60 | 0.07000 | 0.05600 | 0.00390 | 0.00092 | N/A | 0.00383 | | |
| 61 | 0.08000 | 0.06400 | 0.00420 | 0.00096 | N/A | 0.00413 | | |
| 62 | 0.11000 | 0.11000 | 0.00450 | 0.00100 | N/A | 0.00445 | | |
| 63 | 0.11000 | 0.11000 | 0.00450 | 0.00104 | N/A | 0.00481 | | |
| 64 | 0.16000 | 0.16000 | 0.00450 | 0.00108 | N/A | 0.00520 | | |
| 65 | 0.23000 | 0.18000 | 0.00450 | 0.00112 | N/A | 0.00562 | | |
| 66 | 0.20000 | 0.18000 | 0.00450 | 0.00116 | N/A | 0.00607 | | |
| 67 | 0.19000 | 0.30000 | 0.00450 | 0.00120 | N/A | 0.00658 | | |
| 68 | 0.18000 | 0.18000 | 0.00450 | 0.00124 | N/A | 0.00713 | | |
| 69 | 0.20000 | 0.20000 | 0.00450 | 0.00128 | N/A | 0.00775 | | |
| 70 | 0.23000 | 0.23000 | 0.00450 | 0.00132 | N/A | 0.00844 | | |
| 71 | 0.20000 | 0.20000 | 0.00450 | 0.00136 | N/A | 0.00920 | | |
| 72 | 0.20000 | 0.20000 | 0.00450 | 0.00140 | N/A | 0.01004 | | |
| 73 | 0.20000 | 0.20000 | 0.00450 | 0.00144 | N/A | 0.01098 | | |
| 74 | 0.20000 | 0.20000 | 0.00450 | 0.00148 | N/A | 0.01201 | | |
| 75 | 1.00000 | 1.00000 | 0.00000 | 0.00000 | N/A | 0.01315 | | |

This work product was prepared solely for LACERA for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Table A-9
Probability of Separation from Active Service for General Members
Plan D & G – Female

| Age | Service Retirement Plan D | Service Retirement Plan G | Service Disability | Ordinary Disability | Service Death | Ordinary Death | Years of Service | Other Terminations |
|-----|---------------------------|---------------------------|--------------------|---------------------|---------------|----------------|------------------|--------------------|
| 18 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00017 | 0 | 0.07000 |
| 19 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00017 | 1 | 0.05500 |
| 20 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00017 | 2 | 0.04000 |
| 21 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00016 | 3 | 0.03250 |
| 22 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00014 | 4 | 0.02500 |
| 23 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00013 | 5 | 0.02330 |
| 24 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00012 | 6 | 0.02170 |
| 25 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00012 | 7 | 0.02000 |
| 26 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00013 | 8 | 0.01900 |
| 27 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00014 | 9 | 0.01800 |
| 28 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00016 | 10 | 0.01700 |
| 29 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00017 | 11 | 0.01600 |
| 30 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00020 | 12 | 0.01500 |
| 31 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00021 | 13 | 0.01400 |
| 32 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00023 | 14 | 0.01300 |
| 33 | 0.00000 | 0.00000 | 0.00020 | 0.00010 | N/A | 0.00025 | 15 | 0.01200 |
| 34 | 0.00000 | 0.00000 | 0.00025 | 0.00010 | N/A | 0.00027 | 16 | 0.01100 |
| 35 | 0.00000 | 0.00000 | 0.00030 | 0.00010 | N/A | 0.00030 | 17 | 0.01000 |
| 36 | 0.00000 | 0.00000 | 0.00035 | 0.00010 | N/A | 0.00033 | 18 | 0.00920 |
| 37 | 0.00000 | 0.00000 | 0.00040 | 0.00010 | N/A | 0.00036 | 19 | 0.00840 |
| 38 | 0.00000 | 0.00000 | 0.00042 | 0.00014 | N/A | 0.00039 | 20 | 0.00760 |
| 39 | 0.00000 | 0.00000 | 0.00044 | 0.00018 | N/A | 0.00043 | 21 | 0.00680 |
| 40 | 0.01500 | 0.00000 | 0.00046 | 0.00022 | N/A | 0.00047 | 22 | 0.00600 |
| 41 | 0.01500 | 0.00000 | 0.00048 | 0.00026 | N/A | 0.00052 | 23 | 0.00560 |
| 42 | 0.01500 | 0.00000 | 0.00050 | 0.00030 | N/A | 0.00056 | 24 | 0.00520 |
| 43 | 0.01500 | 0.00000 | 0.00060 | 0.00032 | N/A | 0.00061 | 25 | 0.00480 |
| 44 | 0.01500 | 0.00000 | 0.00070 | 0.00034 | N/A | 0.00066 | 26 | 0.00440 |
| 45 | 0.01500 | 0.00000 | 0.00080 | 0.00036 | N/A | 0.00073 | 27 | 0.00400 |
| 46 | 0.01500 | 0.00000 | 0.00090 | 0.00038 | N/A | 0.00079 | 28 | 0.00400 |
| 47 | 0.01500 | 0.00000 | 0.00100 | 0.00040 | N/A | 0.00086 | 29 | 0.00400 |
| 48 | 0.01500 | 0.00000 | 0.00110 | 0.00042 | N/A | 0.00092 | 30 & Above | 0.00000 |
| 49 | 0.01500 | 0.00000 | 0.00120 | 0.00044 | N/A | 0.00100 | | |
| 50 | 0.01500 | 0.01200 | 0.00130 | 0.00046 | N/A | 0.00108 | | |
| 51 | 0.01200 | 0.00960 | 0.00140 | 0.00048 | N/A | 0.00117 | | |
| 52 | 0.01200 | 0.00960 | 0.00150 | 0.00050 | N/A | 0.00126 | | |
| 53 | 0.01500 | 0.01200 | 0.00156 | 0.00052 | N/A | 0.00137 | | |
| 54 | 0.02000 | 0.01600 | 0.00162 | 0.00054 | N/A | 0.00147 | | |
| 55 | 0.02500 | 0.02000 | 0.00168 | 0.00056 | N/A | 0.00160 | | |
| 56 | 0.02500 | 0.02000 | 0.00174 | 0.00058 | N/A | 0.00173 | | |
| 57 | 0.03000 | 0.02400 | 0.00180 | 0.00060 | N/A | 0.00187 | | |
| 58 | 0.03500 | 0.02800 | 0.00194 | 0.00064 | N/A | 0.00203 | | |
| 59 | 0.05000 | 0.04000 | 0.00208 | 0.00068 | N/A | 0.00221 | | |
| 60 | 0.07000 | 0.05600 | 0.00222 | 0.00072 | N/A | 0.00242 | | |
| 61 | 0.08000 | 0.06400 | 0.00236 | 0.00076 | N/A | 0.00264 | | |
| 62 | 0.11000 | 0.11000 | 0.00250 | 0.00080 | N/A | 0.00289 | | |
| 63 | 0.11000 | 0.11000 | 0.00250 | 0.00084 | N/A | 0.00317 | | |
| 64 | 0.16000 | 0.16000 | 0.00250 | 0.00088 | N/A | 0.00350 | | |
| 65 | 0.23000 | 0.18000 | 0.00250 | 0.00092 | N/A | 0.00385 | | |
| 66 | 0.20000 | 0.18000 | 0.00250 | 0.00096 | N/A | 0.00425 | | |
| 67 | 0.19000 | 0.30000 | 0.00250 | 0.00100 | N/A | 0.00471 | | |
| 68 | 0.18000 | 0.18000 | 0.00250 | 0.00104 | N/A | 0.00520 | | |
| 69 | 0.20000 | 0.20000 | 0.00250 | 0.00108 | N/A | 0.00575 | | |
| 70 | 0.23000 | 0.23000 | 0.00250 | 0.00112 | N/A | 0.00636 | | |
| 71 | 0.20000 | 0.20000 | 0.00250 | 0.00116 | N/A | 0.00703 | | |
| 72 | 0.20000 | 0.20000 | 0.00250 | 0.00120 | N/A | 0.00777 | | |
| 73 | 0.20000 | 0.20000 | 0.00250 | 0.00124 | N/A | 0.00859 | | |
| 74 | 0.20000 | 0.20000 | 0.00250 | 0.00128 | N/A | 0.00950 | | |
| 75 | 1.00000 | 1.00000 | 0.00000 | 0.00000 | N/A | 0.01050 | | |

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Table A-10
Probability of Separation from Active Service for General Members
Plan E – Male

| Age | Service Retirement | Service Disability | Ordinary Disability | Service Death | Ordinary Death | Years of Service | Other Terminations |
|-----|--------------------|--------------------|---------------------|---------------|----------------|------------------|--------------------|
| 18 | 0.00000 | N/A | N/A | N/A | 0.00043 | 0 | 0.15000 |
| 19 | 0.00000 | N/A | N/A | N/A | 0.00046 | 1 | 0.08000 |
| 20 | 0.00000 | N/A | N/A | N/A | 0.00044 | 2 | 0.06000 |
| 21 | 0.00000 | N/A | N/A | N/A | 0.00043 | 3 | 0.04500 |
| 22 | 0.00000 | N/A | N/A | N/A | 0.00040 | 4 | 0.03500 |
| 23 | 0.00000 | N/A | N/A | N/A | 0.00037 | 5 | 0.03100 |
| 24 | 0.00000 | N/A | N/A | N/A | 0.00035 | 6 | 0.02700 |
| 25 | 0.00000 | N/A | N/A | N/A | 0.00034 | 7 | 0.02300 |
| 26 | 0.00000 | N/A | N/A | N/A | 0.00036 | 8 | 0.02200 |
| 27 | 0.00000 | N/A | N/A | N/A | 0.00037 | 9 | 0.02100 |
| 28 | 0.00000 | N/A | N/A | N/A | 0.00040 | 10 | 0.02000 |
| 29 | 0.00000 | N/A | N/A | N/A | 0.00041 | 11 | 0.01900 |
| 30 | 0.00000 | N/A | N/A | N/A | 0.00043 | 12 | 0.01800 |
| 31 | 0.00000 | N/A | N/A | N/A | 0.00046 | 13 | 0.01680 |
| 32 | 0.00000 | N/A | N/A | N/A | 0.00048 | 14 | 0.01560 |
| 33 | 0.00000 | N/A | N/A | N/A | 0.00050 | 15 | 0.01440 |
| 34 | 0.00000 | N/A | N/A | N/A | 0.00053 | 16 | 0.01320 |
| 35 | 0.00000 | N/A | N/A | N/A | 0.00056 | 17 | 0.01200 |
| 36 | 0.00000 | N/A | N/A | N/A | 0.00060 | 18 | 0.01160 |
| 37 | 0.00000 | N/A | N/A | N/A | 0.00064 | 19 | 0.01120 |
| 38 | 0.00000 | N/A | N/A | N/A | 0.00068 | 20 | 0.01080 |
| 39 | 0.00000 | N/A | N/A | N/A | 0.00073 | 21 | 0.01040 |
| 40 | 0.00000 | N/A | N/A | N/A | 0.00079 | 22 | 0.01000 |
| 41 | 0.00000 | N/A | N/A | N/A | 0.00085 | 23 | 0.01000 |
| 42 | 0.00000 | N/A | N/A | N/A | 0.00092 | 24 | 0.01000 |
| 43 | 0.00000 | N/A | N/A | N/A | 0.00100 | 25 | 0.01000 |
| 44 | 0.00000 | N/A | N/A | N/A | 0.00108 | 26 | 0.01000 |
| 45 | 0.00000 | N/A | N/A | N/A | 0.00118 | 27 | 0.01000 |
| 46 | 0.00000 | N/A | N/A | N/A | 0.00128 | 28 | 0.01000 |
| 47 | 0.00000 | N/A | N/A | N/A | 0.00139 | 29 | 0.01000 |
| 48 | 0.00000 | N/A | N/A | N/A | 0.00152 | 30 & Above | 0.01000 |
| 49 | 0.00000 | N/A | N/A | N/A | 0.00166 | | |
| 50 | 0.00000 | N/A | N/A | N/A | 0.00179 | | |
| 51 | 0.00000 | N/A | N/A | N/A | 0.00194 | | |
| 52 | 0.00000 | N/A | N/A | N/A | 0.00210 | | |
| 53 | 0.00000 | N/A | N/A | N/A | 0.00227 | | |
| 54 | 0.00000 | N/A | N/A | N/A | 0.00244 | | |
| 55 | 0.02000 | N/A | N/A | N/A | 0.00263 | | |
| 56 | 0.02000 | N/A | N/A | N/A | 0.00283 | | |
| 57 | 0.02500 | N/A | N/A | N/A | 0.00306 | | |
| 58 | 0.02500 | N/A | N/A | N/A | 0.00330 | | |
| 59 | 0.03000 | N/A | N/A | N/A | 0.00355 | | |
| 60 | 0.04000 | N/A | N/A | N/A | 0.00383 | | |
| 61 | 0.06000 | N/A | N/A | N/A | 0.00413 | | |
| 62 | 0.09000 | N/A | N/A | N/A | 0.00445 | | |
| 63 | 0.09000 | N/A | N/A | N/A | 0.00481 | | |
| 64 | 0.20000 | N/A | N/A | N/A | 0.00520 | | |
| 65 | 0.28000 | N/A | N/A | N/A | 0.00562 | | |
| 66 | 0.19000 | N/A | N/A | N/A | 0.00607 | | |
| 67 | 0.19000 | N/A | N/A | N/A | 0.00658 | | |
| 68 | 0.19000 | N/A | N/A | N/A | 0.00713 | | |
| 69 | 0.19000 | N/A | N/A | N/A | 0.00775 | | |
| 70 | 0.19000 | N/A | N/A | N/A | 0.00844 | | |
| 71 | 0.19000 | N/A | N/A | N/A | 0.00920 | | |
| 72 | 0.19000 | N/A | N/A | N/A | 0.01004 | | |
| 73 | 0.19000 | N/A | N/A | N/A | 0.01098 | | |
| 74 | 0.19000 | N/A | N/A | N/A | 0.01201 | | |
| 75 | 1.00000 | N/A | N/A | N/A | 0.01315 | | |

Table A-11
Probability of Separation from Active Service for General Members
Plan E – Female

| Age | Service Retirement | Service Disability | Ordinary Disability | Service Death | Ordinary Death | Years of Service | Other Terminations |
|-----|--------------------|--------------------|---------------------|---------------|----------------|------------------|--------------------|
| 18 | 0.00000 | N/A | N/A | N/A | 0.00017 | 0 | 0.15000 |
| 19 | 0.00000 | N/A | N/A | N/A | 0.00017 | 1 | 0.08000 |
| 20 | 0.00000 | N/A | N/A | N/A | 0.00017 | 2 | 0.06000 |
| 21 | 0.00000 | N/A | N/A | N/A | 0.00016 | 3 | 0.04500 |
| 22 | 0.00000 | N/A | N/A | N/A | 0.00014 | 4 | 0.03500 |
| 23 | 0.00000 | N/A | N/A | N/A | 0.00013 | 5 | 0.03100 |
| 24 | 0.00000 | N/A | N/A | N/A | 0.00012 | 6 | 0.02700 |
| 25 | 0.00000 | N/A | N/A | N/A | 0.00012 | 7 | 0.02300 |
| 26 | 0.00000 | N/A | N/A | N/A | 0.00013 | 8 | 0.02200 |
| 27 | 0.00000 | N/A | N/A | N/A | 0.00014 | 9 | 0.02100 |
| 28 | 0.00000 | N/A | N/A | N/A | 0.00016 | 10 | 0.02000 |
| 29 | 0.00000 | N/A | N/A | N/A | 0.00017 | 11 | 0.01900 |
| 30 | 0.00000 | N/A | N/A | N/A | 0.00020 | 12 | 0.01800 |
| 31 | 0.00000 | N/A | N/A | N/A | 0.00021 | 13 | 0.01680 |
| 32 | 0.00000 | N/A | N/A | N/A | 0.00023 | 14 | 0.01560 |
| 33 | 0.00000 | N/A | N/A | N/A | 0.00025 | 15 | 0.01440 |
| 34 | 0.00000 | N/A | N/A | N/A | 0.00027 | 16 | 0.01320 |
| 35 | 0.00000 | N/A | N/A | N/A | 0.00030 | 17 | 0.01200 |
| 36 | 0.00000 | N/A | N/A | N/A | 0.00033 | 18 | 0.01160 |
| 37 | 0.00000 | N/A | N/A | N/A | 0.00036 | 19 | 0.01120 |
| 38 | 0.00000 | N/A | N/A | N/A | 0.00039 | 20 | 0.01080 |
| 39 | 0.00000 | N/A | N/A | N/A | 0.00043 | 21 | 0.01040 |
| 40 | 0.00000 | N/A | N/A | N/A | 0.00047 | 22 | 0.01000 |
| 41 | 0.00000 | N/A | N/A | N/A | 0.00052 | 23 | 0.01000 |
| 42 | 0.00000 | N/A | N/A | N/A | 0.00056 | 24 | 0.01000 |
| 43 | 0.00000 | N/A | N/A | N/A | 0.00061 | 25 | 0.01000 |
| 44 | 0.00000 | N/A | N/A | N/A | 0.00066 | 26 | 0.01000 |
| 45 | 0.00000 | N/A | N/A | N/A | 0.00073 | 27 | 0.01000 |
| 46 | 0.00000 | N/A | N/A | N/A | 0.00079 | 28 | 0.01000 |
| 47 | 0.00000 | N/A | N/A | N/A | 0.00086 | 29 | 0.01000 |
| 48 | 0.00000 | N/A | N/A | N/A | 0.00092 | 30 & Above | 0.01000 |
| 49 | 0.00000 | N/A | N/A | N/A | 0.00100 | | |
| 50 | 0.00000 | N/A | N/A | N/A | 0.00108 | | |
| 51 | 0.00000 | N/A | N/A | N/A | 0.00117 | | |
| 52 | 0.00000 | N/A | N/A | N/A | 0.00126 | | |
| 53 | 0.00000 | N/A | N/A | N/A | 0.00137 | | |
| 54 | 0.00000 | N/A | N/A | N/A | 0.00147 | | |
| 55 | 0.02000 | N/A | N/A | N/A | 0.00160 | | |
| 56 | 0.02000 | N/A | N/A | N/A | 0.00173 | | |
| 57 | 0.02500 | N/A | N/A | N/A | 0.00187 | | |
| 58 | 0.02500 | N/A | N/A | N/A | 0.00203 | | |
| 59 | 0.03000 | N/A | N/A | N/A | 0.00221 | | |
| 60 | 0.04000 | N/A | N/A | N/A | 0.00242 | | |
| 61 | 0.06000 | N/A | N/A | N/A | 0.00264 | | |
| 62 | 0.09000 | N/A | N/A | N/A | 0.00289 | | |
| 63 | 0.09000 | N/A | N/A | N/A | 0.00317 | | |
| 64 | 0.20000 | N/A | N/A | N/A | 0.00350 | | |
| 65 | 0.28000 | N/A | N/A | N/A | 0.00385 | | |
| 66 | 0.19000 | N/A | N/A | N/A | 0.00425 | | |
| 67 | 0.19000 | N/A | N/A | N/A | 0.00471 | | |
| 68 | 0.19000 | N/A | N/A | N/A | 0.00520 | | |
| 69 | 0.19000 | N/A | N/A | N/A | 0.00575 | | |
| 70 | 0.19000 | N/A | N/A | N/A | 0.00636 | | |
| 71 | 0.19000 | N/A | N/A | N/A | 0.00703 | | |
| 72 | 0.19000 | N/A | N/A | N/A | 0.00777 | | |
| 73 | 0.19000 | N/A | N/A | N/A | 0.00859 | | |
| 74 | 0.19000 | N/A | N/A | N/A | 0.00950 | | |
| 75 | 1.00000 | N/A | N/A | N/A | 0.01050 | | |

Table A-12
Probability of Separation from Active Service for Safety Members
Plan A, B & C – Male

| Age | Service Retirement Plans A-B | Service Retirement Plan C | Service Disability | Ordinary Disability | Service Death | Ordinary Death | Years of Service | Other Terminations |
|-----|------------------------------|---------------------------|--------------------|---------------------|---------------|----------------|------------------|--------------------|
| 18 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00037 | 0 | 0.03500 |
| 19 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00040 | 1 | 0.02750 |
| 20 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00041 | 2 | 0.02000 |
| 21 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00041 | 3 | 0.01500 |
| 22 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00040 | 4 | 0.01200 |
| 23 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00039 | 5 | 0.01130 |
| 24 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00038 | 6 | 0.01070 |
| 25 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00037 | 7 | 0.01000 |
| 26 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00038 | 8 | 0.00920 |
| 27 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00039 | 9 | 0.00840 |
| 28 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00040 | 10 | 0.00760 |
| 29 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00041 | 11 | 0.00680 |
| 30 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00041 | 12 | 0.00600 |
| 31 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00042 | 13 | 0.00560 |
| 32 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00043 | 14 | 0.00520 |
| 33 | 0.00000 | 0.00000 | 0.00210 | 0.00000 | 0.00010 | 0.00044 | 15 | 0.00480 |
| 34 | 0.00000 | 0.00000 | 0.00220 | 0.00000 | 0.00010 | 0.00045 | 16 | 0.00440 |
| 35 | 0.00000 | 0.00000 | 0.00230 | 0.00000 | 0.00010 | 0.00047 | 17 | 0.00400 |
| 36 | 0.00000 | 0.00000 | 0.00240 | 0.00000 | 0.00010 | 0.00049 | 18 | 0.00360 |
| 37 | 0.00000 | 0.00000 | 0.00250 | 0.00000 | 0.00010 | 0.00050 | 19 | 0.00320 |
| 38 | 0.00000 | 0.00000 | 0.00260 | 0.00000 | 0.00010 | 0.00053 | 20 | 0.00280 |
| 39 | 0.00000 | 0.00000 | 0.00270 | 0.00000 | 0.00010 | 0.00056 | 21 | 0.00240 |
| 40 | 0.00750 | 0.00000 | 0.00280 | 0.00000 | 0.00010 | 0.00059 | 22 | 0.00200 |
| 41 | 0.00750 | 0.00000 | 0.00290 | 0.00000 | 0.00010 | 0.00062 | 23 | 0.00200 |
| 42 | 0.00750 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00067 | 24 | 0.00200 |
| 43 | 0.00750 | 0.00000 | 0.00310 | 0.00000 | 0.00010 | 0.00071 | 25 | 0.00200 |
| 44 | 0.00750 | 0.00000 | 0.00320 | 0.00000 | 0.00010 | 0.00076 | 26 | 0.00200 |
| 45 | 0.00750 | 0.00000 | 0.00330 | 0.00000 | 0.00010 | 0.00082 | 27 | 0.00200 |
| 46 | 0.00750 | 0.00000 | 0.00340 | 0.00000 | 0.00010 | 0.00088 | 28 | 0.00200 |
| 47 | 0.00750 | 0.00000 | 0.00350 | 0.00000 | 0.00010 | 0.00095 | 29 | 0.00200 |
| 48 | 0.00750 | 0.00000 | 0.00400 | 0.00000 | 0.00010 | 0.00102 | 30 & Above | 0.00000 |
| 49 | 0.00750 | 0.00000 | 0.00500 | 0.00000 | 0.00010 | 0.00111 | | |
| 50 | 0.02000 | 0.02000 | 0.00750 | 0.00000 | 0.00010 | 0.00120 | | |
| 51 | 0.02000 | 0.02000 | 0.00750 | 0.00000 | 0.00010 | 0.00129 | | |
| 52 | 0.02000 | 0.02000 | 0.00750 | 0.00000 | 0.00010 | 0.00140 | | |
| 53 | 0.03000 | 0.03000 | 0.02000 | 0.00000 | 0.00010 | 0.00151 | | |
| 54 | 0.15000 | 0.10000 | 0.02000 | 0.00000 | 0.00010 | 0.00162 | | |
| 55 | 0.26000 | 0.15000 | 0.07500 | 0.00000 | 0.00010 | 0.00175 | | |
| 56 | 0.17000 | 0.15000 | 0.07500 | 0.00000 | 0.00010 | 0.00190 | | |
| 57 | 0.17000 | 0.28000 | 0.10000 | 0.00000 | 0.00010 | 0.00205 | | |
| 58 | 0.17000 | 0.17000 | 0.10000 | 0.00000 | 0.00010 | 0.00223 | | |
| 59 | 0.27000 | 0.27000 | 0.10000 | 0.00000 | 0.00010 | 0.00243 | | |
| 60 | 0.27000 | 0.27000 | 0.10000 | 0.00000 | 0.00010 | 0.00264 | | |
| 61 | 0.25000 | 0.25000 | 0.05000 | 0.00000 | 0.00010 | 0.00288 | | |
| 62 | 0.25000 | 0.25000 | 0.05000 | 0.00000 | 0.00010 | 0.00315 | | |
| 63 | 0.25000 | 0.25000 | 0.05000 | 0.00000 | 0.00010 | 0.00344 | | |
| 64 | 0.25000 | 0.25000 | 0.05000 | 0.00000 | 0.00010 | 0.00375 | | |
| 65 | 1.00000 | 1.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00410 | | |

Table A-13
Probability of Separation from Active Service for Safety Members
Plan A, B & C – Female

| Age | Service Retirement Plans A-B | Service Retirement Plan C | Service Disability | Ordinary Disability | Service Death | Ordinary Death | Years of Service | Other Terminations |
|-----|------------------------------|---------------------------|--------------------|---------------------|---------------|----------------|------------------|--------------------|
| 18 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00014 | 0 | 0.03500 |
| 19 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00015 | 1 | 0.02750 |
| 20 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00016 | 2 | 0.02000 |
| 21 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00017 | 3 | 0.01500 |
| 22 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00017 | 4 | 0.01200 |
| 23 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00018 | 5 | 0.01130 |
| 24 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00019 | 6 | 0.01070 |
| 25 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00020 | 7 | 0.01000 |
| 26 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00021 | 8 | 0.00920 |
| 27 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00022 | 9 | 0.00840 |
| 28 | 0.00000 | 0.00000 | 0.00340 | 0.00000 | 0.00010 | 0.00024 | 10 | 0.00760 |
| 29 | 0.00000 | 0.00000 | 0.00380 | 0.00000 | 0.00010 | 0.00025 | 11 | 0.00680 |
| 30 | 0.00000 | 0.00000 | 0.00420 | 0.00000 | 0.00010 | 0.00027 | 12 | 0.00600 |
| 31 | 0.00000 | 0.00000 | 0.00460 | 0.00000 | 0.00010 | 0.00028 | 13 | 0.00560 |
| 32 | 0.00000 | 0.00000 | 0.00500 | 0.00000 | 0.00010 | 0.00030 | 14 | 0.00520 |
| 33 | 0.00000 | 0.00000 | 0.00560 | 0.00000 | 0.00010 | 0.00032 | 15 | 0.00480 |
| 34 | 0.00000 | 0.00000 | 0.00620 | 0.00000 | 0.00010 | 0.00034 | 16 | 0.00440 |
| 35 | 0.00000 | 0.00000 | 0.00680 | 0.00000 | 0.00010 | 0.00036 | 17 | 0.00400 |
| 36 | 0.00000 | 0.00000 | 0.00740 | 0.00000 | 0.00010 | 0.00038 | 18 | 0.00360 |
| 37 | 0.00000 | 0.00000 | 0.00800 | 0.00000 | 0.00010 | 0.00041 | 19 | 0.00320 |
| 38 | 0.00000 | 0.00000 | 0.00840 | 0.00000 | 0.00010 | 0.00043 | 20 | 0.00280 |
| 39 | 0.00000 | 0.00000 | 0.00880 | 0.00000 | 0.00010 | 0.00046 | 21 | 0.00240 |
| 40 | 0.00750 | 0.00000 | 0.00920 | 0.00000 | 0.00010 | 0.00049 | 22 | 0.00200 |
| 41 | 0.00750 | 0.00000 | 0.00960 | 0.00000 | 0.00010 | 0.00052 | 23 | 0.00200 |
| 42 | 0.00750 | 0.00000 | 0.01000 | 0.00000 | 0.00010 | 0.00056 | 24 | 0.00200 |
| 43 | 0.00750 | 0.00000 | 0.01040 | 0.00000 | 0.00010 | 0.00059 | 25 | 0.00200 |
| 44 | 0.00750 | 0.00000 | 0.01080 | 0.00000 | 0.00010 | 0.00063 | 26 | 0.00200 |
| 45 | 0.00750 | 0.00000 | 0.01120 | 0.00000 | 0.00010 | 0.00067 | 27 | 0.00200 |
| 46 | 0.00750 | 0.00000 | 0.01160 | 0.00000 | 0.00010 | 0.00071 | 28 | 0.00200 |
| 47 | 0.00750 | 0.00000 | 0.01200 | 0.00000 | 0.00010 | 0.00076 | 29 | 0.00200 |
| 48 | 0.00750 | 0.00000 | 0.01300 | 0.00000 | 0.00010 | 0.00080 | 30 & Above | 0.00000 |
| 49 | 0.00750 | 0.00000 | 0.01500 | 0.00000 | 0.00010 | 0.00085 | | |
| 50 | 0.02000 | 0.02000 | 0.01800 | 0.00000 | 0.00010 | 0.00091 | | |
| 51 | 0.02000 | 0.02000 | 0.02000 | 0.00000 | 0.00010 | 0.00097 | | |
| 52 | 0.02000 | 0.02000 | 0.02400 | 0.00000 | 0.00010 | 0.00103 | | |
| 53 | 0.03000 | 0.03000 | 0.02800 | 0.00000 | 0.00010 | 0.00109 | | |
| 54 | 0.15000 | 0.10000 | 0.03200 | 0.00000 | 0.00010 | 0.00116 | | |
| 55 | 0.26000 | 0.15000 | 0.11000 | 0.00000 | 0.00010 | 0.00123 | | |
| 56 | 0.17000 | 0.15000 | 0.06000 | 0.00000 | 0.00010 | 0.00131 | | |
| 57 | 0.17000 | 0.28000 | 0.06000 | 0.00000 | 0.00010 | 0.00140 | | |
| 58 | 0.17000 | 0.17000 | 0.06000 | 0.00000 | 0.00010 | 0.00148 | | |
| 59 | 0.27000 | 0.27000 | 0.06000 | 0.00000 | 0.00010 | 0.00158 | | |
| 60 | 0.27000 | 0.27000 | 0.06000 | 0.00000 | 0.00010 | 0.00168 | | |
| 61 | 0.25000 | 0.25000 | 0.06000 | 0.00000 | 0.00010 | 0.00178 | | |
| 62 | 0.25000 | 0.25000 | 0.06000 | 0.00000 | 0.00010 | 0.00190 | | |
| 63 | 0.25000 | 0.25000 | 0.06000 | 0.00000 | 0.00010 | 0.00202 | | |
| 64 | 0.25000 | 0.25000 | 0.06000 | 0.00000 | 0.00010 | 0.00215 | | |
| 65 | 1.00000 | 1.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00228 | | |

Appendix B Summary of Plan Provisions

All actuarial calculations are based on our understanding of the statutes governing LACERA as contained in the County Employees Retirement Law (CERL) of 1937 and the California Public Employees' Pension Reform Act of 2013 (PEPRA). The benefit and contribution provisions of this law are summarized briefly below, along with corresponding references to the Government Code Section. This summary does not attempt to cover all the detailed provisions of the law.

| MEMBERSHIP | Government Code Section |
|--|-----------------------------------|
| Permanent employees of Los Angeles County (County) and participating districts who work $\frac{3}{4}$ time or more are eligible for membership in LACERA. | (31551, 31552, Bylaws) |
| Employees eligible for safety membership (law enforcement, firefighting and specific lifeguards) become safety members on the first day of the month after date of hire. Employees who become members on or after January 1, 2013, will enter into Safety Plan C. | (31558) |
| All other employees become general members on the first day of the month after date of hire or the first day of the month after they make an election of either Plan D or Plan E, depending on the law in effect at that time. Employees who become members on or after January 1, 2013 will enter into General Plan G. | (31493, 31493.5, 31493.6, Bylaws) |
| Elective officers become members on the first day of the month after filing a declaration with the Board of Retirement (Board). | (31553, 31562) |
| General members in Plan E may transfer all their Plan E service credit to Plan D during an approved transfer period by making the required contributions. Transferred members relinquish, waive, and forfeit any and all vested or accrued benefits available under any other retirement plan and are entitled only to the benefits of Plan D. | (31494.1, 31494.3) |

RETIREMENT PLANS

The County has established nine defined benefit plans. The following outlines the dates these plans were available, based on a member’s date of entry into LACERA:

Safety Member Plans:

- Plan A:** Inception to August 1977
- Plan B:** September 1977 through December 2012
- Plan C:** January 2013 to present (7522.02)

General Member Plans:

- Plan A:** Inception through August 1977
- Plan B:** September 1977 through September 1978
- Plan C:** October 1978 through May 1979
- Plan D:** June 1979 through December 2012
- Plan E:** February 1982 through December 2012 (31487, 31496)
- Plan G:** January 2013 to present (7522.02)

NOTE: After review of a new member’s account, a member with prior membership may be enrolled into one of the pre-PEPRA plans.

MEMBER CONTRIBUTIONS

Plans A, B, D and General Plan C members

Contributions are based on the entry age and class of each member and are required of all members in Plans A, B, C, and D. Current member rates are shown in Appendix D. Section 5 provides additional detail on how these rates are calculated. (31620)

Contributions cease when general members are credited with 30 years of service in a contributory plan, provided they were members of LACERA or a reciprocal plan on March 7, 1973, and continuously thereafter. All safety members are eligible for the 30-year cessation of contributions. (31625.2, 31836.1)

Interest is credited to contributions semiannually on June 30 and December 31 at an interest rate set by the Board of Investments on amounts that have been on deposit for at least six months. (31591, 31700)

In addition to the normal contributions, members pay one-half of the cost of their plan’s COLA. This is discussed further in Section 5 of this report. (31873)

General Plan G and Safety Plan C members

Members contribute 50% of the aggregate Normal Cost rate for their Plan. (7522.30)

EMPLOYER CONTRIBUTIONS

The employer (County or District) contributes to the retirement fund a percent of the total compensation provided for all members based on an actuarial valuation and recommendation of the actuary and the Board of Investments. (31453, 31454 31581)

SERVICE RETIREMENT ALLOWANCE

Eligibility

- Plans A-B: Safety members** (31662.4, 31662.6, 31663.25)
 Age 50 with 10 years of County service;
 Any age with 20 years of service; or
- Plans A-D: General members** (31672)
 Age 50 with 10 years of County service;
 Any age with 30 years of service; or
 Age 70 and actively employed, regardless of service.
- Plan C: Safety members** (7522.25(d))
 Age 50 with 5 years of service.
- Plan E: General members** (31491, 31491.3)
 Age 65 with 10 years of service.
 A reduced benefit is also payable at age 55 with 10 years of service.
- Plan G: General members** (7522.20(a))
 Age 52 with 5 years of service.

Final Compensation

- General Plans A-D and Safety Plans A-B** (31462.3)
 Average of the member's highest monthly pensionable earnings during any 12-consecutive-month period.
- Plan E:** Average of the member's highest monthly pensionable earnings during any three 12-consecutive month periods. (31488)
- General Plan G and Safety Plan C** (7522.32)
 Average of the member's highest monthly pensionable earnings during any 36-consecutive month period.

The amount of compensation that is taken into account in computing benefits payable to any person who first becomes a member on or after July 1, 1996, shall not exceed the dollar limitations in Section 401(a)(17) of Title 26 of the US Code. (31671)

The amount of compensation taken into account for General Plan G and Safety Plan C members is limited to \$149,016 for 2019. The amount of compensation taken into account shall be adjusted based on changes in the Consumer Price Index for All Urban Consumers: U.S. City Average. Adjustments shall be effective annually on January 1. (7522.10)

SERVICE RETIREMENT ALLOWANCE (continued)

Monthly Allowance

| | | |
|-------------------|---|---|
| Plans A-B: | Safety members 1/50 x Final Compensation x Safety age factor x Years of service. (The Safety Plan A and Safety Plan B age factors are the same.) | (31664) |
| Plans A-D: | General members 1/60 x Final Compensation x a Plan specific age factor x years of service. (The General Plan C and General D age factors are the same.) | (31676.1) (31676.11) (31676.14) (7522.25(d)) |
| Plan C: | Safety members Final Compensation x Safety Plan percentage x Years of service. | |
| Plan E: | General members [(a)+(b)-(c)] x d where: (a) 2% x Final Compensation x (Years of Service (up to 35 years), plus (b) 1 % x Final Compensation x Years of Service in excess of 35 (up to 10) (c) Estimated Primary Insurance Amount (PIA) x Years of Covered Service (up to 35) divided by 35. (d) Early Retirement Adjustment Factor The PIA is calculated based on certain assumptions specified by statute, and an assumed Social Security retirement age of 62. If retirement occurs prior to age 65, benefit amount is adjusted by an Early Retirement Adjustment Factor. | (31491, 31491.3 (b)&(c)) |
| Plan G: | General members Final Compensation x General Plan percentage x Years of Service. | (7522.20(a)) |

Social Security Integration

| | | |
|-------------------|--|---------|
| Plans A-C: | General Members For County service covered by Social Security prior to January 1, 1983, the 1/60 factor is replaced by 1/90 for the first \$350 of compensation. | (31808) |
| Plan D: | The 1/90 factor is applied to the first \$1,050 of compensation. | |

SERVICE RETIREMENT ALLOWANCE (continued)

Sample Plan Age Factors

| Plan | Age 50 | Age 55 | Age 60 | Age 65 & Up | |
|-------------|--------|--------|--------|-------------|--------------|
| General A | 0.8850 | 1.1686 | 1.4638 | 1.5668 | (31676.14) |
| General B | 0.7454 | 1.0000 | 1.3093 | 1.5668 | (31676.11) |
| General C&D | 0.7091 | 0.8954 | 1.1500 | 1.4593 | (31676.1) |
| General E | N/A | 0.3748 | 0.6009 | 1.0000 | (31491.3(a)) |
| Safety A&B | 1.0000 | 1.3099 | 1.3099 | 1.3099 | (31664) |

Sample Plan Age Percentages

| Plan | Age 50 | Age 55 | Age 60 | Age 65 & Up | |
|-----------|--------|--------|--------|-------------|--------------|
| General G | N/A | 1.30% | 1.80% | 2.30%* | (7522.20(a)) |
| Safety C | 2.00% | 2.50% | 2.70% | 2.70% | (7522.25(d)) |

*Maximum percentage for General Plan G is 2.50% at age 67.

Maximum Allowance

| | | |
|----------------------|--|-------------------------------------|
| Plans A-D, G: | Allowance may not exceed 100% of final compensation. | (31676.1, 31676.11, 31676.14) |
| Plan E: | The sum of the normal retirement allowance and the estimated PIA cannot exceed 70% of Final Compensation for a member with 35 or less years of service, and cannot exceed 80% of Final Compensation if service exceeds 35 years. | (31491) |

Unmodified Retirement Allowance (Normal Form)

| | | |
|----------------------|---|------------------------|
| Plans A-D, G: | Life Annuity payable to retired member with 65% continuance to an eligible survivor (or eligible children). | (31760.12, 31785.4) |
| Plan E: | Life Annuity payable to retired member with 55% continuance to an eligible survivor (or eligible children). | (31492.1) |

Eligible survivor includes certain domestic partners. (31780.2)

SERVICE RETIREMENT ALLOWANCE (continued)

Optional Retirement Allowance

A member may elect to have the actuarial equivalent of the service or disability retirement allowance applied to a lesser retirement allowance during the retired member's life in order to provide an optional survivor allowance. (31760)

Unmodified Plus: Members with eligible survivors may elect a higher percent than the standard unmodified continuance, up to 100%. The benefit is actuarially reduced from the unmodified amount. The elected percent of the member's reduced allowance is payable to the eligible survivor. (31760.5)

Option 1: Member's allowance is reduced to pay a cash refund of any unpaid annuity payments (up to the amount of the member's contributions at retirement) to the member's estate or to a beneficiary having an insurable interest in the life of the member. (31761)

Option 2: 100% of member's reduced allowance is payable to a beneficiary having an insurable interest in the life of the member. (31762)

Option 3: 50% of member's reduced allowance is payable to a beneficiary having an insurable interest in the life of the member. (31763)

Option 4: Other % of member's reduced allowance is payable to a beneficiary(ies) having an insurable interest in the life of the member. (31764)

A member may not revoke and name another beneficiary if the member elects Option 2, 3, or 4. (31782)

Pension Advance Option: The Pension Advance Option is available to members who are fully insured under Social Security for the purpose of coordinating a member's retirement allowance with benefits receivable from Social Security. It is not available to disability retirees or members who elect Option 2, 3, or 4. The allowance is increased prior to age 62 and then reduced after 62 by amounts which have equivalent actuarial values. The automatic 65% continuance for eligible spouses of members who elect the Pension Advance Option is based on the unmodified allowance the member would have received if the member had not elected the option. (31810, 31811)

All Allowances (31452.7, 31600)

All allowances are made on a pro-rata basis (based on the number of days in that month) if not in effect for the entire month of retirement. For deaths that occur mid-month, the full month's payment is made.

SERVICE-CONNECTED DISABILITY RETIREMENT ALLOWANCE

Eligibility

| | | |
|----------------------|--|---------|
| Plans A-D, G: | Any age or years of service; disability must result from occupational injury or disease, and member must be permanently incapacitated for the performance of duty. | (31720) |
| Plan E: | Not available under Plan E. | (31487) |

Monthly Allowance

Greater of (1) 50% of final compensation, and (2) the service retirement allowance, if eligible to retire. (31727.4)

Normal Form Of Payment

Life Annuity with 100% continuance to a surviving spouse (or eligible children). (31786)

NONSERVICE-CONNECTED DISABILITY RETIREMENT ALLOWANCE

Eligibility

| | | |
|----------------------|--|---------|
| Plans A-D, G: | Any age with five years of service, and permanently incapacitated for the performance of duty. | (31720) |
| Plan E: | Not available under Plan E. | (31487) |

Monthly Allowance

The monthly allowance is equal to a service retirement allowance if a General member is age 65 or a Safety member is age 55; otherwise the monthly allowance is the greater of that to which the member would be entitled as service retirement or the sum of (a) or (b) where: (31726, 31726.5)

| | | |
|-------------------------|--|------------|
| General Members: | (a) 90% of 1/60 of Final Compensation x years of service, if member must rely on service in another retirement plan in order to be eligible to retire, or allowance exceeds 1/3 of final compensation. | (31727(a)) |
| | (b) 90% of 1/60 of Final Compensation x years of service projected to age 65, not to exceed 1/3 of Final Compensation. | (31727(b)) |

Safety Members: 1/60 is replaced by 1/50 and age 65 is replaced by age 55 in (a) and (b) above. (31727.2)

Normal Form of Payment

Life Annuity with 65% continuance to a surviving spouse (or eligible children). (31760.1, 31760.12, 31785, 31785.4)

SERVICE-CONNECTED PRE-RETIREMENT DEATH BENEFITS

Eligibility (31787)

Plans A-D, G: Active members who die in service as a result of injury or disease arising out of and in the course of employment.

Plan E: Not available under Plan E. (31487)

Monthly Allowance (31787)

A monthly allowance payable to an eligible survivor (or eligible children) equal to the retirement allowance the deceased member would have received under a service-connected disability retirement.

Optional Combined Benefit (31781.3)

- In lieu of the monthly allowance above, a surviving spouse may elect:
- (a) A lump sum equal to 1/12 of the compensation earned in the preceding 12 months x years of service (benefit not to exceed 50% of the 12 months' compensation), plus
 - (b) A monthly payment equal to 50% of the member's Final Compensation, reduced by a monthly amount, which is the actuarial equivalent of (a) above based on the age of surviving spouse.

Death Benefit (Lump Sum) (31781)

The member's accumulated contributions with interest, plus 1/12 of the compensation earned in the preceding 12 months x years of service (benefit not to exceed 50% of the 12 months' compensation).

Additional Allowance for Children (31787.5)

25% of death allowance (whether or not the monthly allowance or combined benefit is chosen) for one child, 40% for two children, and 50% for three or more children.

Additional Amount for Spouse of Safety Member (31787.6)

A surviving spouse of a safety member is also entitled to receive a lump-sum death benefit equal to 12 x monthly rate of compensation at the time of member's death in addition to all other benefits.

Note: For valuation purposes, an unmarried member is assumed to take the lump sum benefit. A married member is assumed to take the monthly allowance or the lump sum, whichever is more valuable.

NONSERVICE-CONNECTED PRE-RETIREMENT DEATH BENEFITS

Eligibility (31780)

Plans A-D, G: Active members who die while in service or while physically or mentally incapacitated for the performance of duty.

Plan E: Not available under Plan E. (31487)

Death Benefit (Lump Sum) (31781)

The member's accumulated contributions with interest, plus 1/12 of the compensation earned in preceding 12 months x the number of completed years of service (benefit not to exceed 50% of the 12 months' compensation).

Optional Death Benefit

In lieu of the lump-sum death benefit, the following several optional death benefits are available to provide flexibility to survivors.

First Optional Death Benefit (31781.1, 31781.12)

If a member who would have been entitled to a non-service-connected disability retirement allowance dies prior to retirement as a result of such disability, the surviving spouse (or eligible children) may elect to receive an optional death allowance equal to 65% of the monthly retirement allowance to which the member would have been entitled as of the date of death.

Second Optional Death Benefit (31781.2, 31765.2)

If a member dies prior to reaching the minimum retirement age but has 10 or more years of County service, a surviving spouse (or eligible children) may elect to leave the amount of the death benefit on deposit until the earliest date the member could have retired and at that time receive the allowance provided for in Section 31765 (an Option 3 benefit) or 31765.2 (a 65% continuance).

Third Optional Death Benefit

A surviving spouse of a member who dies after five years of County service may elect a combined benefit equal to:

(a) A lump sum equal to 1/12 of the compensation earnable in the preceding 12 months x the number of completed years of service (benefit not to exceed 50% of the 12 months' compensation), plus (31781.3)

(b) A monthly payment equal to 65% of the monthly retirement allowance to which the member would have been entitled if the member retired or could have retired for a non-service-connected disability as of the date of death, reduced by a monthly amount which is the actuarial equivalent of (a) above based on the age of surviving spouse. (31781.1, 31781.12)

Fourth Optional Death Benefit

If a member dies while eligible for a service retirement and the surviving spouse is designated as beneficiary, the spouse (or eligible children) may elect to receive 65% of the monthly retirement allowance to which the member would have been entitled as of the date of death. (31765.1, 31765.2)

Fifth Optional Death Benefit

If a member dies while eligible for a service retirement and the surviving spouse is designated as beneficiary and survives the member by not less than 30 days, the spouse (or eligible children) may elect to receive the same retirement allowance as the spouse would have received had the member retired on the date of death and selected Option 3. (31765)

Note: For valuation purposes, an unmarried member is assumed to take the lump sum benefit. A married member is assumed to take the first optional death benefit or the lump sum, whichever is more valuable.

POSTRETIREMENT DEATH/BURIAL BENEFIT

Plans A-E: A one-time lump-sum benefit of \$5,000 is payable to the estate or to the beneficiary designated by the member upon the death of any member while receiving a retirement allowance. This is in addition to any other death or survivor benefits. The amount is currently paid by the County based on agreement with LACERA. It is not included for valuation purposes. (31789.3)

DEFERRED RETIREMENT ALLOWANCE

Eligibility

Plans A, B, D and General Plan C: Five years of county or reciprocal service. Member contributions must be left on deposit. (31700)

Safety Plan C: Age 50 with 5 years of service. (7522.25(d))

Plan E: Age 55 with 10 years of service. (31491)

Plan G: Age 52 with 5 years of service. (7522.20(a))

DEFERRED RETIREMENT ALLOWANCE (continued)

Monthly Allowance

| | | |
|----------------------|--|-----------------------|
| Plans A-D, G: | Same as service retirement allowance; payable any time after the member would have been eligible for service retirement. | (31703, 31704, 31705) |
| | If a former member dies before the effective date of the deferred retirement allowance, the member's accumulated contributions are paid to the estate or to the named beneficiary. | (31702) |
| Plan E: | Same as service retirement allowance at normal retirement age 65 or in an actuarially equivalent reduced amount at early retirement, after age 55. | (31491) |

TRANSFERS BETWEEN PLAN D AND PLAN E

| | |
|---|--------------------|
| Members in Plan D may transfer to Plan E on a prospective basis. Members in Plan E may transfer to Plan D on a prospective basis. | (31494.2, 31494.5) |
|---|--------------------|

RECIPROCITY

| | | |
|-------------------|--|--------------------------------|
| All Plans: | Reciprocal benefits are may be granted to members who are entitled to retirement benefits from two or more retirement plans established under the CERL or from a County retirement plan and the California Public Employees' Retirement System (CalPERS). Reciprocity also applies to the members of the State Teachers' Retirement System Defined Benefit Plan. | (31830, 31840.4, 31840.8) |
| | Final Compensation may be based on service with CalPERS or another County retirement plan, if greater. | (31835) |
| | Vested former members are eligible for disability and death benefits from LACERA, if disabled while a member of CalPERS or another County retirement plan, but combined benefits are limited. | (31837, 31838, 31838.5, 31839) |

TRANSFER FROM CALPERS

Whenever firefighting or law enforcement functions performed by a public agency or the state subject to the California Public Employees Retirement Law are transferred to the County, fire authority, or district, employees performing those functions become members of LACERA. LACERA and CalPERS may enter into an agreement whereby the members' service credit plus the members' and the cities' or states' retirement contributions are transferred from CalPERS to LACERA. (31657)

COST-OF-LIVING INCREASES

Cost-of-living increases (or decreases) are applied to all retirement allowances (service and disability), optional death allowances, and annual death allowances effective April 1, based on changes in the Consumer Price Index (CPI) from the previous January 1 to the current January 1, to the nearest ½ of 1%. (31870, 31870.1)

Plan A: Members (and their beneficiaries) are limited to a maximum 3% cost-of-living increase. (31870.1)

Plans B-D, G: Members (and their beneficiaries) are limited to a maximum 2% cost-of-living increase. (31870)

When the CPI exceeds 2% or 3%, the difference between the actual CPI and the maximum cost-of-living increase given in any year is credited to the COLA Accumulation. It may be used in future years to provide cost-of-living increases when the CPI falls below 2% or 3%, depending on the retirement plan.

Plan E: Members (and their beneficiaries) are limited to a maximum 2% cost-of-living increase. The 2% is pro-rated based on service earned after June 4, 2002. "Elective COLA" increases for service earned prior to June 4, 2002 may be purchased by the member. (31495.5)

STAR PROGRAM

Contributory plan members who have a COLA Accumulation of more than 20% resulting from CPI increases that exceeded the maximum cost-of-living increases that could be granted are eligible for a supplemental cost-of-living increase effective January 1 known as the Supplemental Targeted Adjustment for Retirees Cost-of-Living Adjustment (STAR COLA). These benefits are not evaluated in this report, or as part of the actuarially required funding amount, unless they have been vested by the Board of Retirement. (31874.3(b))

Appendix C Valuation Data and Schedules

On the following table, Exhibit C-1, we present a summary of LACERA membership at June 30, 2019 for active members. Similar information is shown in Exhibit C-2 Retired for retired members and C-2 Former for vested former members.

Note that salary amounts shown are the prior year annual pensionable earnings for those members of plans with a one-year final compensation period. For plans with a three-year final compensation period, the monthly rate of pay at June 2019 is shown.

Additional statistical data on both active and retired members is shown in the following tables. Additional detailed summaries are supplied to LACERA staff in a supplementary report.

Exhibit C-3: Age Distribution of Active Members

Exhibit C-4: Age, Service, Compensation Distribution of Active Members

Exhibit C-5: Age, Retirement Year, Benefit Amount and Plan Distribution of Retired Members

Exhibits C-4 and C-5 are shown for all plans combined as well as for each plan separately.

Data on LACERA membership as of June 30, 2019 was supplied to us by LACERA staff. Based on our review of this data and discussions with LACERA staff, all retiree and beneficiary records were included in our valuation.

All records for active and former members supplied by LACERA were included in the valuation.

**Exhibit C-1
LACERA Membership – Active Members as of June 30, 2019**

| | Sex | Vested | NonVested | Total Number | Annual Salary | Average Age | Average Monthly Salary | Average Service |
|------------------------|------------|---------------|------------------|-------------------------|-------------------------|------------------------|---------------------------------------|----------------------------|
| General Members | | | | | | | | |
| Plan A | M | 35 | - | 35 | \$ 4,665,924 | 72.7 | \$ 11,109 | 40.6 |
| | F | 70 | - | 70 | 6,025,260 | 69.4 | 7,173 | 38.8 |
| Plan B | M | 9 | - | 9 | 944,400 | 68.8 | 8,744 | 35.3 |
| | F | 25 | - | 25 | 2,848,608 | 64.2 | 9,495 | 37.5 |
| Plan C | M | 9 | - | 9 | 748,368 | 64.3 | 6,929 | 37.7 |
| | F | 33 | - | 33 | 3,193,512 | 65.4 | 8,064 | 38.9 |
| Plan D | M | 13,448 | 118 | 13,566 | 1,280,978,172 | 50.5 | 7,869 | 18.2 |
| | F | 27,956 | 210 | 28,166 | 2,421,096,708 | 50.1 | 7,163 | 18.4 |
| Plan E | M | 5,140 | 376 | 5,516 | 486,231,336 | 54.8 | 7,346 | 21.8 |
| | F | 11,222 | 593 | 11,815 | 862,925,232 | 54.7 | 6,086 | 22.8 |
| Plan G | M | 1,633 | 7,520 | 9,153 | 624,942,852 | 38.2 | 5,690 | 3.0 |
| | F | 2,972 | 15,023 | 17,995 | 1,120,990,752 | 37.5 | 5,191 | 2.9 |
| Total | | 62,552 | 23,840 | 86,392 | \$ 6,815,591,124 | 47.3 | \$ 6,574 | 14.4 |
| Safety Members | | | | | | | | |
| Plan A | M | 5 | - | 5 | \$ 717,780 | 64.0 | \$ 11,963 | 37.2 |
| | F | - | - | - | - | N/A | N/A | N/A |
| Plan B | M | 8,233 | 76 | 8,309 | 1,086,584,160 | 45.8 | 10,898 | 19.2 |
| | F | 1,400 | 16 | 1,416 | 174,607,944 | 43.5 | 10,276 | 17.0 |
| Plan C | M | 353 | 2,295 | 2,648 | 239,858,532 | 31.0 | 7,548 | 2.8 |
| | F | 80 | 336 | 416 | 38,418,624 | 30.4 | 7,696 | 2.9 |
| Total | | 10,071 | 2,723 | 12,794 | \$ 1,540,187,040 | 42.0 | \$ 10,032 | 15.1 |
| Grand Total | | 72,623 | 26,563 | 99,186 | \$ 8,355,778,164 | 46.6 | \$ 7,020 | 14.5 |

Exhibit C-2
Retired LACERA Membership – Retired Members as of June 30, 2019

| | | | | Average | Average |
|------------------------|------------|---------------|-------------------------|----------------|------------------------|
| | Sex | Number | Annual Allowance | Age | Monthly Benefit |
| General Members | | | | | |
| Plan A | M | 7,707 | \$ 528,165,018 | 79.7 | \$ 5,711 |
| | F | 13,461 | 656,643,406 | 79.5 | 4,065 |
| Plan B | M | 223 | 14,491,701 | 74.2 | 5,415 |
| | F | 521 | 26,687,269 | 74.2 | 4,269 |
| Plan C | M | 150 | 8,270,582 | 73.0 | 4,595 |
| | F | 345 | 14,845,155 | 74.0 | 3,586 |
| Plan D | M | 5,971 | 259,950,065 | 68.5 | 3,628 |
| | F | 10,981 | 416,606,859 | 68.5 | 3,162 |
| Plan E | M | 4,600 | 143,436,120 | 72.2 | 2,598 |
| | F | 9,573 | 246,512,032 | 71.8 | 2,146 |
| Plan G | M | 13 | 217,064 | 68.1 | 1,391 |
| | F | 15 | 169,505 | 64.8 | 942 |
| Total | | 53,560 | \$ 2,315,994,776 | 73.9 | \$ 3,603 |
| Safety Members | | | | | |
| Plan A | M | 4,790 | \$ 488,796,695 | 76.1 | \$ 8,504 |
| | F | 2,020 | 141,362,102 | 78.0 | 5,832 |
| Plan B | M | 5,008 | 476,409,784 | 60.2 | 7,927 |
| | F | 1,122 | 76,725,758 | 57.3 | 5,699 |
| Plan C | M | 5 | 552,393 | 56.2 | 9,207 |
| | F | 2 | 68,851 | 37.5 | 2,869 |
| Total | | 12,947 | \$ 1,183,915,583 | 68.6 | \$ 7,620 |
| Grand Total | | 66,507 | \$ 3,499,910,359 | 72.9 | \$ 4,385 |

**Exhibit C-2 Former
 LACERA Membership – Vested Former Members as of June 30, 2019⁽¹⁾
 Subtotaled by Plan and Retirement Type**

| | <u>Sex</u> | <u>Number</u> | <u>Average Age</u> |
|-------------------------------|------------|---------------|--------------------|
| <i>General Members</i> | | | |
| Plan A | M | 24 | 72.3 |
| | F | 44 | 71.3 |
| Plan B | M | 3 | 71.3 |
| | F | 12 | 68.2 |
| Plan C | M | 5 | 66.0 |
| | F | 13 | 64.8 |
| Plan D | M | 2,586 | 48.7 |
| | F | 5,326 | 47.9 |
| Plan E | M | 1,059 | 56.8 |
| | F | 2,301 | 56.7 |
| Plan G | M | 978 | 37.3 |
| | F | 2,222 | 36.8 |
| Total | | 14,573 | 47.8 |
| <i>Safety Members</i> | | | |
| Plan A | M | 4 | 67.0 |
| | F | - | - |
| Plan B | M | 687 | 43.7 |
| | F | 131 | 43.7 |
| Plan C | M | 151 | 31.4 |
| | F | 21 | 31.2 |
| Total | | 994 | 41.6 |
| <i>Grand Total</i> | | 15,567 | 47.4 |

1. Includes non-vested former members who still have member contributions with LACERA.

Exhibit C-2a
LACERA Membership – Retired Members as of June 30, 2019
Subtotaled by Plan and Retirement Type

| <u>Plan</u> | <u>Retirement Type</u> | <u>Number</u> | <u>Annual Benefits in Thousands</u> | <u>Average Monthly Benefit</u> |
|-----------------------|------------------------|---------------|-------------------------------------|--------------------------------|
| General Plans: | | | | |
| Plan A | | | | |
| | Healthy | 15,190 | \$ 965,291 | \$ 5,296 |
| | Disabled | 1,509 | 61,160 | 3,378 |
| | Beneficiaries | <u>4,469</u> | <u>158,357</u> | <u>2,953</u> |
| | Total | 21,168 | \$ 1,184,808 | \$ 4,664 |
| Plan B | | | | |
| | Healthy | 618 | \$ 36,876 | \$ 4,972 |
| | Disabled | 58 | 2,107 | 3,027 |
| | Beneficiaries | <u>68</u> | <u>2,196</u> | <u>2,691</u> |
| | Total | 744 | \$ 41,179 | \$ 4,612 |
| Plan C | | | | |
| | Healthy | 377 | \$ 19,844 | \$ 4,386 |
| | Disabled | 51 | 1,714 | 2,800 |
| | Beneficiaries | <u>67</u> | <u>1,558</u> | <u>1,938</u> |
| | Total | 495 | \$ 23,116 | \$ 3,892 |
| Plan D | | | | |
| | Healthy | 13,458 | \$ 574,354 | \$ 3,556 |
| | Disabled | 2,054 | 70,264 | 2,851 |
| | Beneficiaries | <u>1,440</u> | <u>31,940</u> | <u>1,848</u> |
| | Total | 16,952 | \$ 676,558 | \$ 3,326 |
| Plan E | | | | |
| | Healthy | 12,996 | \$ 373,101 | \$ 2,392 |
| | Disabled | N/A | N/A | N/A |
| | Beneficiaries | <u>1,177</u> | <u>16,847</u> | <u>1,193</u> |
| | Total | 14,173 | \$ 389,948 | \$ 2,293 |
| Plan G | | | | |
| | Healthy | 25 | \$ 323 | \$ 1,077 |
| | Disabled | 1 | 49 | 4,056 |
| | Beneficiaries | <u>2</u> | <u>15</u> | <u>619</u> |
| | Total | 28 | \$ 387 | \$ 1,151 |
| Safety Plans: | | | | |
| Plan A | | | | |
| | Healthy | 2,224 | \$ 237,911 | \$ 8,915 |
| | Disabled | 2,999 | 286,460 | 7,960 |
| | Beneficiaries | <u>1,587</u> | <u>105,788</u> | <u>5,555</u> |
| | Total | 6,810 | \$ 630,159 | \$ 7,711 |
| Plan B | | | | |
| | Healthy | 2,625 | \$ 263,301 | \$ 8,359 |
| | Disabled | 3,216 | 273,258 | 7,081 |
| | Beneficiaries | <u>289</u> | <u>16,576</u> | <u>4,780</u> |
| | Total | 6,130 | \$ 553,135 | \$ 7,520 |
| Plan C | | | | |
| | Healthy | 4 | \$ 518 | \$ 10,798 |
| | Disabled | 3 | 103 | 2,859 |
| | Beneficiaries | <u>0</u> | <u>0</u> | <u>N/A</u> |
| | Total | 7 | \$ 621 | \$ 7,396 |
| Grand Totals | | 66,507 | 3,499,910 | 4,385 |

This work product was prepared solely for LACERA for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Exhibit C-2b
LACERA Membership – Retired Members as of June 30, 2019
Subtotaled by Retirement Type and Plan

| <u>Type</u> | <u>Plan</u> | <u>Number</u> | <u>Annual Benefits</u> <u>in Thousands</u> | <u>Average</u> <u>Monthly</u> <u>Benefit</u> |
|--------------------------|-------------|---------------|---|--|
| Healthy Retirees | | | | |
| | General A | 15,190 | \$ 965,291 | \$ 5,296 |
| | General B | 618 | 36,876 | 4,972 |
| | General C | 377 | 19,844 | 4,386 |
| | General D | 13,458 | 574,354 | 3,556 |
| | General E | 12,996 | 373,101 | 2,392 |
| | General G | 25 | 323 | 1,077 |
| | Safety A | 2,224 | 237,911 | 8,915 |
| | Safety B | 2,625 | 263,301 | 8,359 |
| | Safety C | <u>4</u> | <u>518</u> | <u>10,798</u> |
| | Total | 47,517 | \$ 2,471,519 | \$ 4,334 |
| Disabled Retirees | | | | |
| | General A | 1,509 | \$ 61,160 | \$ 3,378 |
| | General B | 58 | 2,107 | 3,027 |
| | General C | 51 | 1,714 | 2,800 |
| | General D | 2,054 | 70,264 | 2,851 |
| | General E | N/A | N/A | N/A |
| | General G | 1 | 49 | 4,056 |
| | Safety A | 2,999 | 286,460 | 7,960 |
| | Safety B | 3,216 | 273,258 | 7,081 |
| | Safety C | <u>3</u> | <u>103</u> | <u>2,859</u> |
| | Total | 9,891 | \$ 695,115 | \$ 5,856 |
| Beneficiaries | | | | |
| | General A | 4,469 | \$ 158,357 | \$ 2,953 |
| | General B | 68 | 2,196 | 2,691 |
| | General C | 67 | 1,558 | 1,938 |
| | General D | 1,440 | 31,940 | 1,848 |
| | General E | 1,177 | 16,847 | 1,193 |
| | General G | 2 | 15 | 619 |
| | Safety A | 1,587 | 105,788 | 5,555 |
| | Safety B | 289 | 16,576 | 4,780 |
| | Safety C | <u>0</u> | <u>0</u> | <u>N/A</u> |
| | Total | 9,099 | \$ 333,277 | \$ 3,052 |
| Grand Totals | | 66,507 | \$ 3,499,910 | \$ 4,385 |

**Exhibit C-3
Age Distribution of Active Members as of June 30, 2019**

| | Age Groups | | | | | | Total |
|-----------------------|--------------|---------------|---------------|---------------|---------------|--------------|---------------|
| | 0-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70+ | |
| General Plans: | | | | | | | |
| Plan A | | | | | | | |
| Male | - | - | - | - | 11 | 24 | 35 |
| Female | - | - | - | - | 43 | 27 | 70 |
| Plan B | | | | | | | |
| Male | - | - | - | - | 6 | 3 | 9 |
| Female | - | - | - | 1 | 21 | 3 | 25 |
| Plan C | | | | | | | |
| Male | - | - | - | - | 8 | 1 | 9 |
| Female | - | - | - | 6 | 20 | 7 | 33 |
| Plan D | | | | | | | |
| Male | 32 | 1,901 | 4,351 | 4,708 | 2,294 | 280 | 13,566 |
| Female | 27 | 4,103 | 9,413 | 9,702 | 4,449 | 472 | 28,166 |
| Plan E | | | | | | | |
| Male | 4 | 423 | 1,232 | 1,937 | 1,599 | 321 | 5,516 |
| Female | 8 | 806 | 2,443 | 4,654 | 3,460 | 444 | 11,815 |
| Plan G | | | | | | | |
| Male | 1,781 | 4,038 | 1,939 | 1,013 | 355 | 27 | 9,153 |
| Female | 3,671 | 8,323 | 3,557 | 1,886 | 529 | 29 | 17,995 |
| Safety Plans: | | | | | | | |
| Plan A | | | | | | | |
| Male | - | - | - | - | 5 | - | 5 |
| Female | - | - | - | - | - | - | - |
| Plan B | | | | | | | |
| Male | 68 | 1,972 | 3,176 | 2,921 | 168 | 4 | 8,309 |
| Female | 14 | 460 | 603 | 325 | 14 | - | 1,416 |
| Plan C | | | | | | | |
| Male | 1,268 | 1,162 | 168 | 45 | 5 | - | 2,648 |
| Female | 221 | 170 | 20 | 5 | - | - | 416 |
| Grand Totals: | <u>7,094</u> | <u>23,358</u> | <u>26,902</u> | <u>27,203</u> | <u>12,987</u> | <u>1,642</u> | <u>99,186</u> |

Exhibit C-4
Age and Service Distribution of Active Members by Count
and Average Compensation as of June 30, 2019
All Plans

| Count | | | | | | | | | | | | | |
|--------------------|-------------------------|--------------|--------------|--------------|--------------|---------------|---------------|---------------|---------------|--------------|--------------|--------------|--------------------|
| Age | Years of Service | | | | | | | | | | | | Total Count |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | |
| Under 25 | 507 | 253 | 119 | 50 | 8 | 1 | - | - | - | - | - | - | 938 |
| 25-29 | 1,496 | 1,415 | 1,291 | 915 | 546 | 487 | 6 | - | - | - | - | - | 6,156 |
| 30-34 | 1,314 | 1,312 | 1,488 | 1,430 | 1,293 | 2,748 | 1,188 | 19 | - | - | - | - | 10,792 |
| 35-39 | 770 | 933 | 937 | 983 | 845 | 2,694 | 4,612 | 744 | 47 | 1 | - | - | 12,566 |
| 40-44 | 501 | 573 | 632 | 536 | 538 | 1,746 | 4,334 | 3,207 | 959 | 73 | - | - | 13,099 |
| 45-49 | 358 | 366 | 395 | 418 | 356 | 1,249 | 3,073 | 3,390 | 3,009 | 1,095 | 89 | 5 | 13,803 |
| 50-54 | 263 | 297 | 298 | 295 | 257 | 860 | 2,247 | 2,491 | 2,703 | 3,167 | 1,630 | 153 | 14,661 |
| 55-59 | 151 | 195 | 195 | 188 | 207 | 749 | 1,746 | 1,884 | 1,774 | 2,286 | 2,274 | 893 | 12,542 |
| 60-64 | 83 | 94 | 82 | 126 | 109 | 480 | 1,309 | 1,418 | 1,213 | 1,366 | 1,420 | 1,411 | 9,111 |
| 65 & Over | 26 | 18 | 50 | 30 | 53 | 278 | 897 | 1,040 | 945 | 778 | 603 | 800 | 5,518 |
| Total Count | 5,469 | 5,456 | 5,487 | 4,971 | 4,212 | 11,292 | 19,412 | 14,193 | 10,650 | 8,766 | 6,016 | 3,262 | 99,186 |

| Compensation | | | | | | | | | | | | | |
|---------------------------------|-------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|------------------|----------------------|
| Age | Years of Service | | | | | | | | | | | | Average Comp. |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | |
| Under 25 | 52,288 | 58,619 | 61,217 | 58,794 | 71,183 | 48,792 | - | - | - | - | - | - | 55,633 |
| 25-29 | 54,702 | 58,331 | 62,954 | 64,867 | 65,153 | 73,287 | 84,284 | - | - | - | - | - | 61,204 |
| 30-34 | 60,549 | 62,253 | 66,036 | 65,872 | 70,360 | 77,352 | 81,644 | 89,538 | - | - | - | - | 70,045 |
| 35-39 | 64,907 | 67,421 | 70,230 | 69,852 | 75,033 | 84,917 | 87,228 | 90,048 | 89,516 | 87,060 | - | - | 80,623 |
| 40-44 | 65,059 | 65,333 | 68,779 | 73,829 | 73,745 | 88,473 | 86,835 | 90,747 | 97,627 | 115,481 | - | - | 85,246 |
| 45-49 | 64,024 | 66,818 | 69,602 | 70,911 | 72,390 | 84,604 | 85,644 | 93,496 | 102,438 | 106,980 | 116,293 | 100,042 | 90,728 |
| 50-54 | 60,436 | 69,594 | 68,324 | 68,232 | 70,537 | 80,473 | 82,298 | 90,476 | 99,686 | 107,623 | 114,780 | 118,374 | 94,822 |
| 55-59 | 65,163 | 63,722 | 67,632 | 70,383 | 71,570 | 82,411 | 75,815 | 82,635 | 92,512 | 99,288 | 107,082 | 104,531 | 90,992 |
| 60-64 | 67,142 | 68,623 | 70,981 | 71,557 | 72,097 | 81,275 | 73,750 | 81,102 | 86,515 | 92,529 | 102,614 | 96,682 | 87,668 |
| 65 & Over | 93,664 | 71,626 | 109,371 | 110,148 | 82,071 | 86,388 | 75,115 | 77,454 | 79,045 | 84,275 | 91,179 | 93,310 | 83,125 |
| Avg. Annual Compensation | \$ 59,818 | \$ 63,174 | \$ 67,145 | \$ 68,406 | \$ 71,491 | \$ 82,463 | \$ 83,481 | \$ 88,303 | \$ 95,707 | \$ 101,008 | \$ 106,655 | \$ 99,026 | \$ 84,244 |

Exhibit C-4a
Age and Service Distribution of Active Members by Count
and Average Compensation as of June 30, 2019
General Plan A

| Count | | | | | | | | | | | | | | |
|--------------------|-------------------------|-----|-----|-----|-----|-----|-------|-------|-------|-------|-------|---------|--------------------|-----|
| Age | Years of Service | | | | | | | | | | | | Total Count | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | | |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 30-34 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 35-39 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 40-44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 45-49 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 50-54 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 55-59 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 60-64 | - | - | - | - | - | - | - | 1 | 1 | 2 | - | - | 7 | 11 |
| 65 & Over | - | - | - | - | - | - | 2 | 6 | 11 | 4 | 3 | 68 | - | 94 |
| Total Count | - | - | - | - | - | - | 2 | 7 | 12 | 6 | 3 | 75 | - | 105 |

| Compensation | | | | | | | | | | | | | | |
|---------------------------------|-------------------------|------|------|------|------|------|-----------|-----------|------------|-----------|-----------|------------|----------------------|------------|
| Age | Years of Service | | | | | | | | | | | | Average Comp. | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | | |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 30-34 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 35-39 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 40-44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 45-49 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 50-54 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 55-59 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 60-64 | - | - | - | - | - | - | - | 32,460 | 92,856 | 48,132 | - | 81,835 | - | 72,220 |
| 65 & Over | - | - | - | - | - | - | 97,842 | 98,520 | 116,893 | 71,322 | 83,848 | 107,166 | - | 105,285 |
| Avg. Annual Compensation | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ 97,842 | \$ 89,083 | \$ 114,890 | \$ 63,592 | \$ 83,848 | \$ 104,802 | \$ - | \$ 101,821 |

**Exhibit C-4b
 Age and Service Distribution of Active Members by Count
 and Average Compensation as of June 30, 2019
 General Plan B**

| Count | | | | | | | | | | | | | |
|--------------------|-------------------------|-----|-----|-----|-----|-----|-------|-------|-------|-------|-------|--------------------|---------|
| Age | Years of Service | | | | | | | | | | | Total Count | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | | 35&Over |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 30-34 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 35-39 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 40-44 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 45-49 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 50-54 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 55-59 | - | - | - | - | - | - | - | - | - | - | - | 1 | 1 |
| 60-64 | - | - | - | - | - | - | - | - | 1 | - | - | 14 | 15 |
| 65 & Over | - | - | - | - | - | - | - | 2 | 1 | 3 | 1 | 11 | 18 |
| Total Count | - | - | - | - | - | - | - | 2 | 2 | 3 | 1 | 26 | 34 |

| Compensation | | | | | | | | | | | | | |
|---------------------------------|-------------------------|------|------|------|------|------|-------|------------|-----------|------------|------------|----------------------|------------|
| Age | Years of Service | | | | | | | | | | | Average Comp. | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | | 35&Over |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 30-34 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 35-39 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 40-44 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 45-49 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 50-54 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 55-59 | - | - | - | - | - | - | - | - | - | - | - | 73,644 | 73,644 |
| 60-64 | - | - | - | - | - | - | - | - | 57,444 | - | - | 91,628 | 89,349 |
| 65 & Over | - | - | - | - | - | - | - | 133,674 | 57,444 | 126,592 | 129,804 | 140,433 | 132,174 |
| Avg. Annual Compensation | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ 133,674 | \$ 57,444 | \$ 126,592 | \$ 129,804 | \$ 111,584 | \$ 111,559 |

**Exhibit C-4c
 Age and Service Distribution of Active Members by Count
 and Average Compensation as of June 30, 2019
 General Plan C**

| Count | | | | | | | | | | | | | | |
|--------------------|-------------------------|-----|-----|-----|-----|-----|-------|-------|-------|-------|-------|---------|--------------------|----|
| Age | Years of Service | | | | | | | | | | | | Total Count | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | | |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 30-34 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 35-39 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 40-44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 45-49 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 50-54 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 55-59 | - | - | - | - | - | - | - | - | 1 | - | - | 5 | - | 6 |
| 60-64 | - | - | - | - | - | - | - | - | - | - | 2 | 16 | - | 18 |
| 65 & Over | - | - | - | - | - | - | - | - | 1 | - | 1 | 16 | - | 18 |
| Total Count | - | - | - | - | - | - | - | - | 2 | - | 3 | 37 | - | 42 |

| Compensation | | | | | | | | | | | | | | |
|---------------------------------|-------------------------|------|------|------|------|------|-------|-------|-----------|-------|------------|-----------|----------------------|-----------|
| Age | Years of Service | | | | | | | | | | | | Average Comp. | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | | |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 30-34 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 35-39 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 40-44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 45-49 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 50-54 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 55-59 | - | - | - | - | - | - | - | - | 63,096 | - | - | 85,517 | - | 81,780 |
| 60-64 | - | - | - | - | - | - | - | - | - | - | 93,930 | 80,737 | - | 82,203 |
| 65 & Over | - | - | - | - | - | - | - | - | 132,768 | - | 199,656 | 102,446 | - | 109,531 |
| Avg. Annual Compensation | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ 97,932 | \$ - | \$ 129,172 | \$ 90,770 | \$ - | \$ 93,854 |

Exhibit C-4d
Age and Service Distribution of Active Members by Count
and Average Compensation as of June 30, 2019
General Plan D

| Count | | | | | | | | | | | | | |
|--------------------|-------------------------|-----------|-----------|-----------|-----------|--------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------------|
| Age | Years of Service | | | | | | | | | | | | Total Count |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | 3 | - | - | - | 53 | 3 | - | - | - | - | - | 59 |
| 30-34 | 3 | 11 | 6 | 9 | 11 | 782 | 575 | 14 | - | - | - | - | 1,411 |
| 35-39 | 10 | 14 | 20 | 18 | 20 | 1,169 | 2,857 | 446 | 38 | 1 | - | - | 4,593 |
| 40-44 | 3 | 8 | 15 | 14 | 14 | 836 | 2,948 | 1,983 | 584 | 54 | - | - | 6,459 |
| 45-49 | 4 | 7 | 16 | 10 | 13 | 569 | 2,147 | 2,127 | 1,723 | 621 | 63 | 5 | 7,305 |
| 50-54 | 4 | 11 | 18 | 12 | 7 | 399 | 1,591 | 1,607 | 1,615 | 1,517 | 705 | 122 | 7,608 |
| 55-59 | 3 | 2 | 4 | 6 | 10 | 301 | 1,215 | 1,293 | 1,143 | 1,253 | 1,057 | 515 | 6,802 |
| 60-64 | 1 | 2 | 6 | 4 | 4 | 198 | 920 | 934 | 796 | 788 | 689 | 496 | 4,838 |
| 65 & Over | - | 1 | 2 | 2 | - | 115 | 587 | 632 | 540 | 383 | 252 | 143 | 2,657 |
| Total Count | 28 | 59 | 87 | 75 | 79 | 4,422 | 12,843 | 9,036 | 6,439 | 4,617 | 2,766 | 1,281 | 41,732 |

| Compensation | | | | | | | | | | | | | |
|---------------------------------|-------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|----------------------|
| Age | Years of Service | | | | | | | | | | | | Average Comp. |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | 56,844 | - | - | - | 56,864 | 69,268 | - | - | - | - | - | 57,494 |
| 30-34 | 72,784 | 86,984 | 83,888 | 80,747 | 76,200 | 74,485 | 68,941 | 81,878 | - | - | - | - | 72,486 |
| 35-39 | 84,444 | 69,912 | 76,130 | 94,911 | 100,776 | 85,567 | 80,404 | 83,820 | 86,626 | 87,060 | - | - | 82,206 |
| 40-44 | 133,012 | 86,558 | 88,090 | 87,314 | 82,296 | 92,102 | 83,966 | 86,654 | 90,312 | 107,847 | - | - | 86,657 |
| 45-49 | 116,403 | 88,635 | 104,562 | 106,945 | 85,651 | 89,723 | 84,136 | 91,214 | 94,343 | 97,791 | 107,757 | 100,042 | 90,516 |
| 50-54 | 197,034 | 136,916 | 85,203 | 97,229 | 92,319 | 83,688 | 82,355 | 90,377 | 95,255 | 97,689 | 100,134 | 107,810 | 92,150 |
| 55-59 | 149,652 | 94,002 | 72,246 | 104,072 | 77,251 | 87,231 | 78,485 | 84,319 | 93,563 | 97,514 | 105,056 | 108,548 | 92,478 |
| 60-64 | 177,924 | 90,738 | 84,374 | 92,421 | 158,556 | 84,220 | 76,018 | 84,956 | 92,318 | 95,102 | 109,205 | 105,444 | 91,732 |
| 65 & Over | - | 43,392 | 84,972 | 58,038 | - | 86,763 | 76,837 | 79,577 | 79,945 | 89,043 | 96,911 | 115,993 | 84,300 |
| Avg. Annual Compensation | \$ 119,373 | \$ 90,474 | \$ 86,426 | \$ 93,385 | \$ 90,789 | \$ 84,948 | \$ 80,913 | \$ 87,237 | \$ 92,564 | \$ 96,613 | \$ 104,154 | \$ 108,074 | \$ 88,711 |

Exhibit C-4e
Age and Service Distribution of Active Members by Count
and Average Compensation as of June 30, 2019
General Plan E

| Count | | | | | | | | | | | | | | |
|--------------------|-------------------------|-----|-----|-----|-----|-----|-------|-------|-------|-------|-------|---------|--------------------|--------|
| Age | Years of Service | | | | | | | | | | | | Total Count | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | | |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | - | - | - | - | 12 | - | - | - | - | - | - | - | 12 |
| 30-34 | - | - | - | - | 1 | 130 | 191 | - | - | - | - | - | - | 322 |
| 35-39 | - | - | - | - | - | 182 | 614 | 109 | 2 | - | - | - | - | 907 |
| 40-44 | - | - | - | - | - | 143 | 690 | 604 | 125 | 3 | - | - | - | 1,565 |
| 45-49 | - | - | - | - | - | 131 | 578 | 680 | 527 | 189 | 5 | - | - | 2,110 |
| 50-54 | - | - | - | - | - | 89 | 478 | 580 | 592 | 821 | 430 | 5 | - | 2,995 |
| 55-59 | - | - | - | - | - | 122 | 480 | 499 | 482 | 791 | 915 | 307 | - | 3,596 |
| 60-64 | - | - | - | - | - | 94 | 375 | 458 | 389 | 536 | 700 | 843 | - | 3,395 |
| 65 & Over | - | - | - | - | - | 65 | 301 | 398 | 387 | 380 | 344 | 554 | - | 2,429 |
| Total Count | - | - | - | - | 1 | 968 | 3,707 | 3,328 | 2,504 | 2,720 | 2,394 | 1,709 | - | 17,331 |

| Compensation | | | | | | | | | | | | | | |
|---------------------------------|-------------------------|------|------|------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------------------|-----------|
| Age | Years of Service | | | | | | | | | | | | Average Comp. | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | | |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | - | - | - | - | 58,931 | - | - | - | - | - | - | - | 58,931 |
| 30-34 | - | - | - | - | 59,568 | 67,325 | 61,160 | - | - | - | - | - | - | 63,644 |
| 35-39 | - | - | - | - | - | 73,432 | 68,461 | 67,174 | 50,442 | - | - | - | - | 69,264 |
| 40-44 | - | - | - | - | - | 82,652 | 71,186 | 70,178 | 71,211 | 100,500 | - | - | - | 71,903 |
| 45-49 | - | - | - | - | - | 80,067 | 73,816 | 73,234 | 80,829 | 76,591 | 97,080 | - | - | 76,072 |
| 50-54 | - | - | - | - | - | 80,172 | 68,454 | 71,384 | 82,098 | 82,690 | 78,730 | 83,172 | - | 77,469 |
| 55-59 | - | - | - | - | - | 79,901 | 64,891 | 69,654 | 76,811 | 87,890 | 89,598 | 81,072 | - | 80,386 |
| 60-64 | - | - | - | - | - | 88,552 | 66,799 | 71,303 | 71,677 | 84,998 | 93,488 | 88,523 | - | 82,338 |
| 65 & Over | - | - | - | - | - | 96,470 | 70,264 | 72,806 | 75,894 | 78,135 | 86,289 | 83,620 | - | 78,826 |
| Avg. Annual Compensation | \$ - | \$ - | \$ - | \$ - | \$ 59,568 | \$ 79,142 | \$ 68,942 | \$ 71,305 | \$ 77,667 | \$ 83,617 | \$ 88,323 | \$ 85,579 | \$ - | \$ 77,846 |

Exhibit C-4f
Age and Service Distribution of Active Members by Count
and Average Compensation as of June 30, 2019
General Plan G

| Count | | | | | | | | | | | | | |
|--------------------|-------------------------|--------------|--------------|--------------|--------------|--------------|-----------|----------|----------|----------|----------|----------|--------------------|
| Age | Years of Service | | | | | | | | | | | | Total Count |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | |
| Under 25 | 355 | 163 | 72 | 34 | 4 | 1 | - | - | - | - | - | - | 629 |
| 25-29 | 1,236 | 1,156 | 1,015 | 708 | 452 | 256 | - | - | - | - | - | - | 4,823 |
| 30-34 | 1,211 | 1,148 | 1,276 | 1,267 | 1,135 | 1,282 | 10 | - | - | - | - | - | 7,329 |
| 35-39 | 720 | 858 | 821 | 873 | 759 | 997 | 4 | - | - | - | - | - | 5,032 |
| 40-44 | 478 | 541 | 584 | 493 | 504 | 602 | 9 | - | - | - | - | - | 3,211 |
| 45-49 | 350 | 350 | 368 | 395 | 336 | 478 | 6 | 2 | - | - | - | - | 2,285 |
| 50-54 | 256 | 279 | 277 | 281 | 243 | 349 | 5 | - | 1 | - | - | - | 1,691 |
| 55-59 | 146 | 191 | 190 | 179 | 192 | 302 | 6 | 2 | - | - | - | - | 1,208 |
| 60-64 | 81 | 92 | 76 | 122 | 104 | 183 | 6 | 3 | - | - | - | - | 667 |
| 65 & Over | 26 | 17 | 48 | 28 | 53 | 96 | 4 | 1 | - | - | - | - | 273 |
| Total Count | 4,859 | 4,795 | 4,727 | 4,380 | 3,782 | 4,546 | 50 | 8 | 1 | - | - | - | 27,148 |

| Compensation | | | | | | | | | | | | | |
|---------------------------------|-------------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|------------------|-------------|-------------|-------------|----------------------|
| Age | Years of Service | | | | | | | | | | | | Average Comp. |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | |
| Under 25 | 42,629 | 47,327 | 47,804 | 45,260 | 48,693 | 48,792 | - | - | - | - | - | - | 44,629 |
| 25-29 | 49,769 | 52,615 | 55,288 | 56,243 | 58,509 | 58,445 | - | - | - | - | - | - | 53,843 |
| 30-34 | 59,304 | 58,713 | 61,883 | 62,102 | 66,480 | 67,493 | 64,246 | - | - | - | - | - | 62,695 |
| 35-39 | 63,781 | 65,800 | 67,378 | 66,558 | 71,996 | 76,801 | 170,592 | - | - | - | - | - | 69,098 |
| 40-44 | 63,865 | 63,798 | 66,769 | 71,924 | 72,528 | 78,983 | 71,299 | - | - | - | - | - | 69,834 |
| 45-49 | 63,163 | 65,322 | 67,302 | 69,058 | 71,319 | 76,387 | 91,498 | 47,076 | - | - | - | - | 69,205 |
| 50-54 | 57,900 | 65,667 | 66,859 | 66,748 | 68,631 | 75,144 | 123,509 | - | 34,956 | - | - | - | 67,401 |
| 55-59 | 63,015 | 62,329 | 67,280 | 67,370 | 69,978 | 75,200 | 119,196 | 157,188 | - | - | - | - | 68,810 |
| 60-64 | 64,768 | 68,142 | 69,924 | 70,873 | 68,699 | 73,145 | 88,974 | 62,416 | - | - | - | - | 70,056 |
| 65 & Over | 93,664 | 73,287 | 110,387 | 113,871 | 82,071 | 78,169 | 130,371 | 249,648 | - | - | - | - | 90,818 |
| Avg. Annual Compensation | \$ 57,363 | \$ 59,961 | \$ 63,363 | \$ 64,734 | \$ 68,447 | \$ 73,030 | \$ 98,071 | \$ 105,678 | \$ 34,956 | \$ - | \$ - | \$ - | \$ 64,312 |

**Exhibit C-4g
 Age and Service Distribution of Active Members by Count
 and Average Compensation as of June 30, 2019
 Safety Plan A**

| Count | | | | | | | | | | | | | | |
|--------------------|-------------------------|-----|-----|-----|-----|-----|-------|-------|-------|-------|-------|---------|--------------------|---|
| Age | Years of Service | | | | | | | | | | | | Total Count | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | | |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 30-34 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 35-39 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 40-44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 45-49 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 50-54 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 55-59 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 60-64 | - | - | - | - | - | - | - | - | 1 | - | - | - | 3 | 4 |
| 65 & Over | - | - | - | - | - | - | - | - | - | - | - | - | 1 | 1 |
| Total Count | - | - | - | - | - | - | - | - | 1 | - | - | - | 4 | 5 |

| Compensation | | | | | | | | | | | | | | |
|---------------------------------|-------------------------|------|------|------|------|------|-------|-------|------------|-------|-------|---------|----------------------|------------|
| Age | Years of Service | | | | | | | | | | | | Average Comp. | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | | |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 30-34 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 35-39 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 40-44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 45-49 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 50-54 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 55-59 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 60-64 | - | - | - | - | - | - | - | - | 184,968 | - | - | - | 131,232 | 144,666 |
| 65 & Over | - | - | - | - | - | - | - | - | - | - | - | - | 139,116 | 139,116 |
| Avg. Annual Compensation | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ 184,968 | \$ - | \$ - | \$ - | \$ 133,203 | \$ 143,556 |

**Exhibit C-4h
Age and Service Distribution of Active Members by Count
and Average Compensation as of June 30, 2019
Safety Plan B**

| Count | | | | | | | | | | | | | | |
|--------------------|-------------------------|-----------|-----------|-----------|-----------|------------|--------------|--------------|--------------|--------------|------------|------------|--------------------|--------------|
| Age | Years of Service | | | | | | | | | | | | Total Count | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | | |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | - | 2 | - | 2 | 75 | 3 | - | - | - | - | - | - | 82 |
| 30-34 | 1 | 8 | 6 | 1 | 8 | 360 | 411 | 5 | - | - | - | - | - | 800 |
| 35-39 | 3 | 3 | 6 | 12 | 8 | 268 | 1,136 | 189 | 7 | - | - | - | - | 1,632 |
| 40-44 | 3 | 4 | 5 | 6 | 3 | 138 | 685 | 619 | 250 | 16 | - | - | - | 1,729 |
| 45-49 | - | 4 | 1 | - | 1 | 58 | 342 | 579 | 759 | 285 | 21 | - | - | 2,050 |
| 50-54 | - | 3 | - | - | 1 | 17 | 172 | 303 | 495 | 829 | 495 | 26 | - | 2,341 |
| 55-59 | - | 1 | - | - | - | 12 | 45 | 90 | 148 | 242 | 302 | 65 | - | 905 |
| 60-64 | - | - | - | - | - | 3 | 8 | 22 | 25 | 40 | 29 | 32 | - | 159 |
| 65 & Over | - | - | - | - | - | 1 | 3 | 1 | 5 | 8 | 2 | 7 | - | 27 |
| Total Count | 7 | 23 | 20 | 19 | 23 | 932 | 2,805 | 1,808 | 1,689 | 1,420 | 849 | 130 | - | 9,725 |

| Compensation | | | | | | | | | | | | | | |
|---------------------------------|-------------------------|-------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|----------------------|-------------------|
| Age | Years of Service | | | | | | | | | | | | Average Comp. | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35&Over | | |
| Under 25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25-29 | - | - | 103,992 | - | 92,424 | 105,836 | 99,300 | - | - | - | - | - | - | 105,225 |
| 30-34 | 77,988 | 97,107 | 97,632 | 86,220 | 98,754 | 107,979 | 109,245 | 110,986 | - | - | - | - | - | 108,305 |
| 35-39 | 108,476 | 105,976 | 92,818 | 104,697 | 110,069 | 113,775 | 114,220 | 117,936 | 116,367 | - | - | - | - | 114,392 |
| 40-44 | 103,212 | 115,968 | 101,407 | 106,768 | 123,788 | 110,096 | 115,116 | 123,931 | 127,923 | 144,056 | - | - | - | 119,919 |
| 45-49 | - | 129,189 | 115,944 | - | 102,348 | 108,568 | 114,998 | 125,833 | 135,816 | 147,156 | 146,476 | - | - | 130,399 |
| 50-54 | - | 157,868 | - | - | 96,396 | 107,699 | 118,809 | 127,508 | 135,310 | 150,494 | 166,955 | 174,714 | - | 145,405 |
| 55-59 | - | 189,504 | - | - | - | 120,839 | 114,494 | 128,761 | 135,728 | 145,725 | 167,142 | 185,442 | - | 150,568 |
| 60-64 | - | - | - | - | - | 121,488 | 127,271 | 126,260 | 129,604 | 144,974 | 166,907 | 186,003 | - | 150,892 |
| 65 & Over | - | - | - | - | - | 135,396 | 136,044 | 174,636 | 136,006 | 138,293 | 147,432 | 160,774 | - | 145,364 |
| Avg. Annual Compensation | \$ 101,865 | \$ 119,066 | \$ 98,683 | \$ 104,379 | \$ 105,458 | \$ 110,057 | \$ 114,135 | \$ 124,774 | \$ 134,319 | \$ 148,714 | \$ 166,467 | \$ 182,106 | \$ - | \$ 129,686 |

Exhibit C-4i
Age and Service Distribution of Active Members by Count
and Average Compensation as of June 30, 2019
Safety Plan C

| Count | | | | | | | | | | | | | |
|--------------------|-------------------------|------------|------------|------------|------------|------------|----------|----------|----------|----------|----------|--------------------|--------------|
| Age | Years of Service | | | | | | | | | | | Total Count | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | | 35&Over |
| Under 25 | 152 | 90 | 47 | 16 | 4 | - | - | - | - | - | - | - | 309 |
| 25-29 | 260 | 256 | 274 | 207 | 92 | 91 | - | - | - | - | - | - | 1,180 |
| 30-34 | 99 | 145 | 200 | 153 | 138 | 194 | 1 | - | - | - | - | - | 930 |
| 35-39 | 37 | 58 | 90 | 80 | 58 | 78 | 1 | - | - | - | - | - | 402 |
| 40-44 | 17 | 20 | 28 | 23 | 17 | 27 | 2 | 1 | - | - | - | - | 135 |
| 45-49 | 4 | 5 | 10 | 13 | 6 | 13 | - | 2 | - | - | - | - | 53 |
| 50-54 | 3 | 4 | 3 | 2 | 6 | 6 | 1 | 1 | - | - | - | - | 26 |
| 55-59 | 2 | 1 | 1 | 3 | 5 | 12 | - | - | - | - | - | - | 24 |
| 60-64 | 1 | - | - | - | 1 | 2 | - | - | - | - | - | - | 4 |
| 65 & Over | - | - | - | - | - | 1 | - | - | - | - | - | - | 1 |
| Total Count | 575 | 579 | 653 | 497 | 327 | 424 | 5 | 4 | - | - | - | - | 3,064 |

| Compensation | | | | | | | | | | | | | |
|---------------------------------|-------------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|------------------|-------------|-------------|-------------|----------------------|------------------|
| Age | Years of Service | | | | | | | | | | | Average Comp. | |
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | | 35&Over |
| Under 25 | 74,849 | 79,071 | 81,766 | 87,552 | 93,672 | - | - | - | - | - | - | - | 78,032 |
| 25-29 | 78,150 | 84,159 | 91,054 | 94,364 | 97,203 | 99,673 | - | - | - | - | - | - | 88,440 |
| 30-34 | 75,236 | 86,482 | 91,045 | 96,081 | 100,235 | 103,940 | 128,988 | - | - | - | - | - | 93,573 |
| 35-39 | 78,007 | 88,816 | 93,432 | 94,932 | 101,063 | 106,566 | 108,888 | - | - | - | - | - | 95,333 |
| 40-44 | 79,927 | 88,243 | 94,529 | 97,863 | 93,972 | 107,969 | 97,740 | 88,848 | - | - | - | - | 94,950 |
| 45-49 | 86,922 | 91,054 | 93,684 | 99,481 | 98,618 | 101,480 | - | 94,422 | - | - | - | - | 96,846 |
| 50-54 | 94,720 | 92,172 | 102,304 | 102,840 | 117,986 | 103,996 | 122,244 | 103,068 | - | - | - | - | 104,717 |
| 55-59 | 95,208 | 143,388 | 116,244 | 182,784 | 121,358 | 130,121 | - | - | - | - | - | - | 131,944 |
| 60-64 | 148,716 | - | - | - | 79,644 | 131,406 | - | - | - | - | - | - | 122,793 |
| 65 & Over | - | - | - | - | - | 127,848 | - | - | - | - | - | - | 127,848 |
| Avg. Annual Compensation | \$ 77,149 | \$ 84,774 | \$ 90,990 | \$ 95,628 | \$ 99,679 | \$ 104,616 | \$ 111,120 | \$ 95,190 | \$ - | \$ - | \$ - | \$ - | \$ 90,822 |

**Exhibit C-5
Distribution of Retired Members by Age and Retirement Year
as of June 30, 2019
All Plans**

| <u>Age</u> | <u>Retirement Year</u> | | | | | | | | | | <u>Total Count</u> | <u>Average Monthly Benefit</u> |
|--------------------------------|------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------------|--|
| | <u>Pre-1975</u> | <u>1975-79</u> | <u>1980-84</u> | <u>1985-89</u> | <u>1990-94</u> | <u>1995-99</u> | <u>2000-04</u> | <u>2005-09</u> | <u>2010-14</u> | <u>2015-19</u> | | |
| Under 35 | - | - | - | - | - | 1 | 1 | 12 | 13 | 113 | 140 | \$ 880 |
| 35-39 | - | - | - | - | - | - | 3 | 7 | 21 | 69 | 100 | 2,611 |
| 40-44 | - | - | - | - | - | 1 | 3 | 23 | 72 | 112 | 211 | 2,985 |
| 45-49 | - | - | - | - | 1 | 6 | 58 | 67 | 103 | 152 | 387 | 3,209 |
| 50-54 | - | - | - | 1 | 24 | 85 | 126 | 118 | 198 | 701 | 1,253 | 3,327 |
| 55-59 | - | - | - | 10 | 74 | 153 | 163 | 166 | 661 | 2,515 | 3,742 | 5,337 |
| 60-64 | - | 1 | 19 | 52 | 114 | 136 | 175 | 595 | 2,343 | 3,277 | 6,712 | 4,901 |
| 65-69 | - | 21 | 69 | 98 | 113 | 180 | 617 | 2,314 | 3,441 | 5,092 | 11,945 | 4,519 |
| 70-74 | 13 | 118 | 205 | 167 | 205 | 811 | 2,619 | 3,307 | 4,158 | 2,415 | 14,018 | 4,563 |
| 75-79 | 31 | 135 | 185 | 223 | 763 | 1,889 | 2,705 | 2,409 | 1,607 | 1,257 | 11,204 | 4,523 |
| 80-84 | 64 | 114 | 165 | 582 | 1,369 | 1,521 | 1,543 | 851 | 560 | 1,012 | 7,781 | 4,052 |
| 85-89 | 91 | 109 | 451 | 746 | 1,238 | 842 | 455 | 293 | 261 | 732 | 5,218 | 3,758 |
| 90-94 | 54 | 213 | 420 | 469 | 506 | 220 | 154 | 153 | 175 | 366 | 2,730 | 3,459 |
| 95-99 | 46 | 137 | 176 | 182 | 100 | 56 | 55 | 50 | 53 | 90 | 945 | 2,991 |
| 100 & Over | 19 | 30 | 22 | 12 | 7 | 8 | 7 | 5 | 8 | 3 | 121 | 2,754 |
| Total Count | 318 | 878 | 1,712 | 2,542 | 4,514 | 5,909 | 8,684 | 10,370 | 13,674 | 17,906 | 66,507 | |
| Avg Monthly Benefit | \$ 2,290 | \$ 2,924 | \$ 3,052 | \$ 3,484 | \$ 4,402 | \$ 4,297 | \$ 5,000 | \$ 4,344 | \$ 4,424 | \$ 4,472 | | \$ 4,385 |

Exhibit C-5a
Distribution of Retired Members by Age and Retirement Year
as of June 30, 2019
General Plan A

| <u>Age</u> | <u>Retirement Year</u> | | | | | | | | | | <u>Total Count</u> | <u>Average Monthly Benefit</u> |
|----------------------------|------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------------|--------------------------------|
| | <u>Pre-1975</u> | <u>1975-79</u> | <u>1980-84</u> | <u>1985-89</u> | <u>1990-94</u> | <u>1995-99</u> | <u>2000-04</u> | <u>2005-09</u> | <u>2010-14</u> | <u>2015-19</u> | | |
| Under 35 | - | - | - | - | - | - | - | 3 | 2 | 10 | 15 | \$ 430 |
| 35-39 | - | - | - | - | - | - | 1 | 3 | 2 | 1 | 7 | 1,932 |
| 40-44 | - | - | - | - | - | - | - | 3 | 6 | - | 9 | 2,258 |
| 45-49 | - | - | - | - | - | - | - | 3 | 3 | 5 | 11 | 3,062 |
| 50-54 | - | - | - | 1 | 1 | 1 | 3 | 2 | 3 | 6 | 17 | 1,931 |
| 55-59 | - | - | - | - | - | 4 | 2 | 10 | 4 | 15 | 35 | 3,049 |
| 60-64 | - | - | 4 | 6 | 1 | 7 | 11 | 48 | 105 | 121 | 303 | 4,476 |
| 65-69 | - | 12 | 26 | 23 | 14 | 28 | 227 | 518 | 813 | 258 | 1,919 | 5,321 |
| 70-74 | 7 | 52 | 70 | 52 | 60 | 456 | 977 | 1,420 | 618 | 313 | 4,025 | 5,532 |
| 75-79 | 16 | 66 | 79 | 87 | 534 | 881 | 1,570 | 682 | 235 | 445 | 4,595 | 5,240 |
| 80-84 | 38 | 71 | 81 | 453 | 874 | 984 | 674 | 183 | 144 | 564 | 4,066 | 4,509 |
| 85-89 | 48 | 74 | 355 | 515 | 991 | 476 | 157 | 97 | 99 | 478 | 3,290 | 3,895 |
| 90-94 | 35 | 166 | 324 | 406 | 400 | 112 | 77 | 84 | 109 | 278 | 1,991 | 3,434 |
| 95-99 | 37 | 117 | 166 | 165 | 64 | 45 | 40 | 35 | 37 | 70 | 776 | 2,972 |
| 100 & Over | 17 | 30 | 22 | 12 | 5 | 5 | 5 | 5 | 7 | 1 | 109 | 2,895 |
| Total Count | 198 | 588 | 1,127 | 1,720 | 2,944 | 2,999 | 3,744 | 3,096 | 2,187 | 2,565 | 21,168 | |
| Avg Monthly Benefit | \$ 1,725 | \$ 2,382 | \$ 2,477 | \$ 3,013 | \$ 4,275 | \$ 4,386 | \$ 5,908 | \$ 6,023 | \$ 5,955 | \$ 3,700 | | \$ 4,664 |

Exhibit C-5b
Distribution of Retired Members by Age and Retirement Year
as of June 30, 2019
General Plan B

| <u>Age</u> | <u>Retirement Year</u> | | | | | | | | | | <u>Total Count</u> | <u>Average Monthly Benefit</u> | |
|----------------------------|------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------------|--------------------------------|-----------------|
| | <u>Pre-1975</u> | <u>1975-79</u> | <u>1980-84</u> | <u>1985-89</u> | <u>1990-94</u> | <u>1995-99</u> | <u>2000-04</u> | <u>2005-09</u> | <u>2010-14</u> | <u>2015-19</u> | | | |
| Under 35 | - | - | - | - | - | - | - | - | - | - | - | - | \$ - |
| 35-39 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 40-44 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 45-49 | - | - | - | - | - | - | - | - | - | - | 1 | 1 | 2,684 |
| 50-54 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 55-59 | - | - | - | - | - | - | - | 1 | 1 | 1 | 1 | 3 | 1,444 |
| 60-64 | - | - | - | - | 1 | 1 | - | 15 | 17 | 40 | 74 | 74 | 5,212 |
| 65-69 | - | - | - | 1 | 1 | 1 | 13 | 26 | 87 | 54 | 183 | 183 | 6,134 |
| 70-74 | - | - | 2 | 5 | 3 | 12 | 23 | 55 | 60 | 14 | 174 | 174 | 4,789 |
| 75-79 | - | - | 1 | 4 | 5 | 12 | 38 | 27 | 18 | 5 | 110 | 110 | 4,147 |
| 80-84 | - | - | 1 | 1 | 4 | 19 | 33 | 20 | 8 | 5 | 91 | 91 | 3,954 |
| 85-89 | - | - | - | 5 | 9 | 24 | 5 | 8 | 2 | 9 | 62 | 62 | 2,847 |
| 90-94 | - | - | 3 | 4 | 14 | 6 | 3 | 1 | - | 6 | 37 | 37 | 1,967 |
| 95-99 | - | - | - | 3 | 3 | - | - | 1 | - | 1 | 8 | 8 | 2,139 |
| 100 & Over | - | - | - | - | - | - | - | - | - | 1 | 1 | 1 | 777 |
| Total Count | - | - | 7 | 23 | 40 | 75 | 115 | 154 | 193 | 137 | 744 | | |
| Avg Monthly Benefit | \$ - | \$ - | \$ 1,312 | \$ 1,362 | \$ 1,985 | \$ 2,422 | \$ 3,589 | \$ 4,596 | \$ 6,207 | \$ 5,924 | | | \$ 4,612 |

**Exhibit C-5c
Distribution of Retired Members by Age and Retirement Year
as of June 30, 2019
General Plan C**

| <u>Age</u> | <u>Retirement Year</u> | | | | | | | | | | <u>Total Count</u> | <u>Average Monthly Benefit</u> |
|--------------------------------|------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------------|--|
| | <u>Pre-1975</u> | <u>1975-79</u> | <u>1980-84</u> | <u>1985-89</u> | <u>1990-94</u> | <u>1995-99</u> | <u>2000-04</u> | <u>2005-09</u> | <u>2010-14</u> | <u>2015-19</u> | | |
| Under 35 | - | - | - | - | - | - | - | - | - | 2 | 2 | \$ 4,905 |
| 35-39 | - | - | - | - | - | - | - | - | - | - | - | - |
| 40-44 | - | - | - | - | - | - | - | - | 2 | - | 2 | 1,446 |
| 45-49 | - | - | - | - | - | - | - | - | 1 | - | 1 | 1,591 |
| 50-54 | - | - | - | - | - | - | - | - | - | 1 | 1 | 1,259 |
| 55-59 | - | - | - | - | - | - | 1 | - | 1 | 2 | 4 | 4,284 |
| 60-64 | - | - | 1 | 2 | - | 1 | - | 5 | 12 | 32 | 53 | 4,534 |
| 65-69 | - | 1 | 2 | 3 | 2 | 3 | 10 | 15 | 40 | 36 | 112 | 5,463 |
| 70-74 | - | - | 3 | 2 | 1 | 5 | 16 | 24 | 43 | 15 | 109 | 4,546 |
| 75-79 | - | - | - | 3 | 10 | 8 | 14 | 25 | 14 | 4 | 78 | 3,082 |
| 80-84 | - | - | - | 8 | 8 | 13 | 22 | 7 | 6 | 5 | 69 | 2,645 |
| 85-89 | - | - | 1 | 3 | 6 | 10 | 7 | 5 | 1 | 4 | 37 | 2,128 |
| 90-94 | - | - | 1 | 2 | 9 | 1 | 1 | 1 | 1 | 7 | 23 | 1,737 |
| 95-99 | - | - | - | 1 | 2 | - | - | - | - | 1 | 4 | 1,092 |
| 100 & Over | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Count | - | 1 | 8 | 24 | 38 | 41 | 71 | 82 | 121 | 109 | 495 | |
| Avg Monthly Benefit | \$ - | \$ 1,808 | \$ 1,477 | \$ 991 | \$ 1,316 | \$ 2,040 | \$ 2,815 | \$ 3,351 | \$ 5,786 | \$ 5,325 | | \$ 3,892 |

Exhibit C-5d
Distribution of Retired Members by Age and Retirement Year
as of June 30, 2019
General Plan D

| Age | Retirement Year | | | | | | | | | | Total Count | Average Monthly Benefit |
|----------------------------|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|-------------------------|
| | Pre-1975 | 1975-79 | 1980-84 | 1985-89 | 1990-94 | 1995-99 | 2000-04 | 2005-09 | 2010-14 | 2015-19 | | |
| Under 35 | - | - | - | - | - | - | - | 3 | 6 | 52 | 61 | \$ 697 |
| 35-39 | - | - | - | - | - | - | 1 | 2 | 7 | 23 | 33 | 1,651 |
| 40-44 | - | - | - | - | - | 1 | 1 | 6 | 29 | 31 | 68 | 1,980 |
| 45-49 | - | - | - | - | 1 | 3 | 14 | 13 | 39 | 59 | 129 | 2,214 |
| 50-54 | - | - | - | - | 3 | 5 | 24 | 39 | 86 | 413 | 570 | 2,025 |
| 55-59 | - | - | - | - | 8 | 34 | 50 | 59 | 424 | 862 | 1,437 | 2,648 |
| 60-64 | - | - | 2 | 7 | 23 | 41 | 62 | 351 | 698 | 1,688 | 2,872 | 3,548 |
| 65-69 | - | 1 | 3 | 14 | 28 | 50 | 220 | 473 | 1,196 | 2,242 | 4,227 | 3,961 |
| 70-74 | - | - | 2 | 12 | 27 | 140 | 275 | 639 | 1,461 | 1,060 | 3,616 | 3,558 |
| 75-79 | - | - | 2 | 10 | 44 | 132 | 311 | 664 | 623 | 330 | 2,116 | 3,153 |
| 80-84 | - | - | 4 | 13 | 46 | 127 | 325 | 307 | 181 | 138 | 1,141 | 2,597 |
| 85-89 | - | - | 2 | 9 | 31 | 126 | 126 | 74 | 52 | 67 | 487 | 2,287 |
| 90-94 | - | - | 2 | 4 | 29 | 38 | 20 | 21 | 10 | 31 | 155 | 1,897 |
| 95-99 | - | 1 | - | 5 | 15 | 6 | 3 | 1 | 2 | 5 | 38 | 1,489 |
| 100 & Over | - | - | - | - | - | 1 | - | - | - | 1 | 2 | 1,691 |
| Total Count | - | 2 | 17 | 74 | 255 | 704 | 1,432 | 2,652 | 4,814 | 7,002 | 16,952 | |
| Avg Monthly Benefit | \$ - | \$ 5,677 | \$ 1,638 | \$ 1,576 | \$ 1,717 | \$ 1,991 | \$ 2,321 | \$ 2,730 | \$ 3,459 | \$ 3,880 | | \$ 3,326 |

Exhibit C-5e
Distribution of Retired Members by Age and Retirement Year
as of June 30, 2019
General Plan E

| Age | Retirement Year | | | | | | | | | | Total Count | Average Monthly Benefit |
|----------------------------|-----------------|---------|---------|---------|---------|---------|----------|----------|----------|----------|---------------|-------------------------|
| | Pre-1975 | 1975-79 | 1980-84 | 1985-89 | 1990-94 | 1995-99 | 2000-04 | 2005-09 | 2010-14 | 2015-19 | | |
| Under 35 | - | - | - | - | - | 1 | - | 3 | 2 | 15 | 21 | \$ 475 |
| 35-39 | - | - | - | - | - | - | 1 | 2 | 5 | 9 | 17 | 1,019 |
| 40-44 | - | - | - | - | - | - | - | 1 | 6 | 18 | 25 | 1,500 |
| 45-49 | - | - | - | - | - | - | - | 2 | 12 | 15 | 29 | 1,271 |
| 50-54 | - | - | - | - | - | - | 2 | 7 | 15 | 23 | 47 | 1,056 |
| 55-59 | - | - | - | - | - | - | 2 | 3 | 19 | 364 | 388 | 955 |
| 60-64 | - | - | - | - | - | - | 3 | 9 | 515 | 703 | 1,230 | 1,662 |
| 65-69 | - | - | - | - | - | 4 | 8 | 604 | 834 | 2,306 | 3,756 | 2,799 |
| 70-74 | - | - | - | - | 1 | 6 | 435 | 718 | 1,879 | 868 | 3,907 | 2,607 |
| 75-79 | - | - | - | - | 1 | 241 | 349 | 972 | 671 | 314 | 2,548 | 2,261 |
| 80-84 | - | - | - | - | 80 | 177 | 459 | 313 | 187 | 141 | 1,357 | 1,733 |
| 85-89 | - | - | - | 29 | 71 | 185 | 132 | 78 | 64 | 60 | 619 | 1,405 |
| 90-94 | - | - | 1 | 10 | 47 | 48 | 26 | 20 | 19 | 9 | 180 | 1,202 |
| 95-99 | - | - | 2 | 8 | 13 | 4 | 4 | 3 | 6 | 5 | 45 | 610 |
| 100 & Over | - | - | - | - | 2 | 2 | - | - | - | - | 4 | 450 |
| Total Count | - | - | 3 | 47 | 215 | 668 | 1,421 | 2,735 | 4,234 | 4,850 | 14,173 | |
| Avg Monthly Benefit | \$ - | \$ - | \$ 266 | \$ 314 | \$ 586 | \$ 823 | \$ 1,282 | \$ 1,686 | \$ 2,576 | \$ 2,982 | | \$ 2,293 |

Exhibit C-5f
Distribution of Retired Members by Age and Retirement Year
as of June 30, 2019
General Plan G

| <u>Age</u> | <u>Retirement Year</u> | | | | | | | | | | <u>Total Count</u> | <u>Average Monthly Benefit</u> | |
|----------------------------|------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------------|--------------------------------|-----------------|
| | <u>Pre-1975</u> | <u>1975-79</u> | <u>1980-84</u> | <u>1985-89</u> | <u>1990-94</u> | <u>1995-99</u> | <u>2000-04</u> | <u>2005-09</u> | <u>2010-14</u> | <u>2015-19</u> | | | |
| Under 35 | - | - | - | - | - | - | - | - | - | - | - | - | \$ - |
| 35-39 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 40-44 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 45-49 | - | - | - | - | - | - | - | - | - | - | 1 | 1 | 891 |
| 50-54 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 55-59 | - | - | - | - | - | - | - | - | - | - | 2 | 2 | 257 |
| 60-64 | - | - | - | - | - | - | - | - | - | - | 9 | 9 | 778 |
| 65-69 | - | - | - | - | - | - | - | - | - | - | 8 | 8 | 1,240 |
| 70-74 | - | - | - | - | - | - | - | - | - | - | 5 | 5 | 991 |
| 75-79 | - | - | - | - | - | - | - | - | - | - | 1 | 1 | 5,544 |
| 80-84 | - | - | - | - | - | - | - | - | - | - | 2 | 2 | 1,694 |
| 85-89 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 90-94 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 95-99 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 100 & Over | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Count | - | - | - | - | - | - | - | - | - | - | 28 | 28 | |
| Avg Monthly Benefit | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ 1,151 | | \$ 1,151 |

Exhibit C-5g
Distribution of Retired Members by Age and Retirement Year
as of June 30, 2019
Safety Plan A

| <u>Age</u> | <u>Retirement Year</u> | | | | | | | | | | <u>Total Count</u> | <u>Average Monthly Benefit</u> |
|----------------------------|------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------------|--------------------------------|
| | <u>Pre-1975</u> | <u>1975-79</u> | <u>1980-84</u> | <u>1985-89</u> | <u>1990-94</u> | <u>1995-99</u> | <u>2000-04</u> | <u>2005-09</u> | <u>2010-14</u> | <u>2015-19</u> | | |
| Under 35 | - | - | - | - | - | - | - | - | 2 | 7 | 9 | \$ - |
| 35-39 | - | - | - | - | - | - | - | - | - | - | - | - |
| 40-44 | - | - | - | - | - | - | - | - | 1 | 1 | 2 | 6,472 |
| 45-49 | - | - | - | - | - | - | - | - | - | - | - | - |
| 50-54 | - | - | - | - | - | 1 | 3 | - | 1 | 2 | 7 | 5,517 |
| 55-59 | - | - | - | - | 2 | - | 1 | - | 3 | 12 | 18 | 5,743 |
| 60-64 | - | 1 | 3 | 2 | 2 | 4 | 5 | 10 | 87 | 25 | 139 | 10,056 |
| 65-69 | - | 7 | 30 | 31 | 29 | 58 | 75 | 399 | 141 | 88 | 858 | 9,179 |
| 70-74 | 6 | 66 | 120 | 85 | 97 | 165 | 837 | 338 | 53 | 117 | 1,884 | 8,265 |
| 75-79 | 15 | 69 | 102 | 119 | 163 | 610 | 401 | 34 | 40 | 155 | 1,708 | 7,760 |
| 80-84 | 26 | 43 | 79 | 106 | 356 | 199 | 29 | 21 | 33 | 155 | 1,047 | 6,978 |
| 85-89 | 43 | 35 | 92 | 184 | 128 | 21 | 27 | 31 | 43 | 111 | 715 | 6,355 |
| 90-94 | 19 | 47 | 89 | 43 | 7 | 15 | 27 | 26 | 36 | 35 | 344 | 5,763 |
| 95-99 | 9 | 19 | 8 | - | 3 | 1 | 8 | 10 | 8 | 8 | 74 | 5,604 |
| 100 & Over | 2 | - | - | - | - | - | 2 | - | 1 | - | 5 | 2,336 |
| Total Count | 120 | 287 | 523 | 570 | 787 | 1,074 | 1,415 | 869 | 449 | 716 | 6,810 | |
| Avg Monthly Benefit | \$ 3,223 | \$ 4,021 | \$ 4,436 | \$ 5,739 | \$ 7,357 | \$ 8,109 | \$ 9,556 | \$ 9,968 | \$ 8,891 | \$ 6,571 | | \$ 7,711 |

**Exhibit C-5h
Distribution of Retired Members by Age and Retirement Year
as of June 30, 2019
Safety Plan B**

| <u>Age</u> | <u>Retirement Year</u> | | | | | | | | | | <u>Total Count</u> | <u>Average Monthly Benefit</u> |
|--------------------------------|------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------------|--|
| | <u>Pre-1975</u> | <u>1975-79</u> | <u>1980-84</u> | <u>1985-89</u> | <u>1990-94</u> | <u>1995-99</u> | <u>2000-04</u> | <u>2005-09</u> | <u>2010-14</u> | <u>2015-19</u> | | |
| Under 35 | - | - | - | - | - | - | 1 | 3 | 1 | 25 | 30 | \$ 1,625 |
| 35-39 | - | - | - | - | - | - | - | - | 7 | 36 | 43 | 4,088 |
| 40-44 | - | - | - | - | - | - | 2 | 13 | 28 | 61 | 104 | 4,026 |
| 45-49 | - | - | - | - | - | 3 | 44 | 49 | 48 | 71 | 215 | 4,096 |
| 50-54 | - | - | - | - | 20 | 78 | 94 | 70 | 93 | 256 | 611 | 4,732 |
| 55-59 | - | - | - | 10 | 64 | 115 | 107 | 93 | 209 | 1,255 | 1,853 | 8,398 |
| 60-64 | - | - | 9 | 35 | 87 | 82 | 94 | 157 | 909 | 659 | 2,032 | 8,501 |
| 65-69 | - | - | 8 | 26 | 39 | 36 | 64 | 279 | 330 | 99 | 881 | 7,798 |
| 70-74 | - | - | 8 | 11 | 16 | 27 | 56 | 113 | 43 | 23 | 297 | 5,816 |
| 75-79 | - | - | 1 | - | 6 | 5 | 22 | 5 | 6 | 3 | 48 | 4,321 |
| 80-84 | - | - | - | 1 | 1 | 2 | 1 | - | 1 | 2 | 8 | 3,554 |
| 85-89 | - | - | 1 | 1 | 2 | - | 1 | - | - | 3 | 8 | 1,342 |
| 90-94 | - | - | - | - | - | - | - | - | - | - | - | - |
| 95-99 | - | - | - | - | - | - | - | - | - | - | - | - |
| 100 & Over | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Count | - | - | 27 | 84 | 235 | 348 | 486 | 782 | 1,675 | 2,493 | 6,130 | |
| Avg Monthly Benefit | \$ - | \$ - | \$ 2,370 | \$ 2,563 | \$ 3,420 | \$ 3,761 | \$ 4,158 | \$ 6,263 | \$ 8,357 | \$ 9,140 | | \$ 7,520 |

Exhibit C-5i
Distribution of Retired Members and Beneficiaries by Age and Retirement Year
as of June 30, 2019
Safety Plan C

| <u>Age</u> | <u>Retirement Year</u> | | | | | | | | | | <u>Total Count</u> | <u>Average Monthly Benefit</u> |
|----------------------------|------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------------|--------------------------------|
| | <u>Pre-1975</u> | <u>1975-79</u> | <u>1980-84</u> | <u>1985-89</u> | <u>1990-94</u> | <u>1995-99</u> | <u>2000-04</u> | <u>2005-09</u> | <u>2010-14</u> | <u>2015-19</u> | | |
| Under 35 | - | - | - | - | - | - | - | - | - | 2 | 2 | \$ 2,830 |
| 35-39 | - | - | - | - | - | - | - | - | - | - | - | - |
| 40-44 | - | - | - | - | - | - | - | - | - | 1 | 1 | 2,917 |
| 45-49 | - | - | - | - | - | - | - | - | - | - | - | - |
| 50-54 | - | - | - | - | - | - | - | - | - | - | - | - |
| 55-59 | - | - | - | - | - | - | - | - | - | 2 | 2 | 1,100 |
| 60-64 | - | - | - | - | - | - | - | - | - | - | - | - |
| 65-69 | - | - | - | - | - | - | - | - | - | 1 | 1 | 23,144 |
| 70-74 | - | - | - | - | - | - | - | - | 1 | - | 1 | 17,848 |
| 75-79 | - | - | - | - | - | - | - | - | - | - | - | - |
| 80-84 | - | - | - | - | - | - | - | - | - | - | - | - |
| 85-89 | - | - | - | - | - | - | - | - | - | - | - | - |
| 90-94 | - | - | - | - | - | - | - | - | - | - | - | - |
| 95-99 | - | - | - | - | - | - | - | - | - | - | - | - |
| 100 & Over | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Count | - | - | - | - | - | - | - | - | 1 | 6 | 7 | |
| Avg Monthly Benefit | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ 17,848 | \$ 5,654 | | \$ 7,396 |

Appendix D Member Contribution Rates

This section illustrates the member normal contribution rates and the normal plus cost-of-living contribution rates by entry age.

Exhibit D-1
Normal Member Contribution Rates

| Entry Age | General | | | | | Safety | | |
|-----------|---------|--------|--------|--------|--------|--------|--------|--------|
| | Plan A | Plan B | Plan C | Plan D | Plan G | Plan A | Plan B | Plan C |
| 16 | 2.68% | 5.36% | 4.57% | 4.57% | 7.36% | 4.17% | 8.34% | 11.27% |
| 17 | 2.74% | 5.48% | 4.66% | 4.66% | 7.36% | 4.17% | 8.34% | 11.27% |
| 18 | 2.80% | 5.59% | 4.76% | 4.76% | 7.36% | 4.17% | 8.34% | 11.27% |
| 19 | 2.86% | 5.71% | 4.87% | 4.87% | 7.36% | 4.25% | 8.50% | 11.27% |
| 20 | 2.92% | 5.83% | 4.97% | 4.97% | 7.36% | 4.34% | 8.67% | 11.27% |
| 21 | 2.98% | 5.95% | 5.07% | 5.07% | 7.36% | 4.42% | 8.85% | 11.27% |
| 22 | 3.04% | 6.08% | 5.18% | 5.18% | 7.36% | 4.51% | 9.03% | 11.27% |
| 23 | 3.10% | 6.21% | 5.29% | 5.29% | 7.36% | 4.61% | 9.21% | 11.27% |
| 24 | 3.17% | 6.34% | 5.40% | 5.40% | 7.36% | 4.70% | 9.40% | 11.27% |
| 25 | 3.24% | 6.47% | 5.52% | 5.52% | 7.36% | 4.74% | 9.48% | 11.27% |
| 26 | 3.30% | 6.61% | 5.63% | 5.63% | 7.36% | 4.78% | 9.55% | 11.27% |
| 27 | 3.37% | 6.75% | 5.75% | 5.75% | 7.36% | 4.87% | 9.75% | 11.27% |
| 28 | 3.45% | 6.89% | 5.87% | 5.87% | 7.36% | 4.97% | 9.95% | 11.27% |
| 29 | 3.52% | 7.04% | 6.00% | 6.00% | 7.36% | 5.08% | 10.15% | 11.27% |
| 30 | 3.59% | 7.19% | 6.12% | 6.12% | 7.36% | 5.14% | 10.28% | 11.27% |
| 31 | 3.67% | 7.34% | 6.25% | 6.25% | 7.36% | 5.20% | 10.40% | 11.27% |
| 32 | 3.75% | 7.50% | 6.38% | 6.38% | 7.36% | 5.31% | 10.61% | 11.27% |
| 33 | 3.83% | 7.66% | 6.52% | 6.52% | 7.36% | 5.41% | 10.83% | 11.27% |
| 34 | 3.91% | 7.82% | 6.66% | 6.66% | 7.36% | 5.52% | 11.04% | 11.27% |
| 35 | 3.99% | 7.98% | 6.80% | 6.80% | 7.36% | 5.63% | 11.27% | 11.27% |
| 36 | 4.07% | 8.14% | 6.95% | 6.95% | 7.36% | 5.75% | 11.49% | 11.27% |
| 37 | 4.15% | 8.30% | 7.10% | 7.10% | 7.36% | 5.86% | 11.72% | 11.27% |
| 38 | 4.23% | 8.47% | 7.25% | 7.25% | 7.36% | 5.98% | 11.95% | 11.27% |
| 39 | 4.32% | 8.63% | 7.40% | 7.40% | 7.36% | 6.09% | 12.19% | 11.27% |
| 40 | 4.40% | 8.80% | 7.55% | 7.55% | 7.36% | 6.21% | 12.43% | 11.27% |
| 41 | 4.49% | 8.97% | 7.70% | 7.70% | 7.36% | 6.34% | 12.67% | 11.27% |
| 42 | 4.57% | 9.15% | 7.85% | 7.85% | 7.36% | 6.45% | 12.91% | 11.27% |
| 43 | 4.66% | 9.32% | 8.01% | 8.01% | 7.36% | 6.56% | 13.12% | 11.27% |
| 44 | 4.75% | 9.49% | 8.17% | 8.17% | 7.36% | 6.65% | 13.30% | 11.27% |
| 45 | 4.83% | 9.66% | 8.33% | 8.33% | 7.36% | 6.70% | 13.40% | 11.27% |
| 46 | 4.91% | 9.83% | 8.49% | 8.49% | 7.36% | 6.70% | 13.40% | 11.27% |
| 47 | 4.99% | 9.97% | 8.66% | 8.66% | 7.36% | 6.70% | 13.40% | 11.27% |
| 48 | 5.04% | 10.09% | 8.82% | 8.82% | 7.36% | 6.70% | 13.40% | 11.27% |
| 49 | 5.09% | 10.18% | 8.98% | 8.98% | 7.36% | 6.70% | 13.40% | 11.27% |
| 50 | 5.12% | 10.23% | 9.14% | 9.14% | 7.36% | 6.70% | 13.40% | 11.27% |
| 51 | 5.13% | 10.25% | 9.30% | 9.30% | 7.36% | 6.70% | 13.40% | 11.27% |
| 52 | 5.13% | 10.25% | 9.43% | 9.43% | 7.36% | 6.70% | 13.40% | 11.27% |
| 53 | 5.13% | 10.25% | 9.54% | 9.54% | 7.36% | 6.70% | 13.40% | 11.27% |
| 54 | 5.13% | 10.25% | 9.63% | 9.63% | 7.36% | 6.70% | 13.40% | 11.27% |
| 55 | 5.13% | 10.25% | 9.68% | 9.68% | 7.36% | 6.70% | 13.40% | 11.27% |
| 56 | 5.13% | 10.25% | 9.70% | 9.70% | 7.36% | 6.70% | 13.40% | 11.27% |
| 57 | 5.13% | 10.25% | 9.70% | 9.70% | 7.36% | 6.70% | 13.40% | 11.27% |
| 58 | 5.13% | 10.25% | 9.70% | 9.70% | 7.36% | 6.70% | 13.40% | 11.27% |
| 59 | 5.13% | 10.25% | 9.70% | 9.70% | 7.36% | 6.70% | 13.40% | 11.27% |
| 60 | 5.13% | 10.25% | 9.70% | 9.70% | 7.36% | 6.70% | 13.40% | 11.27% |

Exhibit D-2
Normal Plus Cost-of-Living Member Contribution Rates

| Entry Age | General | | | | | Safety | | |
|-----------|---------|--------|--------|--------|--------|--------|--------|--------|
| | Plan A | Plan B | Plan C | Plan D | Plan G | Plan A | Plan B | Plan C |
| 16 | 4.94% | 6.75% | 5.80% | 5.76% | 9.11% | 7.80% | 11.09% | 14.54% |
| 17 | 5.05% | 6.90% | 5.91% | 5.87% | 9.11% | 7.80% | 11.09% | 14.54% |
| 18 | 5.16% | 7.04% | 6.04% | 5.99% | 9.11% | 7.80% | 11.09% | 14.54% |
| 19 | 5.28% | 7.19% | 6.18% | 6.13% | 9.11% | 7.95% | 11.31% | 14.54% |
| 20 | 5.39% | 7.34% | 6.30% | 6.26% | 9.11% | 8.12% | 11.53% | 14.54% |
| 21 | 5.50% | 7.49% | 6.43% | 6.39% | 9.11% | 8.27% | 11.77% | 14.54% |
| 22 | 5.61% | 7.65% | 6.57% | 6.52% | 9.11% | 8.44% | 12.01% | 14.54% |
| 23 | 5.72% | 7.82% | 6.71% | 6.66% | 9.11% | 8.63% | 12.25% | 14.54% |
| 24 | 5.85% | 7.98% | 6.85% | 6.80% | 9.11% | 8.80% | 12.50% | 14.54% |
| 25 | 5.98% | 8.15% | 7.00% | 6.95% | 9.11% | 8.87% | 12.61% | 14.54% |
| 26 | 6.09% | 8.32% | 7.14% | 7.09% | 9.11% | 8.95% | 12.70% | 14.54% |
| 27 | 6.22% | 8.50% | 7.29% | 7.24% | 9.11% | 9.11% | 12.97% | 14.54% |
| 28 | 6.36% | 8.67% | 7.44% | 7.39% | 9.11% | 9.30% | 13.24% | 14.54% |
| 29 | 6.49% | 8.86% | 7.61% | 7.56% | 9.11% | 9.51% | 13.50% | 14.54% |
| 30 | 6.62% | 9.05% | 7.76% | 7.71% | 9.11% | 9.62% | 13.68% | 14.54% |
| 31 | 6.77% | 9.24% | 7.93% | 7.87% | 9.11% | 9.73% | 13.84% | 14.54% |
| 32 | 6.92% | 9.44% | 8.09% | 8.03% | 9.11% | 9.94% | 14.11% | 14.54% |
| 33 | 7.06% | 9.64% | 8.27% | 8.21% | 9.11% | 10.12% | 14.41% | 14.54% |
| 34 | 7.21% | 9.85% | 8.45% | 8.39% | 9.11% | 10.33% | 14.69% | 14.54% |
| 35 | 7.36% | 10.05% | 8.62% | 8.56% | 9.11% | 10.54% | 14.99% | 14.54% |
| 36 | 7.51% | 10.25% | 8.81% | 8.75% | 9.11% | 10.76% | 15.29% | 14.54% |
| 37 | 7.66% | 10.45% | 9.00% | 8.94% | 9.11% | 10.97% | 15.59% | 14.54% |
| 38 | 7.80% | 10.66% | 9.19% | 9.13% | 9.11% | 11.19% | 15.90% | 14.54% |
| 39 | 7.97% | 10.87% | 9.38% | 9.32% | 9.11% | 11.40% | 16.22% | 14.54% |
| 40 | 8.12% | 11.08% | 9.57% | 9.51% | 9.11% | 11.62% | 16.54% | 14.54% |
| 41 | 8.28% | 11.29% | 9.76% | 9.70% | 9.11% | 11.87% | 16.85% | 14.54% |
| 42 | 8.43% | 11.52% | 9.95% | 9.89% | 9.11% | 12.07% | 17.17% | 14.54% |
| 43 | 8.60% | 11.73% | 10.16% | 10.09% | 9.11% | 12.28% | 17.45% | 14.54% |
| 44 | 8.76% | 11.95% | 10.36% | 10.29% | 9.11% | 12.45% | 17.69% | 14.54% |
| 45 | 8.91% | 12.16% | 10.56% | 10.49% | 9.11% | 12.54% | 17.83% | 14.54% |
| 46 | 9.06% | 12.38% | 10.77% | 10.69% | 9.11% | 12.54% | 17.83% | 14.54% |
| 47 | 9.20% | 12.55% | 10.98% | 10.91% | 9.11% | 12.54% | 17.83% | 14.54% |
| 48 | 9.30% | 12.70% | 11.18% | 11.11% | 9.11% | 12.54% | 17.83% | 14.54% |
| 49 | 9.39% | 12.82% | 11.39% | 11.31% | 9.11% | 12.54% | 17.83% | 14.54% |
| 50 | 9.44% | 12.88% | 11.59% | 11.51% | 9.11% | 12.54% | 17.83% | 14.54% |
| 51 | 9.46% | 12.90% | 11.79% | 11.71% | 9.11% | 12.54% | 17.83% | 14.54% |
| 52 | 9.46% | 12.90% | 11.96% | 11.88% | 9.11% | 12.54% | 17.83% | 14.54% |
| 53 | 9.46% | 12.90% | 12.10% | 12.01% | 9.11% | 12.54% | 17.83% | 14.54% |
| 54 | 9.46% | 12.90% | 12.21% | 12.13% | 9.11% | 12.54% | 17.83% | 14.54% |
| 55 | 9.46% | 12.90% | 12.28% | 12.19% | 9.11% | 12.54% | 17.83% | 14.54% |
| 56 | 9.46% | 12.90% | 12.30% | 12.22% | 9.11% | 12.54% | 17.83% | 14.54% |
| 57 | 9.46% | 12.90% | 12.30% | 12.22% | 9.11% | 12.54% | 17.83% | 14.54% |
| 58 | 9.46% | 12.90% | 12.30% | 12.22% | 9.11% | 12.54% | 17.83% | 14.54% |
| 59 | 9.46% | 12.90% | 12.30% | 12.22% | 9.11% | 12.54% | 17.83% | 14.54% |
| 60 | 9.46% | 12.90% | 12.30% | 12.22% | 9.11% | 12.54% | 17.83% | 14.54% |

Appendix E Historical Information

This section presents historical statistical information on LACERA's membership and the calculated contribution rates.

Exhibit E-1
Active Membership Data

| General Members | | | | | | Safety Members | | | | | Total Members | | | | |
|--------------------------|--------|-----------------------------|-------------|-----------------|------------------------|----------------|-----------------------------|-------------|-----------------|------------------------|---------------|-----------------------------|-------------|-----------------|------------------------|
| Valuation Date (June 30) | Number | Annual Salary (in millions) | Average Age | Average Service | Average Monthly Salary | Number | Annual Salary (in millions) | Average Age | Average Service | Average Monthly Salary | Number | Annual Salary (in millions) | Average Age | Average Service | Average Monthly Salary |
| 1998 | 65,782 | \$ 2,837 | 44.7 | 12.9 | \$ 3,594 | 10,947 | \$ 725 | 39.9 | 13.8 | \$ 5,519 | 76,729 | \$ 3,562 | 44.0 | 13.0 | \$ 3,870 |
| 1999 | 68,652 | \$ 3,105 | 44.6 | 12.7 | \$ 3,769 | 11,024 | \$ 753 | 40.0 | 13.7 | \$ 5,696 | 79,676 | \$ 3,858 | 43.9 | 12.8 | \$ 4,035 |
| 2000 | 71,940 | \$ 3,353 | 44.4 | 12.5 | \$ 3,884 | 11,264 | \$ 790 | 39.8 | 13.8 | \$ 5,849 | 83,204 | \$ 4,143 | 43.8 | 12.6 | \$ 4,150 |
| 2001 | 75,048 | \$ 3,608 | 44.5 | 12.3 | \$ 4,006 | 12,021 | \$ 860 | 39.6 | 13.0 | \$ 5,967 | 87,069 | \$ 4,468 | 43.9 | 12.4 | \$ 4,277 |
| 2002 | 77,062 | \$ 3,833 | 44.7 | 12.3 | \$ 4,145 | 12,190 | \$ 894 | 39.6 | 13.8 | \$ 6,115 | 89,252 | \$ 4,727 | 44.0 | 12.5 | \$ 4,414 |
| 2003 | 75,995 | \$ 3,954 | 45.2 | 12.7 | \$ 4,336 | 11,765 | \$ 899 | 40.1 | 13.7 | \$ 6,370 | 87,760 | \$ 4,853 | 44.5 | 12.9 | \$ 4,609 |
| 2004 | 74,826 | \$ 3,967 | 45.6 | 13.1 | \$ 4,418 | 11,409 | \$ 885 | 40.6 | 14.7 | \$ 6,467 | 86,235 | \$ 4,852 | 44.9 | 13.3 | \$ 4,689 |
| 2005 | 75,167 | \$ 4,046 | 45.8 | 13.2 | \$ 4,486 | 11,217 | \$ 905 | 41.0 | 14.9 | \$ 6,722 | 86,384 | \$ 4,951 | 45.2 | 13.4 | \$ 4,777 |
| 2006 | 77,167 | \$ 4,267 | 45.7 | 13.0 | \$ 4,608 | 11,464 | \$ 969 | 41.2 | 15.0 | \$ 7,047 | 88,631 | \$ 5,236 | 45.1 | 13.3 | \$ 4,924 |
| 2007 | 79,829 | \$ 4,673 | 45.7 | 12.8 | \$ 4,878 | 12,267 | \$ 1,104 | 40.8 | 14.4 | \$ 7,499 | 92,096 | \$ 5,777 | 45.1 | 13.0 | \$ 5,227 |
| 2008 | 81,664 | \$ 5,017 | 45.8 | 12.8 | \$ 5,119 | 12,828 | \$ 1,187 | 40.5 | 13.7 | \$ 7,714 | 94,492 | \$ 6,204 | 45.1 | 12.9 | \$ 5,471 |
| 2009 | 82,878 | \$ 5,348 | 46.1 | 13.1 | \$ 5,377 | 12,910 | \$ 1,240 | 40.8 | 14.0 | \$ 8,002 | 95,788 | \$ 6,588 | 45.4 | 13.2 | \$ 5,731 |
| 2010 | 81,413 | \$ 5,318 | 46.6 | 13.6 | \$ 5,444 | 12,997 | \$ 1,257 | 41.3 | 14.5 | \$ 8,062 | 94,410 | \$ 6,575 | 45.9 | 13.7 | \$ 5,804 |
| 2011 | 80,145 | \$ 5,295 | 47.0 | 14.0 | \$ 5,506 | 12,641 | \$ 1,240 | 41.9 | 15.1 | \$ 8,172 | 92,786 | \$ 6,535 | 46.3 | 14.2 | \$ 5,869 |
| 2012 | 79,467 | \$ 5,272 | 47.3 | 14.4 | \$ 5,528 | 12,485 | \$ 1,230 | 42.3 | 15.5 | \$ 8,209 | 91,952 | \$ 6,502 | 46.7 | 14.6 | \$ 5,892 |
| 2013 | 79,006 | \$ 5,253 | 47.6 | 14.8 | \$ 5,541 | 12,539 | \$ 1,235 | 42.3 | 15.7 | \$ 8,207 | 91,545 | \$ 6,488 | 46.9 | 14.9 | \$ 5,906 |
| 2014 | 79,943 | \$ 5,488 | 47.6 | 14.9 | \$ 5,720 | 12,523 | \$ 1,253 | 42.6 | 15.8 | \$ 8,337 | 92,466 | \$ 6,741 | 47.0 | 15.0 | \$ 6,075 |
| 2015 | 81,228 | \$ 5,706 | 47.6 | 14.8 | \$ 5,854 | 12,446 | \$ 1,300 | 42.8 | 16.0 | \$ 8,702 | 93,674 | \$ 7,006 | 46.9 | 15.0 | \$ 6,233 |
| 2016 | 82,916 | \$ 5,950 | 47.4 | 14.6 | \$ 5,980 | 12,528 | \$ 1,343 | 42.8 | 16.0 | \$ 8,931 | 95,444 | \$ 7,293 | 46.8 | 14.8 | \$ 6,367 |
| 2017 | 84,513 | \$ 6,290 | 47.3 | 14.5 | \$ 6,202 | 12,698 | \$ 1,388 | 42.5 | 15.6 | \$ 9,110 | 97,211 | \$ 7,678 | 46.7 | 14.6 | \$ 6,582 |
| 2018 | 85,703 | \$ 6,610 | 47.2 | 14.4 | \$ 6,428 | 12,771 | \$ 1,452 | 42.2 | 15.3 | \$ 9,471 | 98,474 | \$ 8,062 | 46.6 | 14.5 | \$ 6,822 |
| 2019 | 86,392 | \$ 6,816 | 47.3 | 14.4 | \$ 6,574 | 12,794 | \$ 1,540 | 42.0 | 15.1 | \$ 10,032 | 99,186 | \$ 8,356 | 46.6 | 14.5 | \$ 7,020 |

**Exhibit E-2
Retired Membership Data**

| General Members | | | | | Safety Members | | | | Total Members | | | |
|-----------------------------|--------|-----------------------------------|-------------|-------------------------|----------------|-----------------------------------|-------------|-------------------------|---------------|-----------------------------------|-------------|-------------------------|
| Valuation Date (June 30) | Number | Annual Allowance (in millions) | Average Age | Average Monthly Benefit | Number | Annual Allowance (in millions) | Average Age | Average Monthly Benefit | Number | Annual Allowance (in millions) | Average Age | Average Monthly Benefit |
| 1998 | 35,462 | \$ 692 | 71.1 | \$ 1,626 | 7,425 | \$ 267 | 62.5 | \$ 3,001 | 42,887 | \$ 959 | 69.6 | \$ 1,864 |
| 1999 | 35,837 | \$ 725 | 71.4 | \$ 1,686 | 7,674 | \$ 291 | 63.1 | \$ 3,166 | 43,511 | \$ 1,016 | 70.0 | \$ 1,947 |
| 2000 | 36,596 | \$ 780 | 71.4 | \$ 1,778 | 8,032 | \$ 324 | 63.1 | \$ 3,358 | 44,628 | \$ 1,104 | 69.9 | \$ 2,062 |
| 2001 | 37,077 | \$ 890 | 71.6 | \$ 2,001 | 8,319 | \$ 382 | 63.4 | \$ 3,828 | 45,396 | \$ 1,272 | 70.1 | \$ 2,336 |
| 2002 | 37,618 | \$ 914 | 71.8 | \$ 2,025 | 8,624 | \$ 403 | 63.7 | \$ 3,892 | 46,242 | \$ 1,317 | 70.3 | \$ 2,374 |
| 2003 | 38,283 | \$ 984 | 71.9 | \$ 2,142 | 8,949 | \$ 443 | 63.9 | \$ 4,128 | 47,232 | \$ 1,427 | 70.4 | \$ 2,518 |
| 2004 | 39,097 | \$ 1,056 | 72.0 | \$ 2,250 | 9,235 | \$ 478 | 64.2 | \$ 4,318 | 48,332 | \$ 1,534 | 70.5 | \$ 2,645 |
| 2005 | 40,251 | \$ 1,138 | 72.1 | \$ 2,355 | 9,518 | \$ 514 | 64.6 | \$ 4,504 | 49,769 | \$ 1,652 | 70.7 | \$ 2,766 |
| 2006 | 41,309 | \$ 1,224 | 72.2 | \$ 2,469 | 9,683 | \$ 549 | 65.0 | \$ 4,728 | 50,992 | \$ 1,773 | 70.8 | \$ 2,898 |
| 2007 | 41,584 | \$ 1,280 | 72.2 | \$ 2,565 | 9,808 | \$ 578 | 65.4 | \$ 4,914 | 51,392 | \$ 1,858 | 70.9 | \$ 3,013 |
| 2008 | 42,298 | \$ 1,356 | 72.4 | \$ 2,671 | 10,052 | \$ 623 | 65.8 | \$ 5,167 | 52,350 | \$ 1,979 | 71.1 | \$ 3,150 |
| 2009 | 42,825 | \$ 1,423 | 72.6 | \$ 2,768 | 10,244 | \$ 663 | 66.3 | \$ 5,394 | 53,069 | \$ 2,086 | 71.4 | \$ 3,275 |
| 2010 | 43,752 | \$ 1,514 | 72.7 | \$ 2,883 | 10,444 | \$ 706 | 66.7 | \$ 5,638 | 54,196 | \$ 2,220 | 71.6 | \$ 3,414 |
| 2011 | 44,726 | \$ 1,597 | 72.9 | \$ 2,976 | 10,645 | \$ 746 | 67.0 | \$ 5,836 | 55,371 | \$ 2,343 | 71.7 | \$ 3,526 |
| 2012 | 45,899 | \$ 1,686 | 73.0 | \$ 3,061 | 10,871 | \$ 789 | 67.3 | \$ 6,049 | 56,770 | \$ 2,475 | 71.9 | \$ 3,633 |
| 2013 | 46,939 | \$ 1,774 | 73.2 | \$ 3,149 | 11,147 | \$ 837 | 67.5 | \$ 6,261 | 58,086 | \$ 2,611 | 72.1 | \$ 3,746 |
| 2014 | 47,867 | \$ 1,836 | 73.4 | \$ 3,196 | 11,362 | \$ 876 | 67.8 | \$ 6,427 | 59,229 | \$ 2,712 | 72.3 | \$ 3,816 |
| 2015 | 48,958 | \$ 1,898 | 73.5 | \$ 3,231 | 11,648 | \$ 914 | 68.0 | \$ 6,541 | 60,606 | \$ 2,813 | 72.5 | \$ 3,867 |
| 2016 | 50,034 | \$ 1,988 | 73.6 | \$ 3,311 | 11,880 | \$ 965 | 68.3 | \$ 6,766 | 61,914 | \$ 2,952 | 72.6 | \$ 3,974 |
| 2017 | 51,083 | \$ 2,079 | 73.8 | \$ 3,391 | 12,241 | \$ 1,030 | 68.4 | \$ 7,012 | 63,324 | \$ 3,109 | 72.7 | \$ 4,091 |
| 2018 | 52,292 | \$ 2,192 | 73.9 | \$ 3,493 | 12,588 | \$ 1,104 | 68.5 | \$ 7,308 | 64,880 | \$ 3,296 | 72.8 | \$ 4,233 |
| 2019 | 53,560 | \$ 2,316 | 73.9 | \$ 3,603 | 12,947 | \$ 1,184 | 68.6 | \$ 7,620 | 66,507 | \$ 3,500 | 72.9 | \$ 4,385 |

Exhibit E-3
Contribution Rates

| Valuation Date (June 30) | General Plans | | | | | Safety Plans | | | | | Total All Plans | | | | |
|-----------------------------|------------------------|----------------------|--------------------------|-----------|-----------------------------|------------------------|----------------------|--------------------------|-----------|-----------------------------|------------------------|----------------------|--------------------------|-----------|-----------------------------|
| | Calculated Normal Cost | Member Contributions | Net Employer Normal Cost | UAAL Rate | Total Employer Contribution | Calculated Normal Cost | Member Contributions | Net Employer Normal Cost | UAAL Rate | Total Employer Contribution | Calculated Normal Cost | Member Contributions | Net Employer Normal Cost | UAAL Rate | Total Employer Contribution |
| 1998 | 10.27% | 3.06% | 7.21% | 0.00% | 7.21% | 25.00% | 8.70% | 16.30% | 0.00% | 16.30% | 13.27% | 4.21% | 9.06% | 0.00% | 9.06% |
| 1999 | 10.98% | 3.20% | 7.78% | 0.00% | 7.78% | 25.41% | 9.12% | 16.29% | 0.00% | 16.29% | 13.81% | 4.36% | 9.45% | 0.00% | 9.45% |
| 2000 | 10.91% | 3.33% | 7.58% | 0.00% | 7.58% | 25.22% | 9.44% | 15.78% | 0.00% | 15.78% | 13.66% | 4.51% | 9.15% | 0.00% | 9.15% |
| 2001 | 11.27% | 3.45% | 7.82% | 0.00% | 7.82% | 25.47% | 9.27% | 16.20% | 0.00% | 16.20% | 14.01% | 4.57% | 9.44% | 0.00% | 9.44% |
| 2002 | 12.04% | 3.53% | 8.51% | 0.21% | 8.72% | 25.92% | 9.37% | 16.55% | 0.21% | 16.76% | 14.66% | 4.63% | 10.03% | 0.21% | 10.24% |
| 2003 | 12.25% | 3.72% | 8.53% | 4.66% | 13.19% | 25.89% | 9.55% | 16.34% | 4.66% | 21.00% | 14.80% | 4.81% | 9.99% | 4.66% | 14.65% |
| 2004 | 12.20% | 3.82% | 8.38% | 6.41% | 14.79% | 24.61% | 9.61% | 15.00% | 6.41% | 21.41% | 14.48% | 4.88% | 9.60% | 6.41% | 16.01% |
| 2005 | 12.22% | 3.91% | 8.31% | 5.33% | 13.64% | 24.69% | 9.68% | 15.01% | 5.33% | 20.34% | 14.50% | 4.97% | 9.53% | 5.33% | 14.86% |
| 2006 | 12.22% | 4.07% | 8.15% | 3.49% | 11.64% | 24.70% | 9.70% | 15.00% | 3.49% | 18.49% | 14.54% | 5.12% | 9.42% | 3.49% | 12.91% |
| 2007 | 13.15% | 4.38% | 8.77% | 2.24% | 11.01% | 26.04% | 10.18% | 15.86% | 2.24% | 18.10% | 15.67% | 5.51% | 10.16% | 2.24% | 12.40% |
| 2008 | 13.18% | 4.47% | 8.71% | 1.99% | 10.70% | 26.01% | 10.22% | 15.79% | 1.99% | 17.78% | 15.68% | 5.59% | 10.09% | 1.99% | 12.08% |
| 2009 | 13.29% | 4.57% | 8.72% | 4.12% | 12.84% | 26.08% | 10.21% | 15.87% | 4.12% | 19.99% | 15.75% | 5.65% | 10.10% | 4.12% | 14.22% |
| 2010 | 13.32% | 4.68% | 8.64% | 6.47% | 15.11% | 25.00% | 10.19% | 14.81% | 6.47% | 21.28% | 15.59% | 5.75% | 9.84% | 6.47% | 16.31% |
| 2011 | 13.36% | 4.91% | 8.45% | 7.89% | 16.34% | 25.09% | 10.50% | 14.59% | 7.89% | 22.48% | 15.65% | 6.00% | 9.65% | 7.89% | 17.54% |
| 2012 | 13.50% | 5.01% | 8.49% | 10.09% | 18.58% | 25.42% | 10.52% | 14.90% | 10.09% | 24.99% | 15.81% | 6.08% | 9.73% | 10.09% | 19.82% |
| 2013 | 13.25% | 5.01% | 8.24% | 11.90% | 20.14% | 24.67% | 10.26% | 14.41% | 11.90% | 26.31% | 15.47% | 6.03% | 9.44% | 11.90% | 21.34% |
| 2014 | 13.14% | 5.09% | 8.05% | 10.04% | 18.09% | 24.71% | 10.23% | 14.48% | 10.04% | 24.52% | 15.37% | 6.08% | 9.29% | 10.04% | 19.33% |
| 2015 | 13.28% | 5.22% | 8.06% | 8.49% | 16.55% | 24.71% | 10.26% | 14.45% | 8.49% | 22.94% | 15.46% | 6.18% | 9.28% | 8.49% | 17.77% |
| 2016 | 14.51% | 5.72% | 8.79% | 9.73% | 18.52% | 25.54% | 10.57% | 14.97% | 9.73% | 24.70% | 16.62% | 6.65% | 9.97% | 9.73% | 19.70% |
| 2017 | 14.62% | 5.87% | 8.75% | 10.10% | 18.85% | 25.69% | 10.56% | 15.13% | 10.10% | 25.23% | 16.70% | 6.76% | 9.94% | 10.10% | 20.04% |
| 2018 | 14.77% | 6.04% | 8.73% | 10.99% | 19.72% | 25.70% | 10.59% | 15.11% | 10.99% | 26.10% | 16.80% | 6.88% | 9.92% | 10.99% | 20.91% |
| 2019 | 16.24% | 6.74% | 9.50% | 11.73% | 21.23% | 28.58% | 11.78% | 16.80% | 11.73% | 28.53% | 18.54% | 7.68% | 10.86% | 11.73% | 22.59% |

**Exhibit E-4
Funded Status History**

(Dollars in Millions)

| Valuation Year | Actuarial Accrued Liability (AAL) | Market Value Basis | | | Actuarial Value Basis | | | Annual Total Payroll | Asset Smoothing Ratio (AVA / MVA) | Asset Volatility Ratio (MVA / Payroll) | Liability Volatility Ratio (AAL / Payroll) |
|-------------------|--|--|---|------------------------------|---|---|------------------------------|----------------------------|--|--|--|
| | | Market Value of Assets (MVA) ¹ | Unfunded AAL (UAAL)/Surplus MVA Basis | Funded Ratio MVA Basis | Actuarial Value of Assets (AVA) ¹ | Unfunded AAL (UAAL)/Surplus AVA Basis | Funded Ratio AVA Basis | | | | |
| 1996 ² | 17,300 | 18,600 | 1,300 | 107.5% | 17,700 | 400 | 102.3% | 3,356 | 95.2% | 5.5 | 5.2 |
| 1997 ² | 19,300 | 21,100 | 1,800 | 109.3% | 19,600 | 300 | 101.6% | 3,373 | 92.9% | 6.3 | 5.7 |
| 1998 | 20,960 | 22,332 | 1,372 | 106.5% | 20,851 | (109) | 99.5% | 3,562 | 93.4% | 6.3 | 5.9 |
| 1999 | 22,785 | 24,382 | 1,597 | 107.0% | 23,536 | 751 | 103.3% | 3,858 | 96.5% | 6.3 | 5.9 |
| 2000 | 24,721 | 27,257 | 2,536 | 110.3% | 25,427 | 706 | 102.9% | 4,143 | 93.3% | 6.6 | 6.0 |
| 2001 | 26,490 | 23,916 | (2,574) | 90.3% | 26,490 | - | 100.0% | 4,469 | 110.8% | 5.4 | 5.9 |
| 2002 | 28,437 | 24,085 | (4,352) | 84.7% | 28,262 | (175) | 99.4% | 4,730 | 117.3% | 5.1 | 6.0 |
| 2003 | 30,474 | 24,616 | (5,858) | 80.8% | 26,564 | (3,910) | 87.2% | 4,934 | 107.9% | 5.0 | 6.2 |
| 2004 | 32,700 | 28,094 | (4,606) | 85.9% | 27,089 | (5,611) | 82.8% | 4,942 | 96.4% | 5.7 | 6.6 |
| 2005 | 34,375 | 30,904 | (3,471) | 89.9% | 29,497 | (4,878) | 85.8% | 5,051 | 95.4% | 6.1 | 6.8 |
| 2006 | 36,259 | 34,256 | (2,003) | 94.5% | 32,820 | (3,439) | 90.5% | 5,333 | 95.8% | 6.4 | 6.8 |
| 2007 | 39,503 | 40,073 | 570 | 101.4% | 37,042 | (2,461) | 93.8% | 5,886 | 92.4% | 6.8 | 6.7 |
| 2008 | 41,975 | 37,834 | (4,141) | 90.1% | 39,662 | (2,313) | 94.5% | 6,257 | 104.8% | 6.0 | 6.7 |
| 2009 | 44,469 | 29,723 | (14,746) | 66.8% | 39,542 | (4,927) | 88.9% | 6,673 | 133.0% | 4.5 | 6.7 |
| 2010 | 46,646 | 32,629 | (14,017) | 69.9% | 38,839 | (7,807) | 83.3% | 6,739 | 119.0% | 4.8 | 6.9 |
| 2011 | 48,599 | 38,587 | (10,012) | 79.4% | 39,194 | (9,405) | 80.6% | 6,705 | 101.6% | 5.8 | 7.2 |
| 2012 | 50,809 | 37,453 | (13,356) | 73.7% | 39,039 | (11,770) | 76.8% | 6,675 | 104.2% | 5.6 | 7.6 |
| 2013 | 53,247 | 41,334 | (11,913) | 77.6% | 39,932 | (13,315) | 75.0% | 6,656 | 96.6% | 6.2 | 8.0 |
| 2014 | 54,942 | 47,223 | (7,719) | 86.0% | 43,654 | (11,288) | 79.5% | 6,815 | 92.4% | 6.9 | 8.1 |
| 2015 | 56,819 | 48,308 | (8,511) | 85.0% | 47,328 | (9,491) | 83.3% | 7,078 | 98.0% | 6.8 | 8.0 |
| 2016 | 62,199 | 47,347 | (14,852) | 76.1% | 49,358 | (12,841) | 79.4% | 7,390 | 104.2% | 6.4 | 8.4 |
| 2017 | 65,311 | 52,217 | (13,094) | 80.0% | 52,166 | (13,145) | 79.9% | 7,749 | 99.9% | 6.7 | 8.4 |
| 2018 | 68,527 | 55,737 | (12,790) | 81.3% | 55,233 | (13,294) | 80.6% | 8,079 | 99.1% | 6.9 | 8.5 |
| 2019 | 74,635 | 57,712 | (16,923) | 77.3% | 57,617 | (17,018) | 77.2% | 8,423 | 99.8% | 6.9 | 8.9 |

1. Asset values exclude non-valuation reserves

2. Only rounded values are available.

Exhibit E-5
Reconciliation of Changes in Unfunded Actuarial Accrued Liability or Surplus

(Dollars in Millions)

| Valuation Year | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Prior Year UAAL | 4,927 | 7,807 | 9,405 | 11,770 | 13,315 | 11,288 | 9,491 | 12,841 | 13,145 | 13,294 |
| Normal Cost | 1,219 | 1,200 | 1,237 | 1,430 | 1,163 | 1,068 | 1,118 | 1,246 | 1,243 | 1,352 |
| Contributions | (1,322) | (1,461) | (1,646) | (1,455) | (1,824) | (1,936) | (1,902) | (1,880) | (2,116) | (2,303) |
| Interest | 382 | 605 | 724 | 895 | 999 | 814 | 682 | 954 | 968 | 976 |
| Changes in Assumptions/Methodology | 54 | 221 | 457 | 511 | - | - | 2,922 | - | - | 2,528 |
| Changes in Benefit Provisions | - | - | - | - | - | - | - | - | - | - |
| Expected Current Year UAAL | 5,260 | 8,372 | 10,177 | 13,151 | 13,653 | 11,234 | 12,311 | 13,161 | 13,240 | 15,847 |
| Actual Current Year UAAL | 7,807 | 9,405 | 11,770 | 13,315 | 11,288 | 9,491 | 12,841 | 13,145 | 13,294 | 17,018 |
| Total (Gain)/Loss on UAAL | 2,547 | 1,033 | 1,593 | 164 | (2,365) | (1,743) | 530 | (16) | 54 | 1,171 |
| Asset (Gains)/Losses | 2,879 | 1,761 | 2,337 | 893 | (1,664) | (1,263) | 496 | (421) | (411) | 477 |
| Ventura Settlement/Court Cases | - | - | - | - | - | - | - | - | - | - |
| Salary Increases | (353) | (579) | (629) | (563) | (291) | 79 | 162 | 277 | 223 | 486 |
| All Other Actuarial (Gains)/Losses | 21 | (149) | (115) | (166) | (410) | (559) | (128) | 128 | 242 | 208 |

Exhibit E-6
Reconciliation of Changes in Calculated Employer Contribution Rate

| Valuation Year | Prior Year Contribution Rate | Changes in Existing Amortization Bases | Assumption/ Method Changes | Salary/Payroll Variations | Plan Amendments | Asset (Gains)/Losses | Demographic/Other (Gains)/Losses | Current Year Contribution Rate |
|----------------|------------------------------|--|----------------------------|---------------------------|------------------|----------------------|----------------------------------|--------------------------------|
| 2004 | 14.65% | N/A ¹ | N/A ¹ | N/A ¹ | N/A ¹ | N/A ¹ | N/A ¹ | 16.01% |
| 2005 | 16.01% | N/A ¹ | N/A ¹ | N/A ¹ | N/A ¹ | N/A ¹ | N/A ¹ | 14.86% |
| 2006 | 14.86% | -0.29% | 0.00% | 0.02% | 0.00% | -1.82% | 0.14% | 12.91% |
| 2007 | 12.91% | -0.28% | 1.34% | 0.61% | 0.00% | -2.14% | -0.04% | 12.40% |
| 2008 | 12.40% | -0.17% | 0.00% | 0.21% | 0.00% | -0.24% | -0.12% | 12.08% |
| 2009 | 12.08% | -0.04% | -1.76% | 0.21% | 0.00% | 3.91% | -0.18% | 14.22% |
| 2010 | 14.22% | 0.00% | -0.27% | -0.10% | 0.00% | 2.29% | 0.17% | 16.31% |
| 2011 | 16.31% | 0.00% | 0.25% | -0.14% | 0.00% | 1.39% | -0.27% | 17.54% |
| 2012 | 17.54% | 0.00% | 0.54% | -0.11% | 0.00% | 1.92% | -0.07% | 19.82% |
| 2013 | 19.82% | 0.00% | 0.82% | -0.01% | 0.00% | 0.74% | -0.03% | 21.34% |
| 2014 | 21.34% | 0.00% | 0.00% | -0.15% | 0.00% | -1.43% | -0.43% | 19.33% |
| 2015 | 19.33% | 0.00% | 0.00% | 0.04% | 0.00% | -1.04% | -0.56% | 17.77% |
| 2016 | 17.77% | 0.00% | 2.87% | 0.20% | 0.00% | 0.39% | -0.02% | 21.21% |
| 2017 | 21.21% | 0.00% | 0.00% | 0.05% | 0.00% | -0.32% | 0.06% | 21.00% |
| 2018 | 21.00% | 0.00% | 0.00% | 0.04% | 0.00% | -0.30% | 0.17% | 20.91% |
| 2019 | 20.91% | 0.00% | 1.10% | 0.20% | 0.00% | 0.42% | -0.04% | 22.59% |

1. Data not available.

**Exhibit E-7
Funding Policy History**

| | Description of changes, if any | Effective Date | Impact on Contribution Rate | Impact on Funded Ratio | Rationale |
|------|---|----------------|-----------------------------|------------------------|-------------------------------------|
| 2009 | Changed from 3-year to 5-year asset smoothing. Included STAR reserve as a valuation asset. Adopted 30-year layered amortization period. | June 30, 2009 | -1.68% ¹ | 4.40% | See June 30, 2009 valuation report. |
| 2010 | Included STAR reserve as a valuation asset. | June 30, 2010 | -0.52% ¹ | 1.40% | See June 30, 2010 valuation report. |
| 2011 | Included STAR reserve as a valuation asset. | June 30, 2011 | -0.52% ¹ | 1.20% | See June 30, 2011 valuation report. |
| 2012 | Included STAR reserve as a valuation asset for 2012 and future valuations (adopted February 2013). | June 30, 2012 | -0.53% ¹ | 1.20% | See June 30, 2012 valuation report. |
| 2019 | Adopted 20-year layered amortization period for new layers. Existing layers are set to be no greater than 22 years, so they are fully amortized no later than 2042. | June 30, 2019 | 0.30% | 0.00% | See June 30, 2019 valuation report. |

1. Note that savings due to inclusion of STAR reserve as valuation asset are not cumulative from year to year.

Exhibit E-8
History of Changes in Economic Assumptions

(Years with no changes excluded)

| Valuation Year | Price Inflation | Wage Inflation | Real Wage Inflation ¹ | Investment Return Assumption | Real Investment Return ² | Effective Date | Change in Contribution Rate | Change in Funded Ratio | Rationale |
|----------------|-----------------|----------------|----------------------------------|------------------------------|-------------------------------------|----------------|-----------------------------|------------------------|--|
| 2004 | 3.50% | 3.75% | 0.25% | 7.75% | 4.25% | July 1, 2004 | 1.65% | N/A ³ | See 2004 Investigation of Experience Report. |
| 2007 | 3.50% | 4.00% | 0.50% | 7.75% | 4.25% | July 1, 2007 | 0.66% | -1.3% | See 2007 Investigation of Experience Report. |
| 2011 | 3.45% | 3.95% | 0.50% | 7.70% | 4.25% | July 1, 2011 | 0.25% | -0.3% | See 2010 Investigation of Experience Report. |
| 2012 | 3.35% | 3.85% | 0.50% | 7.60% | 4.25% | July 1, 2012 | 0.54% | -0.7% | See 2010 Investigation of Experience Report. |
| 2013 | 3.00% | 3.50% | 0.50% | 7.50% | 4.50% | July 1, 2013 | 0.37% | -0.1% | See 2013 Investigation of Experience Report. |
| 2016 | 2.75% | 3.25% | 0.50% | 7.25% | 4.50% | July 1, 2016 | 1.14% | -1.4% | See 2016 Investigation of Experience Report. |
| 2019 | 2.75% | 3.25% | 0.50% | 7.00% | 4.25% | July 1, 2019 | 2.20% | -2.3% | 2019 Investigation of Experience. |

1. Excess of assumed wage inflation over price inflation.

2. Excess of assumed investment return over price inflation.

3. Information not available.

Exhibit E-9
History of Changes in Demographic and Other Non-Economic Assumptions

(Years with no changes excluded)

| | Demographic Assumption Revisions | Effective Date | Change in Contribution Rate | Change in Funded Ratio | Rationale |
|------|---|----------------|-----------------------------|------------------------|---|
| | Mortality, merit salary scale, retirement, termination, probability of refund, probability of eligible survivor | | | | |
| 2004 | revised. | July 1, 2004 | -0.63% | N/A ¹ | Refer to the 2004 Investigation of Experience Report. |
| 2007 | Mortality, retirement, termination, probability of refund, merit salary scale for Safety members revised. | July 1, 2007 | 0.68% | N/A ¹ | Refer to the 2007 Investigation of Experience Report. |
| 2010 | Mortality, retirement, termination, probability of refund, assumed benefit commencement age revised. | July 1, 2010 | -0.27% | -0.1% | Refer to the 2010 Investigation of Experience Report. |
| 2013 | Mortality, retirement, termination, probability of refund, merit salary scale for Safety members, probability of eligible survivor, assumption for beneficiary age, reciprocity assumption revised. | July 1, 2013 | 0.45% | -0.6% | Refer to the 2013 Investigation of Experience Report. |
| 2016 | Mortality, retirement, termination, probability of eligible survivor, assumed benefit commencement age, reciprocity assumption revised. | July 1, 2016 | 1.73% | -2.5% | Refer to the 2016 Investigation of Experience Report. |
| 2019 | Mortality, retirement, termination, probability of refund, merit salary scale, assumed benefit commencement age. | July 1, 2019 | 0.80% | -0.4% | 2019 Investigation of Experience. |

1. Information not available.

Appendix F Glossary

The following definitions include excerpts from a list adopted by the major actuarial organizations in the United States. In some cases, the definitions have been modified for specific applicability to LACERA and include terms used exclusively by LACERA. Defined terms are capitalized throughout this Appendix.

Accrued Benefit

The amount of an individual's benefit (whether or not vested) as of a specific date, determined in accordance with the terms of a pension plan and based on compensation and service to that date.

Actuarial Accrued Liability

That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of pension plan benefits and expenses which is not provided for by future Normal Costs.

Actuarial Assumptions

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

Actuarial Gain (Loss)

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

Actuarial Present Value

The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions.

Actuarial Valuation

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

Actuarial Value of Assets

The value of cash, investments and other property belonging to a pension plan, as used by the actuary for the purpose of an Actuarial Valuation.

Actuarially Equivalent

Of equal Actuarial Present Value, determined as of a given date with each value based on the same set of Actuarial Assumptions.

Amortization Payment

That portion of the pension plan contribution which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

Contingency Reserve

Reserves accumulated for future earning deficiencies, investment losses, and other contingencies. Additions include investment income and other revenues; deductions include investment expense, administrative expense, interest allocated to other reserves, funding the STAR Reserve, and distributions to the Contribution Credit Reserve. Amounts are allocated to the Contingency Reserve to the extent there are positive recognized earnings

to allocate. The California Government Code (Sections 31592 and 31592.2) requires the Contingency Reserve to be set at a minimum of 1.0% of the market value of total assets.

County Contribution Credit Reserve

The accumulated balance of the County's proportionate share of excess earnings as stipulated in the Retirement System Funding Agreement between LACERA and the County. Additions include distributions from excess earnings during the fiscal years ending 1994 through 1998 and related earnings. Deductions include payments, as the County authorizes, for future employer contributions due LACERA and for funding a portion of the Retiree Healthcare Program under the provisions of Internal Revenue Code 401(h).

Employer Reserve

The accumulation of employer contributions for future retirement benefit payments. Additions include contributions from employers and related earnings. Deductions include annuity payments to retired members and survivors, lump sum death benefit payments to member survivors, and supplemental disability payments.

Entry Age Actuarial Cost Method

A method under which the Actuarial Present Value of the Projected Benefits of each individual included in an Actuarial Valuation is allocated on a level basis over the earnings or service of the individual between entry age and assumed exit ages. The portion of this Actuarial Present Value allocated to a valuation year is called the Normal Cost. The portion of this Actuarial Present Value not provided for at a valuation date by the Actuarial Present Value of future Normal Costs is called the Actuarial Accrued Liability.

Funded Ratio

A measurement of the funded status of the Plan. The Funded Ratio is calculated by dividing the Valuation Assets by the Actuarial Accrued Liability. For example, a Funded Ratio of 90% indicates assets are 10% less than liabilities.

Funding Goal

The Funding Goal is the funded status the Board of Investments would like LACERA to achieve. The main goal is to provide benefit security for its members as well as to achieve and maintain stable employer contributions that are as low as possible. A Funded Ratio equal to 100% is the Funding Goal.

Layered Amortization Period

Payment of each year's change in the Unfunded Actuarial Accrued Liability (UAAL) is amortized over separate closed periods. For LACERA, the original UAAL as of June 30, 2009 is being amortized over a closed 30-year period. Subsequent changes in the UAAL were amortized over new closed 30-year periods. Effective with the June 30, 2019 valuation all existing layers with more than 22 years remaining as of June 30, 2020 were re-amortized over closed 22-year periods. All new UAAL layers thereafter are amortized over closed 20-year periods beginning with the date the contribution is first expected to be made. All amortization payments are based on a level percent of pay.

Member Reserve

The accumulation of member contributions. Additions include member contributions and related earnings. Deductions include annuity payments to retirees and refunds to members.

Non-Valuation Reserves

Reserves excluded from the calculation of contribution rates, including the Contingency Reserve, the County Contribution Credit Reserve, and any other reserves specifically excluded by the Board of Investments.

Normal Cost

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

Plan Year

A 12-month period beginning July 1 and ending June 30.

Projected Benefits

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

STAR Reserve

Reserves accumulated for the payment of cost-of-living benefits as defined in California Government Code Section 31874.3.

Supplemental Targeted Adjustment for Retirees (STAR) Benefits Supplemental cost-of-living payments to retired members to restore purchasing power at a specified percentage level, as described in California Government Code Section 31874.3.

Surplus Funding

The excess, if any, of the Actuarial Value of Assets over the Actuarial Accrued Liability. Standard actuarial terminology defines this as the "Funding Excess." LACERA uses the term "Surplus Funding."

Unfunded Actuarial Accrued Liability

The excess, if any, of the Actuarial Accrued Liability over the Actuarial Value of Assets.

Valuation Date

The date upon which the Normal Cost, Actuarial Accrued Liability, and Actuarial Value of Assets are determined. Generally, the Valuation Date will coincide with the ending of a Plan Year.

Valuation Reserves

All reserves excluding the Non-Valuation Reserves.

Attachment II

Milliman's 2019 Pension Plan Experience Study
Report Final



Los Angeles County Employees Retirement Association

2019 Investigation of Experience
for Retirement Benefit Assumptions

January 2020 Board Meeting

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January 28, 2020

Board of Investments
Los Angeles County Employees Retirement Association
300 North Lake Avenue, Suite 820
Pasadena, CA 91101-4199

Re: Los Angeles County Employees Retirement Association

Dear Members of the Board:

It is a pleasure to submit this report of our investigation of the experience of the Los Angeles County Employees Retirement Association (LACERA) for the three-year period ending June 30, 2019. The results of this investigation are the basis for recommended changes in actuarial assumptions for the actuarial valuation of retirement benefits to be performed as of June 30, 2019.

The purpose of this report is to communicate the results of our review of the actuarial methods and the economic and demographic assumptions to be used in the completion of the upcoming valuation. Several of our recommendations represent changes from the prior methods or assumptions and are designed to better anticipate the emerging experience of LACERA.

We have provided financial information showing the estimated hypothetical impact of the recommended assumptions if they had been used in the June 30, 2018 actuarial valuation. We believe the recommended assumptions provide a reasonable estimate of anticipated experience affecting LACERA. Nevertheless, the emerging costs will vary from those presented in this report to the extent that actual experience differs from that projected by the actuarial assumptions. Future actuarial measurements may differ significantly from the current measurements presented in this report due to factors such as the following:

- Plan experience differing from the actuarial assumptions,
- Future changes in the actuarial assumptions,
- Increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as potential additional contribution requirements due to changes in the plan's funded status), and
- Changes in the plan provisions or accounting standards.

Due to the scope of this assignment, we did not perform an analysis of the potential range of such measurements.

In preparing this report, we relied without audit on information (some oral and some in writing) supplied by LACERA's staff. This information includes, but is not limited to, statutory provisions, employee data, and financial information. We used LACERA's benefit provisions as stated in our June 30, 2018 Actuarial Valuation report. In our examination, after discussion with LACERA and making certain adjustments, we have found the data to be reasonably consistent and comparable with data used for other purposes. Since the experience study results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is

incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our determinations might need to be revised.

We certify that the assumptions developed in this report satisfy ASB Standards of Practice, in particular, No. 27 (Selection of Economic Assumptions for Measuring Pension Obligations) and No. 35 (Selection of Demographic and Other Non-Economic Assumptions for Measuring Pension Obligations).

This investigation of experience report recommends assumptions to be used in the valuation to provide an estimate of the System's financial condition as of a single date. The valuation can neither predict the System's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of System benefits, only the timing of System contributions. While the valuation is based on an array of individually reasonable assumptions, other assumption sets may also be reasonable and valuation results based on those assumptions would be different. No one set of assumptions is uniquely correct. Determining results using alternative assumptions is outside the scope of our engagement.

Milliman's work is prepared solely for the internal business use of LACERA. To the extent that Milliman's work is not subject to disclosure under applicable public records laws, Milliman's work may not be provided to third parties without Milliman's prior written consent. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. Milliman's consent to release its work product to any third party may be conditioned on the third party signing a Release, subject to the following exception(s):

- (a) The System may provide a copy of Milliman's work, in its entirety, to the System's professional service advisors who are subject to a duty of confidentiality and who agree to not use Milliman's work for any purpose other than to benefit the System.
- (b) The System may provide a copy of Milliman's work, in its entirety, to other governmental entities, as required by law.

No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

The consultants who worked on this assignment are retirement actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices.

We would like to acknowledge the help in the preparation of the data for this investigation given by the LACERA staff. We look forward to our discussions and the opportunity to respond to your questions and comments at your next meeting.

We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

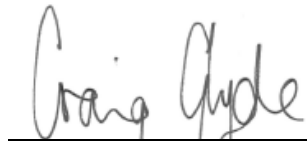
Sincerely,



Mark Olleman, FSA, EA, MAAA
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Consulting Actuary

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1. Executive Summary and Recommendations

Milliman has performed the triennial investigation of experience for the period July 1, 2016 through June 30, 2019. This report contains the findings of this investigation and includes several recommended changes in assumptions.

Determining the adequacy of the current contribution rates is dependent on the assumptions used to project the future benefit payments and then to discount the value of future benefits to determine the present values. Therefore, the assumptions are critical in assisting the System in adequately funding future retirement benefits.

Summary

This section describes the key findings of this investigation of experience. We have recommended several changes to the demographic and economic assumptions. If adopted, these changes would have a material effect on the member and employer contribution rates effective July 1, 2020. The potential impact to the members is discussed on the next page. The potential impact to employers is discussed at the end of this section.

We will refer to our recommended assumptions as the “recommended” or “proposed” assumptions throughout this report. We have provided a summary of the proposed changes to the assumptions later in this section. The Board of Investments has the ultimate decision on the assumptions to be used in the actuarial valuation.

Introduction

Section 2 discusses the following:

- How the investigation of experience study was performed.
- Actuarial Standards of Practice No. 27 and No. 35.
- The presentation of results you will see in this report.

Actuarial Methods (Includes Amortization Periods and Member Contribution Rates)

Section 3 describes the actuarial methods used in performing our valuation and in assisting LACERA to administer the plan. We are recommending one change in the actuarial methods used in the valuation. Under LACERA’s current amortization policy, annual changes in the Unfunded Actuarial Accrued Liability (UAAL) are funded over separate 30-year periods as a level percentage of payroll. These annual payments are referred to as “layers.” We recommend that the 30-year period for these layers be changed to 20 years for future changes in the UAAL. 30 years is inconsistent with actuarial guidance and is longer than other California retirement systems.

We are not recommending any changes in the amortization periods for the existing amortization layers. However, it should be noted that some existing layers would still have amortization periods much longer than 20 years. One option for LACERA would be to combine all existing layers greater than 22 years and reamortize them over 22 years in the 2019 valuation. Under this approach, LACERA would be fully transitioned to 20-year amortization with the 2021 valuation. Either of these two approaches (no changes to existing layers, or changing to a 22-year maximum period for existing layers) would be appropriate for LACERA.

One additional option that we discussed with the Board of Investments was the reamortization of the full UAAL as of June 30, 2019 over a 25-year period, with future changes in the UAAL being amortized over 20-year periods. This weakens the funding of the existing UAAL by reducing the contribution rate for existing layers. However, Milliman would view this as reasonable if the change was combined with a reduction in the investment return assumption to 6.75%. Overall, Milliman would view this as strengthening funding, and it would result in each component of the assumptions and methods being acceptable.

We are also recommending an update to the operating tables LACERA uses in the calculation of optional forms of payment to reflect any changes in the COLA, mortality, and investment return assumptions.

Also note that new member rates will be computed based on the 2019 triennial valuation using the assumptions adopted. We have estimated the new member rates based on the proposed assumptions, as shown in Section 3. These estimates show that there will be material increases in member rates under the proposed assumptions. Note that the actual member contribution rates cannot be determined until completion of the June 30, 2019 valuation.

Sample member contribution rates are shown in the following table. We have shown the results under two economic scenarios: 1) the recommended investment return assumption of 6.75% and a wage growth assumption of 3.00%; and 2) a reasonable alternative investment return assumption of 7.00% and a wage growth assumption of 3.25%. We have shown these two sets as they were the two alternatives where most of the focus was during discussions between Milliman and the Board of Investments this fall. Note that all estimated member contribution rates also include the proposed demographic assumption changes and are the total member rate (i.e., Normal + COLA).

| | Entry Age | Currently in Effect ⁽²⁾ | Estimated Member Contribution Rates Effective July 1, 2020 ⁽¹⁾ | |
|------------------------|-----------|------------------------------------|---|-----------------------------|
| | | | Inv = 6.75% Wage = 3.00% | Inv = 7.00% Wage = 3.25% |
| General Members | | | | |
| Plan D | 25 | 6.27% | 7.02% | 6.83% |
| | 35 | 7.83% | 8.66% | 8.43% |
| | 45 | 9.78% | 10.62% | 10.33% |
| | 55 | 11.57% | 12.35% | 12.00% |
| Plan G | All Ages | 8.43% | 9.46% | 9.21% |
| Safety Members | | | | |
| Plan B | 25 | 11.00% | 12.81% | 12.42% |
| | 35 | 13.57% | 15.24% | 14.75% |
| | 45 | 16.20% | 18.14% | 17.56% |
| | 55 | 16.35% | 18.14% | 17.55% |
| Plan C | All Ages | 13.69% | 15.33% | 14.83% |

1. Final member contribution rates will not be determined until the COLA portion is calculated in the June 30, 2019 actuarial valuation.

2. The rates currently in effect are based on the June 30, 2016 actuarial valuation and include an investment return assumption of 7.25% and a wage growth assumption of 3.25%.

Economic Assumptions

Section 4 discusses the economic assumptions: price inflation, general wage growth (includes price inflation and productivity), investment return, and future COLA increases. As with virtually all actuarial assumptions, there is not one right answer; however, we do believe there is considerable evidence that a lower investment return assumption is appropriate for LACERA. We have recommended a reduction in the investment return assumption to 6.75%. We have also included two alternative investment return assumptions of 6.50% or 7.00% in our discussion, which we believe would be reasonable with certain wage growth assumptions.

The most compelling reason to lower the investment return assumption is the lower expectation for future investment returns. The capital market assumptions reported by LACERA's general investment consultant, Meketa Investment Group (Meketa), forecast an expected net return based on LACERA's asset allocation of between 6.8% and 7.5% depending on the timeframe (10 to 20 years). Milliman's capital market assumptions are projecting a 6.4% net expected return for LACERA's target portfolio over the next 20 years (6.3% net expected return over 10 years).

Further, the capital market assumptions used in the analysis of the expected return were determined at January 2019 (or the end of 2018). Subsequent to those capital market assumptions being determined, there has been a significant decline in yields on fixed income which we believe will cause a drag on future expected returns, and an increase in the price-to-earnings ratio which leaves less room for future growth. Therefore, we recommend that the investment return assumption be lowered to 6.75% (net of both investment and administration expenses). Note that we relied upon both Meketa's and Milliman's capital market assumptions in making this recommendation, as well as a survey of other investment consultants.

As detailed in Section 4, there is an expectation for lower price inflation in both the short and long term. In particular, there has been a sustained period of low inflation, with a 2.2% average increase over the 20-year period ending in 2018. Looking forward, there is a continued expectation of low price inflation, as evidenced by the current (November, 2019) implied inflation expectation of approximately 1.7% based on the difference in yield between 30-year Treasury Inflation-Protected Securities (TIPS) and a regular 30-year treasury bond. However, it should be noted that CPI increases in the Los Angeles area have been 1.0% higher over the last four years than the national average, which most forecasts are focused on.

We recommend a price inflation assumption of either 2.50% (if the investment return assumption is lowered to 6.75% or less) or 2.75%. We recommend the wage inflation assumption be set equal to the price inflation plus 0.5% (either 3.00% or 3.25%), as there is a high correlation between price and wage inflation. We recommend a reduction in the assumed cost-of-living adjustment (COLA) for retiree benefits for most Plan A retirees if the price inflation assumption is reduced.

The following table shows our recommended assumption set, along with two alternatives.

| Assumption | Economic Assumptions | | | |
|---|----------------------|-----------------------------------|---------------|---------------|
| | Current | Recommended | Alternative A | Alternative B |
| Investment Return ⁽¹⁾ | 7.25% | 6.75% | 7.00% | 6.50% |
| General Wage Growth | 3.25% | 3.00% or 3.25% | 3.25% | 3.00% |
| Payroll Growth | 3.25% | 3.00% or 3.25% | 3.25% | 3.00% |
| Price Inflation | 2.75% | 2.50% or 2.75% | 2.75% | 2.50% |
| Future Retiree COLAs ⁽²⁾ (Plan A / Other Plans) | 2.75% / 2.00% | 2.50% / 2.00% or 2.75% / 2.00% | 2.75% / 2.00% | 2.50% / 2.00% |

1. Net of both investment and administration expenses. For GASB financial reporting, the recommended investment return assumption is 0.13% higher.
2. The first of the two numbers applies to Plan A; the second number applies to the remainder of the plans (although the Plan E COLA is pro-rated based on pre-2002 service). To account for existing Plan A COLA balances, retirees and beneficiaries with a retirement date prior to April 1, 1981 are assumed to receive 3.00% annual COLAs.

Analysis by Compensation Level

In our analysis of the active demographic assumptions (merit salary, active death, service retirement, disability, and termination), we reflected the impact of compensation levels by weighting the results by compensation. That is, a member with annual compensation of \$80,000 has twice the impact on the observed rates in comparison to a member with annual compensation of \$40,000. We observed some differences in member behavior based on compensation. For example, members with higher levels of compensation tended to have higher probabilities of retiring at a given age. These compensation-weighted probabilities are shown as the “Actual” bars in the graphs in Section 5 through Section 9.

Merit Salary Increases

Section 5 discusses the individual salary increases due to promotion and longevity – the merit component of salaries. Merit salary increases were higher than assumed increases, primarily for Safety members. We are recommending small increases in the assumption for General members to reflect actual experience. For Safety members, we are recommending small increases at most service levels and large increases at certain service levels where longevity increases occur for many members.

Death from Active Status

Section 6 discusses the probability of a member dying while in active employment. For nonservice-connected deaths, the actual rates were greater than what the current assumptions predicted. We are recommending updating the assumptions to new active employee mortality tables specific to public plans. The recommended tables result in a small increase in the assumed mortality. For the service-connected death assumption, we are not recommending a change given the limited data for this assumption.

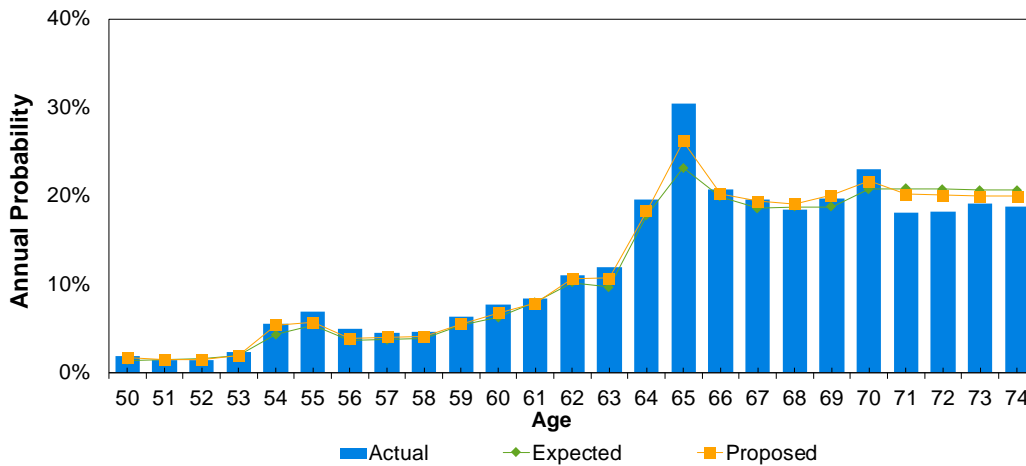
Service Retirement

Section 7 discusses the probability of an eligible active member taking a service retirement at a specific age. The results of our study showed actual retirement rates that were generally equal to or greater than the assumptions. The current assumptions expected 7,050 retirements among all active members; 7,569 actually occurred, resulting in a total Actual-to-Expected ratio of 107%. We have recommended increases to service retirement rates

for Safety B members and some minor changes to General Plans D and E. We have also recommended new separate tables for General G and Safety C to reflect their specific age factors.

The following graph shows the actual experience for all members from the current experience study (light blue bars). The proposed assumptions are shown as an orange line and compared to the current assumptions (green line). As the graph illustrates, the overall changes were relatively small.

Service Retirement Rates – All Plans



Disability Retirement

Section 8 discusses the probability of an active member becoming disabled. We studied both service-connected disability and nonservice-connected disability. The results were as follows:

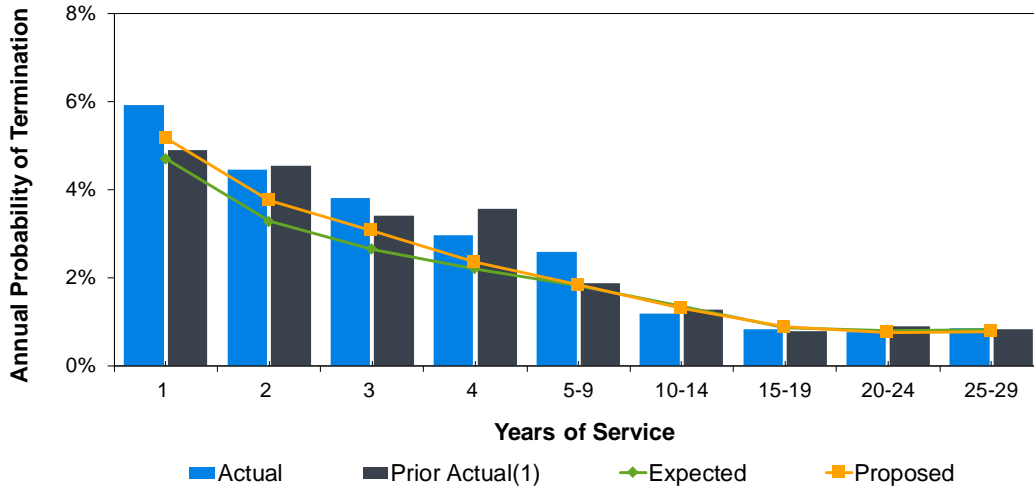
| Type | Actual | Expected | Actual / Expected | Proposed | Actual / Proposed |
|----------------------|------------|------------|-------------------|------------|-------------------|
| Service-Connected | 640 | 788 | 81% | 661 | 97% |
| Nonservice-Connected | 55 | 81 | 68% | 77 | 71% |
| Total | 695 | 869 | 80% | 738 | 94% |

For disability retirements, actual experience was less than expected. We are recommending reductions to the assumed rates to better fit actual experience, primarily to the service-connected disability rates.

Termination

Section 9 summarizes the results of our study of terminations of employment for reasons other than death, service retirement, or disability. The current assumptions expected 3,324 terminations and 3,890 actually occurred, resulting in a total Actual-to-Expected ratio of 117%. We have recommended increases to the termination rates at service less than five years.

The following graph shows the actual experience for all members from the current experience study (light blue bars), as well as the average experience from the prior two experience studies (dark gray bars). The proposed assumptions are shown as an orange line and compared to the current assumptions (green line).



1. Prior Actual numbers reflect average experience from last two studies (2016 and 2013).

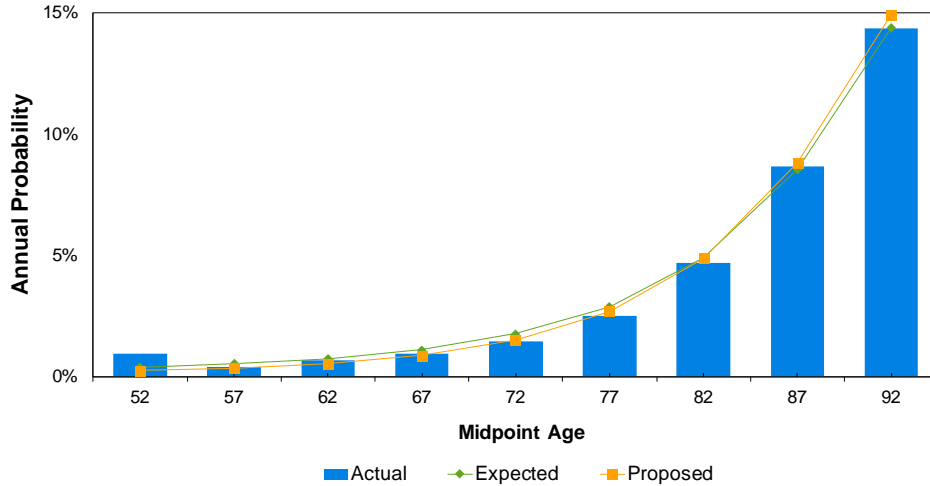
Probability of Refund

In Section 10, we report the actual number of vested members electing a refund upon termination was 91% of the expected number. We are recommending small reductions in this assumption to reflect the recent experience.

Retiree Mortality

The mortality assumption is used to predict the life expectancy of both members currently in pay status and those expected to receive a benefit in the future. The results of the study showed there were 3% more deaths than the assumptions predicted. However, retirees with larger-than-average benefits tend to have lower mortality than those with smaller-than-average benefits. Adjusting for the impact of the benefit levels on mortality, there were actually 6% fewer deaths than assumed. That is, the assumptions projected that 6% more benefits would stop being paid during the period than actually occurred.

We are recommending new retiree mortality rates based on recently published tables that are specific to public plan general and safety members, with adjustments to match LACERA experience. Under the recommended tables the assumptions are very close to actual experience, after accounting for the impact of benefit levels. The graph below shows the results of the study for service retirees on a benefit-weighted basis.



We are also recommending the continued use of a projection scale that reflects the gradual year-to-year improvement in mortality that is expected to occur in the future. This approach is sometimes referred to as “generational mortality” because it results in the succeeding generation of members living longer than the preceding one. We are not recommending any changes to the projection scale. Additional details are provided in Section 11.

Miscellaneous Assumptions

Section 12 discusses some other assumptions that are made. We are recommending the following:

- Retain the current assumption for the probability a member will have an eligible survivor at retirement who is eligible for the unreduced continuance benefit.
- Increase the assumed retirement age for deferred vested members for General Plan D. Retain the current assumption for all other plans.
- Retain the current assumption for the probability of a deferred vested member establishing reciprocity and retiring with another system.

Summary of Recommendations

The following table summarizes our recommendations. The next section provides an overview of the financial impact of these proposed changes.

| Assumption | Recommendation | | | | | | | | | | | | | | | | | | | | |
|---|--|--------------------------------|----------------------|--|---------|-------------|-------------------|-------|-------|---------------------|-------|----------------|----------------|-------|----------------|-----------------|-------|----------------|---|---------------|--------------------------------|
| Actuarial Methods (Amortization) | Amortize future changes in the UAAL over 20 years. For existing amortization layers, either 1) continue to amortize the existing layers over the current periods; or 2) amortize all existing layers over the shorter of the current period and 22 years. A full reset at 25 years would also be reasonable if a 6.75% investment return assumption is adopted. | | | | | | | | | | | | | | | | | | | | |
| Other Actuarial Methods | Update operating tables used in the calculation of optional forms of payment to include recommended changes. | | | | | | | | | | | | | | | | | | | | |
| Economic | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="background-color: #003366; color: white;">Assumption</th> <th colspan="2" style="background-color: #003366; color: white;">Economic Assumptions</th> </tr> <tr> <th style="background-color: #003366; color: white;">Current</th> <th style="background-color: #003366; color: white;">Recommended</th> </tr> </thead> <tbody> <tr> <td>Investment Return</td> <td style="text-align: center;">7.25%</td> <td style="text-align: center;">6.75%</td> </tr> <tr> <td>General Wage Growth</td> <td style="text-align: center;">3.25%</td> <td style="text-align: center;">3.00% or 3.25%</td> </tr> <tr> <td>Payroll Growth</td> <td style="text-align: center;">3.25%</td> <td style="text-align: center;">3.00% or 3.25%</td> </tr> <tr> <td>Price Inflation</td> <td style="text-align: center;">2.75%</td> <td style="text-align: center;">2.50% or 2.75%</td> </tr> <tr> <td>Future Retiree COLAs (Plan A / Other Plans)</td> <td style="text-align: center;">2.75% / 2.00%</td> <td style="text-align: center;">2.50% / 2.00% or 2.75% / 2.00%</td> </tr> </tbody> </table> | Assumption | Economic Assumptions | | Current | Recommended | Investment Return | 7.25% | 6.75% | General Wage Growth | 3.25% | 3.00% or 3.25% | Payroll Growth | 3.25% | 3.00% or 3.25% | Price Inflation | 2.75% | 2.50% or 2.75% | Future Retiree COLAs (Plan A / Other Plans) | 2.75% / 2.00% | 2.50% / 2.00% or 2.75% / 2.00% |
| Assumption | Economic Assumptions | | | | | | | | | | | | | | | | | | | | |
| | Current | Recommended | | | | | | | | | | | | | | | | | | | |
| Investment Return | 7.25% | 6.75% | | | | | | | | | | | | | | | | | | | |
| General Wage Growth | 3.25% | 3.00% or 3.25% | | | | | | | | | | | | | | | | | | | |
| Payroll Growth | 3.25% | 3.00% or 3.25% | | | | | | | | | | | | | | | | | | | |
| Price Inflation | 2.75% | 2.50% or 2.75% | | | | | | | | | | | | | | | | | | | |
| Future Retiree COLAs (Plan A / Other Plans) | 2.75% / 2.00% | 2.50% / 2.00% or 2.75% / 2.00% | | | | | | | | | | | | | | | | | | | |
| Merit Salary Increase | Increases, primarily for Safety plans. | | | | | | | | | | | | | | | | | | | | |
| Death While Active | Move to updated tables specific to public plans with adjustments for consistency with LACERA experience. | | | | | | | | | | | | | | | | | | | | |
| Service Retirement | Small increases to General Plans D and E and Safety plans. | | | | | | | | | | | | | | | | | | | | |
| Disability Retirement | Reductions to both service-connected disability and nonservice-connected disability rates. | | | | | | | | | | | | | | | | | | | | |
| Termination | Small increases in rates at lower levels of service. Extend termination rates beyond 20 years for Safety C members. | | | | | | | | | | | | | | | | | | | | |
| Probability of Refund | Small reductions. | | | | | | | | | | | | | | | | | | | | |
| Retiree Mortality | Move to updated tables specific to public plans with adjustments for consistency with LACERA experience. | | | | | | | | | | | | | | | | | | | | |
| Miscellaneous | Increase the assumed retirement age for deferred vested members for General Plan D. | | | | | | | | | | | | | | | | | | | | |

Estimated Financial Impact

The estimated financial impact of the proposed changes to the economic assumptions, if adopted, is expected to be significant. For the recommended demographic assumptions, the financial impact will be smaller, but is still projected to result in a material increase in the employer contribution rates. The following exhibit is designed to give the reader an idea of how the proposed changes may affect LACERA as a whole. Note that these estimates

represent the immediate impact. Ultimately, the long-term costs should approximately balance out, so, for example, the proposed assumptions with the lower investment return component will require more contributions in the short term but will ultimately require less contributions in the future than the current set of assumptions.

The financial impact was evaluated by performing additional valuations with the June 30, 2018 valuation data and benefits, and reflecting the proposed assumption changes. This allows us to evaluate the relative financial impact of the various proposed changes. We have projected these results forward to June 30, 2019. Note that the impact of the various assumption changes by component is somewhat dependent on the order in which they are evaluated.

We have shown the estimated financial impact based on the recommended 6.75% investment return assumption and a 3.00% wage growth assumption. We have shown this set of economic assumptions because the Board of Investments has previously indicated a preference for this assumption compared to our alternative recommendation of a 6.75% investment return assumption with a 3.25% wage growth assumption.

**Projected Results of June 30, 2019 Valuation
 With Proposed Assumptions**

| | Funded Ratio | Total Employer Contribution | |
|---|--------------|-----------------------------|-----------------|
| | | % of Payroll | \$ millions |
| June 30, 2018 Valuation | 80.6% | 20.9% | \$ 1,771 |
| Preliminary Estimate of Year-to-Year Change | 0.1% | 0.4% | 93 |
| Est. June 30, 2019 Valuation (no changes) | 80.7% | 21.3% | \$ 1,864 |
| Recommended Economic & 20-Year Amortization of New UAAL Layers | | | |
| 6.75% Interest / 3.00% Wage / 2.50% CPI | -3.9% | 4.0% | \$ 350 |
| Recommended Demographic Assumptions | | | |
| Merit Salary | -0.2% | 0.4% | \$ 35 |
| Post-Retirement Mortality | 0.1% | 0.0% | - |
| Rates of Retirement | -0.2% | 0.3% | 26 |
| All Other Changes | -0.1% | 0.1% | 9 |
| Subtotal Demographic Change | <u>-0.4%</u> | <u>0.8%</u> | <u>\$ 70</u> |
| Summary | | | |
| Est. June 30, 2019 Valuation (no changes) | 80.7% | 21.3% | \$ 1,864 |
| Economic Assumptions | -3.9% | 4.0% | 350 |
| Demographic Assumptions | -0.4% | 0.8% | 70 |
| Total Assumption Changes | <u>-4.3%</u> | <u>4.8%</u> | <u>\$ 420</u> |
| Est. June 30, 2019 Valuation with Changes⁽¹⁾⁽²⁾ | 76.4% | 26.1% | \$ 2,284 |

1. Impact estimated based on June 30, 2018 actuarial valuation. New assumptions will be implemented with the June 30, 2019 actuarial valuation and affect contribution rates effective July 1, 2020, so actual results will vary. A 20-year amortization of changes in the June 30, 2019 UAAL is included in the estimate.

2. Impact of proposed changes will vary by plan; however, relative increase for the combined General plans and the combined Safety plans should be similar.

Reset of Amortization Period

As discussed at the bottom of page 1 of this report, one option that we have discussed with the Board of Investments is the reamortization of the full UAAL as of June 30, 2019 over a 25-year period, with future changes in the UAAL being amortized over 20-year periods. The following table shows the estimated financial impact of a 25-year reamortization of the UAAL.

| | Funded Ratio | Total Employer Contribution | |
|---|--------------|-----------------------------|-----------------|
| | | % of Payroll | \$ millions |
| 25-Year Reamortization of UAAL | | | |
| Est. June 30, 2019 Valuation (no changes) | 80.7% | 21.3% | \$ 1,864 |
| Combined Assumption Changes | -4.3% | 4.8% | 420 |
| 25-Year Reamortization Impact | 0.0% | -1.4% | (123) |
| Adjusted Financial Impact with Reamortization | <u>-4.3%</u> | <u>3.4%</u> | <u>\$ 297</u> |
| Est. June 30, 2019 Valuation | 76.4% | 24.7% | \$ 2,161 |

Estimated Financial Impact of Alternative Reasonable Assumptions

Milliman has provided the estimated financial impact of a number of reasonable alternative assumptions during our presentations to the Board of Investments. As previously noted, one of the reasonable alternatives that has been extensively discussed during our presentations is a 7.00% investment return assumption with a 3.25% wage growth assumption and a 20-year amortization of future changes in the UAAL. We estimate that this alternative would have a 77.8% Funded Ratio and a total employer contribution rate of 24.7% of pay if the change in assumptions were fully recognized in the June 30, 2019 actuarial valuation.

Phase-in of Employer Contribution Rates

When new assumptions were adopted following the previous investigation of experience, LACERA elected to phase-in the increases in employer contribution rates over a three-year period. That is, in the first year, one-third of the increase was recognized followed by two-thirds in the second year. In the third year, no adjustment was made as the full increase was recognized. Note that this results in a slightly higher employer contribution rate in the third year than if the increase in the employer contribution rates was fully recognized in the first year .

This approach is acceptable under actuarial guidance, and we believe it continues to be a reasonable approach for LACERA. We provided LACERA with estimates of the financial impact of using the three-year phase-in approach at the December Board of Investments meeting.

Conclusion

We recommend that the Board adopt the proposed actuarial assumptions shown in Appendix A. We believe these assumptions reasonably reflect future expectations. Other assumption packages may be reasonable, and we have provided information on other assumptions that we feel are reasonable.

2. Introduction

Funding and Valuation Principles

While our goal is to make the best possible estimate of future experience, it is important for the Board to recognize that the future will almost certainly differ from our current best efforts to forecast it. Routine scheduled reevaluations of the actuarial assumptions, such as through this experience investigation, are a sound methodology to identify where assumptions differ from emerging experience and to fine-tune the actuarial estimates to keep them as close as possible to emerging experience.

It is expected that there will be years in which the actual investment return will exceed the actuarial assumption, and there will be years when the actual experience will not meet the assumed rate. It is the annualized expected median long-term rate that is used to actuarially project and finance the retirement benefits.

Recognition should be made that a higher investment return assumption will tend to lower required contributions in the short term (and higher required contributions in the long term), while a lower investment return assumption will tend to require higher contributions in the short term (and lower required contributions in the long term). However, the actual contributions will ultimately be determined by the actual experience, so in the long term, this should approximately balance out.

The actuarial assumptions are usually divided into two groups: economic and demographic. The economic assumptions must not only reflect LACERA's actual experience but also give even greater consideration to the long-term expectation of future economic growth for the nation as well as the global economy.

The non-economic, or demographic assumptions, are based on LACERA's actual experience, adjusted to reflect trends and historical experience. Thus, the economic assumptions are much more subjective than the demographic assumptions, and the demographic assumptions are much more dependent on recent experience.

Overview

This report presents the results of an investigation of the recent actuarial experience of LACERA. We will refer to this investigation as an experience study.

Throughout this report, we refer to "expected" and "proposed" actuarial assumptions. The "expected" assumptions are those used for our actuarial valuation of LACERA as of June 30, 2018. They may also be referred to as the "current" assumptions. These assumptions and methods were adopted by the Board based on Milliman's 2016 experience study. The "proposed" or "recommended" assumptions are those we recommend for use in the valuation as of June 30, 2019 and for subsequent valuations until further changes are made.

The choice of economic assumptions (investment return, general wage growth, payroll increase, and COLA increase) is discussed in Section 4 of this report. These assumptions are generally chosen on the basis of expectations as to the effect of future economic conditions on the operation of LACERA. However, the setting of these assumptions is much more subjective than the setting and recommending of demographic assumptions.

Sections 5 through 12 of this report show the results of our study of demographic assumptions. These assumptions tend to be more objective than the economic assumptions. The exhibits are detailed comparisons between actual and expected decrements (members leaving active or retired status, for reasons such as retirement or death) on both the current and proposed bases. Each exhibit is identified by two numbers corresponding to the section of the report and the specific exhibit within that section. For example, Exhibit 7-1 is referred to in Section 7, retirement rates.

For each type of assumption, graphs show the actual, the expected and proposed rates, usually by some combination of gender, plan, years of service, and age. The exhibits also show the total numbers of actual and expected terminations. Ratios larger than 100% on the current basis generally indicate that the rates may need to be raised; ratios smaller than 100% generally indicate that rates may need to be lowered.

For each exhibit, the actual decrement rates for the current and prior period are shown as bar graphs on either a quinquennial-age basis, a years-of-service basis, or, in the case of retirement rates, on an age-by-age basis. The current assumptions – the "expected" rates – used in the June 30, 2018 actuarial valuation, are shown, as well as the new proposed assumptions, as line graphs. Therefore, the assumption changes we are proposing are illustrated by the difference between the two lines in each exhibit. Note that in cases where no change is being proposed, only the expected rate line is shown.

Actuarial Standard of Practice No. 27

The Actuarial Standards Board has adopted Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. This standard provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations under defined benefit plans such as LACERA.

Because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

ASOP 27 states that each economic assumption selected by the actuary should be reasonable. The assumption is reasonable if it has the following characteristics:

- It is appropriate for the purpose of the measurement.
- It reflects the actuary's professional judgment.
- It takes into account relevant historical and current economic data.
- It reflects the actuary's estimate of future experience and observation of the estimates in market data.
- It has no significant bias (i.e., it is not significantly optimistic or pessimistic), but may specifically make provision for adverse deviation.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period.

In our opinion, the economic assumptions we recommend for Retirement Board consideration in this report have been developed in accordance with ASOP No. 27.

Actuarial Standard of Practice No. 35: Selection of Demographic Assumptions

Actuarial Standard of Practice No. 35 (ASOP No. 35) governs the selection of demographic and other non-economic assumptions for measuring pension obligations. ASOP No. 35 states that the actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations, and select assumptions based upon application of that professional judgment. The actuary should select reasonable demographic assumptions in light of the particular characteristics of the defined benefit plan that is the subject of the measurement.

ASOP 35 Steps

The actuary should follow these steps in selecting the demographic assumptions:

1. **Identify the types of assumptions.** Types of demographic assumptions include but are not limited to: retirement, mortality, termination of employment, disability, election of optional forms of payment, administrative expenses, family composition, and treatment of missing or incomplete data. The actuary should consider the purpose and nature of the measurement, the materiality of each assumption, and the characteristics of the covered group in determining which types of assumptions should be incorporated into the actuarial model.
2. **Consider the relevant assumption universe.** The relevant assumption universe includes experience studies or published tables based on the experience of other representative populations, the experience of the plan sponsor, the effects of plan design, general trends, and future expectations.
3. **Consider the assumption format.** The assumption format includes whether assumptions are based on parameters such as gender, age, service, or calendar year. The actuary should consider the impact the format may have on the results, the availability of relevant information, the potential to model anticipated plan experience, and the size of the covered population.
4. **Select the Specific Assumptions.** In selecting an assumption the actuary should consider the potential impact of future plan design as well as the factors listed above.
5. **Select a Reasonable Assumption.** The assumption should be expected to appropriately model the contingency being measured. The assumption should not be anticipated to produce significant actuarial gains or losses.

ASOP 35 General Considerations and Application

Each individual demographic assumption should satisfy the criteria of ASOP No. 35. In selecting demographic assumptions, the actuary should also consider: the internal consistency between the assumptions, materiality, cost effectiveness, and the combined effect of all assumptions. At each measurement date, the actuary should consider whether the selected assumptions continue to be reasonable, but the actuary is not required to do a complete assumption study at each measurement date. In our opinion, the demographic assumptions recommended in this report have been developed in accordance with ASOP No. 35.

3. Actuarial Methods

As part of the triennial investigation, we have reviewed the valuation methods and other issues related to the actuarial assumptions.

- **Actuarial Cost Method:** The actuarial valuation is prepared using the entry age actuarial cost method. We believe that this cost method is appropriate for LACERA’s valuation. It is also the cost method that is required for financial reporting under GASB Statements 67 and 68. We recommend no change. Note that this is by far the most common method used for public sector retirement systems, as it results in more stability in normal costs and provides a level allocation of costs over each individual’s working lifetime.
- **Valuation Assets:** We believe that the current asset valuation method where gains and losses are smoothed over five years is appropriate for LACERA’s valuation. A five-year period is used by a majority of large public retirement systems. We recommend no change.

Under LACERA’s funding policy, the reserve value for STAR benefits is included in the Valuation Assets; however, the liability for any STAR benefits that may be granted in the future is not included in the liability portion of valuation. At the time decision this decision was made, our recommendation was to exclude the STAR reserve from the Valuation Assets for consistency with the treatment of STAR benefits. If the funding policy is revisited, we recommend the STAR reserved be excluded from the valuation assets.

It should be noted that the California Actuary Advisory Panel (CAAP) has published a paper on model actuarial funding policies which include guidelines for asset smoothing. LACERA’s method of five-year smoothing without a corridor falls in the “Acceptable Practices” category under these guidelines (categories described below for reference). The only difference between LACERA’s method and the method described in the “Model Practices” is that it includes a corridor of no greater than 50% to 150%, and LACERA has no corridor for five-year smoothing. We believe a five-year period is short enough that a corridor is not needed.

| Categories Under CAAP Guidelines | |
|--------------------------------------|---|
| Model Practices | Those practices most consistent with the Level Cost Acturial Model (LCAM) developed by CAAP. |
| Acceptable Practices | Generally those which, while not consistent with the LCAM, are well established in practice and typically do not require additional analysis. |
| Acceptable Practices with Conditions | May be acceptable in some circumstances either to reflect different policy objectives or on the basis of additional analysis. |
| Non-Recommended Practices | Systems using these practices should acknowledge the policy concerns identified in the CAAP Guidelines. |
| Unacceptable Practices | No description provided by CAAP, but implication appears to be clear. |

Operating Tables

We are recommending changes in the investment return and mortality assumptions and have included possible changes to the COLA increase assumptions. If any of these changes are adopted, the operating tables should be updated to reflect the changes.

Blended Mortality Table

We have studied the following factors that apply to the blended mortality tables used in the operating factors:

- **Gender Proportion:** We found that males account for 33% of the total present value of benefits for current General members and 86% for current Safety members.
We are recommending the General Unisex mortality table use a blending of 35% male and 65% female (no change) and the Safety Unisex mortality table use a blending of 85% male and 15% female (was 90%/10%).
- **Assumed Retirement Year:** Since generational mortality rates vary by age and year, theoretically new operating tables would be needed every year. For administrative simplicity, we recommend using the mortality tables based on the member's age in the year 2023. This is three years in the future from the implementation date. This is expected to allow for use of the new mortality table for the next six years.
- **Retirement Type:** LACERA uses healthy mortality (i.e., the mortality table used for service retirees) in cases where a members as a disability, but the benefit is based on the service retirement formula. We believe this continues to be a reasonable approach.

Reflecting the proposed assumptions in the optional monthly annuities would result in changes in the modified (or Unmodified Plus) benefit amount for future retirees who elect optional forms of payment. It would not affect the unmodified benefit.

Sample member contribution rates are shown in the following table. We have shown the results under two economic scenarios: 1) the recommended investment return assumption of 6.75% and a wage growth assumption of 3.00%; and 2) a reasonable alternative investment return assumption of 7.00% and a wage growth assumption of 3.25%. We have shown these two sets as they were the two alternatives where most of the focus was during discussions between Milliman and the Board of Investments this fall. Note that all estimated member contribution rates include the proposed demographic assumption changes and are the total member rate (i.e., Normal + COLA).

| | Entry Age | Currently in Effect ⁽²⁾ | Estimated Member Contribution Rates Effective July 1, 2020 ⁽¹⁾ | |
|------------------------|-----------|------------------------------------|---|-----------------------------|
| | | | Inv = 6.75% Wage = 3.00% | Inv = 7.00% Wage = 3.25% |
| General Members | | | | |
| Plan D | 25 | 6.27% | 7.02% | 6.83% |
| | 35 | 7.83% | 8.66% | 8.43% |
| | 45 | 9.78% | 10.62% | 10.33% |
| | 55 | 11.57% | 12.35% | 12.00% |
| Plan G | All Ages | 8.43% | 9.46% | 9.21% |
| Safety Members | | | | |
| Plan B | 25 | 11.00% | 12.81% | 12.42% |
| | 35 | 13.57% | 15.24% | 14.75% |
| | 45 | 16.20% | 18.14% | 17.56% |
| | 55 | 16.35% | 18.14% | 17.55% |
| Plan C | All Ages | 13.69% | 15.33% | 14.83% |

1. Final member contribution rates will not be determined until the COLA portion is calculated in the June 30, 2019 actuarial valuation.

2. The rates currently in effect are based on the June 30, 2016 actuarial valuation and include an investment return assumption of 7.25% and a wage growth assumption of 3.25%.

4. Economic Assumptions

Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations under defined benefit plans. As future events are unknown, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent experience. To meet the standard, the assumption should reflect “the actuary’s estimate of future experience” and “it has no significant bias (i.e., it is not significantly optimistic or pessimistic).”

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period.

This section will discuss the economic assumptions. We have recommended two potential reductions in the price inflation assumption with corresponding reductions in the investment return, wage inflation, and COLA increase (for Plan A) assumptions. We believe either of these sets of assumptions satisfy ASOP No. 27.

The following table shows our recommendation and the alternative assumption sets.

| Economic Assumptions | Current Assumptions | Recommended Assumptions | |
|-----------------------------------|---------------------|-------------------------|----------------|
| | | Alternative #1 | Alternative #2 |
| Investment Return ⁽¹⁾ | 7.25% | 6.75% | 6.75% |
| General Wage Growth | 3.25% | 3.25% | 3.00% |
| Payroll Growth | 3.25% | 3.25% | 3.00% |
| Price Inflation | 2.75% | 2.75% | 2.50% |
| COLAs for Retirees ⁽²⁾ | 2.75% / 2.00% | 2.75% / 2.00% | 2.50% / 2.00% |

1. Net of both investment and administration expenses. For GASB financial reporting, the recommended investment return assumption is 0.13% higher.

2. The first of the two numbers applies to Plan A; the second number applies to the remainder of the plans (although the Plan E COLA is pro-rated percentage of 2.00% based on pre-2002 service). To account for existing Plan A COLA balances, retirees and beneficiaries with a retirement date prior to April 1, 1981 are assumed to receive 3.00% annual COLAs.

1. Price Inflation

Use in the Valuation

When we refer to inflation in this report, we are generally referring to price inflation. The inflation assumption has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment return, general wage increases and the payroll increase assumption. It does not have a direct impact on the valuation results, except where it affects the assumed COLA to be paid.

The long-term relationship between inflation and investment return has long been recognized by economists. The basic principle is that the investors demand a “real return” – the excess of actual investment returns over inflation. If inflation rates are expected to be high, investors will demand investment returns that are also expected to be high enough to exceed inflation, while lower inflation rates will result in lower expected investment returns, at least in the long run.

The current valuation assumption for inflation is 2.75% per year. Our recommendation is to retain the assumption, or consider lowering it to 2.50% (if the investment return assumption is lowered to 6.75% or less).

Historical Perspective

The data for inflation shown below is based on the national Consumer Price Index, US City Average, All Urban Consumers (CPI-U) as published by the Bureau of Labor Statistics.

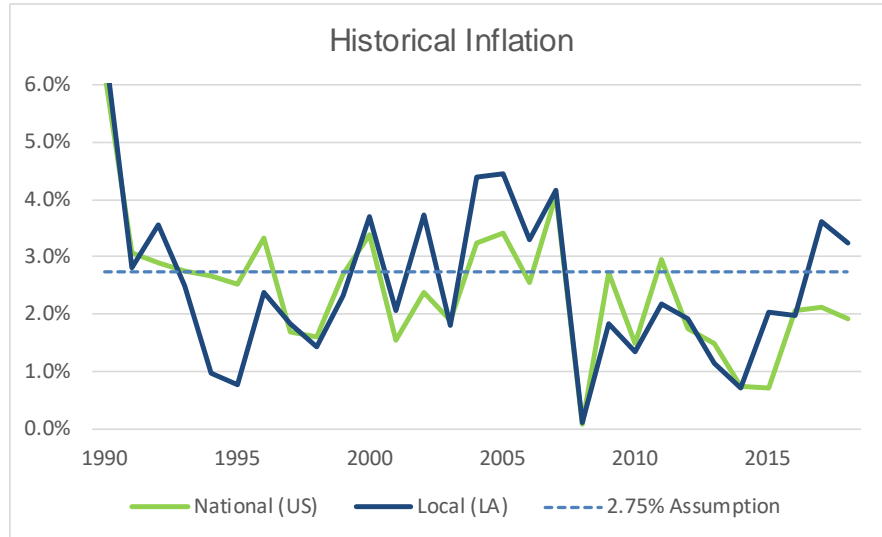
Although economic activities in general and inflation in particular, do not lend themselves to prediction on the basis of historical analysis, historical patterns and long term trends are a factor to be considered in developing the inflation assumption.

There are numerous ways to review historical data, with significantly differing results. The table below shows the compounded annual inflation rate for various 10-year periods, and for the 50-year period ended in December 2018. Note that the 50-year average is heavily influenced by the inflation of the late 1970s and early 1980s. The last 30 years have averaged closer to 2.5%.

| Decade | CPI Increase |
|-----------------------|--------------|
| 2009-2018 | 1.8% |
| 1999-2008 | 2.5% |
| 1989-1998 | 3.1% |
| 1979-1988 | 5.9% |
| 1969-1978 | 6.7% |
| Prior 50 Years | |
| 1969-2018 | 4.0% |

These are national statistics. The inflation assumption as it relates to the investment return assumption should be based more on national and even global inflation; whereas, the inflation assumption used in the wage growth, payroll growth, and COLA increase assumptions is tied to inflation in California. We believe that although there have been historical differences between U.S. and California CPI changes, in the long term there should be a high correlation. For comparison, the average CPI increase for California has been 4.2% for the 50-year period 1966-2018, compared to the national average of 4.0%.

The following graph shows historical CPI increases since 1990. The national CPI increase has generally been less than 2.75% over the last 10 years of the period. Also shown for comparison are CPI increases specific to the Los Angeles area. These have tracked fairly close to the national statistics, although over the last four years, local CPI has exceeded the national CPI by 1.0% on average.



Forecasts of Inflation

Since the U.S. Treasury started issuing inflation indexed bonds, it is possible to determine the approximate rate of inflation anticipated by the financial markets by comparing the yields on inflation indexed bonds with traditional fixed government bonds. Current market prices as of November 2019 suggest investors expect inflation to be about 1.7% over the next 30 years. Most forecasts of future price inflation by economists and investment professionals are lower than 2.75%, although they are generally 2.0% or greater.

Additionally, we reviewed the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2019 Trustees Report, the projected average annual increase in the CPI over the next 75 years under the intermediate cost assumptions was 2.60%.

Recommendation

The price inflation assumption is not used in determining LACERA’s funding and thus has no direct impact on the contribution rates; however, it is a factor in our recommendations for the wage growth, COLA, and investment return assumptions.

Given that LACERA has recently experienced both greater-than-assumed COLAs and wage increases, it would be reasonable to leave the inflation assumption at 2.75%. Forecasts on a national basis are for lower inflation, so it would also be reasonable to lower the inflation assumption to 2.50%.

| Consumer Price Inflation | |
|----------------------------|-------|
| Current Assumption | 2.75% |
| Recommended Alternative #1 | 2.75% |
| Recommended Alternative #2 | 2.50% |

2. Wage Growth

Use in the Valuation

Estimates of future salaries are based on two types of assumptions: 1) general wage increase and 2) merit increase. Rates of increase in the general wage level of the membership are directly related to inflation, while individual salary increases due to promotion and longevity generally occur even in the absence of inflation. The promotion and longevity assumptions, referred to as the merit scale, will be reviewed with the other demographic assumptions (see Section 5).

The current assumption is for wage growth of 0.50% above the inflation assumption.

Historical Perspective

We have used statistics from the Social Security Administration on the National Average Wage back to 1969.

There are numerous ways to review this data. For consistency with our observations of other indices, the table below shows the compounded annual rates of wage growth for various 10-year periods and for the 50-year period ending in 2018. The excess of wage growth over price inflation represents “productivity” (or the increase in the standard of living, also called the real wage inflation rate).

| Decade | Wage Growth | CPI Increase | Real Wage Inflation |
|-----------------------|-------------|--------------|---------------------|
| 2009-2018 | 2.2% | 1.8% | 0.4% |
| 1999-2008 | 3.7% | 2.5% | 1.2% |
| 1989-1998 | 4.1% | 3.1% | 1.0% |
| 1979-1988 | 6.2% | 5.9% | 0.3% |
| 1969-1978 | 6.6% | 6.7% | -0.1% |
| Prior 50 Years | | | |
| 1969-2018 | 4.5% | 4.0% | 0.5% |

LACERA-Specific Experience

We reviewed the increase in the average compensation for LACERA members since 1989. Over that period, the average compensation increased by 3.10% annually, compared to a 2.53% average annual increase in inflation. Therefore, for LACERA members only, we estimate real wage inflation has averaged 0.57% (3.10% less 2.53%) over the last three decades.

Forecasts of Future Wages

Wage inflation has been projected by the Office of the Chief Actuary of the Social Security Administration. In the 2019 Trustees Report, the ultimate long-term annual increase in the National Average Wage is estimated to be 1.2% higher than the Social Security intermediate inflation assumption of 2.6% per year.

Recommendation

Over the last 50 years, the actual experience, on a national basis, has been close to the current assumption, although this has varied considerably by decade. Over the most recent 10-year period, the real wage growth has been 0.4%, after being higher than the assumption for each of the two decades before that. Actual experience for employees participating in LACERA has also been close to the assumption over the last 30 years. We believe that wages will continue to grow at a greater rate than prices over the long term, although not to the extent projected by Social Security. We are recommending that the long-term assumed real wage inflation rate remain at 0.50% per year.

| Real Wage Inflation Rate | |
|--------------------------|-------|
| Current assumption | 0.50% |
| Recommended assumption | 0.50% |

The wage growth assumption is the total of the consumer price inflation assumption and the real wage inflation rate. If the real wage inflation assumption remains at 0.50% and the price inflation assumption is set at 2.50% or 2.75%, this would result in a total wage growth assumption of 3.00% or 3.25% respectively.

Payroll Increase Assumption

In addition to setting salary assumptions for individual members, the aggregate payroll of LACERA is expected to increase, without accounting for the possibility of an increase in membership. See comments on growth in membership discussed below.

The current payroll increase assumption is equal to the general wage growth assumption of 3.25%. It is our general recommendation to set these two assumptions to be equal, unless there is a specific circumstance that would call for an alternative assumption. We are recommending that the payroll increase assumption continue to be set equal to total wage growth assumption.

Growth in Active Membership

We propose continuing the assumption that no future growth or decline in active membership will occur. This assumption affects the Unfunded Actuarial Accrued Liability (UAAL) amortization payment rate. With no assumed growth in membership, future salaries are assumed to grow due to wage growth increases only. If increases should occur because of additional members, there will be a larger pool of salaries over which to spread the UAAL, if any, resulting in an actuarial gain.

3. Investment Return

Use in the Valuation

The investment return assumption is one of the primary determinants in the calculation of the expected cost of LACERA's benefits, providing a discount of the future benefit payments that reflects the time value of money. This assumption has a direct impact on the calculation of liabilities, normal costs, member contribution rates, and the factors for optional forms of benefits. The current investment return assumption for LACERA is 7.25% per year, net of all administrative and investment-related expenses.

Expected Long-Term Investment Return

To estimate the expected long-term return we have looked at capital market assumptions from three sources: Milliman, Meketa (LACERA's external investment consultant, and a survey of other investment consulting firms (Horizon Survey of Capital Market Assumptions, 2019 edition). We have combined these capital market assumptions with LACERA's target asset allocation. The target asset allocation is summarized in the following table:

| Class | Target Allocation |
|---------------------------------|-------------------|
| Global Equity | 35% |
| Private Equity | 10% |
| Opportunistic Real Estate | 2% |
| High Yield Bonds | 3% |
| Bank Loans | 4% |
| Emerging Market Debt | 2% |
| Illiquid Credit | 3% |
| Core / Value-Add Real Estate | 7% |
| Natural Resources / Commodities | 4% |
| Private Infrastructure | 3% |
| TIPs | 3% |
| Investment Grade Bonds | 19% |
| Diversified Hedge Funds | 4% |
| Cash | 1% |

Combining the capital market assumptions with the target asset allocation policy, we calculated both the 10- and 20-year expected returns for each of the three sources. These expected returns have been reduced for administrative and investment expenses, as discussed later, and are the median expected return on a geometric basis for LACERA’s assets. Note that we have also indicated the associated inflation assumptions for the capital market assumptions. A higher inflation assumption will generally lead to a higher expected return.

| | Meketa | Milliman | Horizon |
|-------------------------------------|--------|----------|---------|
| Based on 10-Year Assumptions | | | |
| Median Annualized Return | 6.8% | 6.3% | 6.6% |
| Assumed Inflation | 2.1% | 2.3% | 2.2% |
| Based on 20-Year Assumptions | | | |
| Median Annualized Return | 7.5% | 6.4% | 7.3% |
| Assumed Inflation | 2.6% | 2.3% | 2.3% |

Notes:

1. Returns are net of assumed expenses of 0.18% of assets.
2. The Horizon Survey reports a limited number of asset classes. In cases where there was not a corresponding asset class in the survey, Meketa’s assumptions for the corresponding time horizon were used.
3. Horizon 10-year assumptions include some consultants with less than 10 years. Horizon 20-year assumptions include some consultants with more than 20 years and are based on a subgroup of less than half of the full group.

When actuaries recommend the investment return assumption, they generally consider a long-term time horizon. As LACERA is a mature plan (over half the value of accrued liabilities are expected to be paid in the next 15 years), we have considered both the 10-year and 20-year time horizons in making our recommendation. This reflects the time horizon over which the majority of LACERA’s actuarial accrued liability is to be paid.

Timing of Capital Market Assumptions

The capital market assumptions used in this analysis were determined as of January 2019 (or the end of 2018). Subsequent to those capital market assumptions being determined, there has been a significant decline in yields on fixed income which we believe will cause a drag on future expected returns, and an increase in the price-to-earnings ratio which leaves less room for future growth. At the October Board of Investments meeting, Meketa indicated that they also expect to see a decline in the expected return. We have considered this decrease in expected future returns in making our recommendations, but have not directly reflected it in our analysis.

Administrative and Investment-Related Expenses

The investment return used for the valuation is assumed to be net of all administrative and investment-related expenses. Most asset classes in the Milliman capital market assumptions are effectively net of investment expenses. It is our understanding this is true for Meketa and the investment consultants included in the Horizon survey. Asset classes that are readily marketable, such as global equity and fixed income, do not reflect expenses in the expected return assumption. For those classes, we assume investment fees based on the cost of indexing, as it is unlikely LACERA would pay active managers unless it was expected the return could at least match the index return. Additionally, we adjust for other investment-related expenses, such as internal investment staff and outside consultants. Our assumption is that investment expenses will be 0.05% of assets.

The following table shows the ratio of administrative expenses to the LACERA Plan assets over the last 10 fiscal years ending June 30. The expense ratio is calculated as the expense amount divided by the ending asset balance at fair market value.

| (\$million) Year Beginning | Beginning Market Assets | Admin. Expense | |
|----------------------------------|-------------------------------|----------------|-------|
| | | Amount | Ratio |
| 2009 | \$30,499 | \$49 | 0.16% |
| 2010 | 33,434 | 51 | 0.15 |
| 2011 | 39,452 | 50 | 0.13 |
| 2012 | 38,307 | 54 | 0.14 |
| 2013 | 41,774 | 59 | 0.14 |
| 2014 | 47,722 | 63 | 0.13 |
| 2015 | 48,818 | 67 | 0.14 |
| 2016 | 47,847 | 67 | 0.14 |
| 2017 | 52,743 | 67 | 0.13 |
| 2018 | 56,300 | 71 | 0.13 |

For the administrative expenses, we have assumed no change in the current assumption of 0.13% of market assets, as the actual ratio has been close to this over the last five years. Accounting for this, combined with the 0.05% we have assumed for investment-related expenses, we have included a reduction of 0.18% in our calculation of the expected return. For example, Meketa calculated a 7.0% 10-year expected return; we have used 6.8% in our analysis, reflecting this 0.18% reduction.

The expense assumption does not have a direct impact on the actuarial valuation results, but it does provide a measure of gross return on investments that will be needed to meet the actuarial assumption used for the valuation. For example, our recommended investment return assumption is 6.75%, so LACERA would need to earn a gross return on its assets of 6.93% in order to net the 6.75% for funding purposes.

We recommend the 0.13% adjustment for administrative expenses be added to the investment return assumption adopted to determine the discount rate used in LACERA’s GASB 67 and 68 valuations, as GASB requires the discount rate to be the long-term expected rate of return gross of administrative expenses, but not investment expenses.

Excess Earnings

Section 31592.2 of the 1937 Act provides the Retirement Board with the authority to set aside earnings of the retirement fund during any year in excess of the total interest credited to contributions when such surplus exceeds 1.00% of the total assets of the retirement system.

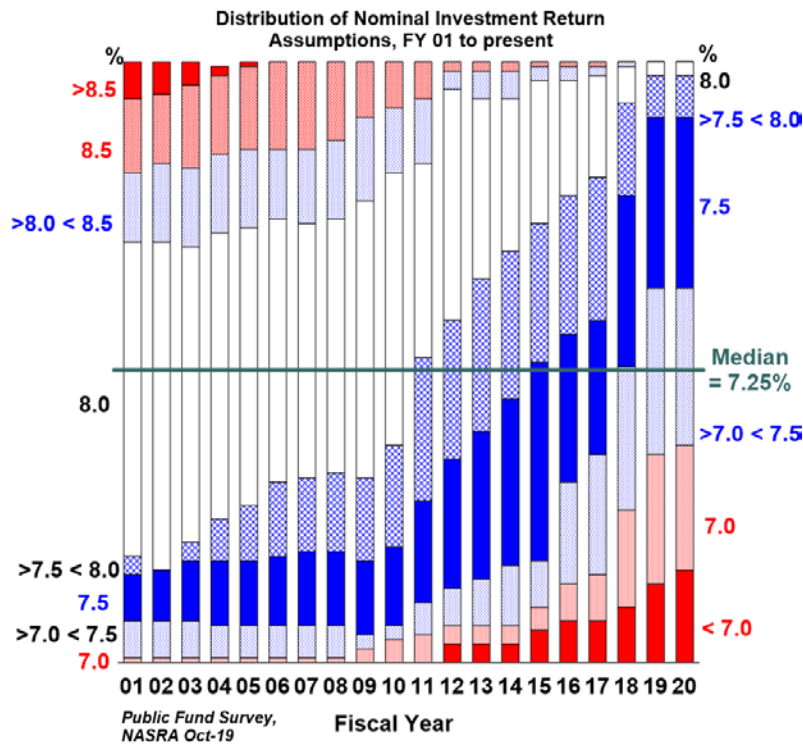
Under LACERA’s Retirement Benefit Funding Policy, it is the intention of the Board of Investments to distribute no excess earnings unless the plan is fully funded and then to only provide limited benefits on the basis of excess earnings after the plan is fully funded. Since it is expected to be quite some time before LACERA once again reaches full funding status, the likelihood of any excess earnings being distributed for discretionary benefits is quite low in the foreseeable future. Further Section 7522.44 may further restrict the Board’s ability to distribute excess earnings. Therefore, for purposes of the 2019 experience study, we do not propose to recognize any additional excess earnings benefits for future years when setting the investment return assumption. This issue should be addressed again in 2022 as part of the 2022 assumption study.

If the Board of Investments determines that the fund should share excess earnings with members when times are good, but the fund is not able to collect additional revenue when investment returns lag expectations, there is a

cost to LACERA over time. Thus, if the Board changes its policy toward excess earnings, it must find some way to recognize an obligation for benefits attributable to excess earnings. An excess earnings policy would result in increased payments made by LACERA to members over the long term. If these potential future benefits are not recognized in setting the investment return assumption or in determining LACERA's future benefit payments, the total liabilities will be understated.

Peer System Comparison

According to the *Public Fund Survey*, the average investment return assumption for statewide systems has been steadily declining. As of the most recent study, the median rate is 7.25%. The following chart shows a progression of the distribution of the investment return assumptions. In 2001, very few systems had an assumption of 7.25% or lower and over 80% had an assumption of 8.0% or greater. As of fiscal year 2019, over 50% have an assumption of 7.25% or less and this is continuing to trend down.



Cost Implications of Changes in Investment Return Assumption

In most retirement systems with variable contribution rates, such as LACERA, the greatest factor contributing to the volatility of contribution rates is the return on investments. If, in the future, the full actuarial assumption of 7.25% is not able to be credited to the valuation reserves, there may be an increase in the employer contribution rate. The base member contribution rates are determined based on the '37 Act statutes, the actuarial assumptions, and the benefit provisions and are not affected by asset values. The COLA portion of the member rates also does not reflect asset values. Therefore, any experience gain or loss in investments is not expected to directly impact the member contribution rates but will impact the employer contribution rates.

To assist the Board in understanding the sensitivity to changes in the investment return rate assumption, we revalued the 2018 valuation results using the recommended investment return assumption of 6.75%, as well as an alternative of 7.00%. This is discussed in the Financial Impact section of the Executive Summary.

Conclusion

Based on Meketa's January 2019 capital market assumptions, there is slightly more than a 50% probability that the current investment return of 7.25% will be met over the next 20 years; however, there is less than a 50% probability that the current investment return of 7.25% will be met over the next 10 years. Based on Milliman's capital market assumptions, the probability of meeting 7.25% is materially less than 50% over all time horizons. Further, expected returns have declined since January 2019. Therefore, we are recommending a reduction in the investment return assumption to 6.75%.

| Investment Return (net of all expenses) | |
|---|----------------|
| Current assumption | 7.25% |
| Recommended | 6.75% |
| Reasonable Alternatives | 6.50% or 7.00% |

Post-Retirement Cost-of-Living Adjustments (COLA)

The current assumption is that retiree COLAs will be equal to the maximum COLA level provided by the plan (3% for Plan A, up to 2% for Plan E based on the individual, and 2% for the other plans), but not greater than the price inflation assumption. We recommend this assumption be continued. This means that if the price inflation is reduced, the assumed COLA for Plan A should be reduced to that level. The only exception is that to account for existing Plan A COLA balances, retirees and beneficiaries with a retirement date prior to April 1, 1981 are assumed to receive 3.00% annual COLAs.

5. Salary Increases Due to Promotion and Longevity (Merit Increases)

As discussed in Section 4, estimates of future salaries are based on assumptions for two types of increases:

1. Increases in each individual's salary due to promotion or longevity, which occur even in the absence of inflation; and
2. Increases in the general wage level of the membership, which are closely related to inflation and increases in productivity.

In section 4, we reviewed the general wage growth assumption. In this section, we will study increases due to promotion or longevity. We generally refer to these increases as merit increases.

Results

Merit increases are assumed to be related to two factors. We studied each of these factors to see if they were significant, and, if so, what the impact was. Our findings were as follows:

- **Service:** Members in the early stages of their careers tend to get larger merit increases. In other studies, we have found years of service to have the most significant impact on merit increases. We found this to be true with LACERA.
- **Membership:** The current rates assume that Safety members receive slightly larger salary increases than General members later in their career. As noted in the Methodology section below, we studied a longer period this year. Based on this study, we observed that Safety members received significantly larger merit increases at certain service levels (19, 24 and 29 years of service). We reviewed the most recent contract for deputy sheriffs and confirmed that the contract has included longevity pay increases at those service levels for a number of years. Note that other Safety groups have different provisions in their contracts, but given the size of the deputy sheriff group, it is clearly having a significant impact. Therefore, we believe the results of the study are valid and are recommending changes to reflect the actual experience.

Methodology

In studying merit increases, we first calculated the increase in member salaries that was due to general wage growth for each year of the study. For each individual we then calculated the total salary increase by comparing salaries for successive years. The merit increase was then identified by removing the general wage growth portion from the member's total salary increase.

There can be significant year-to-year variations in the calculated general wage growth, which can in turn cause disparities in the observed merit salary increases. To reduce these variations, we are using longer time frames in our studies of merit salary increases. For LACERA, we have used a 15-year period.

Recommendation

Merit salary increases were higher than assumed increases, primarily for Safety members. We are recommending small increases in the assumption for General members to reflect actual experience. For Safety members, we are recommending small increases at most service levels and large increases at service years 19, 24, and 29. The assumed rates are shown numerically in Appendix A.

Exhibit 5-1
 Salary Increases by Service – General Members

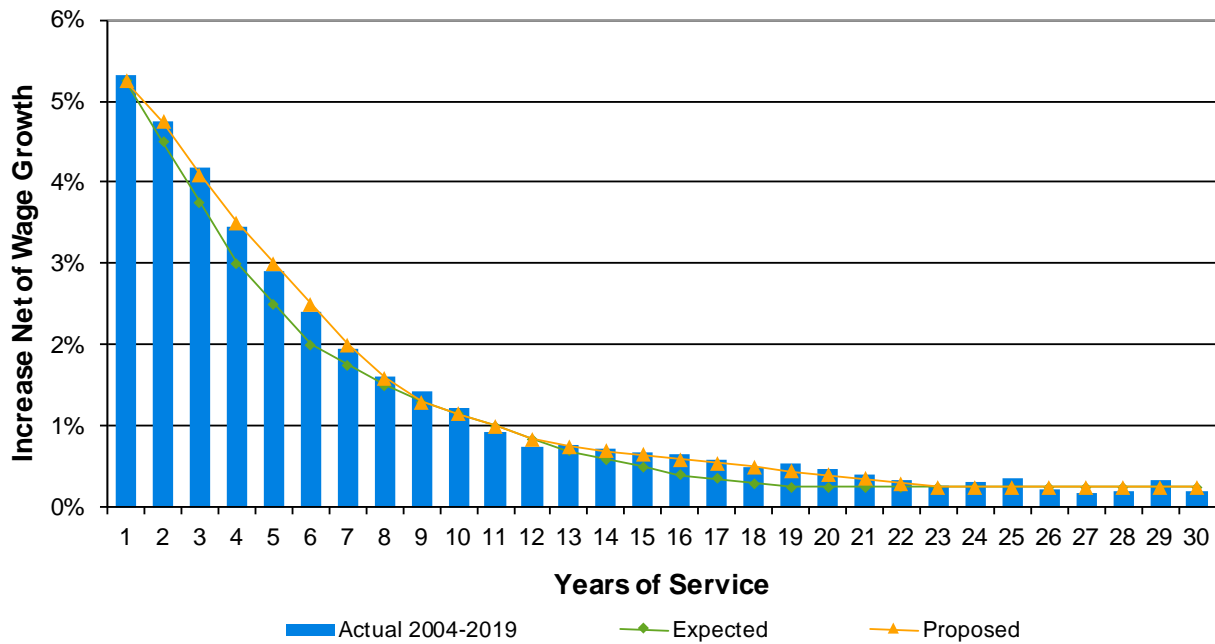
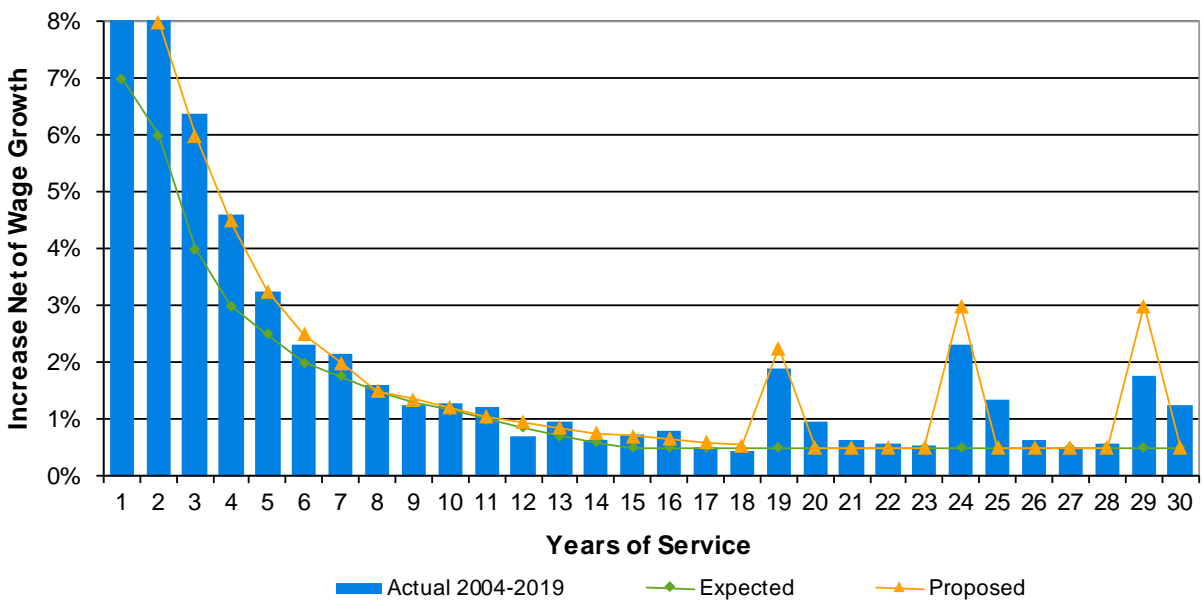


Exhibit 5-2
 Salary Increases by Service – Safety Members



6. Death from Active Status

We studied rates of mortality among active members. At any given age, the current assumption is a lower probability of death for an active member than for a retired member. We feel this is reasonable as a person who is actively working tends to be healthier on average, and therefore less likely to die than the general population.

Results: Service-Connected Deaths

The current assumptions for service-connected deaths are zero for General members and 0.01% per year for Safety members. Since the actual experience is extremely limited, we recommend retaining the current service-connected death assumption for active members. The data is not a statistically significant enough size to merit studying separately.

Results: Nonservice-Connected Deaths (Ordinary Deaths)

The following is a comparison of the actual-to-expected deaths of active members by plan and gender for this study period. We have recommended changes to the ordinary death rates to reflect more recent mortality tables based on experience for public sector retirement systems. The recommended tables are discussed on the following page.

| Plan | Gender | Actual | Expected | Actual / Expected | Proposed | Actual / Proposed |
|--------------------------------|--------------|------------|------------|-------------------|------------|-------------------|
| General A-D & G ⁽¹⁾ | Male | 125 | 99 | 126% | 104 | 120% |
| General A-D & G ⁽¹⁾ | Female | 152 | 130 | 117% | 127 | 120% |
| Safety | Male | 30 | 24 | 125% | 28 | 107% |
| Safety | Female | 1 | 3 | 33% | 3 | 33% |
| | Total | 308 | 256 | 120% | 262 | 118% |

1. Note that Plan E has been excluded from this study, as we believe that these deaths are under-reported because Plan E does not provide a death benefit for active members.

The results of the study are shown graphically in Exhibits 6-1 to 6-4. The proposed rates are also shown numerically in Appendix A. The rates are currently based on three factors. We studied each of these factors to see if they were significant, and, if so, what the impact was. Our findings were as follows:

- **Age:** Members at older ages tend to have a greater probability of dying than younger members. This is almost universally true in mortality studies.
- **Gender:** Male members tend to have a greater probability of dying than females. This trend is generally true for all mortality studies, and we found this to be true with LACERA.
- **Membership:** Safety members have comparatively lower rates of mortality than the general population. These lower rates of death while still in active employment are most likely a result of the much earlier retirement ages available to Safety members and their higher rates of disability while active. That is, Safety members who are less healthy than the rest of the population will tend to leave active employment sooner, and only the healthiest group remains in active Safety employment at ages 50 and above when there is a higher probability of active death.

Additionally, we looked at the impact of the compensation level on active mortality rates. We observed that members with lower compensation levels had higher rates of mortality. The graphs at the end of this section reflect the compensation-weighted probabilities of death while active.

New Public Plan-Specific Mortality Tables

In 2019, the Society of Actuaries published new mortality tables based on data from public sector retirement systems. In particular, tables specific to general and safety members were included. We compared how well the current LACERA mortality tables and the new class-specific mortality table matched the actual experience. Based on our analysis, we found that the tables matched well with the retired mortality experience. There was more variation among the active member groups, which is typical of what we see with other systems. We are recommending a change to the new tables.

Recommendation

Based on results of the study, we have recommended lowering the member death rates as follows:

| Class | Gender | Current Table | | Proposed Table |
|---------|--------|--|----|---|
| General | Male | RP 2014E Male, Generational ⁽¹⁾ | -2 | PubG-2010 (120%) Employee Male ⁽²⁾ |
| General | Female | RP 2014E Female, Generational ⁽¹⁾ | -0 | PubG-2010 (130%) Employee Female ⁽²⁾ |
| Safety | Male | RP 2014E Male, Generational ⁽¹⁾ | -6 | PubS-2010 (100%) Employee Male ⁽²⁾ |
| Safety | Female | RP 2014E Female, Generational ⁽¹⁾ | -0 | PubS-2010 (100%) Employee Female ⁽²⁾ |

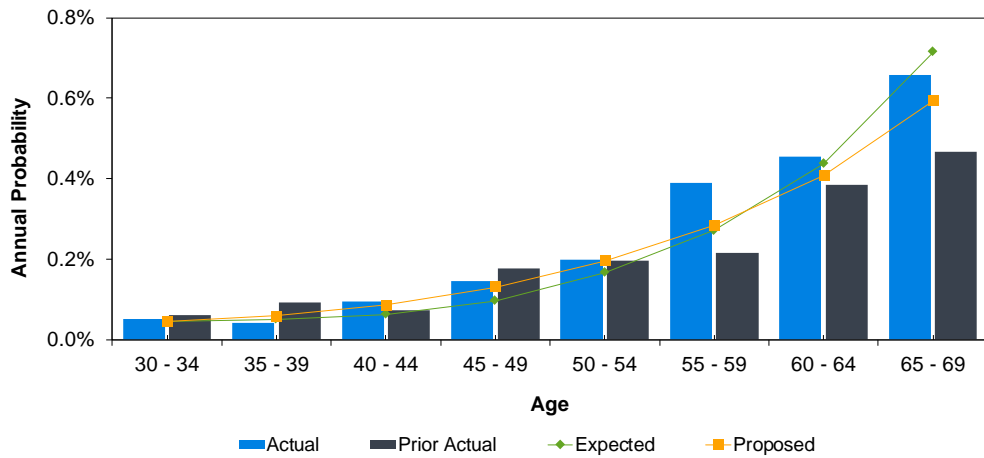
1. All tables are the RP-2014 Employee mortality table with mortality improvement based on 100% of the MP-201 Ultimate projection scale.

2. All tables are the Pub-2010 Employee mortality tables for General and Safety members, with mortality improvement based on 100% of the MP-2019 Ultimate projection scale.

To reflect future increase in life expectancies, we are recommending continued use of the same mortality improvement projection scale. Note that the public-specific mortality tables did not include projections scales. See Section 11 (Retiree Mortality) for additional discussion on this topic.

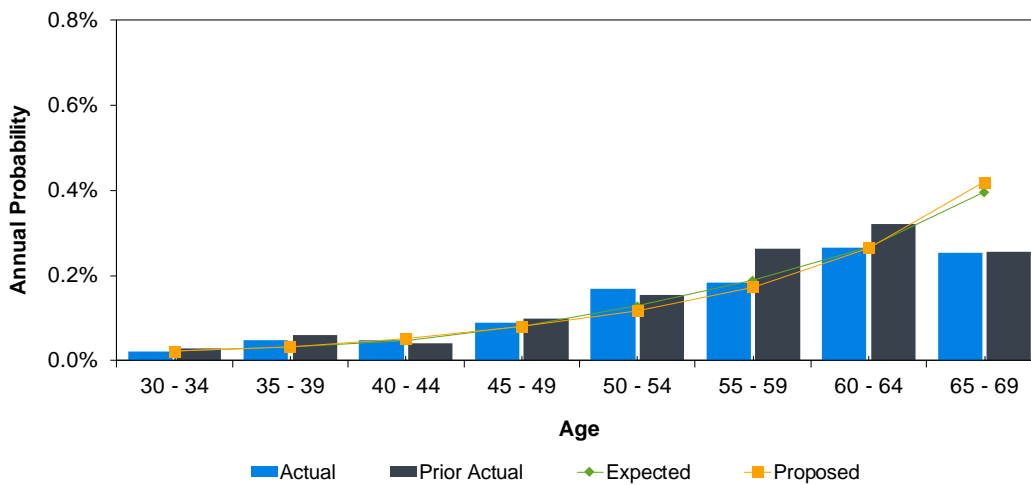
There is insufficient data for female Safety members to perform an analysis that is statistically significant. We have recommended the female Safety member nonservice-connected death rate be set equal to the female General member assumption. This is consistent with the current assumption.

Exhibit 6-1
Nonservice-Connected Death – General A-D & G Male Members



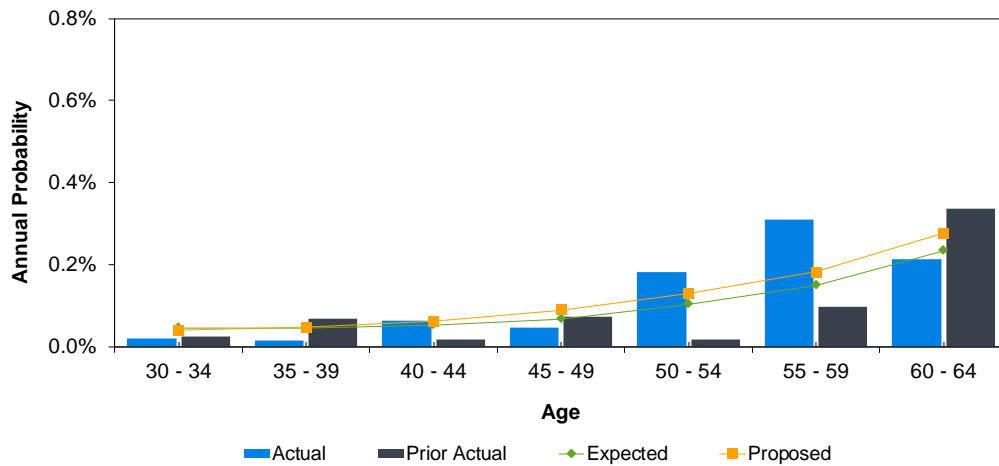
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 99 | 125 | 104 |
| Actual / Expected | 126% | | 120% |

Exhibit 6-2
Nonservice-Connected Death – General A-D & G Female Members



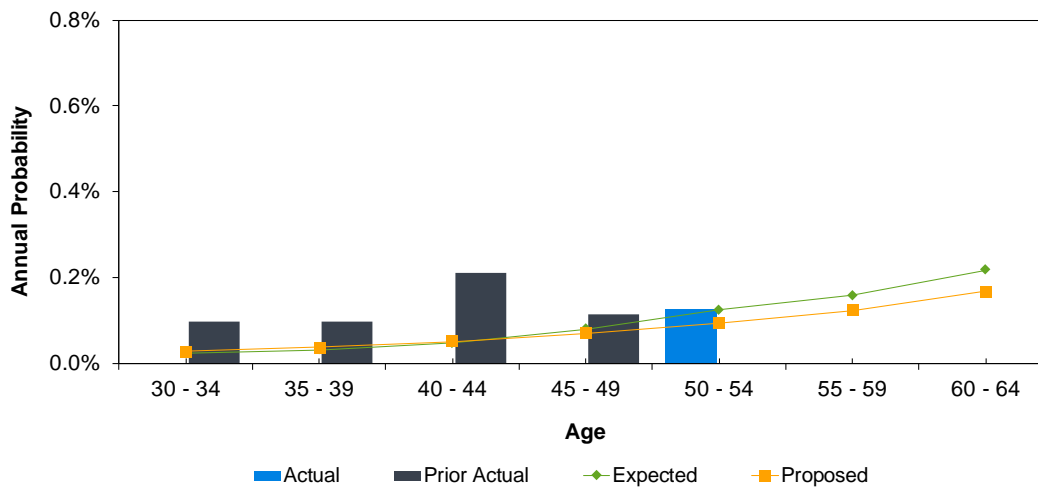
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 130 | 152 | 127 |
| Actual / Expected | 117% | | 120% |

Exhibit 6-3
Nonservice-Connected Death – Safety Male Members



| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 24 | 30 | 28 |
| Actual / Expected | 125% | | 107% |

Exhibit 6-4
Nonservice-Connected Death – Safety Female Members



| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 3 | 1 | 3 |
| Actual / Expected | 33% | | 33% |

7. Service Retirements

Exhibits in this section present comparisons of actual service retirements during the study period with those expected according to the actuarial assumptions used in our June 30, 2018 valuation. Overall, the actual number of service retirements exceeded the number expected, although there were some differences by plan.

Results

For General D and Safety A & B plan members, the actual number of retirements exceeded the expected number.

| Plan | Actual | Expected | Actual / Expected |
|--------------|--------------|--------------|-------------------|
| General A-C | 218 | 244 | 89% |
| General D | 3,829 | 3,375 | 113% |
| General E | 2,387 | 2,423 | 99% |
| Safety A & B | 1,135 | 1,008 | 113% |
| Total | 7,569 | 7,050 | 107% |

Counts reported for General members are for ages 50-74;
 counts reported for Safety members are for ages less than 65.

Retirement rates are currently based on two factors. We studied each of these factors to see if they were significant, and, if so, what the impact was. Our findings were as follows:

- **Age:** For General members, probabilities of retirement tend to be higher at ages 60 and above than at earlier ages. Additionally, there tend to be even higher rates at ages 62, 65, 66, and 67, likely due to the impact of Medicare and Social Security. The trend is less pronounced for LACERA than we generally see in other systems, since the County has not participated in Social Security since 1982.
- **Membership:** The older, closed General Plans A-C have higher rates of retirement than the younger Plans D and E, likely due to the more valuable benefit formula at the younger ages for these plans. Safety members are currently assumed to have retired from active status by age 65 and have much higher rates of retirement between ages 55 and 60 than the General members. General members are assumed to have retired from active status by age 75. Note that we have excluded the new plans (General G and Safety C) as there were insufficient members eligible for retirement during the period to analyze their experience.

Additionally, we looked at the impact of the compensation level on service retirement rates. We observed that members with higher compensation have higher probabilities of retiring at a given age. The graphs at the end of this section reflect the compensation-weighted probabilities of service retirement.

Recommendation

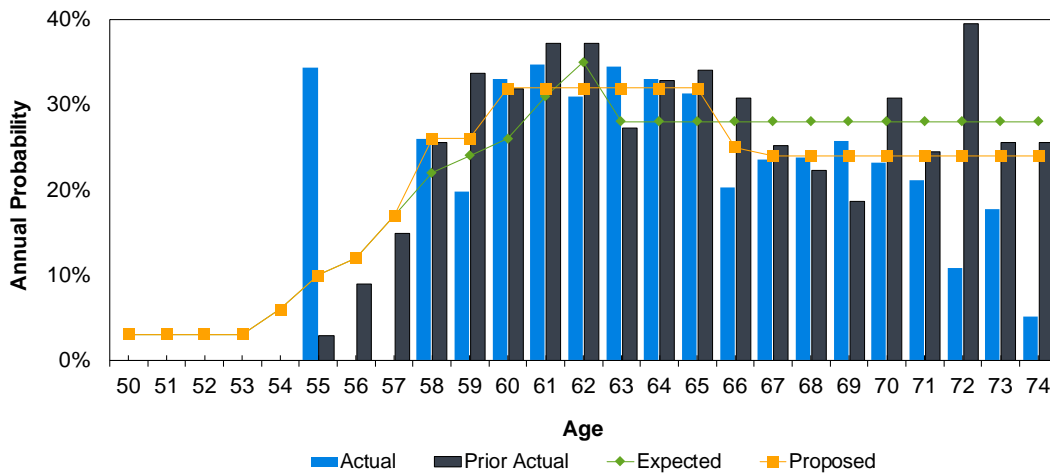
We are recommending some changes in the rates of retirement, as shown in Exhibits 7-1 to 7-4. These are primarily increases in the assumed service retirement rates. We have also recommended new tables for General G and Safety C to reflect their specific age factors. The new proposed rates are shown numerically in Appendix A. The recommended changes will increase the number of expected retirements.

The results reflecting the proposed assumptions are shown in the following table:

| Plan | Actual | Expected | Actual / Expected | Proposed | Actual / Proposed |
|--------------|--------------|--------------|----------------------|--------------|----------------------|
| General A-C | 218 | 244 | 89% | 243 | 90% |
| General D | 3,829 | 3,375 | 113% | 3,584 | 107% |
| General E | 2,387 | 2,423 | 99% | 2,506 | 95% |
| Safety A & B | 1,135 | 1,008 | 113% | 1,073 | 106% |
| Total | 7,569 | 7,050 | 107% | 7,406 | 102% |

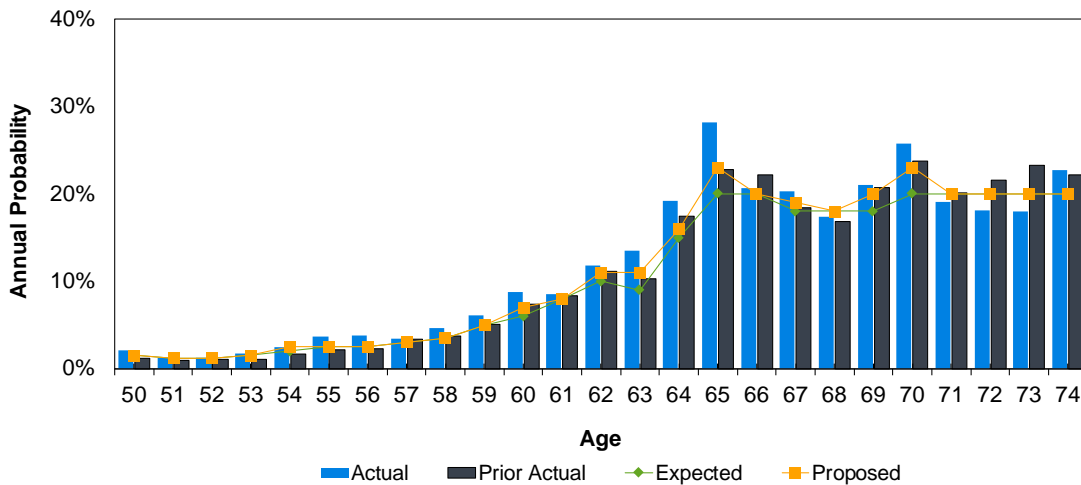
Counts reported for General members for ages 50-74; counts reported for Safety members are for ages less than 65.

Exhibit 7-1
 Service Retirement – General A, B & C Members



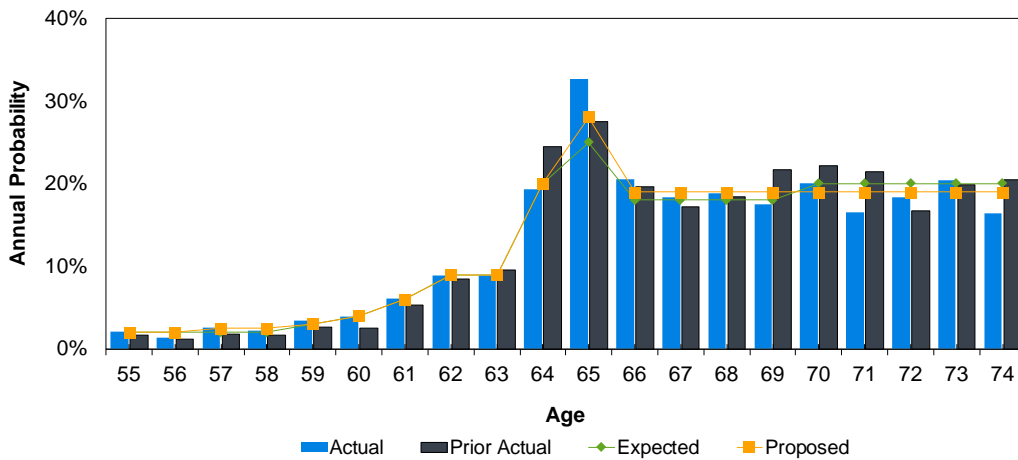
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 244 | 218 | 243 |
| Actual / Expected | 89% | | 90% |

Exhibit 7-2
 Service Retirement – General D Members



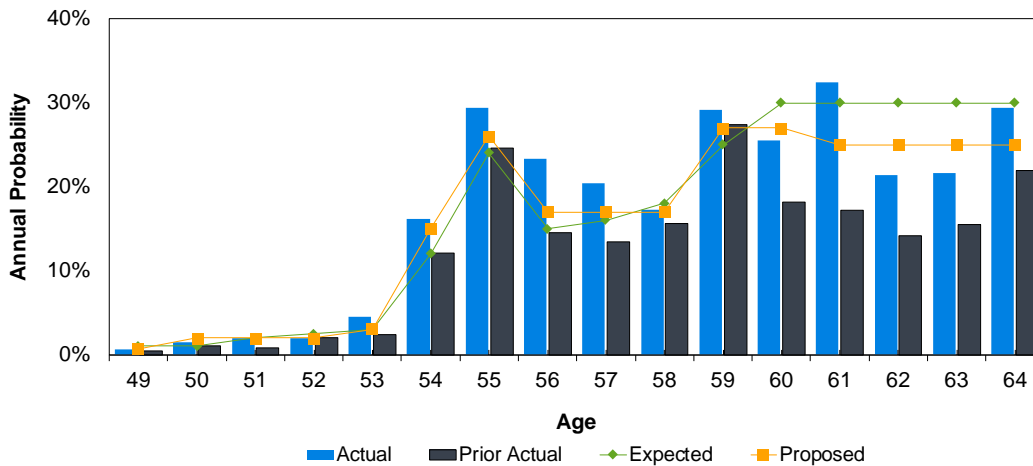
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 3,375 | 3,829 | 3,584 |
| Actual / Expected | 113% | | 107% |

Exhibit 7-3
 Service Retirement – General E Members



| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 2,423 | 2,387 | 2,506 |
| Actual / Expected | 99% | | 95% |

Exhibit 7-4
 Service Retirement – Safety Members



| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 1,008 | 1,135 | 1,073 |
| Actual / Expected | 113% | | 106% |

8. Disability Retirements

LACERA allows a member to start receiving benefits prior to eligibility for service retirement if the member becomes disabled. There are two types of disability:

- **Service-Connected Disability:** This is available only to members who are disabled for the performance of duty. There is no service requirement for this benefit, and the service-connected disability benefit generally pays a larger benefit than nonservice-connected disability.
- **Nonservice-Connected Disability:** This is available to a disabled member upon satisfying the vesting requirement.

Results: Service-Connected Disability

Overall, we found there were fewer service-connected disabilities than the current rates predicted. The following is a comparison of the actual to expected service-connected disabilities for active members by gender and plan for this study period.

| Plan | Gender | Actual | Expected | Actual / Expected |
|-----------------|--------|------------|------------|-------------------|
| General A-D & G | Male | 76 | 92 | 83% |
| General A-D & G | Female | 132 | 133 | 99% |
| Safety | Male | 355 | 490 | 72% |
| Safety | Female | 77 | 73 | 105% |
| Total | | 640 | 788 | 81% |

Exhibits 8-1 to 8-4, at the end of this section, show the results of the study graphically. The rates are currently based on age, gender, and plan membership. Our findings were as follows:

- **Age:** Members at older ages tend to have a greater probability of becoming disabled than younger members.
- **Gender:** For General members, males have a higher rate of disability than females. For Safety members, females tend to have higher rates (relative to males) at younger ages.
- **Membership:** Safety members have significantly higher rates of disability than General members; therefore, separate rates are recommended for each class. All General contributory members were studied together. Plan E does not provide for disability benefits and is therefore excluded from the study.

Recommendation: Service-Connected Disability

Male General and Safety members experienced fewer service-connected disabilities than were expected by the current assumptions. We are recommending adjustments primarily at older ages to better fit the actual pattern of disability retirements.

Actual experience for female General and Safety members was close to the assumptions for each class. We are recommending minor adjustments to better fit the actual pattern of disability retirements for both General and Safety female members.

The revised results are shown in the following table:

| Plan | Gender | Actual | Expected | Actual / Expected | Proposed | Actual / Proposed |
|-----------------|--------|------------|------------|-------------------|------------|-------------------|
| General A-D & G | Male | 76 | 92 | 83% | 89 | 85% |
| General A-D & G | Female | 132 | 133 | 99% | 129 | 102% |
| Safety | Male | 355 | 490 | 72% | 370 | 96% |
| Safety | Female | 77 | 73 | 105% | 73 | 105% |
| Total | | 640 | 788 | 81% | 661 | 97% |

Results: Nonservice-Connected Disability

Overall, we found there were fewer nonservice-connected disabilities than the current rates would have predicted, which is the opposite of our findings from the prior study. The following is a comparison of the actual-to-expected nonservice-connected disabilities for active members by plan and gender for this study period.

| Plan | Gender | Actual | Expected | Actual / Expected |
|-----------------|--------|-----------|-----------|-------------------|
| General A-D & G | Male | 20 | 27 | 74% |
| General A-D & G | Female | 34 | 54 | 63% |
| Safety | Male | 0 | 0 | N/A |
| Safety | Female | 1 | 0 | N/A |
| Total | | 55 | 81 | 68% |

Exhibits 8-5 to 8-6 show the results of the study graphically. We studied rates by gender, age, and plan. Our findings were as follows:

- Age: Members at older ages tend to have a greater probability of becoming disabled than younger members.
- Gender: Females tend to have slightly higher disability rates at younger ages than males.
- Membership: There were very few nonservice-connected disabilities for Safety members.

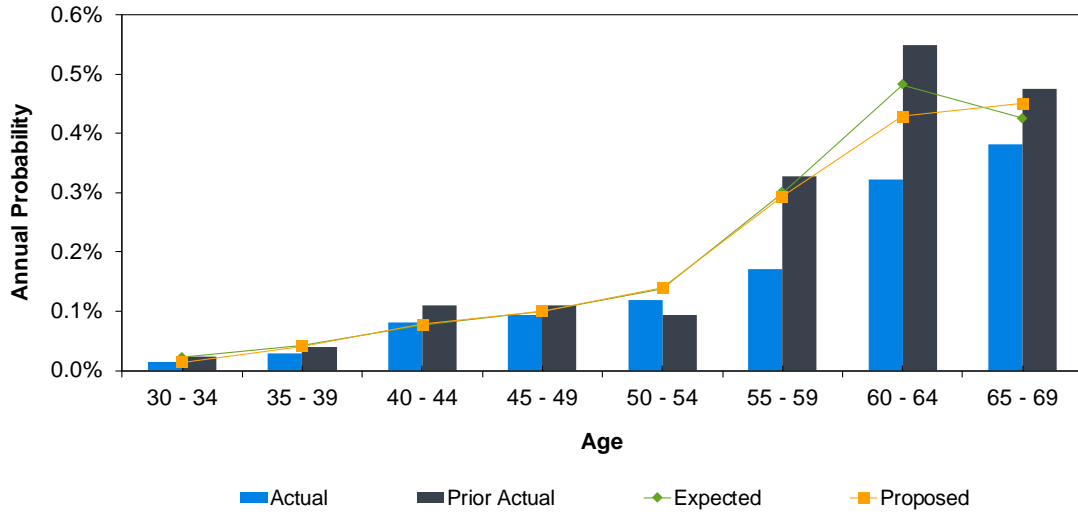
Recommendation: Nonservice-Connected Disability

Actual experience for nonservice-connected disabilities was lower than the assumptions for General members predicted, which is the opposite of experience in the prior study. Overall we do not view this difference as material given the small number of retirements. However, we are recommending adjustments to these assumptions to better fit the actual pattern of disability retirements over the last two study periods.. For Safety members there was only one nonservice-connected disability, so we recommend continuing the current practice of assuming all Safety disability retirements are service-connected.

The results reflecting the proposed assumptions are shown in the following table.

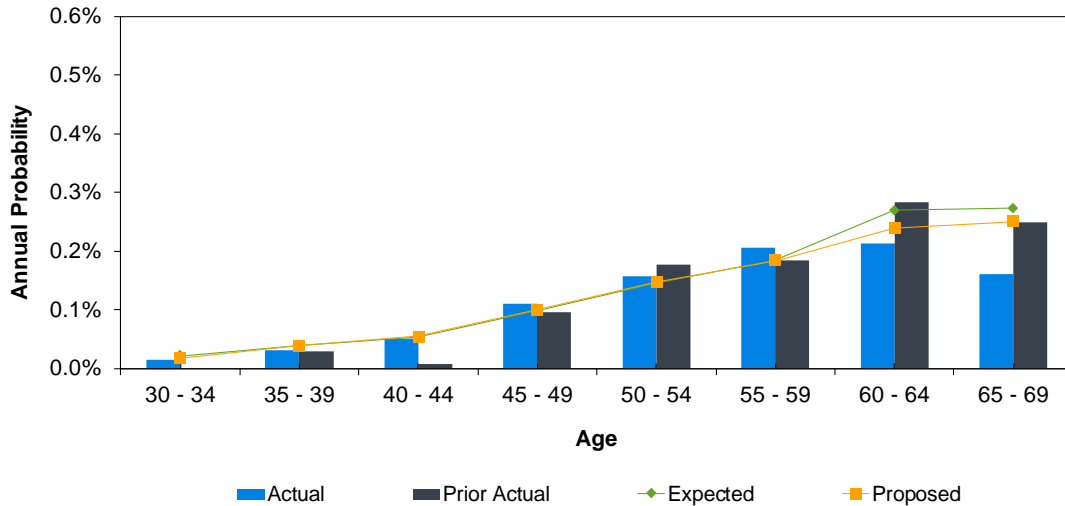
| Plan | Gender | Actual | Expected | Actual / Expected | Proposed | Actual / Proposed |
|-----------------|--------|-----------|-----------|-------------------|-----------|-------------------|
| General A-D & G | Male | 20 | 27 | 74% | 29 | 69% |
| General A-D & G | Female | 34 | 54 | 63% | 48 | 71% |
| Safety | Male | 0 | 0 | N/A | 0 | N/A |
| Safety | Female | 1 | 0 | N/A | 0 | N/A |
| Total | | 55 | 81 | 68% | 77 | 71% |

Exhibit 8-1
 Service-Connected Disability Retirement – General A-D & G Male Members



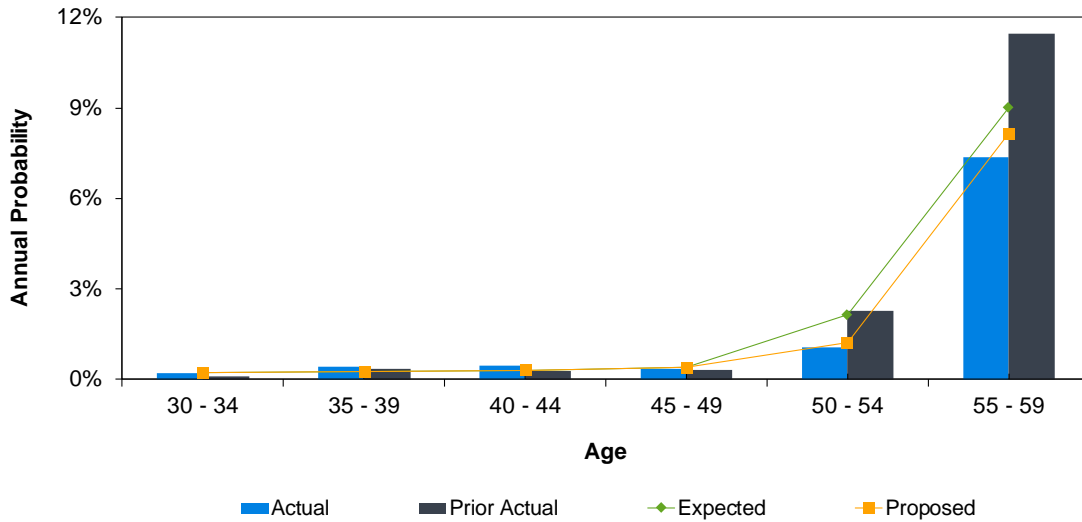
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 92 | 76 | 89 |
| Actual / Expected | 83% | | 85% |

Exhibit 8-2
 Service-Connected Disability Retirement – General A-D & G Female Members



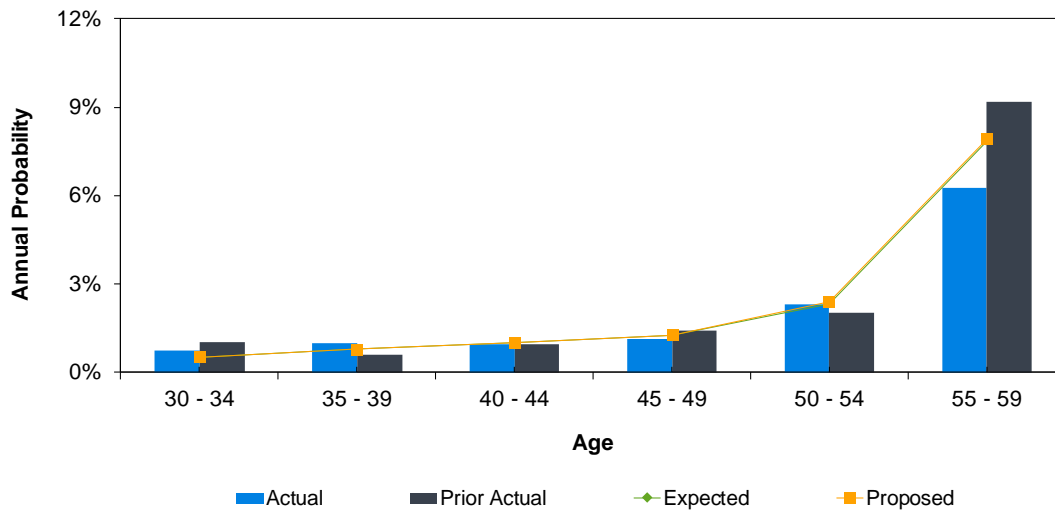
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 133 | 132 | 129 |
| Actual / Expected | 99% | | 102% |

Exhibit 8-3
 Service-Connected Disability Retirement – Safety Male Members



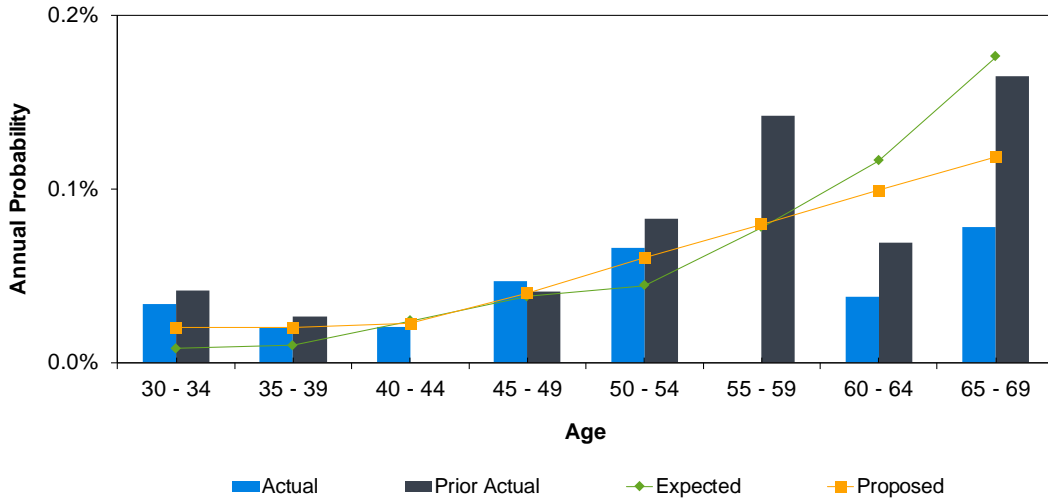
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 490 | 355 | 370 |
| Actual / Expected | 72% | | 96% |

Exhibit 8-4
 Service-Connected Disability Retirement – Safety Female Members



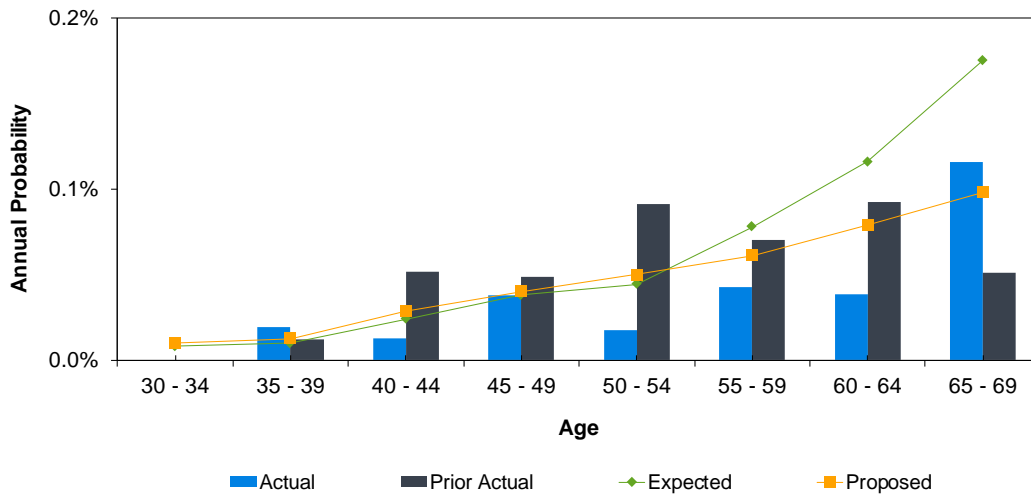
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 73 | 77 | 73 |
| Actual / Expected | 105% | | 105% |

Exhibit 8-5
Nonservice-Connected Disability Retirement – General A-D & G Male Members



| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 27 | 20 | 29 |
| Actual / Expected | 74% | | 69% |

Exhibit 8-6
Nonservice-Connected Disability Retirement – General A-D & G Female Members



| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 54 | 34 | 48 |
| Actual / Expected | 63% | | 71% |

9. Terminations (Includes both Refunds and Vested Terminations)

This section of the report summarizes the results of our study of terminations of employment for reasons other than death, service retirement, or disability. A member who terminates, but does not retire, is assumed to either take a refund (a withdrawal) or to terminate employment but leave the member contributions with the System (a vested termination). We will refer to the combination of the two rates as the aggregate termination rate. This approach sets a probability that the member will terminate, and then assumes a certain portion of the members terminating will elect a refund. The probability of refund is discussed in more detail in Section 10.

Results: Aggregate Terminations (Refunds and Vested Terminations)

Exhibits 9-1 to 9-3 at the end of this section show the results of the study graphically. Total terminations were greater than the assumptions predicted, with some variance by plan. We studied General D and General G together, and all Safety plans together this year. General A – C and Safety A no longer have many members impacted by the termination assumption so are not considered in this analysis. General D and Safety B provide experience for members with longer service while General G and Safety C provide experience for members with shorter service.

The following table summarizes these results along with our proposed changes:

| Plan | Actual | Expected | Actual / Expected | Proposed | Actual / Proposed |
|---------------|--------------|--------------|----------------------|--------------|----------------------|
| General D & G | 3,139 | 2,664 | 118% | 2,826 | 111% |
| General E | 507 | 454 | 112% | 454 | 112% |
| Safety | 244 | 206 | 118% | 214 | 114% |
| Total | 3,890 | 3,324 | 117% | 3,494 | 111% |

Termination rates are currently based on two factors: years of service and membership. We studied each of these factors to see if they were significant, and if so, what the impact was. Our findings were as follows:

- **Service:** Members in the early stages of their careers generally have a higher probability of terminating. In other studies, we have found years of service to have the most significant impact on termination, and have also found this to be true with LACERA.
- **Membership:** Currently, members are assumed to have a different probability of termination depending on which plan they are in. Each plan was analyzed and we determined an appropriate set of rates based on their experience. We found that there were differences with respect to rates of termination by plan, particularly when comparing Safety members to the other General plans.

Recommendation

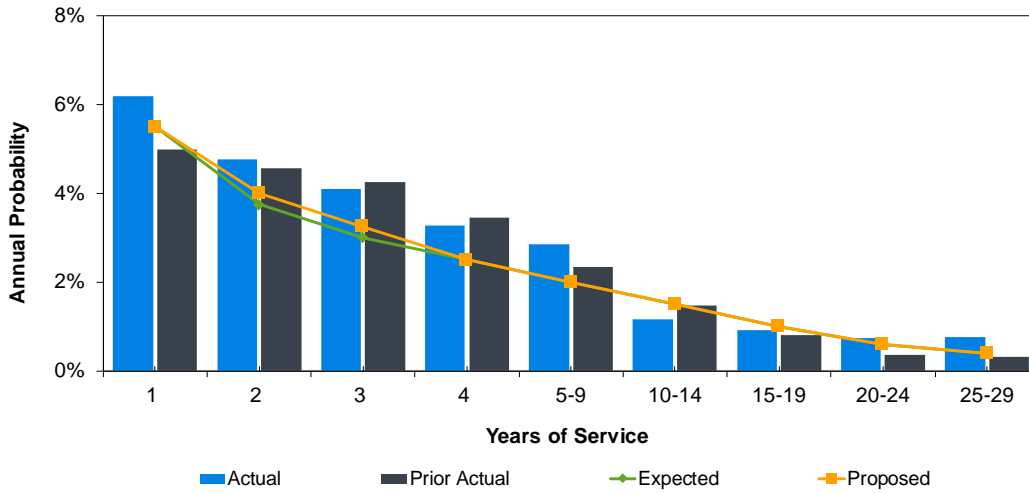
We are recommending rates of termination for all plans as follows:

- **General Plans D & G:** We are recommending slightly higher termination rates for members with less than three years of service and no changes for members with longer service.
- **General Plan E:** We are recommending no change to this assumption.

- **General Plans A-C:** These plans are closed and no new employees are covered by these plans since May of 1979. The total membership is aging and has almost 30 years of service in most cases. Under the current approach to applying termination rates, once a member is eligible for retirement, no termination is assumed. Thus, these rates represent the very low probabilities there are still members not yet eligible for retirement that could terminate. The current rate of termination is assumed at a flat 0.5%, regardless of age or years of service. We are recommending no change to this assumption.
- **Safety Members:** We are recommending slightly higher termination rates for members with one year of service, and adding an annual termination rate of 0.2% for members with between 20 and 29 years of service. Note that the extended termination rates do not apply to Safety A & B members who are eligible for service retirement with 20 years of service or more.

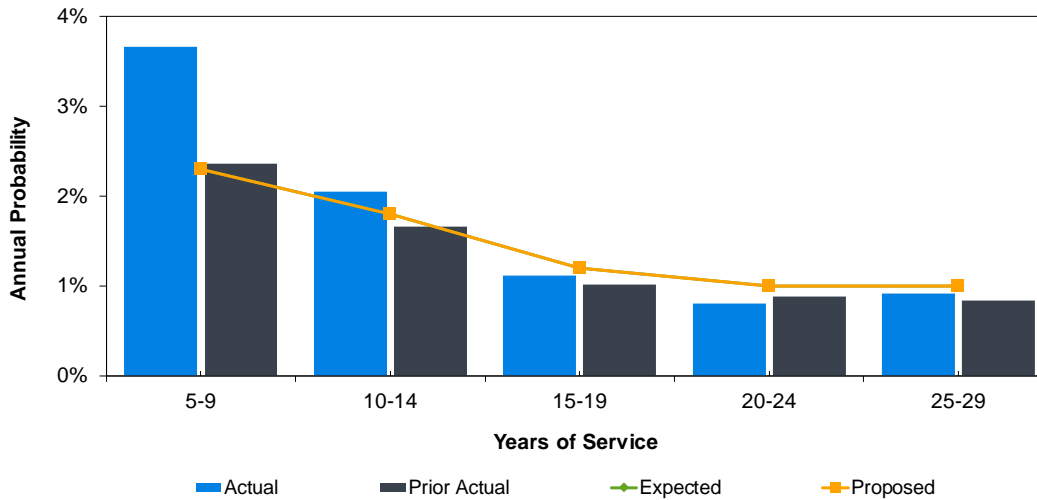
Additionally, we looked at the impact of member compensation level on termination rates. Compensation level appeared to have very little impact on termination rates, although we did observe slightly higher rates in the first years of service for members with higher compensation levels. The graphs at the end of this section reflect the compensation-weighted probabilities of termination from active status.

Exhibit 9-1
Termination Rates – General Plan D & G Members



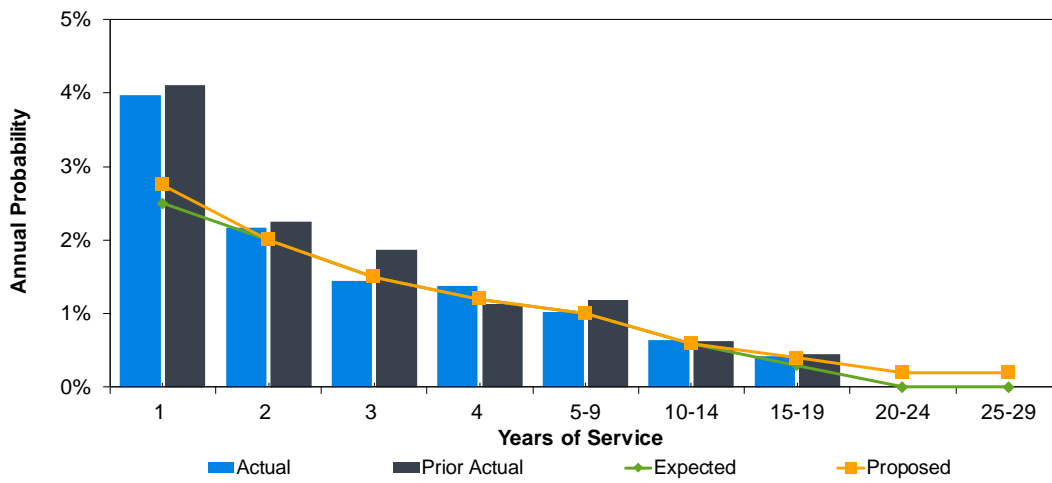
| | 2016 - 2019 Data (Excludes First Year) | | |
|-------------------|--|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 2,664 | 3,139 | 2,826 |
| Actual / Expected | 118% | | 111% |

Exhibit 9-2
Termination Rates – General Plan E Members



| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|-----------|
| | Expected | Actual | Proposed |
| Total Count | 454 | 507 | No Change |
| Actual / Expected | 112% | | |

Exhibit 9-3
 Termination Rates – Safety Members



| | 2016 - 2019 Data (Excludes First Year) | | |
|-------------------|--|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 206 | 244 | 214 |
| Actual / Expected | 118% | | 114% |

10. Probability of Refund

As discussed in Section 9, the aggregate termination rates include both members who terminate and take a refund of their contributions and those who elect to keep their contributions with LACERA and receive a deferred vested benefit. The percentage of members who are expected take a refund of their contributions is the probability of refund assumption.

Results

The current assumptions project that a portion of vested members will take a refund of their contributions based on their years of service and classification.

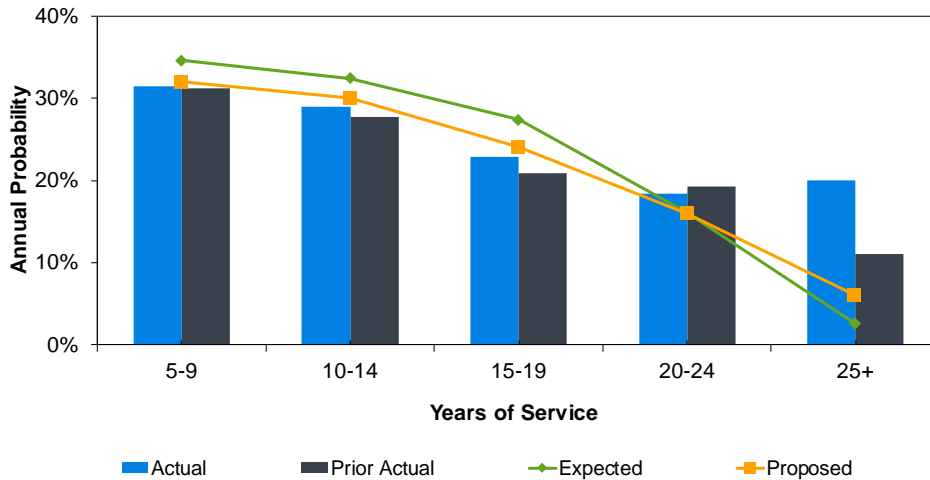
For vested members, there were somewhat fewer refunds than the assumptions projected for General and Safety members. Exhibits 10-1 to 10-2 on the following page show the results of the study graphically.

| Plan | Actual | Expected | Actual / Expected | Proposed | Actual / Proposed |
|--------------|------------|------------|----------------------|------------|----------------------|
| General | 432 | 474 | 91% | 436 | 99% |
| Safety | 32 | 38 | 85% | 32 | 100% |
| Total | 464 | 512 | 91% | 468 | 99% |

Recommendation

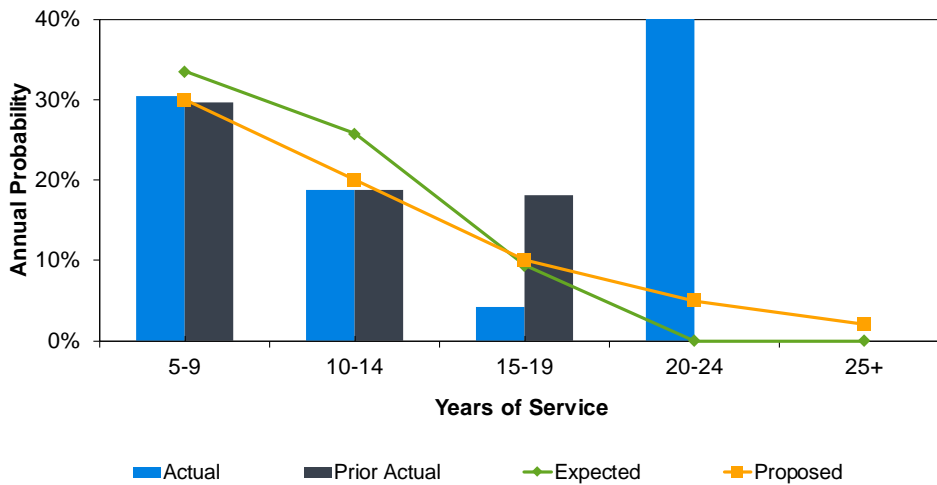
We are recommending changes in the probability of refund for both General or Safety members, generally to lower the probability of refunds for members with between 5 years of service and 20 years of service. We also recommend extending the assumption so that no refunds are assumed after a member has 30 years of service. Currently refunds are assumed to not occur after a General member has 26 years of service and a Safety member has 19 years of service. The rates start higher for members with fewer years of service and decline, as indicated, to 0% or no refund. Note that the probability of refund for Safety members with 20 or more years of service only applies to Safety Plan C members, as members of Safety Plans A & B are eligible for service retirement with 20 years of service.

Exhibit 10-1
 Probability of Refund – General Members



| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 474 | 432 | 436 |
| Actual / Expected | 91% | | 99% |

Exhibit 10-2
 Probability of Refund – Safety Members



| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 38 | 32 | 32 |
| Actual / Expected | 85% | | 99% |

11. Retiree Mortality for Valuation Purposes

In this section we look at the results of the study of actual and expected death rates of retired members. We studied rates of mortality among healthy and disabled retired members.

Mortality has been improving in this country and is expected to continue to improve. We recommend continued use of generational mortality tables (see later discussion) to account for projected future improvements in mortality. Generational mortality is reflected by including a mortality improvement scale that projects small annual decreases in mortality rates. Therefore, generational mortality explicitly assumes that members born more recently will live longer than the members born before them.

The Actuarial Standards of Practice require expected future mortality improvements to be considered in selecting the assumption. Using generational mortality tables achieves this. If generational mortality tables are not used, a margin in the mortality assumption should be used to account for future improvements in mortality, which is discussed later in this section.

Results

Overall, we found there were more deaths than the current rates predicted for healthy retired members: 4,101 actual to 3,959 expected for a total ratio of 104%. This ratio was 103% in the prior study indicating the improvement in mortality over the three-year study period was close to the expectation. The following is a comparison of the actual-to-expected deaths of service retired members by gender and type for the study period 2016-2019, including updated ratios based on our proposed assumptions.

Healthy (Service Retirement) Mortality

| Plan | Type | Gender | Actual | Expected | Actual / | Proposed | Actual / |
|--------------|---------|--------|--------------|--------------|-------------|--------------|-------------|
| | | | | | Expected | | Proposed |
| General | Healthy | Male | 1,708 | 1,689 | 101% | 1,561 | 109% |
| General | Healthy | Female | 2,038 | 1,897 | 107% | 1,881 | 108% |
| Safety | Healthy | Male | 259 | 283 | 92% | 246 | 105% |
| Safety | Healthy | Female | 15 | 17 | 88% | 16 | 94% |
| Total | | | 4,020 | 3,886 | 103% | 3,704 | 109% |

Note: Results in the table above are based on headcount. The recommended assumptions account for differences due to benefit levels (discussed below).

For disabled retirees, there were more deaths than the current rates predicted: 787 actual to 765 expected for a total ratio of 103%. This ratio was 103% in the prior study indicating the improvement in mortality over the three-year study period was close to the expectation. The following is a comparison of the actual-to-expected deaths of disabled retired members by gender and type for the study period 2016-2019, including updated ratios based on our proposed assumptions.

Disabled Mortality

| Plan | Type | Gender | Actual | Expected | Actual / | Proposed | Actual / |
|--------------|----------|--------|------------|------------|-------------|------------|-------------|
| | | | | | Expected | | Proposed |
| General | Disabled | Male | 187 | 184 | 102% | 166 | 113% |
| General | Disabled | Female | 212 | 218 | 97% | 206 | 103% |
| Safety | Disabled | Male | 368 | 340 | 108% | 329 | 112% |
| Safety | Disabled | Female | 20 | 23 | 87% | 22 | 91% |
| Total | | | 787 | 765 | 103% | 723 | 109% |

Note: Results in the table above are based on headcount. The recommended assumptions account for differences due to benefit levels (discussed below).

Exhibits 11-1 through 11-8 show the results of the study graphically for the period studied, 2016-2019. The rates are currently based on several factors. We studied each of these factors to see if they were significant, and, if so, what the impact was. Our findings were as follows:

- **Age:** Members at older ages tend to have a greater probability of dying than younger members. This is almost universally true in mortality studies.
- **Gender:** Male members tend to have a greater probability of dying than females. This trend is generally true for all mortality studies, and we found this to be true with LACERA.
- **Retirement Type:** Healthy retirees live longer than disabled retirees. This trend is generally true for all mortality studies, and we found this to be true with LACERA. Note that the difference between healthy and disabled retirees is significant for General members, but for Safety members the difference in rates of mortality is much less.
- **Membership:** The current assumptions predict that male Safety members live longer than male General members. This study confirms the same relationship between the memberships, although the difference for healthy retirees is fairly small.
- **Benefit Amount:** We also studied how the amount of an individual's benefits affected his/her mortality. We found that members with larger-than-average benefits tended to have lower mortality than those with smaller-than-average benefits. This is important because this means that if the assumptions exactly predict the number of deaths, the plan will incur actuarial losses. We found this to be particularly true for healthy male retirees. We have accounted for the impact of the benefit levels on mortality in our recommended rates. The graphs at the end of this section reflect the benefit-weighted probabilities of death while retired.

Generational Mortality Tables

Most actuarial valuations for public sector retirement systems use generational mortality tables, which explicitly reflect expected improvements in mortality. Generational mortality tables include a base table and a projection table. The projection table reflects the expected annual reduction in mortality rates at each age. Therefore, each year in the future, the mortality at a specific age is expected to decline slightly (and people born in succeeding years are expected to live slightly longer).

For example, if the mortality rate at age 75 is 2.00% for a member currently aged 75 and the projected improvement is 1.00%, the mortality rate at age 75 for a member currently aged 74 will be 1.98% [$2.00\% \times (100.00\% - 1.00\%)$]. Therefore, the life expectancy for a 75-year old in the next year will be greater than a 75-year old in the current year. This can result in significant differences in life expectancies when projecting improvements 30-plus years into the future.

One of the main benefits of generational mortality tables is that the valuation assumptions should effectively update each year to reflect improved mortality, and the mortality tables should need to be changed less frequently. During the previous investigation of experience study, LACERA adopted a generational mortality assumption.

Projection Scale for Mortality Improvement

There is a strong consensus in the actuarial community that future improvements in mortality should be reflected in the valuation assumptions. There is less consensus, however, about how much mortality improvement should be reflected. The projection scale (which projects future improvements in mortality) published by the Society of Actuaries (SOA) in 2014 incorporates a complex matrix of rates of improvement that vary by both age and birth year. Ultimately, the projection scale (MP-2014) goes to a flat 1% annual improvement in years 2027 and later for ages 85 or less.

Our general recommendation is to use a mortality projection scale of between 100% and 120% of the ultimate portion of the MP-2014 projection scale. In other words, our recommendation is to assume 1.0% and 1.2% annual improvements in mortality (for ages less than 85). We believe this reasonably reflects the long-term expectation of mortality improvement. We have compared our recommended projection scale with actual mortality improvement from the most recent 60 years of experience of the US Social Security system and found them to be reasonably consistent.

LACERA currently uses a mortality projection equal to 100% of the MP-2014 ultimate projection scale. That is, the current projection scale is a flat 1.0% improvement through age 85. For subsequent ages, the projected improvement is fractionally less, grading down to 0.0% at age 115. For example, the projected improvement is 0.64% per year at age 100. We believe this continues to be a reasonable assumption and recommend retaining this assumption.

New Public Plan-Specific Mortality Tables

As discussed in Section 6, the Society of Actuaries recently published new mortality tables based on data from public sector retirement systems. In particular, tables specific to general and safety members were included. We compared how well the current LACERA mortality tables and the new class-specific mortality table matched the actual experience. Based on our analysis, we found that the tables matched well with the retired mortality experience. We are recommending a change to the new tables.

Recommendation

We recommend an update to the mortality assumptions to reflect the new public plan specific mortality tables and retaining the mortality projection scale. Note that the total healthy retiree actual/proposed ratio under the recommended assumptions is 109% based on a head-count weighted basis. Accounting for the impact of benefit values, the actual/proposed ratio is 99%. We believe the combination of the recommended mortality tables with the projection scale allows for a reasonable expectation of future life expectancy increases.

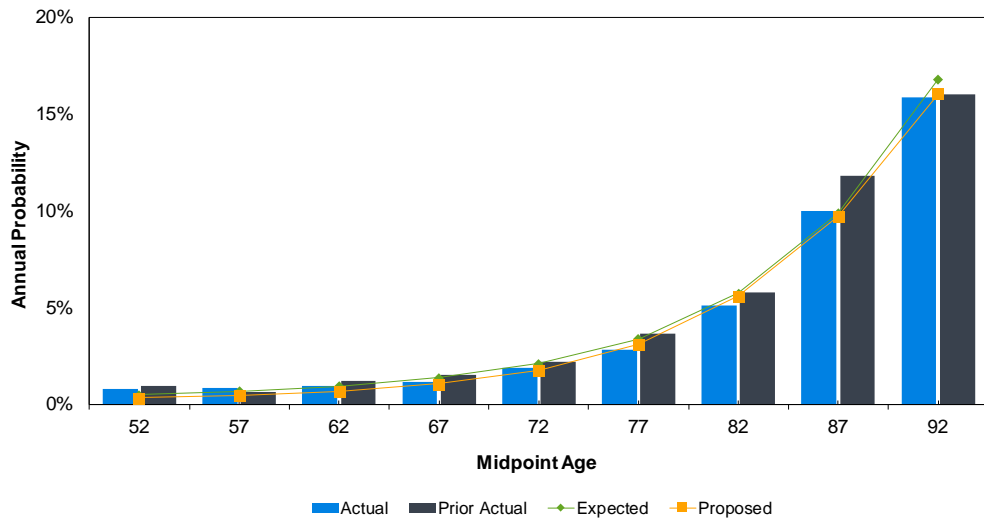
LACERA uses standard mortality tables adjusted to best fit the patterns of mortality among its retirees. The table below describes the new tables being recommended for healthy and disabled retirees. These are based on the recent study of public plan retirees. Note that for beneficiaries of healthy and disabled retirees, we recommend that the mortality for healthy general retirees be used.

The recommended mortality rates are based on the PubG-2010 and PubS-2010 Healthy Retiree and Disabled Retiree mortality tables and all assume generational mortality improvement based on 100% of the MP-2014 Ultimate projection scale, as follows:

| Class | Type ⁽¹⁾ | Sex | Mortality Tables ⁽²⁾ | |
|---------|---------------------|--------|--|---|
| | | | Current Table | Proposed Table |
| General | Healthy | Male | RP-2014 (105%) Healty Annuitant Male | PubG-2010 (100%) Healthy Retiree Male |
| General | Healthy | Female | RP-2014 (100%) Healty Annuitant Female | PubG-2010 (110%) Healthy Retiree Female |
| Safety | Healthy | Male | RP-2014 (95%) Healty Annuitant Male | PubS-2010 (85%) Healthy Retiree Male |
| Safety | Healthy | Female | RP-2014 (100%) Healty Annuitant Female | PubS-2010 (100%) Healthy Retiree Female |
| General | Disabled | Male | Avg of: RP-2014 (105%) Healty Annuitant Male RP-2014 (100%) Disabled Retiree Male | Avg of: PubG-2010 (100%) Healthy Retiree Male PubG-2010 (100%) Disabled Retiree Male |
| General | Disabled | Female | Avg of: RP-2014 (100%) Healty Annuitant Female RP-2014 (100%) Disabled Retiree Female | Avg of: PubG-2010 (100%) Healthy Retiree Female PubG-2010 (100%) Disabled Retiree Female |
| Safety | Disabled | Male | RP-2014 (100%) Healty Annuitant Male | PubS-2010 (100%) Disabled Retiree Male |
| Safety | Disabled | Female | RP-2014 (100%) Healty Annuitant Female | PubS-2010 (100%) Disabled Retiree Female |

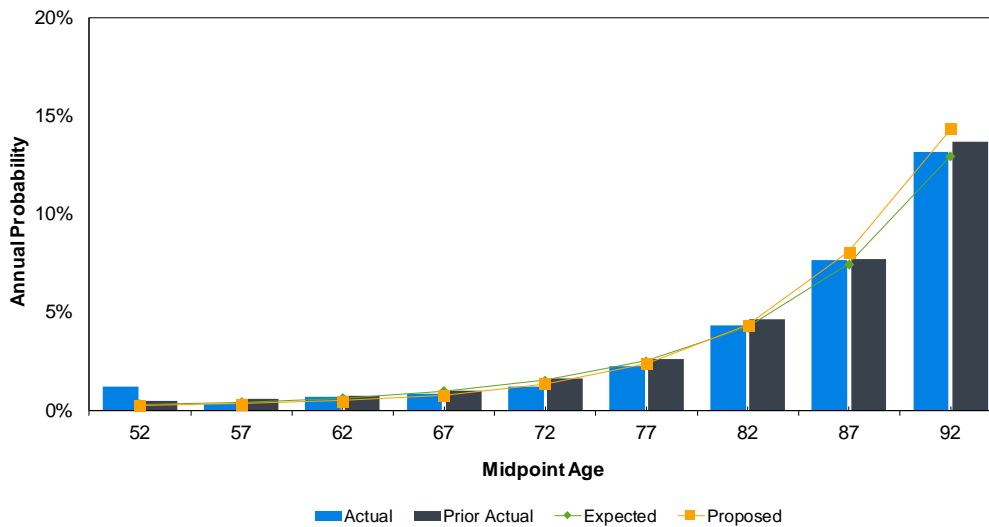
1. Beneficiaries are assumed to have the same mortality as a healthy General member of the same sex.
2. Generational Projections using 100% of the MP-2014 Ultimate projection scale.

Exhibit 11-1
 Healthy Mortality – Male General Members



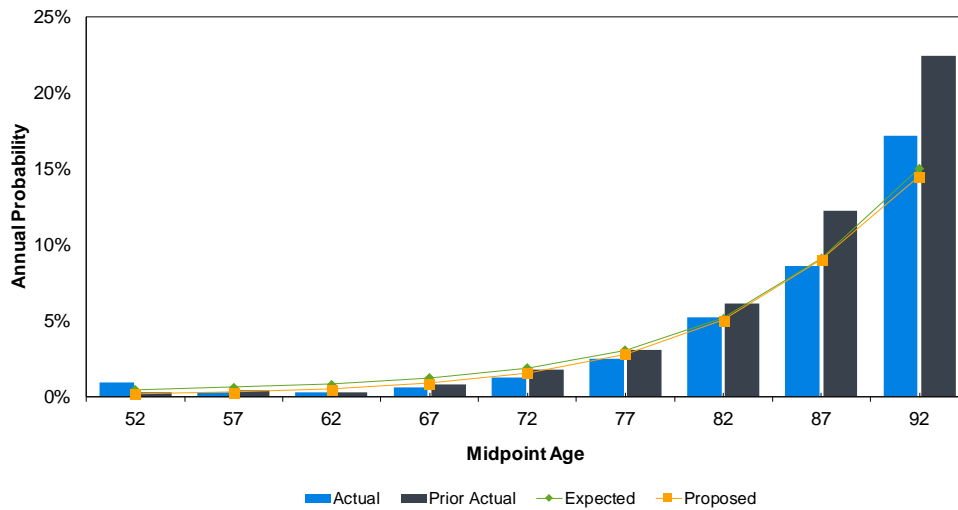
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 1,689 | 1,708 | 1,561 |
| Actual / Expected | 101% | | 109% |

Exhibit 11-2
 Healthy Mortality – Female General Members



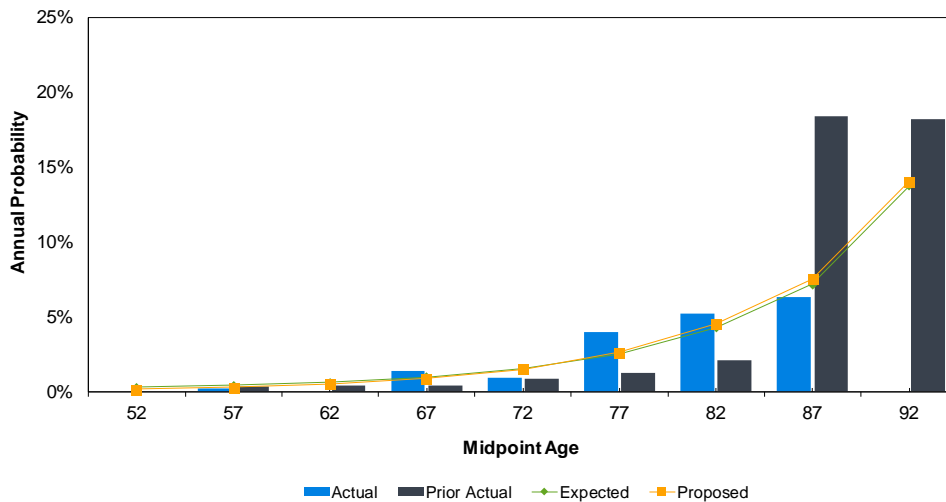
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 1,897 | 2,038 | 1,881 |
| Actual / Expected | 107% | | 108% |

**Exhibit 11-3
 Healthy Mortality – Male Safety Members**



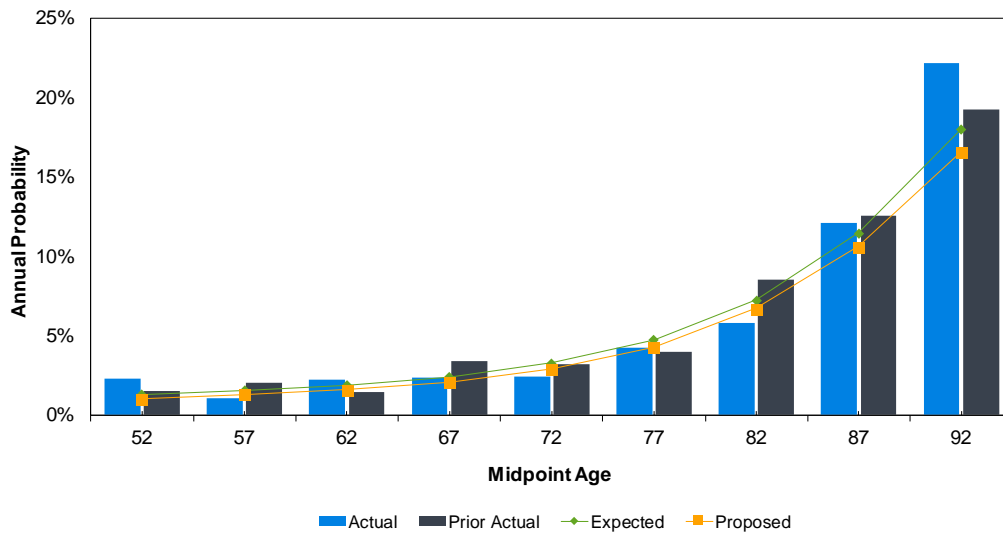
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 283 | 259 | 246 |
| Actual / Expected | 92% | | 105% |

**Exhibit 11-4
 Healthy Mortality – Female Safety Members**



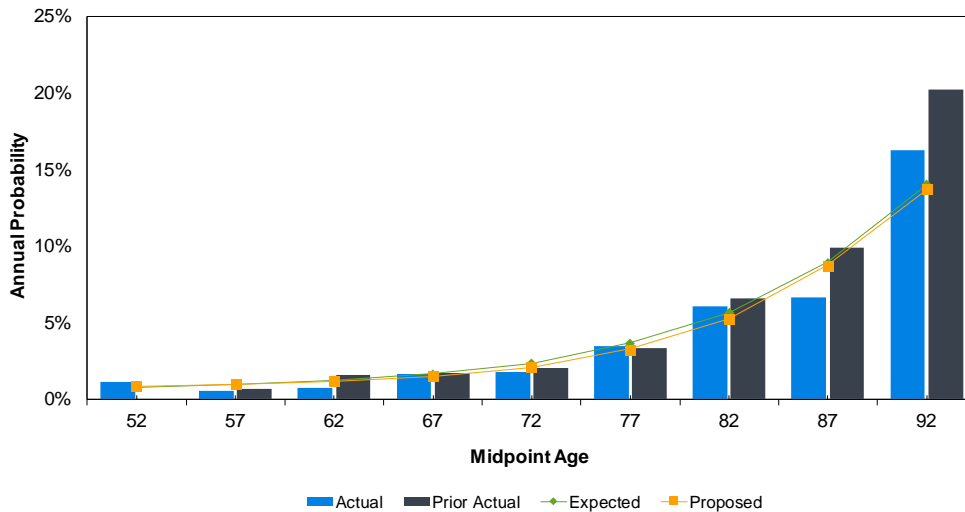
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 17 | 15 | 16 |
| Actual / Expected | 88% | | 94% |

Exhibit 11-5
 Disabled Mortality – Male General Members



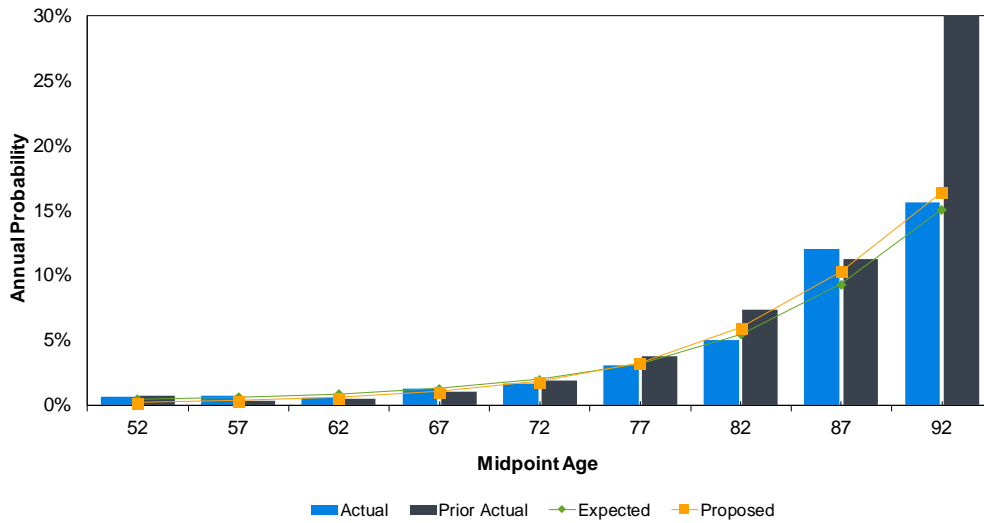
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 184 | 187 | 166 |
| Actual / Expected | 102% | | 113% |

Exhibit 11-6
 Disabled Mortality – Female General Members



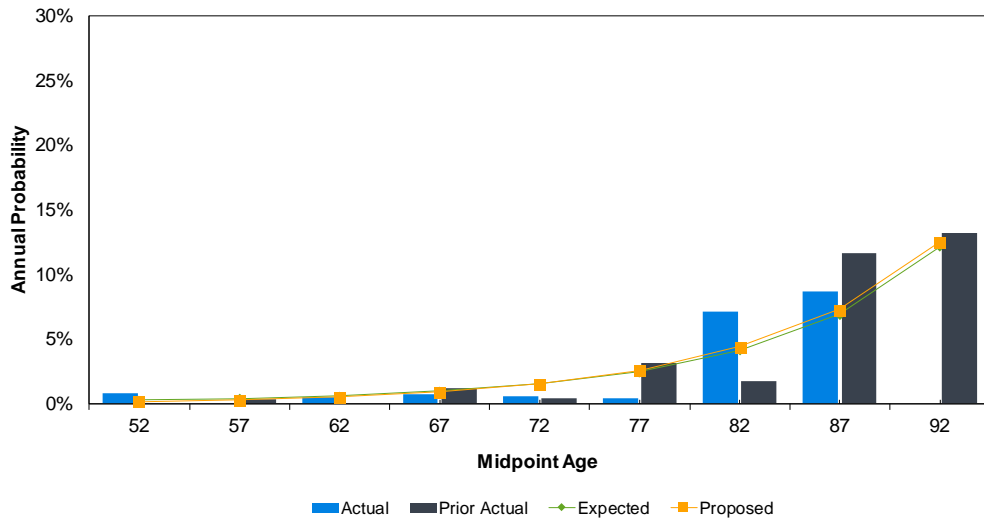
| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 218 | 212 | 206 |
| Actual / Expected | 97% | | 103% |

Exhibit 11-7
 Disabled Mortality – Male Safety Members



| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 340 | 368 | 329 |
| Actual / Expected | 108% | | 112% |

Exhibit 11-8
 Disabled Mortality – Female Safety Members



| | 2016 - 2019 Data | | |
|-------------------|------------------|--------|----------|
| | Expected | Actual | Proposed |
| Total Count | 23 | 20 | 22 |
| Actual / Expected | 87% | | 91% |

12. Miscellaneous Assumptions

Probability of Eligible Survivor

All members are assumed to elect the unmodified retirement allowance. Surviving beneficiaries (spouses or qualified domestic partners of members) generally receive a 65% continuance of the member's benefit (100% continuance for service-connected disabilities and 55% for Plan E members). Thus, the probability a member has an eligible survivor impacts the value of the benefit.

Based on our analysis of retirements during the study period, we found that 80% of males and 49% of females received an unmodified (or unmodified plus) benefit with an eligible survivor. As the actual experience was close to the assumptions, we are recommending no changes.

| Retiree Gender | Probability of retiring with an Eligible Survivor | | |
|----------------|---|-------------------|------------------------|
| | Current Assumption | Actual Experience | Recommended Assumption |
| Male | 77% | 80% | No change |
| Female | 50% | 49% | No change |

Beneficiary Age

To determine the value of a member's retirement or death benefit, we must estimate the value of the portion payable to the surviving eligible beneficiary. Since the value of the survivor's benefit is dependent on his/her age, we must estimate it. We studied the beneficiary age difference compared to the member based on retirements during the study period. Based on this analysis, we are recommending no changes in the assumed age difference between retirees and beneficiaries.

| Retiree Gender | Beneficiary's Age Relative to Member | | |
|----------------|--------------------------------------|-------------------|------------------------|
| | Current Assumption | Actual Experience | Recommended Assumption |
| Male | 4 years younger | 3.3 years younger | No change |
| Female | 2 years older | 2.0 years older | No change |

Since the majority of eligible survivors are expected to be of the opposite gender, even with the inclusion of qualified domestic partners, we will continue to assume that the survivor's gender is the opposite of the member.

Retirement for Deferred Vested Members

The age when members who terminate (or have terminated) with a vested benefit are assumed to retire varies by plan. We have studied the actual retirement ages of deferred vested members during the study period, and we recommend a change in the assumption for General members in Plan D.

| Assumption for Deferred Commencement | | | |
|--------------------------------------|---------------------|--------------------|------------------|
| Plan | Age at Commencement | | |
| | Current Assump. | Actual Results | Proposed Assump. |
| GA | 62 | 66.7 | No Change |
| GB | 62 | N/A ⁽¹⁾ | No Change |
| GC | 62 | N/A ⁽¹⁾ | No Change |
| GD | 57 | 59.0 | 59 |
| GE | 62 | 61.9 | No Change |
| GG | 57 | N/A ⁽¹⁾ | No Change |
| SA | 55 | N/A ⁽¹⁾ | No Change |
| SB | 50 | 50.8 | No Change |
| SC | 50 | N/A ⁽¹⁾ | No Change |

1. Insufficient data for analysis.

Note that General Plans A, B and C and Safety Plan A have very few deferred vested members. For these plans, we consider this assumption to not be material. For General Plan G and Safety Plan C, there is very little experience for this assumption at this time.

Reciprocity

Members who terminate in the future (or have already terminated) with a deferred vested benefit may go to work for a reciprocal employer. This can result in an increase in the member’s final compensation used in the calculation of their LACERA benefit. Currently, 16% reciprocity is assumed for General members, and 35% is assumed for Safety members. We are recommending no change in the reciprocity assumption.

| Retirements from Deferred Status (2016-2019) | | | | | |
|--|-------|-------------------|--------------------|-----------------|------------------|
| Plan | Total | Reciprocal Status | % with Reciprocity | Current Assump. | Proposed Assump. |
| General | 1,137 | 198 | 17% | 16% | No Change |
| Safety | 88 | 34 | 39% | 35% | No Change |
| Total | 1,225 | 232 | 19% | | |

Appendix A: Proposed Actuarial Procedures and Assumptions

This section of the experience study report reflects how the Appendix A of the June 30, 2019 actuarial valuation would appear if the Board of Investments adopts all of the recommended assumptions.

Appendix A Actuarial Procedures and Assumptions

The actuarial procedures and assumptions used in this valuation are described in this section. The assumptions were reviewed and changed effective with the June 30, 2019 valuation, as a result of the 2019 triennial Investigation of Experience Study.

The actuarial assumptions used in the valuations are intended to estimate the future experience of the members of LACERA and of LACERA itself in areas that affect the projected benefit flow and anticipated investment earnings. Any variations in future experience from that expected from these assumptions will result in corresponding changes in the estimated costs of LACERA's benefits.

Table A-1 summarizes the assumptions. The mortality rates are taken from the sources listed.

Tables A-2 and A-3 show how members are expected to leave retired status due to death.

Table A-4 presents the probability of refund of contributions upon termination of employment while vested.

Table A-5 presents the expected annual percentage increase in salaries.

Tables A-6 to A-13 were developed from the experience as measured by the 2019 Investigation of Experience Study. The rates are the probabilities a member will leave the System for various reasons.

Note: Recommended changes from the prior assumptions have been shaded in green.

Actuarial Cost Method

The actuarial valuation is prepared using the entry age actuarial cost method (CERL 31453.5). Under the principles of this method, the actuarial present value of the projected benefits of each individual included in the valuation is allocated as a level percentage of the individual's projected compensation between entry age and assumed exit (until maximum retirement age).

For members who transferred between plans, entry age is based on original entry into the System.

The portion of this actuarial present value allocated to a valuation year is called the normal cost. The portion of this actuarial present value not provided for at a valuation date by the sum of (a) the actuarial value of the assets, and (b) the actuarial present value of future normal costs is called the Unfunded Actuarial Accrued Liability (UAAL). The original UAAL as of June 30, 2009 is amortized as a level percentage of the projected salaries of present and future members of LACERA over a closed 30-year period. Future gains and losses are amortized over new closed 30-year periods. This is referred to as "layered" amortization.

For General Plan G and Safety Plan C, the normal cost rate is rounded up to the nearest 0.02%.

Records and Data

The data used in this valuation consists of financial information and the age, service, and income records for active and inactive members and their survivors. All of the data were supplied by LACERA and are accepted for valuation purposes without audit.

Replacement of Former Members

The ages and relative salaries at entry of future members are assumed to follow a new entrant distribution based on the pattern of current members. Under this assumption, the normal cost rates for active members will remain fairly stable in future years unless there are changes in the governing law, the actuarial assumptions, or the pattern of the new entrants.

Growth in Membership

For benefit determination purposes, no growth in the membership of LACERA is assumed. For funding purposes, if amortization is required, the total payroll of covered members is assumed to grow due to the combined effects of future wage increases of current active members and the replacement of the current active members by new employees. No growth or decline in the total number of active members is assumed.

Internal Revenue Code Section 415 Limit

The Internal Revenue Code Section 415 maximum benefit limitations are not reflected in the valuation for funding purposes. Any limitation is reflected in a member's benefit after retirement.

Internal Revenue Code Section 401(a)(17)

The Internal Revenue Code Section 401(a)(17) maximum compensation limitation is not reflected in the valuation for funding purposes. Any limitation is reflected in a member's benefit after retirement.

Employer Contributions

The employer contribution rate is set by the Board of Investments based on actuarial valuations.

Member Contributions

The member contribution rates vary by entry age (except for PEPRA plans) and are described in the law. Code references are shown in Appendix B of the valuation report. The methods and assumptions used are detailed later in this section.

The individual member rates by entry age, plan, and class are illustrated in Appendix D of the valuation report.

Valuation of Assets

The assets are valued using a five-year smoothed method based on the difference between the expected market value and the actual market value of the assets as of the valuation date. The expected market value is the prior year's market value increased with the net increase in the cash flow of funds, all increased with interest during the past fiscal year at the expected investment return rate assumption. The five-year smoothing valuation basis for all assets was adopted effective June 30, 2009.

Investment Earnings and Expenses

The future investment earnings of the assets of LACERA are assumed to accrue at an annual rate of 6.75% compounded annually, net of both investment and administrative expenses. This rate was adopted June 30, 2019.

Post-retirement Benefit Increases

Post-retirement increases are assumed for the valuation in accordance with the benefits provided as described in Appendix B. These adjustments are assumed payable each year in the future as they are not greater than the expected increase in the Consumer Price Index of 2.50% or 2.75% per year. This rate was adopted June 30, 2019.

Interest on Member Contributions

The annual credited interest rate on member contributions is assumed to be 6.75% compounded semi-annually for an annualized rate of 6.86%. This rate was adopted June 30, 2019.

Future Salaries

The rates of annual salary increase assumed for the purpose of the valuation are illustrated in Table A-5. In addition to increases in salary due to promotions and longevity, this scale includes an assumed 3.00% or 3.25% per annum rate of increase in the general wage level of the membership. These rates were adopted June 30, 2019.

Increases are assumed to occur mid-year (i.e., January 1st) and only apply to base salary, excluding megaflex compensation. The mid-year timing reflects that salary increases occur throughout the year, or on average mid-year.

For plans with a one-year final average compensation period, actual average annual compensation is used. For Plan E, Plan G and Safety Plan C, the monthly rate as of June of the valuation year was annualized. Due to irregular compensation payments now included as pensionable earnings, actual annual pay is preferred over annualizing a single monthly payment amount.

Social Security Wage Base

Plan E members have their benefits offset by an assumed Social Security Benefit. For valuation funding purposes, we need to project the Social Security Benefit. We assume the current Social Security provisions will continue and the annual Wage Base will increase at the rate of 3.00% or 3.25% per year. Note that statutory provisions describe exactly how to compute the offset for purposes of determining a member's offset amount at time of termination or retirement. This rate was adopted June 30, 2019.

Note also, that it is assumed all Plan E members born after 1950 have less than 10 years of Social Security-covered service and, therefore, do not have their benefit offset.

General Plan G and Safety Plan C members have their compensation limited to approximately 120% of the Social Security Wage Base. The limit for 2019 is \$149,016 (after applying the 120% factor) and is projected to increase at the CPI rate of 2.50% or 2.75%. This rate of future increase was adopted effective June 30, 2019.

Retirement

Members in General Plans A-D may retire at age 50 with 10 years of service, or any age with 30 years of service, or age 70 regardless of the number of years of service. General Plan G members are eligible to retire at age 52 with 5 years of service, or age 70 regardless of the number of years of service. Non-contributory Plan E members may retire at age 55 with 10 years of service. Members of Safety Plans A and B may retire at age 50 with 10 years of service, or any age with 20 years of service. Safety Plan C members are eligible to retire at age 50 with 5 years of County service. The retirement rates vary by age and are shown by plan in Tables A-6 through A-13.

All general members who attain or who have attained age 75 in active service and all safety members who have attained age 65 in active service are assumed to retire immediately (except for Safety Plan C members who have not yet attained 5 years of service).

Deferred vested members are assumed to retire at the later of their current age and the assumed retirement age specified as follows:

| Assumption for Deferred Commencement | |
|--------------------------------------|---------------------|
| Plan | Age at Commencement |
| GA | 62 |
| GB | 62 |
| GC | 62 |
| GD | 59 |
| GE | 62 |
| GG | 57 |
| SA | 55 |
| SB | 50 |
| SC | 50 |

The assumptions regarding termination of employment, early retirement, and unreduced service retirement are treated as a single set of decrements in regards to a particular member. For example, a general member hired at age 30 has a probability of withdrawing from LACERA due to death, disability or other termination of employment until age 50. After age 50, the member could still withdraw due to death, disability, or retirement. Thus, in no year during the member's projected employment would the member be eligible for both a probability of other termination of employment and a probability of retirement.

The retirement probabilities were adopted June 30, 2019.

Disability

The rates of disability used in the valuation are also illustrated in Tables A-6 through A-13. These rates were adopted June 30, 2019.

Post-Retirement Mortality – Other Than Disabled Members

The same post-retirement mortality rates are used in the valuation for active members, members retired for service, and beneficiaries. These rates are illustrated in Table A-2. Current beneficiary mortality is assumed to be the same assumption as healthy members of the same sex. Future beneficiaries are assumed to be of the opposite sex and have the same mortality as General members.

Note that these assumptions directly reflect expected future mortality improvement. These rates were adopted June 30, 2019.

- Males General members: PubG-2010 Healthy Retiree Mortality Table for Males, with MP-2014 Ultimate Projection Scale.
- Safety members: PubS-2010 Healthy Retiree Mortality Table for Males multiplied by 85%, with MP-2014 Ultimate Projection Scale.
- Females General members: PubG-2010 Healthy Retiree Mortality Table for Females multiplied by 110%, with MP-2014 Ultimate Projection Scale.
- Safety members: PubS-2010 Healthy Retiree Mortality Table for Females, with MP-2014 Ultimate Projection Scale.

Post-Retirement Mortality – Disabled Members

For disabled members, the mortality rates used in the valuation rates are illustrated in Table A-3. Note that these assumptions directly reflect expected future mortality improvement. These rates were adopted June 30, 2019.

- Males General members: Average of PubG-2010 Healthy Retiree Mortality Table for Males and PubG-2010 Disabled Retiree Mortality Table for Males, both projected with MP-2014 Ultimate Projection Scale.
- Safety members: PubS-2010 Healthy Retiree Mortality Table for Males, with MP-2014 Ultimate Projection Scale.
- Females General members: Average of PubG-2010 Healthy Retiree Mortality Table for Females and PubG-2010 Disabled Retiree Mortality Table for Females, both projected with MP-2014 Ultimate Projection Scale.
- Safety members: PubS-2010 Healthy Retiree Mortality Table for Females, with MP-2014 Ultimate Projection Scale.

Mortality while in Active Status

For active members, the mortality rates used in the valuation rates are illustrated in Tables A-6 through A-13. These rates were adopted June 30, 2019.

| Class | Gender | Proposed Table |
|---------|--------|---|
| General | Male | PubG-2010 (120%) Employee Male ⁽¹⁾ |
| General | Female | PubG-2010 (130%) Employee Female ⁽¹⁾ |
| Safety | Male | PubS-2010 (100%) Employee Male ⁽¹⁾ |
| Safety | Female | PubS-2010 (100%) Employee Female ⁽¹⁾ |

1. Projection using MP-2014 Ultimate projection scale.

Note: Safety members have an additional service-connected mortality rate of 0.01% per year.

Other Employment Terminations

Tables A-6 to A-13 show, for all ages, the rates assumed in this valuation for future termination from active service other than for death, disability, or retirement. These rates do not apply to members eligible for service retirement. These rates were adopted June 30, 2019.

Terminating employees may withdraw their contributions immediately upon termination of employment and forfeit the right to further benefits, or they may leave their contributions with LACERA. Former contributing members whose contributions are on deposit may later elect to receive a refund, may return to work, or may remain inactive until becoming eligible to receive a retirement benefit under either LACERA or a reciprocal retirement system. All terminating members who are not eligible for vested benefits are assumed to withdraw their contributions immediately. It is assumed that all terminating members will not be rehired in the future.

Table A-4 gives the assumed probabilities that vested members will withdraw their contributions and elect a refund immediately upon termination and the probability that remaining members will elect a deferred vested benefit. All non-vested members are assumed to elect a refund and withdraw their contributions. These rates were adopted June 30, 2019.

Probability of Eligible Survivors

For members not currently in pay status, 77% of all males and 50% of all females are assumed to have eligible survivors (spouses or qualified domestic partners). Survivors are assumed to be four years younger than male members and two years older than female members. Survivors are assumed to be of the opposite gender as the member. There is no explicit assumption for children's benefits. We believe the survivor benefits based on this assumption are sufficient to cover children's benefits as they occur.

Valuation of Vested Former Members

The deferred retirement benefit is calculated based on the member's final compensation and service at termination. The compensation amount is projected until the assumed retirement age for members who are assumed to be employed by a reciprocal agency. For members who are missing compensation data, Final Compensation is estimated as the average amount for all members who terminated during the same year and had a valid compensation amount. The greater of the present value of the calculated benefit and the employee's current contribution balance is valued for future deferred vested members.

Reciprocal Employment

16% of General and 35% of Safety current and future deferred vested members are assumed to work for a reciprocal employer.

Current vested reciprocal members are assumed to receive annual salary increases of 3.75% or 4.00%. Future reciprocal vested members are assumed to receive the same salary increases they would have received if they had stayed in active employment with LACERA and retired at the assumed retirement age.

Valuation of Annuity Purchases

Over 30 years ago, LACERA purchased single life annuities from two insurance companies for some retired members (currently less than 1% of the retired population). The total liability for these members is calculated and then offset by the expected value of the benefit to be paid by the insurance companies.

For affected members, the insurance companies are responsible for:

1. Straight life annuity payments
2. Statutory COLAs

LACERA is responsible for:

1. Benefit payments payable to any beneficiary
2. STAR COLAs

Member Contribution Rate Assumptions

The following assumptions summarize the procedures used to compute member contribution rates based on entry age.

In general, the member rate is determined by the present value of the future benefit (PVFB) payable at retirement age, divided by the present value of all future salaries payable between age at entry and retirement age. For these purposes, per the CERL:

- A. The Annuity factor used for general members is based on a 35% / 65% blend of the male and female valuation mortality tables and projection scale, with a static projection to 2041. For Safety members, it is based on a 85% / 15% blend of the male and female annuity factors.
- B. The annuity factor used in determining the PVFB at entry age is equal to the life only annuity factor at 6.75%.
- C. The Final Compensation is based on the salary paid in the year prior to attaining the retirement age.
Example: For a Plan C Member who enters at age 59 or earlier, the Final Compensation at retirement (age 60) will be the monthly average of the annual salaries during age 59.
- D. Member Rates are assumed to increase with entry age (except for PEPRA plans). There are a few exceptions at the higher entry ages where the calculated rate is less than the previous entry age (for example, age 53 for General A). In these cases the member contribution rate is adjusted so that it is no less than the value for the previous entry age.

Table A-1
Summary of Valuation Assumptions as of June 30, 2019

- I. Economic assumptions
 - A. General wage increases 3.00% or 3.25%
 - B. Investment earnings 6.75%
 - C. Growth in membership 0.00%
 - D. Post-retirement benefit increases (varies by plan) Plan COLA not greater than CPI assumption.
 - E. CPI inflation assumption 2.50% or 2.75%
- II. Demographic assumptions
 - A. Salary increases due to service Table A-5
 - B. Retirement Tables A-6 to A-13
 - C. Disability Tables A-6 to A-13
 - D. Mortality during active employment Tables A-6 to A-13
 - E. Mortality for active members after termination and service retired members⁽¹⁾ Table A-2

| Class | Gender | |
|---------|--------|---|
| General | Male | PubG-2010 (100%) Healthy Retiree Male |
| General | Female | PubG-2010 (110%) Healthy Retiree Female |
| Safety | Male | PubS-2010 (85%) Healthy Retiree Male |
| Safety | Female | PubS-2010 (100%) Healthy Retiree Female |

- F. Mortality among disabled members⁽¹⁾ Table A-3

| Class | Gender | |
|---------|--------|---|
| General | Male | Avg of: PubG-2010 (100%) Healthy Retiree Male PubG-2010 (100%) Disabled Retiree Male |
| General | Female | Avg of: PubG-2010 (100%) Healthy Retiree Female PubG-2010 (100%) Disabled Retiree Female |
| Safety | Male | PubS-2010 (100%) Healthy Retiree Male |
| Safety | Female | PubS-2010 (100%) Healthy Retiree Female |

- G. Mortality for beneficiaries⁽¹⁾ Table A-2
 Basis – Beneficiaries are assumed to have the same mortality as a general member of the opposite gender who has taken a service retirement.
- H. Other terminations of employment Tables A-6 to A-13
- I. Refund of contributions on vested termination Table A-4

1. All mortality rates are projected using the MP-2014 Ultimate projection scale.

Table A-2
 Mortality for Members Retired for Service⁽¹⁾

| Age | Safety Male | Safety Female | General Male | General Female |
|-----|-------------|---------------|--------------|----------------|
| 20 | 0.0520% | 0.0210% | 0.0740% | 0.0380% |
| 25 | 0.0470% | 0.0260% | 0.0560% | 0.0260% |
| 30 | 0.0520% | 0.0350% | 0.0720% | 0.0440% |
| 35 | 0.0590% | 0.0470% | 0.0940% | 0.0680% |
| 40 | 0.0750% | 0.0640% | 0.1320% | 0.1060% |
| 45 | 0.1037% | 0.0870% | 0.1960% | 0.1650% |
| 50 | 0.1632% | 0.1490% | 0.2980% | 0.2442% |
| 55 | 0.2601% | 0.2580% | 0.4310% | 0.3146% |
| 60 | 0.4318% | 0.4460% | 0.6150% | 0.4224% |
| 65 | 0.7489% | 0.7700% | 0.9130% | 0.6743% |
| 70 | 1.3328% | 1.3290% | 1.5260% | 1.1693% |
| 75 | 2.4021% | 2.2950% | 2.6710% | 2.0713% |
| 80 | 4.3376% | 3.9620% | 4.7740% | 3.6960% |
| 85 | 7.7648% | 6.8420% | 8.5910% | 6.8255% |
| 90 | 13.4810% | 11.8150% | 14.6720% | 12.6357% |

Annual Projected Mortality Improvement

| Age | All Groups |
|-----------|------------|
| 65 & Less | 1.000% |
| 70 | 1.000% |
| 75 | 1.000% |
| 80 | 1.000% |
| 85 | 1.000% |
| 90 | 0.930% |
| 95 | 0.850% |
| 100 | 0.640% |
| 105 | 0.430% |
| 110 | 0.210% |
| 115 | 0.000% |

1. Mortality rates are those applicable for the fiscal year beginning in 2010. Annual projected improvements are assumed in the following years under the schedule shown. For example, the annual mortality rate for an 85-year old Safety male in fiscal year beginning in 2019 is 7.0933% calculated as follows:

$$\begin{aligned}
 \text{Age 85 rate in 2019} &= \text{Age 85 rate in 2010 with 9 years improvement} \\
 &= 7.7648\% \times (100.0\% - 1.0\%)^9 \\
 &= 7.0933\%
 \end{aligned}$$

Table A-3
 Mortality for Members Retired for Disability⁽¹⁾

| Age | Safety Male | Safety Female | General Male | General Female |
|-----|-------------|---------------|--------------|----------------|
| 20 | 0.0610% | 0.0210% | 0.2430% | 0.1340% |
| 25 | 0.0550% | 0.0260% | 0.1670% | 0.0940% |
| 30 | 0.0610% | 0.0350% | 0.2130% | 0.1485% |
| 35 | 0.0700% | 0.0470% | 0.2760% | 0.2315% |
| 40 | 0.0880% | 0.0640% | 0.3885% | 0.3625% |
| 45 | 0.1220% | 0.0870% | 0.6015% | 0.5675% |
| 50 | 0.1920% | 0.1490% | 0.9515% | 0.8525% |
| 55 | 0.3060% | 0.2580% | 1.2725% | 1.0140% |
| 60 | 0.5080% | 0.4460% | 1.5590% | 1.1700% |
| 65 | 0.8810% | 0.7700% | 1.9785% | 1.4345% |
| 70 | 1.5680% | 1.3290% | 2.7135% | 1.9625% |
| 75 | 2.8260% | 2.2950% | 3.9315% | 2.9430% |
| 80 | 5.1030% | 3.9620% | 6.0610% | 4.6835% |
| 85 | 9.1350% | 6.8420% | 9.7030% | 7.7680% |
| 90 | 15.8600% | 11.8150% | 15.4625% | 12.5760% |

1. Mortality rates are those applicable for the fiscal year beginning in 2010. Annual projected improvements are assumed in the following years under the schedule shown on the preceding page.

Table A-4
Immediate Refund of Contributions upon Termination of Employment
(Excludes Plan E)

| Years of Service | General | Safety |
|-------------------------|----------------|---------------|
| 0 | 100% | 100% |
| 1 | 100% | 100% |
| 2 | 100% | 100% |
| 3 | 100% | 100% |
| 4 | 100% | 100% |
| 5 | 32% | 30% |
| 6 | 32% | 30% |
| 7 | 32% | 30% |
| 8 | 32% | 28% |
| 9 | 31% | 26% |
| 10 | 31% | 24% |
| 11 | 30% | 22% |
| 12 | 30% | 20% |
| 13 | 29% | 18% |
| 14 | 28% | 16% |
| 15 | 26% | 14% |
| 16 | 25% | 12% |
| 17 | 24% | 10% |
| 18 | 22% | 9% |
| 19 | 21% | 8% |
| 20 | 19% | 7% |
| 21 | 18% | 6% |
| 22 | 16% | 5% |
| 23 | 14% | 4% |
| 24 | 12% | 3% |
| 25 | 10% | 2% |
| 26 | 8% | 2% |
| 27 | 6% | 2% |
| 28 | 4% | 2% |
| 29 | 2% | 2% |
| 30 & Up | 0% | 0% |

Table A-5
 Annual Increase in Salary⁽¹⁾

| Years of Service | General | Safety |
|------------------|---------|--------|
| <1 | 6.00% | 9.00% |
| 1 | 5.25% | 8.50% |
| 2 | 4.75% | 8.00% |
| 3 | 4.10% | 6.00% |
| 4 | 3.50% | 4.50% |
| 5 | 3.00% | 3.25% |
| 6 | 2.50% | 2.50% |
| 7 | 2.00% | 2.00% |
| 8 | 1.60% | 1.50% |
| 9 | 1.30% | 1.35% |
| 10 | 1.15% | 1.20% |
| 11 | 1.00% | 1.05% |
| 12 | 0.85% | 0.95% |
| 13 | 0.75% | 0.85% |
| 14 | 0.70% | 0.75% |
| 15 | 0.65% | 0.70% |
| 16 | 0.60% | 0.65% |
| 17 | 0.55% | 0.60% |
| 18 | 0.50% | 0.55% |
| 19 | 0.45% | 2.25% |
| 20 | 0.40% | 0.50% |
| 21 | 0.35% | 0.50% |
| 22 | 0.30% | 0.50% |
| 23 | 0.25% | 0.50% |
| 24 | 0.25% | 3.00% |
| 25 | 0.25% | 0.50% |
| 26 | 0.25% | 0.50% |
| 27 | 0.25% | 0.50% |
| 28 | 0.25% | 0.50% |
| 29 | 0.25% | 3.00% |
| 30 or More | 0.25% | 0.50% |

1. The total expected increase in salary includes both merit (shown above) and the general wage increase assumption of 3.00% or 3.25% per annum. The total result is compounded rather than additive. For example, the total increase to service less than one year is 9.18% or 9.45% for General members.

**Appendix A: Rates of Separation from Active Service
Tables A-6 to A-13**

A schedule of the probabilities of termination of employment due to the following causes can be found on the following pages:

| | |
|----------------------|---|
| Service Retirement: | Member retires after meeting age and service requirements for reasons other than disability. |
| Withdrawal: | Member terminates and elects a refund of member contributions, or a deferred vested retirement benefit. |
| Service Disability: | Member receives disability retirement; disability is service related. |
| Ordinary Disability: | Member receives disability retirement; disability is not service related. |
| Service Death: | Member dies before retirement; death is service related. |
| Ordinary Death: | Member dies before retirement; death is not service related. |

Each rate represents the probability that a member will separate from service at each age due to the particular cause. For example, a rate of 0.0300 for a member's service retirement at age 50 means we assume that 30 out of 1,000 members who are age 50 will retire at that age.

Each table represents the detailed rates needed for each LACERA plan by gender:

| | |
|--|--------------------------------------|
| Table A-6: General Plan A, B & C – Males | A-10: General Plan E – Males |
| A-7: General Plan A, B & C – Females | A-11: General Plan E – Females |
| A-8: General Plan D & G – Males | A-12: Safety Plan A, B & C – Males |
| A-9: General Plan D & G – Females | A-13: Safety Plan A, B & C – Females |

Table A-6
Rate of Separation from Active Service for General Members
Plans A, B & C – Male

| Age | Service Retirement | Other Terminations | Service Disability | Ordinary Disability | Service Death | Ordinary Death |
|-----|--------------------|--------------------|--------------------|---------------------|---------------|----------------|
| 18 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00043 |
| 19 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00046 |
| 20 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00044 |
| 21 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00043 |
| 22 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00040 |
| 23 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00037 |
| 24 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00035 |
| 25 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00034 |
| 26 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00036 |
| 27 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00037 |
| 28 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00040 |
| 29 | 0.00000 | 0.00500 | 0.00010 | 0.00010 | N/A | 0.00041 |
| 30 | 0.00000 | 0.00500 | 0.00010 | 0.00020 | N/A | 0.00043 |
| 31 | 0.00000 | 0.00500 | 0.00010 | 0.00020 | N/A | 0.00046 |
| 32 | 0.00000 | 0.00500 | 0.00010 | 0.00020 | N/A | 0.00048 |
| 33 | 0.00000 | 0.00500 | 0.00016 | 0.00020 | N/A | 0.00050 |
| 34 | 0.00000 | 0.00500 | 0.00022 | 0.00020 | N/A | 0.00053 |
| 35 | 0.00000 | 0.00500 | 0.00028 | 0.00020 | N/A | 0.00056 |
| 36 | 0.00000 | 0.00500 | 0.00034 | 0.00020 | N/A | 0.00060 |
| 37 | 0.00000 | 0.00500 | 0.00040 | 0.00020 | N/A | 0.00064 |
| 38 | 0.00000 | 0.00500 | 0.00048 | 0.00020 | N/A | 0.00068 |
| 39 | 0.00000 | 0.00500 | 0.00056 | 0.00020 | N/A | 0.00073 |
| 40 | 0.03000 | 0.00500 | 0.00064 | 0.00020 | N/A | 0.00079 |
| 41 | 0.03000 | 0.00500 | 0.00072 | 0.00020 | N/A | 0.00085 |
| 42 | 0.03000 | 0.00500 | 0.00080 | 0.00020 | N/A | 0.00092 |
| 43 | 0.03000 | 0.00500 | 0.00084 | 0.00024 | N/A | 0.00100 |
| 44 | 0.03000 | 0.00500 | 0.00088 | 0.00028 | N/A | 0.00108 |
| 45 | 0.03000 | 0.00500 | 0.00092 | 0.00032 | N/A | 0.00118 |
| 46 | 0.03000 | 0.00500 | 0.00096 | 0.00036 | N/A | 0.00128 |
| 47 | 0.03000 | 0.00500 | 0.00100 | 0.00040 | N/A | 0.00139 |
| 48 | 0.03000 | 0.00500 | 0.00104 | 0.00044 | N/A | 0.00152 |
| 49 | 0.03000 | 0.00500 | 0.00108 | 0.00048 | N/A | 0.00166 |
| 50 | 0.03000 | 0.00500 | 0.00112 | 0.00052 | N/A | 0.00179 |
| 51 | 0.03000 | 0.00500 | 0.00116 | 0.00056 | N/A | 0.00194 |
| 52 | 0.03000 | 0.00500 | 0.00120 | 0.00060 | N/A | 0.00210 |
| 53 | 0.03000 | 0.00500 | 0.00156 | 0.00064 | N/A | 0.00227 |
| 54 | 0.06000 | 0.00500 | 0.00192 | 0.00068 | N/A | 0.00244 |
| 55 | 0.10000 | 0.00500 | 0.00228 | 0.00072 | N/A | 0.00263 |
| 56 | 0.12000 | 0.00500 | 0.00264 | 0.00076 | N/A | 0.00283 |
| 57 | 0.17000 | 0.00500 | 0.00300 | 0.00080 | N/A | 0.00306 |
| 58 | 0.26000 | 0.00500 | 0.00330 | 0.00084 | N/A | 0.00330 |
| 59 | 0.26000 | 0.00500 | 0.00360 | 0.00088 | N/A | 0.00355 |
| 60 | 0.32000 | 0.00500 | 0.00390 | 0.00092 | N/A | 0.00383 |
| 61 | 0.32000 | 0.00500 | 0.00420 | 0.00096 | N/A | 0.00413 |
| 62 | 0.32000 | 0.00500 | 0.00450 | 0.00100 | N/A | 0.00445 |
| 63 | 0.32000 | 0.00500 | 0.00450 | 0.00104 | N/A | 0.00481 |
| 64 | 0.32000 | 0.00500 | 0.00450 | 0.00108 | N/A | 0.00520 |
| 65 | 0.32000 | 0.00500 | 0.00450 | 0.00112 | N/A | 0.00562 |
| 66 | 0.25000 | 0.00500 | 0.00450 | 0.00116 | N/A | 0.00607 |
| 67 | 0.24000 | 0.00500 | 0.00450 | 0.00120 | N/A | 0.00658 |
| 68 | 0.24000 | 0.00500 | 0.00450 | 0.00124 | N/A | 0.00713 |
| 69 | 0.24000 | 0.00500 | 0.00450 | 0.00128 | N/A | 0.00775 |
| 70 | 0.24000 | 0.00500 | 0.00450 | 0.00132 | N/A | 0.00844 |
| 71 | 0.24000 | 0.00500 | 0.00450 | 0.00136 | N/A | 0.00920 |
| 72 | 0.24000 | 0.00500 | 0.00450 | 0.00140 | N/A | 0.01004 |
| 73 | 0.24000 | 0.00500 | 0.00450 | 0.00144 | N/A | 0.01098 |
| 74 | 0.24000 | 0.00500 | 0.00450 | 0.00148 | N/A | 0.01201 |
| 75 | 1.00000 | 0.00000 | 0.00000 | 0.00000 | N/A | 0.01315 |

Table A-7
 Rate of Separation from Active Service for General Members
 Plans A, B & C – Female

| Age | Service Retirement | Other Terminations | Service Disability | Ordinary Disability | Service Death | Ordinary Death |
|-----|--------------------|--------------------|--------------------|---------------------|---------------|----------------|
| 18 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00017 |
| 19 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00017 |
| 20 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00017 |
| 21 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00016 |
| 22 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00014 |
| 23 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00013 |
| 24 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00012 |
| 25 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00012 |
| 26 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00013 |
| 27 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00014 |
| 28 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00016 |
| 29 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00017 |
| 30 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00020 |
| 31 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00021 |
| 32 | 0.00000 | 0.00500 | 0.00015 | 0.00010 | N/A | 0.00023 |
| 33 | 0.00000 | 0.00500 | 0.00020 | 0.00010 | N/A | 0.00025 |
| 34 | 0.00000 | 0.00500 | 0.00025 | 0.00010 | N/A | 0.00027 |
| 35 | 0.00000 | 0.00500 | 0.00030 | 0.00010 | N/A | 0.00030 |
| 36 | 0.00000 | 0.00500 | 0.00035 | 0.00010 | N/A | 0.00033 |
| 37 | 0.00000 | 0.00500 | 0.00040 | 0.00010 | N/A | 0.00036 |
| 38 | 0.00000 | 0.00500 | 0.00042 | 0.00014 | N/A | 0.00039 |
| 39 | 0.00000 | 0.00500 | 0.00044 | 0.00018 | N/A | 0.00043 |
| 40 | 0.03000 | 0.00500 | 0.00046 | 0.00022 | N/A | 0.00047 |
| 41 | 0.03000 | 0.00500 | 0.00048 | 0.00026 | N/A | 0.00052 |
| 42 | 0.03000 | 0.00500 | 0.00050 | 0.00030 | N/A | 0.00056 |
| 43 | 0.03000 | 0.00500 | 0.00060 | 0.00032 | N/A | 0.00061 |
| 44 | 0.03000 | 0.00500 | 0.00070 | 0.00034 | N/A | 0.00066 |
| 45 | 0.03000 | 0.00500 | 0.00080 | 0.00036 | N/A | 0.00073 |
| 46 | 0.03000 | 0.00500 | 0.00090 | 0.00038 | N/A | 0.00079 |
| 47 | 0.03000 | 0.00500 | 0.00100 | 0.00040 | N/A | 0.00086 |
| 48 | 0.03000 | 0.00500 | 0.00110 | 0.00042 | N/A | 0.00092 |
| 49 | 0.03000 | 0.00500 | 0.00120 | 0.00044 | N/A | 0.00100 |
| 50 | 0.03000 | 0.00500 | 0.00130 | 0.00046 | N/A | 0.00108 |
| 51 | 0.03000 | 0.00500 | 0.00140 | 0.00048 | N/A | 0.00117 |
| 52 | 0.03000 | 0.00500 | 0.00150 | 0.00050 | N/A | 0.00126 |
| 53 | 0.03000 | 0.00500 | 0.00156 | 0.00052 | N/A | 0.00137 |
| 54 | 0.06000 | 0.00500 | 0.00162 | 0.00054 | N/A | 0.00147 |
| 55 | 0.10000 | 0.00500 | 0.00168 | 0.00056 | N/A | 0.00160 |
| 56 | 0.12000 | 0.00500 | 0.00174 | 0.00058 | N/A | 0.00173 |
| 57 | 0.17000 | 0.00500 | 0.00180 | 0.00060 | N/A | 0.00187 |
| 58 | 0.26000 | 0.00500 | 0.00194 | 0.00064 | N/A | 0.00203 |
| 59 | 0.26000 | 0.00500 | 0.00208 | 0.00068 | N/A | 0.00221 |
| 60 | 0.32000 | 0.00500 | 0.00222 | 0.00072 | N/A | 0.00242 |
| 61 | 0.32000 | 0.00500 | 0.00236 | 0.00076 | N/A | 0.00264 |
| 62 | 0.32000 | 0.00500 | 0.00250 | 0.00080 | N/A | 0.00289 |
| 63 | 0.32000 | 0.00500 | 0.00250 | 0.00084 | N/A | 0.00317 |
| 64 | 0.32000 | 0.00500 | 0.00250 | 0.00088 | N/A | 0.00350 |
| 65 | 0.32000 | 0.00500 | 0.00250 | 0.00092 | N/A | 0.00385 |
| 66 | 0.25000 | 0.00500 | 0.00250 | 0.00096 | N/A | 0.00425 |
| 67 | 0.24000 | 0.00500 | 0.00250 | 0.00100 | N/A | 0.00471 |
| 68 | 0.24000 | 0.00500 | 0.00250 | 0.00104 | N/A | 0.00520 |
| 69 | 0.24000 | 0.00500 | 0.00250 | 0.00108 | N/A | 0.00575 |
| 70 | 0.24000 | 0.00500 | 0.00250 | 0.00112 | N/A | 0.00636 |
| 71 | 0.24000 | 0.00500 | 0.00250 | 0.00116 | N/A | 0.00703 |
| 72 | 0.24000 | 0.00500 | 0.00250 | 0.00120 | N/A | 0.00777 |
| 73 | 0.24000 | 0.00500 | 0.00250 | 0.00124 | N/A | 0.00859 |
| 74 | 0.24000 | 0.00500 | 0.00250 | 0.00128 | N/A | 0.00950 |
| 75 | 1.00000 | 0.00000 | 0.00000 | 0.00000 | N/A | 0.01050 |

Table A-8
 Rate of Separation from Active Service for General Members
 Plan D & G – Male

| Age | Service Retirement Plan D | Service Retirement Plan G | Service Disability | Ordinary Disability | Service Death | Ordinary Death | Years of Service | Other Terminations |
|-----|---------------------------|---------------------------|--------------------|---------------------|---------------|----------------|------------------|--------------------|
| 18 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00043 | 0 | 0.07000 |
| 19 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00046 | 1 | 0.05500 |
| 20 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00044 | 2 | 0.04000 |
| 21 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00043 | 3 | 0.03250 |
| 22 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00040 | 4 | 0.02500 |
| 23 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00037 | 5 | 0.02330 |
| 24 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00035 | 6 | 0.02170 |
| 25 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00034 | 7 | 0.02000 |
| 26 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00036 | 8 | 0.01900 |
| 27 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00037 | 9 | 0.01800 |
| 28 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00040 | 10 | 0.01700 |
| 29 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | N/A | 0.00041 | 11 | 0.01600 |
| 30 | 0.00000 | 0.00000 | 0.00010 | 0.00020 | N/A | 0.00043 | 12 | 0.01500 |
| 31 | 0.00000 | 0.00000 | 0.00010 | 0.00020 | N/A | 0.00046 | 13 | 0.01400 |
| 32 | 0.00000 | 0.00000 | 0.00010 | 0.00020 | N/A | 0.00048 | 14 | 0.01300 |
| 33 | 0.00000 | 0.00000 | 0.00016 | 0.00020 | N/A | 0.00050 | 15 | 0.01200 |
| 34 | 0.00000 | 0.00000 | 0.00022 | 0.00020 | N/A | 0.00053 | 16 | 0.01100 |
| 35 | 0.00000 | 0.00000 | 0.00028 | 0.00020 | N/A | 0.00056 | 17 | 0.01000 |
| 36 | 0.00000 | 0.00000 | 0.00034 | 0.00020 | N/A | 0.00060 | 18 | 0.00920 |
| 37 | 0.00000 | 0.00000 | 0.00040 | 0.00020 | N/A | 0.00064 | 19 | 0.00840 |
| 38 | 0.00000 | 0.00000 | 0.00048 | 0.00020 | N/A | 0.00068 | 20 | 0.00760 |
| 39 | 0.00000 | 0.00000 | 0.00056 | 0.00020 | N/A | 0.00073 | 21 | 0.00680 |
| 40 | 0.01500 | 0.00000 | 0.00064 | 0.00020 | N/A | 0.00079 | 22 | 0.00600 |
| 41 | 0.01500 | 0.00000 | 0.00072 | 0.00020 | N/A | 0.00085 | 23 | 0.00560 |
| 42 | 0.01500 | 0.00000 | 0.00080 | 0.00020 | N/A | 0.00092 | 24 | 0.00520 |
| 43 | 0.01500 | 0.00000 | 0.00084 | 0.00024 | N/A | 0.00100 | 25 | 0.00480 |
| 44 | 0.01500 | 0.00000 | 0.00088 | 0.00028 | N/A | 0.00108 | 26 | 0.00440 |
| 45 | 0.01500 | 0.00000 | 0.00092 | 0.00032 | N/A | 0.00118 | 27 | 0.00400 |
| 46 | 0.01500 | 0.00000 | 0.00096 | 0.00036 | N/A | 0.00128 | 28 | 0.00400 |
| 47 | 0.01500 | 0.00000 | 0.00100 | 0.00040 | N/A | 0.00139 | 29 | 0.00400 |
| 48 | 0.01500 | 0.00000 | 0.00104 | 0.00044 | N/A | 0.00152 | 30 & Above | 0.00000 |
| 49 | 0.01500 | 0.00000 | 0.00108 | 0.00048 | N/A | 0.00166 | | |
| 50 | 0.01500 | 0.01200 | 0.00112 | 0.00052 | N/A | 0.00179 | | |
| 51 | 0.01200 | 0.00960 | 0.00116 | 0.00056 | N/A | 0.00194 | | |
| 52 | 0.01200 | 0.00960 | 0.00120 | 0.00060 | N/A | 0.00210 | | |
| 53 | 0.01500 | 0.01200 | 0.00156 | 0.00064 | N/A | 0.00227 | | |
| 54 | 0.02000 | 0.01600 | 0.00192 | 0.00068 | N/A | 0.00244 | | |
| 55 | 0.02500 | 0.02000 | 0.00228 | 0.00072 | N/A | 0.00263 | | |
| 56 | 0.02500 | 0.02000 | 0.00264 | 0.00076 | N/A | 0.00283 | | |
| 57 | 0.03000 | 0.02400 | 0.00300 | 0.00080 | N/A | 0.00306 | | |
| 58 | 0.03500 | 0.02800 | 0.00330 | 0.00084 | N/A | 0.00330 | | |
| 59 | 0.05000 | 0.04000 | 0.00360 | 0.00088 | N/A | 0.00355 | | |
| 60 | 0.07000 | 0.05600 | 0.00390 | 0.00092 | N/A | 0.00383 | | |
| 61 | 0.08000 | 0.06400 | 0.00420 | 0.00096 | N/A | 0.00413 | | |
| 62 | 0.11000 | 0.11000 | 0.00450 | 0.00100 | N/A | 0.00445 | | |
| 63 | 0.11000 | 0.11000 | 0.00450 | 0.00104 | N/A | 0.00481 | | |
| 64 | 0.16000 | 0.16000 | 0.00450 | 0.00108 | N/A | 0.00520 | | |
| 65 | 0.23000 | 0.18000 | 0.00450 | 0.00112 | N/A | 0.00562 | | |
| 66 | 0.20000 | 0.18000 | 0.00450 | 0.00116 | N/A | 0.00607 | | |
| 67 | 0.19000 | 0.30000 | 0.00450 | 0.00120 | N/A | 0.00658 | | |
| 68 | 0.18000 | 0.18000 | 0.00450 | 0.00124 | N/A | 0.00713 | | |
| 69 | 0.20000 | 0.20000 | 0.00450 | 0.00128 | N/A | 0.00775 | | |
| 70 | 0.23000 | 0.23000 | 0.00450 | 0.00132 | N/A | 0.00844 | | |
| 71 | 0.20000 | 0.20000 | 0.00450 | 0.00136 | N/A | 0.00920 | | |
| 72 | 0.20000 | 0.20000 | 0.00450 | 0.00140 | N/A | 0.01004 | | |
| 73 | 0.20000 | 0.20000 | 0.00450 | 0.00144 | N/A | 0.01098 | | |
| 74 | 0.20000 | 0.20000 | 0.00450 | 0.00148 | N/A | 0.01201 | | |
| 75 | 1.00000 | 1.00000 | 0.00000 | 0.00000 | N/A | 0.01315 | | |

Table A-9
 Rate of Separation from Active Service for General Members
 Plan D & G – Female

| Age | Service Retirement Plan D | Service Retirement Plan G | Service Disability | Ordinary Disability | Service Death | Ordinary Death | Years of Service | Other Terminations |
|-----|---------------------------|---------------------------|--------------------|---------------------|---------------|----------------|------------------|--------------------|
| 18 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00017 | 0 | 0.07000 |
| 19 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00017 | 1 | 0.05500 |
| 20 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00017 | 2 | 0.04000 |
| 21 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00016 | 3 | 0.03250 |
| 22 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00014 | 4 | 0.02500 |
| 23 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00013 | 5 | 0.02330 |
| 24 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00012 | 6 | 0.02170 |
| 25 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00012 | 7 | 0.02000 |
| 26 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00013 | 8 | 0.01900 |
| 27 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00014 | 9 | 0.01800 |
| 28 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00016 | 10 | 0.01700 |
| 29 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00017 | 11 | 0.01600 |
| 30 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00020 | 12 | 0.01500 |
| 31 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00021 | 13 | 0.01400 |
| 32 | 0.00000 | 0.00000 | 0.00015 | 0.00010 | N/A | 0.00023 | 14 | 0.01300 |
| 33 | 0.00000 | 0.00000 | 0.00020 | 0.00010 | N/A | 0.00025 | 15 | 0.01200 |
| 34 | 0.00000 | 0.00000 | 0.00025 | 0.00010 | N/A | 0.00027 | 16 | 0.01100 |
| 35 | 0.00000 | 0.00000 | 0.00030 | 0.00010 | N/A | 0.00030 | 17 | 0.01000 |
| 36 | 0.00000 | 0.00000 | 0.00035 | 0.00010 | N/A | 0.00033 | 18 | 0.00920 |
| 37 | 0.00000 | 0.00000 | 0.00040 | 0.00010 | N/A | 0.00036 | 19 | 0.00840 |
| 38 | 0.00000 | 0.00000 | 0.00042 | 0.00014 | N/A | 0.00039 | 20 | 0.00760 |
| 39 | 0.00000 | 0.00000 | 0.00044 | 0.00018 | N/A | 0.00043 | 21 | 0.00680 |
| 40 | 0.01500 | 0.00000 | 0.00046 | 0.00022 | N/A | 0.00047 | 22 | 0.00600 |
| 41 | 0.01500 | 0.00000 | 0.00048 | 0.00026 | N/A | 0.00052 | 23 | 0.00560 |
| 42 | 0.01500 | 0.00000 | 0.00050 | 0.00030 | N/A | 0.00056 | 24 | 0.00520 |
| 43 | 0.01500 | 0.00000 | 0.00060 | 0.00032 | N/A | 0.00061 | 25 | 0.00480 |
| 44 | 0.01500 | 0.00000 | 0.00070 | 0.00034 | N/A | 0.00066 | 26 | 0.00440 |
| 45 | 0.01500 | 0.00000 | 0.00080 | 0.00036 | N/A | 0.00073 | 27 | 0.00400 |
| 46 | 0.01500 | 0.00000 | 0.00090 | 0.00038 | N/A | 0.00079 | 28 | 0.00400 |
| 47 | 0.01500 | 0.00000 | 0.00100 | 0.00040 | N/A | 0.00086 | 29 | 0.00400 |
| 48 | 0.01500 | 0.00000 | 0.00110 | 0.00042 | N/A | 0.00092 | 30 & Above | 0.00000 |
| 49 | 0.01500 | 0.00000 | 0.00120 | 0.00044 | N/A | 0.00100 | | |
| 50 | 0.01500 | 0.01200 | 0.00130 | 0.00046 | N/A | 0.00108 | | |
| 51 | 0.01200 | 0.00960 | 0.00140 | 0.00048 | N/A | 0.00117 | | |
| 52 | 0.01200 | 0.00960 | 0.00150 | 0.00050 | N/A | 0.00126 | | |
| 53 | 0.01500 | 0.01200 | 0.00156 | 0.00052 | N/A | 0.00137 | | |
| 54 | 0.02000 | 0.01600 | 0.00162 | 0.00054 | N/A | 0.00147 | | |
| 55 | 0.02500 | 0.02000 | 0.00168 | 0.00056 | N/A | 0.00160 | | |
| 56 | 0.02500 | 0.02000 | 0.00174 | 0.00058 | N/A | 0.00173 | | |
| 57 | 0.03000 | 0.02400 | 0.00180 | 0.00060 | N/A | 0.00187 | | |
| 58 | 0.03500 | 0.02800 | 0.00194 | 0.00064 | N/A | 0.00203 | | |
| 59 | 0.05000 | 0.04000 | 0.00208 | 0.00068 | N/A | 0.00221 | | |
| 60 | 0.07000 | 0.05600 | 0.00222 | 0.00072 | N/A | 0.00242 | | |
| 61 | 0.08000 | 0.06400 | 0.00236 | 0.00076 | N/A | 0.00264 | | |
| 62 | 0.11000 | 0.11000 | 0.00250 | 0.00080 | N/A | 0.00289 | | |
| 63 | 0.11000 | 0.11000 | 0.00250 | 0.00084 | N/A | 0.00317 | | |
| 64 | 0.16000 | 0.16000 | 0.00250 | 0.00088 | N/A | 0.00350 | | |
| 65 | 0.23000 | 0.18000 | 0.00250 | 0.00092 | N/A | 0.00385 | | |
| 66 | 0.20000 | 0.18000 | 0.00250 | 0.00096 | N/A | 0.00425 | | |
| 67 | 0.19000 | 0.30000 | 0.00250 | 0.00100 | N/A | 0.00471 | | |
| 68 | 0.18000 | 0.18000 | 0.00250 | 0.00104 | N/A | 0.00520 | | |
| 69 | 0.20000 | 0.20000 | 0.00250 | 0.00108 | N/A | 0.00575 | | |
| 70 | 0.23000 | 0.23000 | 0.00250 | 0.00112 | N/A | 0.00636 | | |
| 71 | 0.20000 | 0.20000 | 0.00250 | 0.00116 | N/A | 0.00703 | | |
| 72 | 0.20000 | 0.20000 | 0.00250 | 0.00120 | N/A | 0.00777 | | |
| 73 | 0.20000 | 0.20000 | 0.00250 | 0.00124 | N/A | 0.00859 | | |
| 74 | 0.20000 | 0.20000 | 0.00250 | 0.00128 | N/A | 0.00950 | | |
| 75 | 1.00000 | 1.00000 | 0.00000 | 0.00000 | N/A | 0.01050 | | |

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Table A-10
 Rate of Separation from Active Service for General Members
 Plan E – Male

| Age | Service Retirement | Service Disability | Ordinary Disability | Service Death | Ordinary Death | Years of Service | Other Terminations |
|-----|--------------------|--------------------|---------------------|---------------|----------------|------------------|--------------------|
| 18 | 0.00000 | N/A | N/A | N/A | 0.00043 | 0 | 0.15000 |
| 19 | 0.00000 | N/A | N/A | N/A | 0.00046 | 1 | 0.08000 |
| 20 | 0.00000 | N/A | N/A | N/A | 0.00044 | 2 | 0.06000 |
| 21 | 0.00000 | N/A | N/A | N/A | 0.00043 | 3 | 0.04500 |
| 22 | 0.00000 | N/A | N/A | N/A | 0.00040 | 4 | 0.03500 |
| 23 | 0.00000 | N/A | N/A | N/A | 0.00037 | 5 | 0.03100 |
| 24 | 0.00000 | N/A | N/A | N/A | 0.00035 | 6 | 0.02700 |
| 25 | 0.00000 | N/A | N/A | N/A | 0.00034 | 7 | 0.02300 |
| 26 | 0.00000 | N/A | N/A | N/A | 0.00036 | 8 | 0.02200 |
| 27 | 0.00000 | N/A | N/A | N/A | 0.00037 | 9 | 0.02100 |
| 28 | 0.00000 | N/A | N/A | N/A | 0.00040 | 10 | 0.02000 |
| 29 | 0.00000 | N/A | N/A | N/A | 0.00041 | 11 | 0.01900 |
| 30 | 0.00000 | N/A | N/A | N/A | 0.00043 | 12 | 0.01800 |
| 31 | 0.00000 | N/A | N/A | N/A | 0.00046 | 13 | 0.01680 |
| 32 | 0.00000 | N/A | N/A | N/A | 0.00048 | 14 | 0.01560 |
| 33 | 0.00000 | N/A | N/A | N/A | 0.00050 | 15 | 0.01440 |
| 34 | 0.00000 | N/A | N/A | N/A | 0.00053 | 16 | 0.01320 |
| 35 | 0.00000 | N/A | N/A | N/A | 0.00056 | 17 | 0.01200 |
| 36 | 0.00000 | N/A | N/A | N/A | 0.00060 | 18 | 0.01160 |
| 37 | 0.00000 | N/A | N/A | N/A | 0.00064 | 19 | 0.01120 |
| 38 | 0.00000 | N/A | N/A | N/A | 0.00068 | 20 | 0.01080 |
| 39 | 0.00000 | N/A | N/A | N/A | 0.00073 | 21 | 0.01040 |
| 40 | 0.00000 | N/A | N/A | N/A | 0.00079 | 22 | 0.01000 |
| 41 | 0.00000 | N/A | N/A | N/A | 0.00085 | 23 | 0.01000 |
| 42 | 0.00000 | N/A | N/A | N/A | 0.00092 | 24 | 0.01000 |
| 43 | 0.00000 | N/A | N/A | N/A | 0.00100 | 25 | 0.01000 |
| 44 | 0.00000 | N/A | N/A | N/A | 0.00108 | 26 | 0.01000 |
| 45 | 0.00000 | N/A | N/A | N/A | 0.00118 | 27 | 0.01000 |
| 46 | 0.00000 | N/A | N/A | N/A | 0.00128 | 28 | 0.01000 |
| 47 | 0.00000 | N/A | N/A | N/A | 0.00139 | 29 | 0.01000 |
| 48 | 0.00000 | N/A | N/A | N/A | 0.00152 | 30 & Above | 0.01000 |
| 49 | 0.00000 | N/A | N/A | N/A | 0.00166 | | |
| 50 | 0.00000 | N/A | N/A | N/A | 0.00179 | | |
| 51 | 0.00000 | N/A | N/A | N/A | 0.00194 | | |
| 52 | 0.00000 | N/A | N/A | N/A | 0.00210 | | |
| 53 | 0.00000 | N/A | N/A | N/A | 0.00227 | | |
| 54 | 0.00000 | N/A | N/A | N/A | 0.00244 | | |
| 55 | 0.02000 | N/A | N/A | N/A | 0.00263 | | |
| 56 | 0.02000 | N/A | N/A | N/A | 0.00283 | | |
| 57 | 0.02500 | N/A | N/A | N/A | 0.00306 | | |
| 58 | 0.02500 | N/A | N/A | N/A | 0.00330 | | |
| 59 | 0.03000 | N/A | N/A | N/A | 0.00355 | | |
| 60 | 0.04000 | N/A | N/A | N/A | 0.00383 | | |
| 61 | 0.06000 | N/A | N/A | N/A | 0.00413 | | |
| 62 | 0.09000 | N/A | N/A | N/A | 0.00445 | | |
| 63 | 0.09000 | N/A | N/A | N/A | 0.00481 | | |
| 64 | 0.20000 | N/A | N/A | N/A | 0.00520 | | |
| 65 | 0.28000 | N/A | N/A | N/A | 0.00562 | | |
| 66 | 0.19000 | N/A | N/A | N/A | 0.00607 | | |
| 67 | 0.19000 | N/A | N/A | N/A | 0.00658 | | |
| 68 | 0.19000 | N/A | N/A | N/A | 0.00713 | | |
| 69 | 0.19000 | N/A | N/A | N/A | 0.00775 | | |
| 70 | 0.19000 | N/A | N/A | N/A | 0.00844 | | |
| 71 | 0.19000 | N/A | N/A | N/A | 0.00920 | | |
| 72 | 0.19000 | N/A | N/A | N/A | 0.01004 | | |
| 73 | 0.19000 | N/A | N/A | N/A | 0.01098 | | |
| 74 | 0.19000 | N/A | N/A | N/A | 0.01201 | | |
| 75 | 1.00000 | N/A | N/A | N/A | 0.01315 | | |

Table A-11
 Rate of Separation from Active Service for General Members
 Plan E – Female

| Age | Service Retirement | Service Disability | Ordinary Disability | Service Death | Ordinary Death | Years of Service | Other Terminations |
|-----|--------------------|--------------------|---------------------|---------------|----------------|------------------|--------------------|
| 18 | 0.00000 | N/A | N/A | N/A | 0.00017 | 0 | 0.15000 |
| 19 | 0.00000 | N/A | N/A | N/A | 0.00017 | 1 | 0.08000 |
| 20 | 0.00000 | N/A | N/A | N/A | 0.00017 | 2 | 0.06000 |
| 21 | 0.00000 | N/A | N/A | N/A | 0.00016 | 3 | 0.04500 |
| 22 | 0.00000 | N/A | N/A | N/A | 0.00014 | 4 | 0.03500 |
| 23 | 0.00000 | N/A | N/A | N/A | 0.00013 | 5 | 0.03100 |
| 24 | 0.00000 | N/A | N/A | N/A | 0.00012 | 6 | 0.02700 |
| 25 | 0.00000 | N/A | N/A | N/A | 0.00012 | 7 | 0.02300 |
| 26 | 0.00000 | N/A | N/A | N/A | 0.00013 | 8 | 0.02200 |
| 27 | 0.00000 | N/A | N/A | N/A | 0.00014 | 9 | 0.02100 |
| 28 | 0.00000 | N/A | N/A | N/A | 0.00016 | 10 | 0.02000 |
| 29 | 0.00000 | N/A | N/A | N/A | 0.00017 | 11 | 0.01900 |
| 30 | 0.00000 | N/A | N/A | N/A | 0.00020 | 12 | 0.01800 |
| 31 | 0.00000 | N/A | N/A | N/A | 0.00021 | 13 | 0.01680 |
| 32 | 0.00000 | N/A | N/A | N/A | 0.00023 | 14 | 0.01560 |
| 33 | 0.00000 | N/A | N/A | N/A | 0.00025 | 15 | 0.01440 |
| 34 | 0.00000 | N/A | N/A | N/A | 0.00027 | 16 | 0.01320 |
| 35 | 0.00000 | N/A | N/A | N/A | 0.00030 | 17 | 0.01200 |
| 36 | 0.00000 | N/A | N/A | N/A | 0.00033 | 18 | 0.01160 |
| 37 | 0.00000 | N/A | N/A | N/A | 0.00036 | 19 | 0.01120 |
| 38 | 0.00000 | N/A | N/A | N/A | 0.00039 | 20 | 0.01080 |
| 39 | 0.00000 | N/A | N/A | N/A | 0.00043 | 21 | 0.01040 |
| 40 | 0.00000 | N/A | N/A | N/A | 0.00047 | 22 | 0.01000 |
| 41 | 0.00000 | N/A | N/A | N/A | 0.00052 | 23 | 0.01000 |
| 42 | 0.00000 | N/A | N/A | N/A | 0.00056 | 24 | 0.01000 |
| 43 | 0.00000 | N/A | N/A | N/A | 0.00061 | 25 | 0.01000 |
| 44 | 0.00000 | N/A | N/A | N/A | 0.00066 | 26 | 0.01000 |
| 45 | 0.00000 | N/A | N/A | N/A | 0.00073 | 27 | 0.01000 |
| 46 | 0.00000 | N/A | N/A | N/A | 0.00079 | 28 | 0.01000 |
| 47 | 0.00000 | N/A | N/A | N/A | 0.00086 | 29 | 0.01000 |
| 48 | 0.00000 | N/A | N/A | N/A | 0.00092 | 30 & Above | 0.01000 |
| 49 | 0.00000 | N/A | N/A | N/A | 0.00100 | | |
| 50 | 0.00000 | N/A | N/A | N/A | 0.00108 | | |
| 51 | 0.00000 | N/A | N/A | N/A | 0.00117 | | |
| 52 | 0.00000 | N/A | N/A | N/A | 0.00126 | | |
| 53 | 0.00000 | N/A | N/A | N/A | 0.00137 | | |
| 54 | 0.00000 | N/A | N/A | N/A | 0.00147 | | |
| 55 | 0.02000 | N/A | N/A | N/A | 0.00160 | | |
| 56 | 0.02000 | N/A | N/A | N/A | 0.00173 | | |
| 57 | 0.02500 | N/A | N/A | N/A | 0.00187 | | |
| 58 | 0.02500 | N/A | N/A | N/A | 0.00203 | | |
| 59 | 0.03000 | N/A | N/A | N/A | 0.00221 | | |
| 60 | 0.04000 | N/A | N/A | N/A | 0.00242 | | |
| 61 | 0.06000 | N/A | N/A | N/A | 0.00264 | | |
| 62 | 0.09000 | N/A | N/A | N/A | 0.00289 | | |
| 63 | 0.09000 | N/A | N/A | N/A | 0.00317 | | |
| 64 | 0.20000 | N/A | N/A | N/A | 0.00350 | | |
| 65 | 0.28000 | N/A | N/A | N/A | 0.00385 | | |
| 66 | 0.19000 | N/A | N/A | N/A | 0.00425 | | |
| 67 | 0.19000 | N/A | N/A | N/A | 0.00471 | | |
| 68 | 0.19000 | N/A | N/A | N/A | 0.00520 | | |
| 69 | 0.19000 | N/A | N/A | N/A | 0.00575 | | |
| 70 | 0.19000 | N/A | N/A | N/A | 0.00636 | | |
| 71 | 0.19000 | N/A | N/A | N/A | 0.00703 | | |
| 72 | 0.19000 | N/A | N/A | N/A | 0.00777 | | |
| 73 | 0.19000 | N/A | N/A | N/A | 0.00859 | | |
| 74 | 0.19000 | N/A | N/A | N/A | 0.00950 | | |
| 75 | 1.00000 | N/A | N/A | N/A | 0.01050 | | |

Table A-12
 Rate of Separation from Active Service for Safety Members
 Plan A, B & C – Male

| Age | Service Retirement Plans A-B | Service Retirement Plan C | Service Disability | Ordinary Disability | Service Death | Ordinary Death | Years of Service | Other Terminations |
|-----|------------------------------|---------------------------|--------------------|---------------------|---------------|----------------|------------------|--------------------|
| 18 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00037 | 0 | 0.03500 |
| 19 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00040 | 1 | 0.02750 |
| 20 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00041 | 2 | 0.02000 |
| 21 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00041 | 3 | 0.01500 |
| 22 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00040 | 4 | 0.01200 |
| 23 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00039 | 5 | 0.01130 |
| 24 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00038 | 6 | 0.01070 |
| 25 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00037 | 7 | 0.01000 |
| 26 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00038 | 8 | 0.00920 |
| 27 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00039 | 9 | 0.00840 |
| 28 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00040 | 10 | 0.00760 |
| 29 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00041 | 11 | 0.00680 |
| 30 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00041 | 12 | 0.00600 |
| 31 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00042 | 13 | 0.00560 |
| 32 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00010 | 0.00043 | 14 | 0.00520 |
| 33 | 0.00000 | 0.00000 | 0.00210 | 0.00000 | 0.00010 | 0.00044 | 15 | 0.00480 |
| 34 | 0.00000 | 0.00000 | 0.00220 | 0.00000 | 0.00010 | 0.00045 | 16 | 0.00440 |
| 35 | 0.00000 | 0.00000 | 0.00230 | 0.00000 | 0.00010 | 0.00047 | 17 | 0.00400 |
| 36 | 0.00000 | 0.00000 | 0.00240 | 0.00000 | 0.00010 | 0.00049 | 18 | 0.00360 |
| 37 | 0.00000 | 0.00000 | 0.00250 | 0.00000 | 0.00010 | 0.00050 | 19 | 0.00320 |
| 38 | 0.00000 | 0.00000 | 0.00260 | 0.00000 | 0.00010 | 0.00053 | 20 | 0.00280 |
| 39 | 0.00000 | 0.00000 | 0.00270 | 0.00000 | 0.00010 | 0.00056 | 21 | 0.00240 |
| 40 | 0.00750 | 0.00750 | 0.00280 | 0.00000 | 0.00010 | 0.00059 | 22 | 0.00200 |
| 41 | 0.00750 | 0.00750 | 0.00290 | 0.00000 | 0.00010 | 0.00062 | 23 | 0.00200 |
| 42 | 0.00750 | 0.00750 | 0.00300 | 0.00000 | 0.00010 | 0.00067 | 24 | 0.00200 |
| 43 | 0.00750 | 0.00750 | 0.00310 | 0.00000 | 0.00010 | 0.00071 | 25 | 0.00200 |
| 44 | 0.00750 | 0.00750 | 0.00320 | 0.00000 | 0.00010 | 0.00076 | 26 | 0.00200 |
| 45 | 0.00750 | 0.00750 | 0.00330 | 0.00000 | 0.00010 | 0.00082 | 27 | 0.00200 |
| 46 | 0.00750 | 0.00750 | 0.00340 | 0.00000 | 0.00010 | 0.00088 | 28 | 0.00200 |
| 47 | 0.00750 | 0.00750 | 0.00350 | 0.00000 | 0.00010 | 0.00095 | 29 | 0.00200 |
| 48 | 0.00750 | 0.00750 | 0.00400 | 0.00000 | 0.00010 | 0.00102 | 30 & Above | 0.00000 |
| 49 | 0.00750 | 0.00750 | 0.00500 | 0.00000 | 0.00010 | 0.00111 | | |
| 50 | 0.02000 | 0.02000 | 0.00750 | 0.00000 | 0.00010 | 0.00120 | | |
| 51 | 0.02000 | 0.02000 | 0.00750 | 0.00000 | 0.00010 | 0.00129 | | |
| 52 | 0.02000 | 0.02000 | 0.00750 | 0.00000 | 0.00010 | 0.00140 | | |
| 53 | 0.03000 | 0.03000 | 0.02000 | 0.00000 | 0.00010 | 0.00151 | | |
| 54 | 0.15000 | 0.10000 | 0.02000 | 0.00000 | 0.00010 | 0.00162 | | |
| 55 | 0.26000 | 0.15000 | 0.07500 | 0.00000 | 0.00010 | 0.00175 | | |
| 56 | 0.17000 | 0.15000 | 0.07500 | 0.00000 | 0.00010 | 0.00190 | | |
| 57 | 0.17000 | 0.28000 | 0.10000 | 0.00000 | 0.00010 | 0.00205 | | |
| 58 | 0.17000 | 0.17000 | 0.10000 | 0.00000 | 0.00010 | 0.00223 | | |
| 59 | 0.27000 | 0.27000 | 0.10000 | 0.00000 | 0.00010 | 0.00243 | | |
| 60 | 0.27000 | 0.27000 | 0.10000 | 0.00000 | 0.00010 | 0.00264 | | |
| 61 | 0.25000 | 0.25000 | 0.05000 | 0.00000 | 0.00010 | 0.00288 | | |
| 62 | 0.25000 | 0.25000 | 0.05000 | 0.00000 | 0.00010 | 0.00315 | | |
| 63 | 0.25000 | 0.25000 | 0.05000 | 0.00000 | 0.00010 | 0.00344 | | |
| 64 | 0.25000 | 0.25000 | 0.05000 | 0.00000 | 0.00010 | 0.00375 | | |
| 65 | 1.00000 | 1.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00410 | | |

Table A-13
 Rate of Separation from Active Service for Safety Members
 Plan A, B & C – Female

| Age | Service Retirement Plans A-B | Service Retirement Plan C | Service Disability | Ordinary Disability | Service Death | Ordinary Death | Years of Service | Other Terminations |
|-----|------------------------------|---------------------------|--------------------|---------------------|---------------|----------------|------------------|--------------------|
| 18 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00014 | 0 | 0.03500 |
| 19 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00015 | 1 | 0.02750 |
| 20 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00016 | 2 | 0.02000 |
| 21 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00017 | 3 | 0.01500 |
| 22 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00017 | 4 | 0.01200 |
| 23 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00018 | 5 | 0.01130 |
| 24 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00019 | 6 | 0.01070 |
| 25 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00020 | 7 | 0.01000 |
| 26 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00021 | 8 | 0.00920 |
| 27 | 0.00000 | 0.00000 | 0.00300 | 0.00000 | 0.00010 | 0.00022 | 9 | 0.00840 |
| 28 | 0.00000 | 0.00000 | 0.00340 | 0.00000 | 0.00010 | 0.00024 | 10 | 0.00760 |
| 29 | 0.00000 | 0.00000 | 0.00380 | 0.00000 | 0.00010 | 0.00025 | 11 | 0.00680 |
| 30 | 0.00000 | 0.00000 | 0.00420 | 0.00000 | 0.00010 | 0.00027 | 12 | 0.00600 |
| 31 | 0.00000 | 0.00000 | 0.00460 | 0.00000 | 0.00010 | 0.00028 | 13 | 0.00560 |
| 32 | 0.00000 | 0.00000 | 0.00500 | 0.00000 | 0.00010 | 0.00030 | 14 | 0.00520 |
| 33 | 0.00000 | 0.00000 | 0.00560 | 0.00000 | 0.00010 | 0.00032 | 15 | 0.00480 |
| 34 | 0.00000 | 0.00000 | 0.00620 | 0.00000 | 0.00010 | 0.00034 | 16 | 0.00440 |
| 35 | 0.00000 | 0.00000 | 0.00680 | 0.00000 | 0.00010 | 0.00036 | 17 | 0.00400 |
| 36 | 0.00000 | 0.00000 | 0.00740 | 0.00000 | 0.00010 | 0.00038 | 18 | 0.00360 |
| 37 | 0.00000 | 0.00000 | 0.00800 | 0.00000 | 0.00010 | 0.00041 | 19 | 0.00320 |
| 38 | 0.00000 | 0.00000 | 0.00840 | 0.00000 | 0.00010 | 0.00043 | 20 | 0.00280 |
| 39 | 0.00000 | 0.00000 | 0.00880 | 0.00000 | 0.00010 | 0.00046 | 21 | 0.00240 |
| 40 | 0.00750 | 0.00750 | 0.00920 | 0.00000 | 0.00010 | 0.00049 | 22 | 0.00200 |
| 41 | 0.00750 | 0.00750 | 0.00960 | 0.00000 | 0.00010 | 0.00052 | 23 | 0.00200 |
| 42 | 0.00750 | 0.00750 | 0.01000 | 0.00000 | 0.00010 | 0.00056 | 24 | 0.00200 |
| 43 | 0.00750 | 0.00750 | 0.01040 | 0.00000 | 0.00010 | 0.00059 | 25 | 0.00200 |
| 44 | 0.00750 | 0.00750 | 0.01080 | 0.00000 | 0.00010 | 0.00063 | 26 | 0.00200 |
| 45 | 0.00750 | 0.00750 | 0.01120 | 0.00000 | 0.00010 | 0.00067 | 27 | 0.00200 |
| 46 | 0.00750 | 0.00750 | 0.01160 | 0.00000 | 0.00010 | 0.00071 | 28 | 0.00200 |
| 47 | 0.00750 | 0.00750 | 0.01200 | 0.00000 | 0.00010 | 0.00076 | 29 | 0.00200 |
| 48 | 0.00750 | 0.00750 | 0.01300 | 0.00000 | 0.00010 | 0.00080 | 30 & Above | 0.00000 |
| 49 | 0.00750 | 0.00750 | 0.01500 | 0.00000 | 0.00010 | 0.00085 | | |
| 50 | 0.02000 | 0.02000 | 0.01800 | 0.00000 | 0.00010 | 0.00091 | | |
| 51 | 0.02000 | 0.02000 | 0.02000 | 0.00000 | 0.00010 | 0.00097 | | |
| 52 | 0.02000 | 0.02000 | 0.02400 | 0.00000 | 0.00010 | 0.00103 | | |
| 53 | 0.03000 | 0.03000 | 0.02800 | 0.00000 | 0.00010 | 0.00109 | | |
| 54 | 0.15000 | 0.10000 | 0.03200 | 0.00000 | 0.00010 | 0.00116 | | |
| 55 | 0.26000 | 0.15000 | 0.11000 | 0.00000 | 0.00010 | 0.00123 | | |
| 56 | 0.17000 | 0.15000 | 0.06000 | 0.00000 | 0.00010 | 0.00131 | | |
| 57 | 0.17000 | 0.28000 | 0.06000 | 0.00000 | 0.00010 | 0.00140 | | |
| 58 | 0.17000 | 0.17000 | 0.06000 | 0.00000 | 0.00010 | 0.00148 | | |
| 59 | 0.27000 | 0.27000 | 0.06000 | 0.00000 | 0.00010 | 0.00158 | | |
| 60 | 0.27000 | 0.27000 | 0.06000 | 0.00000 | 0.00010 | 0.00168 | | |
| 61 | 0.25000 | 0.25000 | 0.06000 | 0.00000 | 0.00010 | 0.00178 | | |
| 62 | 0.25000 | 0.25000 | 0.06000 | 0.00000 | 0.00010 | 0.00190 | | |
| 63 | 0.25000 | 0.25000 | 0.06000 | 0.00000 | 0.00010 | 0.00202 | | |
| 64 | 0.25000 | 0.25000 | 0.06000 | 0.00000 | 0.00010 | 0.00215 | | |
| 65 | 1.00000 | 1.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00228 | | |

Attachment III

**Cavanaugh MacDonald's 2019 Pension Plan
Valuation Audit Report Final**



Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

**LOS ANGELES COUNTY
EMPLOYEES RETIREMENT ASSOCIATION**

**ACTUARIAL REVIEW REPORT FOR THE
JUNE 30, 2019 ACTUARIAL VALUATION
OF RETIREMENT BENEFITS**

**Prepared by Cavanaugh Macdonald Consulting
March 2, 2020**





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

March 2, 2020

Mr. Richard Bendall
Chief, Internal Audit
Los Angeles County Employees Retirement Association
300 North Lake Avenue, Suite 820
Pasadena, CA 91101

Dear Mr. Bendall:

Cavanaugh Macdonald Consulting, LLC (CMC) has performed an independent review of the June 30, 2019 actuarial valuation of retirement benefits for the Los Angeles County Employees Retirement Association (LACERA). As an independent reviewing, or auditing, actuary, we have been asked to express an opinion regarding the reasonableness and accuracy of the valuation results, including a review of sample lives as well as a full independent replication of the key valuation results.

Our opinion on the valuation results is based on an independent replication of the June 30, 2019 actuarial valuation of LACERA and a review of detailed sample lives. We previously reviewed the 2019 Experience Study, prepared by Milliman. Our report, dated January 30, 2020, includes our opinion that the actuarial assumptions and methods recommended in the study were reasonable for purposes of performing the actuarial funding valuation. With respect to this audit report, we would like to thank Milliman, LACERA's retained actuary, for their cooperation and assistance in providing the required information to us in a timely fashion. **We find the June 30, 2019 actuarial valuation results to be reasonable and accurate, based on the assumptions and methods used. The valuation was performed by qualified actuaries and was performed in accordance with the principles and practices prescribed by the Actuarial Standards Board.** This report documents the detailed results of our review.

Additional Information and Disclosures

This report has been prepared for LACERA and its stakeholders by CMC, and is intended to assist LACERA as it validates the reasonability of the liabilities, costs, and other calculations for retirement benefits, determined as of June 30, 2019. Additionally, the findings, conclusions, and recommendations presented in this report are specific to LACERA, LACERA's retirement benefits, and the work produced by Milliman. CMC may produce different findings or arrive at different conclusions in other situations or even in cases involving other similar retirement benefit plans. As such, it is important to keep in mind that the use of this information for purposes other than those expressed here may not be appropriate.



In preparing this review, we have relied on the following information provided by LACERA and/or Milliman:

- Milliman's draft report titled, *Los Angeles County Employees Retirement Association June 30, 2019 Actuarial Valuation of Retirement Benefits* (2019 LACERA Actuarial Valuation);
- A report produced by Segal Consulting on May 9, 2017 titled, *Los Angeles County Employees Retirement Association Audit of the June 30, 2016 Actuarial Valuation*;
- Raw retirement plan actuarial valuation census data as of June 30, 2019, provided by LACERA;
- Milliman's processed retirement plan actuarial valuation census data as of June 30, 2019;
- Detailed sample lives prepared by Milliman; and
- Complete tables of actuarial assumptions used in the valuation, provided by Milliman.

While we cannot verify the accuracy of all of this information, the supplied information was reviewed for reasonableness and consistency and we have no reason to doubt the substantial accuracy or completeness of the information. We believe that it is reliable for the purpose of conducting this review. The results and conclusions contained in this report depend on the integrity of this information, and if any of the supplied information or analyses change, our results and conclusions may be different and this report may need to be revised.

The undersigned are familiar with the funding aspects of public retirement plan valuations and meet the Qualification Standards of the American Academy of Actuaries necessary to render the actuarial opinions contained in this report. All sections of this report, including any appendices and attachments, are considered an integral part of the actuarial opinions.

CMC does not provide legal, investment, or accounting advice. Thus, the information in this report is not intended to supersede or supplant the advice and interpretations of LACERA or its external consultants.

Sincerely,

A handwritten signature in blue ink that reads 'Patrice Beckham'.

Patrice Beckham, FSA, EA, MAAA, FCA
Principal and Consulting Actuary

A handwritten signature in blue ink that reads 'Brent A. Banister'.

Brent A. Banister, Ph.D., FSA, EA, MAAA, FCA
Chief Actuary



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1. EXECUTIVE SUMMARY

As an independent auditing actuary, Cavanaugh Macdonald Consulting, LLC (CMC) has been tasked to provide a general overview and express an opinion of the reasonableness and soundness of the actuarial work performed by Milliman for the Los Angeles County Employees Retirement Association (LACERA). The specific work product to be reviewed was the June 30, 2019 Actuarial Valuation of Retirement Benefits. The specific items to be included in the actuarial audit include:

- (1) Evaluation of the data used in the performance of the valuation, including the degree to which the data is sufficient and appropriate for the purpose of an actuarial valuation, as well as the appropriateness of any assumptions used in creating the member data file;
- (2) Independent parallel valuation as of June 30, 2019 using the actuarial assumptions, methodologies and funding methods used by the retained actuary in their performance of the June 30, 2019 actuarial valuation;
- (3) Evaluation of our parallel valuation results compared to the major valuation results in the June 30, 2019 valuation report prepared by Milliman and a reconciliation of any material discrepancies in the findings, assumptions, methodologies, or other calculations found in the retained actuary's work.
- (4) A detailed review of selected sample lives.
- (5) Review of the June 30, 2019 actuarial valuation report.

Our audit findings are based on actuarial reports, member census data, and supplemental information provided by both LACERA and Milliman.

In the following sections, we have summarized the key points from the report details.

Data Analysis

Underlying the results of any actuarial valuation is the census or membership data including details of each member entitled to a benefit payment in the future. If the data are not accurate, then results drawn from the data may not be accurate, either. We confirmed that the census data provided to the actuary by LACERA contains the necessary elements to perform an actuarial valuation, although we did not audit the data itself. The second part of this step was to ensure that Milliman used the data appropriately.

We requested the original member census data provided to Milliman for the 2019 valuation directly from LACERA. We also requested member data, as reconciled for the 2019 valuation, from Milliman along with complete descriptions of assumptions, methods and valuation procedures. Our comparison of the census data used by Milliman for the June 30, 2019 actuarial valuation with the original data produced by LACERA indicated that Milliman's data is substantially consistent with the LACERA data. **We find that the data is consistent, complete and appropriate for the purpose for which it is being used.**



1. EXECUTIVE SUMMARY

Parallel Valuation Results

The key findings and recommendations resulting from our audit of Milliman's June 30, 2019 actuarial valuation are discussed below. We matched well overall and reasonably well on the various component pieces. We do not expect to be able to match Milliman's results exactly because we are using independent approaches to valuing the liabilities.

There are three key metrics in the actuarial valuation:

- Present Value of Future Benefits (PVB),
- Actuarial Accrued Liability (AAL),
- Normal Cost (NC).

The PVB is a measure of all benefits expected to be ultimately paid for all current members of the Plan in the future. The AAL reflects the portion of the PVB attributable to service already performed as of the valuation date. The Normal Cost is the portion of the PVB allocated to the current plan year. Of the three measures, we expect to match the PVB the closest, typically within 1% to 3%, while the AAL is often not quite as close, and the Normal Cost often reflects the greatest difference, with variance of 3% to 6% at times. This wider range is a consequence of the mathematics involved in which small variants in approach have a larger impact on the results.

In Section 3 of this report, the detailed results of our independent parallel valuation of the LACERA liabilities are compared with the June 30, 2019 valuation results prepared by Milliman. We were able to match all key measurements within a reasonable range. **We find the calculation results in the June 30, 2019 valuation to be reasonable and appropriate for their intended purposes.**

Overall, our parallel valuation results were very close to Milliman's, particularly for the present value of future benefits which is the most important metric from a funding perspective. The following exhibit illustrates the ratio of Cavanaugh Macdonald's results to Milliman's for all three of the key valuation metrics. A ratio near 100% indicates a very close match. For some of the older plans, there are relatively few active members and differences in approach can have a larger impact on the overall numbers so the ratios may be further from 100% for those groups, particularly for the normal cost.



1. EXECUTIVE SUMMARY

| Plan | Ratio of CMC Results to Milliman's | | |
|-------------|------------------------------------|-----------------------------|-------------|
| | Present Value of Benefits | Actuarial Accrued Liability | Normal Cost |
| General – A | 100% | 100% | 97% |
| General – B | 99% | 99% | 97% |
| General – C | 100% | 100% | 99% |
| General – D | 99% | 98% | 100% |
| General – E | 100% | 99% | 100% |
| General – G | 98% | 97% | 97% |
| Safety – A | 100% | 100% | 98% |
| Safety – B | 99% | 99% | 97% |
| Safety – C | 98% | 95% | 96% |
| All Plans | 99% | 99% | 99% |

Based on our auditing experience and professional judgment, Cavanaugh Macdonald believes all of the variances shown in the table above are within an acceptable range and the result confirm the reliability of the June 30, 2019 valuation results prepared by Milliman.

As indicated in our *Actuarial Audit of the 2019 Experience Investigation Report*, dated January 30, 2020, we found the actuarial assumptions and methods recommended by Milliman to be reasonable and in accordance with applicable Actuarial Standards of Practice. The assumptions used in this valuation, including a 7.0% investment return assumption, are those that were approved by LACERA's Board of Investments at their January 2020 meeting. We verified that the correct set of actuarial assumptions was used to produce the June 30, 2019 valuation results.

Because of the change to the actuarial assumptions, the employee contribution rates for non-PEPRA Plans, both normal and cost-of-living contributions, were re-determined in the June 30, 2019 valuation report. Based on the methodology described in the report, we verified that the contribution rates shown are reasonable.

As part of this audit, Cavanaugh Macdonald also reviewed the actuarial audit report, prepared by Segal Consulting and dated May 9, 2017, including specific recommendations made for future valuations. After reviewing Milliman's current valuation process and report, we are pleased to report that all changes recommended in Segal's report have been full addressed and there are no outstanding issues.

Review of Selected Individuals

As part of our review, we examined results for a number of individual members. By focusing on a limited number of individuals, it is often possible to detect differences that have a smaller impact that are not apparent in the overall replication results. In this case, however, we found that the liability measures reported by Milliman for each of the individual test lives were consistent with our calculations.



1. EXECUTIVE SUMMARY

Review of Report

As part of our review of the report, we verified the key calculations shown in the exhibits. We also verified the reasonableness of the member contribution rates that are provided in the report. We did not observe any significant issues.

The impact of the assumption changes on the employer contribution rates is being phased in over three years. We agree with the calculation of the phase-in for the employer contribution rates as shown in the June 30, 2019 valuation report. In addition, the projection of the employer contribution rate on page 3 of Milliman's valuation report is helpful in disclosing the expected increase in the employer contribution rate due to both the phase-in of the assumption changes as well as the impact of deferred investment experience.

We reviewed the June 30, 2019 Actuarial Valuation Report produced by Milliman in detail. We confirmed that the report contains the basic model disclosures recommended by the California Actuarial Advisory Panel (CAAP). We also reviewed the report for compliance with Actuarial Standards of Practice, including the new standard first required to be included in the 2019 valuation report, *ASOP 51, Assessment and Disclosure of Risk in Measuring Pension Obligations*. **We found the report to be well written, comprehensive in content, and in compliance with the ASOPs.** We offer a few comments and suggestions for improvement, but all are minor.

Conclusion

It is our belief that an audit should not focus on finding trivial differences between actuarial processes, procedures, philosophies, or styles utilized by two different actuaries, but rather to verify there are no material errors, and to identify potential improvements to the process and procedures utilized by LACERA's actuary. Actuarial work draws on professional judgment, so there is a subjective component that must be considered alongside the objective component of matching numerical results. In performing this audit, we attempt to limit discussions concerning stylistic preferences and focus more on the significant philosophical approaches, the accuracy of calculations, the completeness and reliability of reporting, and the compliance with generally acceptable actuarial practices and standards of practice in all of the work reviewed.

Because of the complexity of actuarial work, we would not expect to match Milliman's valuation results exactly, nor would we necessarily expect our opinions regarding the results to be the same as those of Milliman. While we offer some different viewpoints or ideas, we believe that Milliman's work provides an appropriate assessment of the status of the retirement benefits for purposes of determining contribution rates.

***Audit Finding:* We find the actuarial calculations in the June 30, 2019 actuarial valuation to be reasonable, based on the actuarial assumptions and methods used. The valuation was performed by qualified actuaries and was performed in accordance with the principles and practices prescribed by the Actuarial Standards Board.** Furthermore, the valuation report



1. EXECUTIVE SUMMARY

complies with applicable Actuarial Standards of Practice and the basic model disclosures recommended by the California Actuarial Advisory Panel.

The remainder of this report provides the basis for our findings for each of the requested tasks, including our recommendations.



2. DATA REVIEW

Milliman and LACERA each supplied CMC with the member data used for the June 30, 2019 actuarial valuation. This included both the raw data prepared by LACERA and the processed data used by Milliman for its actuarial software. We compared the records and are comfortable with the data processing being performed by Milliman.

There is minimal data scrubbing performed by Milliman, so we were generally able to confirm that the processed records used by Milliman were consistent with the data provided by LACERA. We further tested that the manner in which records were selected for inclusion or exclusion in the valuation or assignment of valuation status was appropriate.

We tested the member counts by status and the totals of selected key fields to be sure they were reasonably close. The following tables contain some additional detail summarizing our review. In most cases, the matching is quite close, considering rounding issues. For the Safety C plans, our compensation numbers do not quite match Milliman's, although we do match their input numbers. We have determined that this is due to some adjustments that were made by Milliman for new hires. This has no meaningful impact on the total results since these individuals have virtually no actuarial accrued liability.

We believe that the data provided by LACERA is sufficient for Milliman to reasonably perform its work. We did not audit the data, but simply determined whether Milliman was using the data appropriately and that it was consistent with the raw data provided by LACERA. ***Overall, we are comfortable that the data Milliman uses to perform its valuation is complete and appropriate for the purposes of an actuarial funding valuation, as well as consistent with the data supplied by LACERA.***



2. DATA REVIEW

ANALYSIS OF ACTIVE DATA

| | | Number | Annual Salary | Average Age | Average Monthly Salary | Average Service |
|------------------------|---------------|--------|-----------------|-------------|------------------------|-----------------|
| General Members | | | | | | |
| Plan A | LACERA Data | 105 | \$10,691,184 | 70.5 | \$8,485 | 39.4 |
| | Milliman Data | 105 | \$10,691,184 | 70.5 | \$8,485 | 39.4 |
| | % Difference | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Plan B | LACERA Data | 34 | \$3,793,008 | 65.4 | \$9,297 | 36.9 |
| | Milliman Data | 34 | \$3,793,008 | 65.4 | \$9,296 | 36.9 |
| | % Difference | 0.00% | 0.00% | 0.00% | -0.01% | 0.00% |
| Plan C | LACERA Data | 42 | \$3,941,880 | 65.3 | \$7,821 | 38.6 |
| | Milliman Data | 42 | \$3,941,880 | 65.2 | \$7,821 | 38.6 |
| | % Difference | 0.00% | 0.00% | -0.15% | 0.00% | 0.00% |
| Plan D | LACERA Data | 41,736 | \$3,701,354,112 | 50.3 | \$7,390 | 18.3 |
| | Milliman Data | 41,732 | \$3,702,074,880 | 50.2 | \$7,393 | 18.3 |
| | % Difference | -0.01% | 0.02% | -0.20% | 0.03% | 0.00% |
| Plan E | LACERA Data | 17,335 | \$1,349,166,408 | 54.8 | \$6,486 | 22.5 |
| | Milliman Data | 17,331 | \$1,349,156,568 | 54.7 | \$6,487 | 22.5 |
| | % Difference | -0.02% | 0.00% | -0.18% | 0.02% | 0.00% |
| Plan G | LACERA Data | 27,148 | \$1,745,933,604 | 37.8 | \$5,359 | 2.9 |
| | Milliman Data | 27,148 | \$1,745,933,604 | 37.7 | \$5,359 | 2.9 |
| | % Difference | 0.00% | 0.00% | -0.26% | 0.00% | 0.00% |
| Total | LACERA Data | 86,400 | \$6,814,880,196 | 47.3 | \$6,573 | 14.4 |
| | Milliman Data | 86,392 | \$6,815,591,124 | 47.3 | \$6,574 | 14.4 |
| | % Difference | -0.01% | 0.01% | 0.00% | 0.02% | 0.00% |
| Safety Members | | | | | | |
| Plan A | LACERA Data | 5 | \$717,780 | 64.0 | \$11,963 | 37.2 |
| | Milliman Data | 5 | \$717,780 | 64.0 | \$11,963 | 37.2 |
| | % Difference | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Plan B | LACERA Data | 9,727 | \$1,261,456,104 | 45.5 | \$10,807 | 18.9 |
| | Milliman Data | 9,725 | \$1,261,192,104 | 45.5 | \$10,807 | 18.9 |
| | % Difference | -0.02% | -0.02% | 0.00% | 0.00% | 0.00% |
| Plan C | LACERA Data | 3,064 | \$278,277,156 | 30.9 | \$7,568 | 2.8 |
| | Milliman Data | 3,064 | \$278,277,156 | 30.9 | \$7,568 | 2.8 |
| | % Difference | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Total | LACERA Data | 12,796 | \$1,540,451,040 | 42.0 | \$10,032 | 15.0 |
| | Milliman Data | 12,794 | \$1,540,187,040 | 42.0 | \$10,032 | 15.1 |
| | % Difference | -0.02% | -0.02% | 0.00% | 0.00% | 0.67% |
| Total | LACERA Data | 99,196 | \$8,355,331,236 | 46.6 | \$7,019 | 14.5 |
| | Milliman Data | 99,186 | \$8,355,778,164 | 46.6 | \$7,020 | 14.5 |
| | % Difference | -0.01% | 0.01% | 0.00% | 0.01% | 0.00% |



2. DATA REVIEW

ANALYSIS OF VESTED FORMER MEMBER DATA

| | | Number | Average Age |
|------------------------|---------------|--------|-------------|
| General Members | | | |
| Plan A | LACERA Data | 68 | 71.8 |
| | Milliman Data | 68 | 71.7 |
| | % Difference | 0.00% | -0.14% |
| Plan B | LACERA Data | 15 | 68.8 |
| | Milliman Data | 15 | 68.8 |
| | % Difference | 0.00% | 0.00% |
| Plan C | LACERA Data | 18 | 65.1 |
| | Milliman Data | 18 | 65.1 |
| | % Difference | 0.00% | 0.00% |
| Plan D | LACERA Data | 7,837 | 48.2 |
| | Milliman Data | 7,912 | 48.2 |
| | % Difference | 0.96% | 0.00% |
| Plan E | LACERA Data | 3,437 | 56.5 |
| | Milliman Data | 3,360 | 56.7 |
| | % Difference | -2.24% | 0.35% |
| Plan G | LACERA Data | 3,200 | 37.0 |
| | Milliman Data | 3,200 | 37.0 |
| | % Difference | 0.00% | 0.00% |
| Total | LACERA Data | 14,575 | 47.9 |
| | Milliman Data | 14,573 | 47.8 |
| | % Difference | -0.01% | -0.21% |
| Safety Members | | | |
| Plan A | LACERA Data | 4 | 66.8 |
| | Milliman Data | 4 | 67.0 |
| | % Difference | 0.00% | 0.30% |
| Plan B | LACERA Data | 816 | 43.7 |
| | Milliman Data | 818 | 43.7 |
| | % Difference | 0.25% | 0.00% |
| Plan C | LACERA Data | 172 | 31.4 |
| | Milliman Data | 172 | 31.4 |
| | % Difference | 0.00% | 0.00% |
| Total | LACERA Data | 992 | 41.7 |
| | Milliman Data | 994 | 41.6 |
| | % Difference | 0.20% | -0.24% |
| Total | LACERA Data | 15,567 | 47.5 |
| | Milliman Data | 15,567 | 47.4 |
| | % Difference | 0.00% | -0.21% |

Note: Inactive vested counts from the LACERA data are not adjusted for suspended active records.



2. DATA REVIEW

ANALYSIS OF IN-PAY MEMBER DATA

| | | Number | Annual Allowances | Average Age | Average Monthly Benefit |
|------------------------|---------------|--------|-------------------|-------------|-------------------------|
| General Members | | | | | |
| Plan A | LACERA Data | 21,168 | \$1,184,871,149 | 79.6 | \$4,665 |
| | Milliman Data | 21,168 | \$1,184,808,424 | 79.6 | \$4,664 |
| | % Difference | 0.00% | -0.01% | 0.00% | -0.02% |
| Plan B | LACERA Data | 744 | \$41,178,970 | 74.2 | \$4,612 |
| | Milliman Data | 744 | \$41,178,970 | 74.2 | \$4,612 |
| | % Difference | 0.00% | 0.00% | 0.00% | 0.00% |
| Plan C | LACERA Data | 495 | \$23,115,737 | 73.7 | \$3,892 |
| | Milliman Data | 495 | \$23,115,737 | 73.7 | \$3,892 |
| | % Difference | 0.00% | 0.00% | 0.00% | 0.00% |
| Plan D | LACERA Data | 16,952 | \$676,963,686 | 68.6 | \$3,328 |
| | Milliman Data | 16,952 | \$676,556,924 | 68.5 | \$3,326 |
| | % Difference | 0.00% | -0.06% | -0.15% | -0.06% |
| Plan E | LACERA Data | 14,169 | \$389,685,748 | 72.0 | \$2,292 |
| | Milliman Data | 14,173 | \$389,948,152 | 71.9 | \$2,293 |
| | % Difference | 0.03% | 0.07% | -0.14% | 0.04% |
| Plan G | LACERA Data | 28 | \$386,254 | 66.3 | \$1,150 |
| | Milliman Data | 28 | \$386,569 | 66.3 | \$1,151 |
| | % Difference | 0.00% | 0.08% | 0.00% | 0.09% |
| Total | LACERA Data | 53,556 | \$2,316,201,544 | 74.0 | \$3,604 |
| | Milliman Data | 53,560 | \$2,315,994,776 | 73.9 | \$3,603 |
| | % Difference | 0.01% | -0.01% | -0.14% | -0.03% |
| Safety Members | | | | | |
| Plan A | LACERA Data | 6,809 | \$630,440,117 | 76.7 | \$7,716 |
| | Milliman Data | 6,810 | \$630,158,797 | 76.7 | \$7,711 |
| | % Difference | 0.01% | -0.04% | 0.00% | -0.06% |
| Plan B | LACERA Data | 6,130 | \$553,506,460 | 59.7 | \$7,525 |
| | Milliman Data | 6,130 | \$553,135,542 | 59.7 | \$7,520 |
| | % Difference | 0.00% | -0.07% | 0.00% | -0.07% |
| Plan C | LACERA Data | 7 | \$621,238 | 50.8 | \$7,396 |
| | Milliman Data | 7 | \$621,244 | 50.9 | \$7,396 |
| | % Difference | 0.00% | 0.00% | 0.20% | 0.00% |
| Total | LACERA Data | 12,946 | \$1,184,567,815 | 68.6 | \$7,625 |
| | Milliman Data | 12,947 | \$1,183,915,583 | 68.6 | \$7,620 |
| | % Difference | 0.01% | -0.06% | 0.00% | -0.07% |
| Total | LACERA Data | 66,502 | \$3,500,769,359 | 72.9 | \$4,387 |
| | Milliman Data | 66,507 | \$3,499,910,359 | 72.9 | \$4,385 |
| | % Difference | 0.01% | -0.02% | 0.00% | -0.05% |



2. DATA REVIEW

ANALYSIS OF IN-PAY MEMBER DATA – HEALTHY RETIREES

| | | Number | Annual Benefits (in thousands) | Average Monthly Benefit |
|------------------------|---------------|--------|-----------------------------------|-------------------------|
| General Members | | | | |
| Plan A | LACERA Data | 15,190 | \$965,285 | \$5,296 |
| | Milliman Data | 15,190 | \$965,291 | \$5,296 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Plan B | LACERA Data | 618 | \$36,876 | \$4,972 |
| | Milliman Data | 618 | \$36,876 | \$4,972 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Plan C | LACERA Data | 377 | \$19,844 | \$4,386 |
| | Milliman Data | 377 | \$19,844 | \$4,386 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Plan D | LACERA Data | 13,459 | \$574,575 | \$3,558 |
| | Milliman Data | 13,458 | \$574,354 | \$3,556 |
| | % Difference | -0.01% | -0.04% | -0.06% |
| Plan E | LACERA Data | 12,996 | \$373,089 | \$2,392 |
| | Milliman Data | 12,996 | \$373,101 | \$2,392 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Plan G | LACERA Data | 25 | \$323 | \$1,076 |
| | Milliman Data | 25 | \$323 | \$1,077 |
| | % Difference | 0.00% | 0.00% | 0.09% |
| Safety Members | | | | |
| Plan A | LACERA Data | 2,224 | \$237,909 | \$8,914 |
| | Milliman Data | 2,224 | \$237,911 | \$8,915 |
| | % Difference | 0.00% | 0.00% | 0.01% |
| Plan B | LACERA Data | 2,625 | \$263,407 | \$8,362 |
| | Milliman Data | 2,625 | \$263,301 | \$8,359 |
| | % Difference | 0.00% | -0.04% | -0.04% |
| Plan C | LACERA Data | 4 | \$518 | \$10,798 |
| | Milliman Data | 4 | \$518 | \$10,798 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Total | LACERA Data | 47,518 | \$2,471,826 | \$4,335 |
| | Milliman Data | 47,517 | \$2,471,519 | \$4,334 |
| | % Difference | 0.00% | -0.01% | -0.02% |



2. DATA REVIEW

ANALYSIS OF IN-PAY MEMBER DATA – DISABLED RETIREES

| | | Number | Annual Benefits (in thousands) | Average Monthly Benefit |
|------------------------|---------------|--------|-----------------------------------|-------------------------|
| General Members | | | | |
| Plan A | LACERA Data | 1,509 | \$61,160 | \$3,378 |
| | Milliman Data | 1,509 | \$61,160 | \$3,378 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Plan B | LACERA Data | 58 | \$2,107 | \$3,027 |
| | Milliman Data | 58 | \$2,107 | \$3,027 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Plan C | LACERA Data | 51 | \$1,714 | \$2,800 |
| | Milliman Data | 51 | \$1,714 | \$2,800 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Plan D | LACERA Data | 2,054 | \$70,175 | \$2,847 |
| | Milliman Data | 2,054 | \$70,264 | \$2,851 |
| | % Difference | 0.00% | 0.13% | 0.14% |
| Plan E | LACERA Data | N/A | N/A | N/A |
| | Milliman Data | N/A | N/A | N/A |
| | % Difference | N/A | N/A | N/A |
| Plan G | LACERA Data | 1 | \$49 | \$4,056 |
| | Milliman Data | 1 | \$49 | \$4,056 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Safety Members | | | | |
| Plan A | LACERA Data | 2,999 | \$286,460 | \$7,960 |
| | Milliman Data | 2,999 | \$286,460 | \$7,960 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Plan B | LACERA Data | 3,216 | \$273,077 | \$7,076 |
| | Milliman Data | 3,216 | \$273,258 | \$7,081 |
| | % Difference | 0.00% | 0.07% | 0.07% |
| Plan C | LACERA Data | 3 | \$103 | \$2,859 |
| | Milliman Data | 3 | \$103 | \$2,859 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Total | LACERA Data | 9,891 | \$694,845 | \$5,854 |
| | Milliman Data | 9,891 | \$695,115 | \$5,856 |
| | % Difference | 0.00% | 0.04% | 0.03% |



2. DATA REVIEW

ANALYSIS OF IN-PAY MEMBER DATA – BENEFICIARIES

| | | Number | Annual Benefits (in thousands) | Average Monthly Benefit |
|------------------------|---------------|--------|-----------------------------------|-------------------------|
| General Members | | | | |
| Plan A | LACERA Data | 4,469 | \$158,427 | \$2,954 |
| | Milliman Data | 4,469 | \$158,357 | \$2,953 |
| | % Difference | 0.00% | -0.04% | -0.03% |
| Plan B | LACERA Data | 68 | \$2,196 | \$2,691 |
| | Milliman Data | 68 | \$2,196 | \$2,691 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Plan C | LACERA Data | 67 | \$1,558 | \$1,938 |
| | Milliman Data | 67 | \$1,558 | \$1,938 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Plan D | LACERA Data | 1,439 | \$32,214 | \$1,866 |
| | Milliman Data | 1,440 | \$31,940 | \$1,848 |
| | % Difference | 0.07% | -0.85% | -0.96% |
| Plan E | LACERA Data | 1,173 | \$16,597 | \$1,179 |
| | Milliman Data | 1,177 | \$16,847 | \$1,193 |
| | % Difference | 0.34% | 1.51% | 1.19% |
| Plan G | LACERA Data | 2 | \$15 | \$619 |
| | Milliman Data | 2 | \$15 | \$619 |
| | % Difference | 0.00% | 0.00% | 0.00% |
| Safety Members | | | | |
| Plan A | LACERA Data | 1,586 | \$106,072 | \$5,573 |
| | Milliman Data | 1,587 | \$105,788 | \$5,555 |
| | % Difference | 0.06% | -0.27% | -0.32% |
| Plan B | LACERA Data | 289 | \$17,022 | \$4,908 |
| | Milliman Data | 289 | \$16,576 | \$4,780 |
| | % Difference | 0.00% | -2.62% | -2.61% |
| Plan C | LACERA Data | 0 | \$0 | N/A |
| | Milliman Data | 0 | \$0 | N/A |
| | % Difference | 0.00% | 0.00% | N/A |
| Total | LACERA Data | 9,093 | \$334,101 | \$3,062 |
| | Milliman Data | 9,099 | \$333,277 | \$3,052 |
| | % Difference | 0.07% | -0.25% | -0.33% |



3. ACTUARIAL VALUATION RESULTS REVIEW

This section of our review discusses the reasonableness and accuracy of the liabilities and contribution rates developed in Milliman's June 30, 2019 actuarial valuation of LACERA. We independently programmed the various types of benefits provided to members by LACERA using standard actuarial approaches.

The retirement benefits offered by LACERA are generally more complex than many other systems, partly because of the number of groups and benefit tiers covering the members. Different actuaries could reasonably use different approaches to modeling the liabilities of the different Plans. In order to be able to meaningfully compare our results to Milliman's results and to perform a useful sample life audit, we chose certain approaches to mimic those used by Milliman. However, we made an effort to minimize this type of information in order to maintain our independence. While Milliman was responsive to our questions, they were also careful not to provide any information that would have provided inappropriate insight into their processes. As a result, we believe that the results we obtained are a meaningful test of the reliability of the work performed by Milliman.

As the following summary shows, our independent valuation results matched those of Milliman well overall and by the various Plans. As with any audit, we do not expect to match results exactly because we know are using independent approaches to modeling the liabilities. In particular, ancillary benefits such as active death and disability benefits are generally harder to match without coordinated effort, which loses a degree of the independence that is desired in an actuarial audit. These ancillary benefits, however, are typically of less significant from a liability and cost perspective.

Results in the following tables are shown for the Present Value of Benefits (PVB), the Actuarial Accrued Liability (AAL), and the Normal Cost. The PVB is a measure of the value of all benefits expected to be ultimately paid for all current members of the system. The AAL reflects the portion of the PVB attributable to service already performed, and is the measure typically used for funding and accounting purposes. The Normal Cost is the portion of the PVB allocated to the current plan year. Of the three measures, we typically expect to match the PVB the closest, typically within 1% to 3%, while the AAL is often not quite as close, and the Normal Cost often varies by 3% to 6%. Based on the results shown in the following tables, we are satisfied that the June 30, 2019 results presented in Milliman's valuation report provide a fair representation of LACERA's current funded status and the contribution rates needed to fund the Plan.



3. ACTUARIAL VALUATION RESULTS REVIEW

| General | | | | | | | | | | | | |
|--|---------------|---------------|------------|------------|------------|------------|--------------|--------------|--------------|--------------|----------|----------|
| | Plan A | | Plan B | | Plan C | | Plan D | | Plan E | | Plan G | |
| | Milliman | CMC | Milliman | CMC | Milliman | CMC | Milliman | CMC | Milliman | CMC | Milliman | CMC |
| Present Value of Future Benefits (PVB): | | | | | | | | | | | | |
| Actives | \$109 | \$107 | \$39 | \$38 | \$42 | \$42 | \$22,689 | \$22,360 | \$6,803 | \$6,768 | \$5,586 | \$5,466 |
| Inactive Vesteds | 9 | 9 | 2 | 2 | 1 | 1 | 596 | 606 | 450 | 447 | 29 | 29 |
| Retirees | <u>11,576</u> | <u>11,541</u> | <u>470</u> | <u>468</u> | <u>274</u> | <u>274</u> | <u>8,594</u> | <u>8,576</u> | <u>4,080</u> | <u>4,092</u> | <u>5</u> | <u>5</u> |
| Total | \$11,694 | \$11,657 | \$511 | \$508 | \$317 | \$317 | \$31,879 | \$31,542 | \$11,333 | \$11,307 | \$5,620 | \$5,500 |
| Actuarial Accrued Liability | \$11,689 | \$11,652 | \$509 | \$506 | \$316 | \$316 | \$25,500 | \$25,052 | \$10,162 | \$10,109 | \$984 | \$957 |
| Normal Cost Rate | 23.39% | 22.73% | 18.45% | 17.96% | 15.28% | 15.10% | 17.26% | 17.22% | 10.74% | 10.76% | 18.22% | 17.64% |
| Ratio (CMC/Milliman) | | | | | | | | | | | | |
| PVB: | | | | | | | | | | | | |
| Actives | | 98% | | 97% | | 100% | | 99% | | 99% | | 98% |
| Inactive Vesteds | | 100% | | 100% | | 100% | | 102% | | 99% | | 100% |
| Retirees | | 100% | | 100% | | 100% | | 100% | | 100% | | 100% |
| Total | | 100% | | 99% | | 100% | | 99% | | 100% | | 98% |
| Actuarial Accrued Liability | | 100% | | 99% | | 100% | | 98% | | 99% | | 97% |
| Normal Cost Rate | | 97% | | 97% | | 99% | | 100% | | 100% | | 97% |

Note: Dollars in millions.



3. ACTUARIAL VALUATION RESULTS REVIEW

| | Safety | | | | | | | |
|--|--------------|--------------|--------------|--------------|----------|----------|---------------|---------------|
| | Plan A | | Plan B | | Plan C | | Total | |
| | Milliman | CMC | Milliman | CMC | Milliman | CMC | Milliman | CMC |
| Present Value of Future Benefits (PVB): | | | | | | | | |
| Actives | \$10 | \$10 | \$12,161 | \$11,969 | \$1,609 | \$1,580 | \$49,048 | \$48,340 |
| Inactive Vesteds | 0 | 1 | 125 | 123 | 2 | 2 | 1,214 | 1,220 |
| Retirees | <u>7,304</u> | <u>7,307</u> | <u>8,709</u> | <u>8,701</u> | <u>9</u> | <u>9</u> | <u>41,021</u> | <u>40,973</u> |
| Total | \$7,314 | \$7,318 | \$20,995 | \$20,793 | \$1,620 | \$1,591 | \$91,283 | \$90,533 |
| Actuarial Accrued Liability | \$7,314 | \$7,318 | \$17,948 | \$17,699 | \$213 | \$202 | \$74,635 | \$73,811 |
| Normal Cost Rate | 29.75% | 29.27% | 28.48% | 27.75% | 29.08% | 28.05% | 18.54% | 18.30% |
| Ratio (CMC/Milliman) | | | | | | | | |
| PVB: | | | | | | | | |
| Actives | | 100% | | 98% | | 98% | | 99% |
| Inactive Vesteds | | N/A | | 98% | | 100% | | 100% |
| Retirees | | 100% | | 100% | | 100% | | 100% |
| Total | | 100% | | 99% | | 98% | | 99% |
| Actuarial Accrued Liability | | 100% | | 99% | | 95% | | 99% |
| Normal Cost Rate | | 98% | | 97% | | 96% | | 99% |

Note: Dollars in millions.



4. SAMPLE LIFE REVIEW

In addition to the replication of results discussed in Section 3, we were also asked by LACERA to perform a review of sample lives. These samples included 16 active (or suspended active) members, 5 deferred (or contingent deferred) vested members, and 7 in-pay members (including healthy retirees, disabled retirees, and beneficiaries). We selected these records to provide a reliable sampling of plans, payment options, age, sex, and service levels of the Plans. Certain records were specifically selected to allow an in-depth review of unusual provisions. We were provided with detail of the present value of benefits for all of the sample lives, as well as actuarial liability, normal cost, and present value of future salary for the active members. Furthermore, for active members, all of the amounts were further broken down by decrement (termination, death, disability) to allow for more detailed analysis.

In our review of these individual records, we did not observe any issues of concern. For the majority of individuals, we matched the present value of future benefits within 2%. Overall, we observed:

- PVB – We matched Milliman total within 1.8%.
- Actuarial Liability – We matched Milliman total within 2.0%.
- Normal cost – We matched Milliman total within 1.5%.
- Present value of future salary – We matched Milliman total within 1.1%.

This consistency among a small number of records helps support the pattern observed in the aggregate and further demonstrates that Milliman's calculation of LACERA's liabilities is reasonable.



5. VALUATION REPORT REVIEW

CONTENT OF THE ACTUARIAL REPORTS

The Actuarial Standard Board has issued a number of Actuarial Standards of Practice (ASOP) which provide guidance on measuring retirement benefit obligations and communicating the results (ASOP Nos. 1, 4, 23, 27, 35, 41, 44 and 51). The guidance in those standards include specific elements to be included in actuarial communications regarding retirement benefits, either directly or by reference to other documents. Some elements would not be pertinent in all communications, but since an actuarial valuation report is the most complete picture of the actuarial status of the plan, all of the elements listed should be covered in the report, even if only briefly.

We reviewed the June 30, 2019 actuarial valuation report to confirm that it provides sufficient information for another actuary to understand the valuation process and to assess the reasonableness of the results, as required under Actuarial Standards of Practice. We also reviewed the report for compliance with Actuarial Standards of Practice, including a new standard first required to be included in the 2019 valuation report, *ASOP 51, Assessment and Disclosure of Risk in Measuring Pension Obligations*. Milliman created a separate section of the valuation report which discusses the various risks faced by LACERA in funding the Plan.

We also compared the contents of the draft valuation report to over 30 specific items detailed for pension actuarial work in the various ASOPs listed above. ***In our review of the report, we found it to be in compliance with the applicable ASOPs.*** We identified one area where we believe more explicit comments might be helpful to clarify compliance. ASOP 4, Paragraph 4.1(q) and its subparagraphs call for certain information regarding the disclosure of funded status. In particular, there should be statements clarifying what the status information might or might not signify regarding settling plan liabilities or plan contributions. Based on language added to the final report, Milliman fully addressed this suggestion.

The California Actuarial Advisory Panel (CAAP) has published a document entitled “*Model Disclosure Elements for Actuarial Valuation Reports on Public Retirement Systems in California*”. The disclosure elements are organized as basic disclosures generally suitable for the regular actuarial valuation report and enhanced disclosures that may be appropriate for inclusion in either the regular actuarial valuation report or in other reports specific to a certain purpose. We reviewed the June 30, 2019 Actuarial Valuation Report produced by Milliman and confirmed that the report contains all of the basic model disclosures recommended by the California Actuarial Advisory Panel. It also includes many of the enhanced disclosure items set out in the CAAP document.

The valuation report is generally well written and organized. We have just a few suggestions for Milliman’s consideration. These points are raised for discussion purposes only. Final decisions should be based on LACERA’s needs after discussing them with their retained actuary.

- Include an exhibit that shows the projection of the unfunded actuarial accrued liability to June 30, 2020. This would make the calculation easier to understand and verify. We generally include such an exhibit in our reports and have found it to be helpful.



5. VALUATION REPORT REVIEW

- We would suggest creating separate amortization bases for the change in the actuarial accrued liability due to assumption changes rather than including it with the gain/loss base. One advantage of the layered amortization method is transparency regarding the events that have impacted the current amount of the unfunded actuarial accrued liability. By including the impact from the assumption change with the gain/loss for that year, the relative magnitude of the assumption change is not clear. While some of this information is currently available in Exhibit 8b, over the longer term information regarding the significant impact of the assumption changes in 2016 and 2019 will be lost. Showing the initial impact and the remaining balance for the assumption changes in the amortization schedule provides insight into the impact these changes have had on LACERA's current funding. While we realize this creates more layers, we believe the value added more than offsets any downside. If LACERA and Milliman agree with a revision in disclosing the amortization bases for assumption changes, the change could be implemented by creating separate assumption bases only for 2016 and 2019 since the impact of those two assumption changes was significant. The new approach can be used for all future years as well.
- Although not required by Actuarial Standards of Practice or the California Actuarial Advisory Panel, we would suggest projections of funded status and employer contribution rates be included in the risk section of the report, if a model is produced by Milliman as part of the annual retainer services. We have found such projections to be most useful in helping interested parties better understand the potential funding risks.
- We would suggest adding additional detail in the assumptions section of the report regarding assumed decrement timing, as well as technical data items with regards to how missing or unusable data elements are handled in the valuation process.
- We would suggest providing greater detail as to how the Normal Plus Cost of Living member contribution rates are determined. While we were able to match Milliman's numbers closely, we were not able to do so without some additional detail by Milliman that is not readily deduced from the described methodology. This detail only needs to be sufficient for another actuary to understand the process, and would not necessarily need to be grasped by other readers.

None of these suggestions are critical in nature and certain suggestions may not be deemed to be an improvement by LACERA. To the extent the recommended changes are determined to be appropriate and beneficial, they could be implemented in the next valuation report.

Attachment IV

Cavanaugh MacDonald's 2019 Pension Plan
Experience Study Audit Report Final



Cavanaugh Macdonald
CONSULTING, LLC

The experience and dedication you deserve

**ACTUARIAL REVIEW REPORT ON THE
2019 INVESTIGATION OF EXPERIENCE
FOR THE
LOS ANGELES COUNTY EMPLOYEES
RETIREMENT ASSOCIATION**

Prepared by Cavanaugh Macdonald Consulting, LLC

January 30, 2020





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

January 30, 2020

Mr. Richard Bendall
Chief Audit Executive
Los Angeles County Employees Retirement Association
300 North Lake Avenue, Suite 840
Pasadena, California 91101

Dear Mr. Bendall:

Cavanaugh Macdonald Consulting, LLC has performed an independent review of the 2019 Investigation of Experience for Retirement Benefit Assumptions, prepared for the Los Angeles County Employees Retirement Association (LACERA). As an independent reviewing or auditing actuary, we have provided our professional opinion on the reasonableness and appropriateness of the actuarial assumptions and actuarial cost methods recommended in the report and offered comments on possible ways to improve the process in future experience investigations.

The retained actuary for LACERA is Milliman, Inc. and we would like to thank them for their cooperation and assistance in providing the required information to us. **We find the proposed actuarial assumptions and methods to be reasonable. The Investigation of Experience was performed by qualified actuaries and was performed in accordance with the principles and practices prescribed by the Actuarial Standards Board.** This report documents the detailed results of our review.

If you need anything else, please do not hesitate to give us a call. The undersigned are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report.

Sincerely,

Brent A. Banister, Ph.D., FSA, EA, MAAA, FCA
Chief Actuary

Patrice A. Beckham, FSA, FCA, MAAA, EA
Principal and Consulting Actuary



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1. EXECUTIVE SUMMARY

LACERA engaged Cavanaugh Macdonald Consulting, LLC (CMC) to prepare an independent review of the 2019 Investigation of Experience for the Retirement Benefits Assumptions Report prepared by Milliman for LACERA. The scope of the actuarial review requested by LACERA includes an independent verification of the results and evaluation of any recommendations in the Report, the preparation of a report containing CMC’s findings and conclusions from the actuarial review, and a presentation of any findings to the Board of Investment.

The process of setting actuarial assumptions brings together a blend of both numerical analysis and professional judgment. An experience study is not simply a mathematical exercise, but also draws on the experience and insight of the professionals conducting the study. While our review included confirming certain data tabulations supporting the results in Milliman’s report, we wish to stress that we have also examined the bigger picture to determine if an assumption, or recommended change, is appropriate. We consider whether there are other ways to form an assumption, whether an assumption may be simplified, and whether or not the assumption reflects trends that we have observed in other plans. The fact that we might prefer an alternate approach does not automatically mean that Milliman’s approach is not reasonable. Rather, we offer some of these thoughts as a consideration for future studies, fully aware that there are multiple ways in which to appropriately model a dynamic retirement program like LACERA.

Overall, we find Milliman’s work to be accurate and complete, and we have not identified any material findings.

We summarize our findings for each major review task as follows:

1. Review of Data Used in the 2019 Experience Study

The actuarial review of the 2019 Investigation of Experience for Retirement Benefit Assumptions Report is based on the experience study data that Milliman provided. We requested and received from Milliman the full valuation data files for the 2016, 2017, 2018, and 2019 valuations. These files allowed us to replicate certain portions of Milliman’s work with regards to the analysis of demographic assumptions. In our opinion, the data used is sufficient for the purposes of the experience study, appears consistent with previous Retirement Plan valuations and, therefore, appropriately reflects the active and inactive membership of LACERA during the three-year period ending on June 30, 2019.

2. Review the Proposed Economic and Demographic Assumptions Contained in the 2019 Investigation of Experience for Retirement Benefits Assumptions Report

We find the work prepared by Milliman—reviewed within the scope of this assignment—to be based on reasonable processes, to be technically sound, and to be fairly presented. Milliman’s work related to LACERA’s experience, selecting assumptions, and presenting the associated results is based on generally accepted actuarial practices and principles. Relevant details for each assumption reviewed are provided in Section 3 of our Report.



1. EXECUTIVE SUMMARY

3. Present Any Recommendations to the Board of Investments Regarding the Work Completed by Milliman

We believe that the actuarial assumptions recommended by Milliman are reasonable and appropriate for use in the upcoming actuarial valuation for LACERA. We have no findings of material discrepancies with generally accepted actuarial principles or professional standards. In Section 4, we provide some minor considerations and recommendations for future studies.

Milliman proposes changes to most of the assumptions in its experience study. We would classify many of these as typical on-going and fine-tuning changes. We believe that all of the proposed changes are reasonable and appropriate. Our findings and recommendations are summarized as follows:

- The most significant of the proposed changes is the investment return assumption. Milliman provides two sets of other economic assumptions that each are consistent with their recommendation of 6.75% for the investment return assumption. The key difference in these two sets is the underlying inflation assumption which affects the other economic assumptions. While 6.75% is a reasonable assumption, Milliman notes that there is a broader range that could be acceptable. We comment on this further in our report.
- We suggest that Milliman consider the use of separate assumptions for Los Angeles inflation (for wage growth and COLA) and national inflation (for the investment assumption), especially if the Board is considering adopting a 2.50% national inflation assumption.
- Milliman's analysis of the total investment return assumption is a reasonable method, but we would suggest that they consider directly developing an assumption for the real rate of return to make the analysis of total return more transparent. This would also allow the inflation and real return assumptions to be decoupled.

Conclusions

Because of the complexity of actuarial work, we would not expect our opinions regarding the selection of assumptions and methods to be the same as the opinions of Milliman. We do expect, however, that there would be sufficient explanation of their choices that we can acknowledge that they are reasonable based upon the relevant factors. In our opinion, the assumptions and methods proposed by Milliman are reflective of sound professional judgement and are appropriate for the systematic funding of the pension obligations of LACERA.

We have determined that the actuarial methods, assumptions, processes, and the report are consistent with the applicable Actuarial Standards of Practice. Throughout this report, we have noted a few minor items for consideration that we believe may present opportunities for improvement, but none that we believe would have a material impact on the proposed assumptions.



1. EXECUTIVE SUMMARY

The remainder of this report provides the basis for our findings and recommendations for each assumption that appears in the 2019 Investigation of Experience for Retirement Benefits Assumptions Report and our conclusions.

We would like to thank LACERA's staff for their responsiveness in providing the items and information that we requested during the course of our review. Additionally, we would also like to thank Milliman for their cooperation and assistance in providing the requested information, and answering our questions.



2. ACTUARIAL ASSUMPTIONS

BACKGROUND ON ACTUARIAL ASSUMPTIONS

The actuarial assumptions form the basis of any actuarial valuation or cost study. Since it is not possible to know in advance how each member's career will evolve in terms of salary growth, future service and cause of termination, the actuary must develop assumptions in an attempt to estimate future patterns. These assumptions enable the actuary to estimate the amount of benefits earned and to reasonably anticipate when and how long these benefits will be paid. Similarly, the actuary must make an assumption about future investment earnings of the trust fund. In developing the assumptions, the actuary examines the past experience, but more heavily considers future expectations to make the best estimate of the anticipated experience under the plan.

There are two general types of actuarial assumptions:

- Economic assumptions – these include the investment return assumption (expected return on plan assets), assumed rates of salary increase, price inflation, wage inflation, and increases in total covered payroll. The selection of economic assumptions should conform to ASOP No. 27 *“Selection of Economic Assumptions for Measuring Pension Obligations”*.
- Demographic assumptions – these include the assumed rates of retirement, mortality, termination, and disability. The selection of demographic assumptions should conform to ASOP No. 35 *“Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations”*.

The discussion on the actuarial assumptions on the following pages is based on the data and recommendations found in Milliman's 2019 Investigation of Experience for Retirement Benefit Assumptions report.



2. ACTUARIAL ASSUMPTIONS

ECONOMIC ASSUMPTIONS

Actuarial Standards of Practice (ASOPs) are issued by the Actuarial Standards Board to provide guidance to actuaries with respect to certain aspects of performing their work. As mentioned earlier, ASOP 27 is the actuarial standard that addresses the selection of or recommendations regarding economic assumptions for measuring pension obligations (liabilities) under defined benefit plans. There are two particular items from ASOP 27 that we believe are relevant to the discussion in our report: 1) For a given assumption, there is a range of possible choices, and 2) An assumption may be made with a degree of conservatism, when appropriate and disclosed.

Milliman has proposed two alternate sets of recommended assumptions for the Board of Investments to consider. The current and recommended sets of economic assumptions are:

| | Current | Milliman Recommendations | |
|---------------------------|--------------|--------------------------|---------------|
| | Assumption | Alternative 1 | Alternative 2 |
| Price inflation | 2.75% | 2.75% | 2.50% |
| Real wage growth | <u>0.50%</u> | <u>0.50%</u> | <u>0.50%</u> |
| Total wage growth | 3.25% | 3.25% | 3.00% |
| Payroll Growth | 3.25% | 3.25% | 3.00% |
| Price inflation | 2.75% | 2.75% | 2.50% |
| Real rate of return | <u>4.50%</u> | <u>4.00%</u> | <u>4.25%</u> |
| Investment return | 7.25% | 6.75% | 6.75% |
| Cost-of-Living Adjustment | | | |
| Plan A | 2.75% | 2.75% | 2.50% |
| All others | 2.00% | 2.00% | 2.00% |

Each assumption is briefly discussed in the following narrative.

Price Inflation: Price inflation impacts the rates of future salary increase, the payroll growth assumption, and the investment return assumption, so the underlying price inflation component in each must be consistent in accordance with the guidance provided in ASOP 27. In addition, because the retirees receive a cost-of-living adjustment (COLA) linked to changes in the CPI-U, the inflation assumption also impacts the COLA assumption.

Inflation has varied significantly over time, with some notably high periods in the 1970's influencing the long-term average. Over more recent periods, inflation has been consistently below the long-term average, and the financial markets' pricing of inflation (comparing Treasuries and TIPS) suggests that the market expects the trend to continue for the next 30 years. However, these results may be partially driven by the actions of the Federal Reserve Bank and, therefore, may not be indicative of the long-term estimation that actuaries need for their work.



2. ACTUARIAL ASSUMPTIONS

While there can be arguments made for assuming inflation will remain low for a very long period of time, we note that inflation is not random. It can be significantly affected by monetary and fiscal policy, and those policies may change dramatically and rapidly. Consequently, there are also some strong arguments for assuming that inflation could increase from the current level at some point in the future.

Milliman provides supporting documentation for their recommendation to either lower the inflation assumption from 2.75% to 2.50% or to leave it unchanged. We note that the recent trend among public retirement systems has been to lower this assumption, with most selecting an assumption in the range of 2.25% to 2.75%. LACERA bases their COLA on the Los Angeles area CPI, which has tended to be higher than the national CPI over the recent past. Wages are also likely to be affected by the local economy. This leads us to believe that either of the two options recommended by Milliman are reasonable, with the set of assumptions using a 2.75% inflation assumption providing some degree of conservatism, while the 2.50% assumption may be closer to what is expected nationally.

General Wage Growth: The general wage growth or wage inflation assumption consists of price inflation and real wage growth (also called productivity). These increases are affected by a variety of factors including price inflation, the policies and financial state of the employer, and the nature and extent of competition for employees in the relevant labor markets. Over time, however, the impact of wage increases in the broader economy will have a strong influence as workers and competing employers respond to market forces.

Milliman considers several relevant sources in their analysis of this assumption including:

- (1) the National Average Wage Index (published by the Social Security Administration),
- (2) the assumption used by the Social Security Administration in their 75-year projections, and
- (3) actual LACERA data.

Based on these sources, Milliman recommends retaining the current 0.50% real wage growth assumption. While we do not find this assumption unreasonable, we would note that over the last 30 years – following the high inflation period of the 70’s and early 80’s – the real wage growth in the general economy has been higher than the 50-year average of 0.50% that Milliman cites. We also realize that the National Average Wage Index does not perfectly track wage inflation, although it is a reasonable proxy.

Public-sector employees have also lagged the increases across the broader economy in more recent years, at least when the costs of benefits are excluded. Another source to consider is the State and Local Government Workers Employment Cost Index, produced by the Bureau of Labor Statistics. It provides evidence that real “across the board” salary increases have averaged about 0.2% annually during the last 10 to 20 years. Total compensation (with benefits) have increased at a real rate of about 0.8% over that same period. Whether these trends will continue or there will be a correction is an open question.



2. ACTUARIAL ASSUMPTIONS

We believe that Milliman’s recommended assumption of 0.50% for real wage increase is reasonable. However, long term historical data shows that real wage increases are generally higher in periods of lower price inflation and vice versa. Therefore, it might be appropriate to use a higher real wage increase assumption if a lower price inflation assumption, such as 2.50%, is selected.

In Milliman’s analysis of merit salary increases, there is a persistent merit increase of around 0.25% for service after 30 years. Typically, there is very little, if any, merit increase after 30 years. One could argue that this increase is more appropriately classified as part of the general wage increase rather than merit, although Milliman believes it truly is part of the merit salary increase. If it were considered part of the general wage increase, the real wage increase could be set at 0.75% and the merit scale reduced by 0.25%, resulting in an unchanged total salary increase assumption. In our opinion, Milliman’s choice of 0.50% real wage growth is reasonable, although we would also be comfortable with an assumption of 0.75%, potentially accompanied by an offsetting reduction of 0.25% in the merit salary increase assumption.

Milliman also uses the general wage growth assumption as the basis for their recommended payroll increase assumption. The payroll growth assumption is used in the amortization of the Unfunded Actuarial Accrued Liability (UAAL) and is appropriate for developing costs that are reasonably stable as a percentage of payroll. Using the general wage inflation to estimate future payroll growth has been a common practice amongst public plan practitioners for many years, but we would point out that some retirement systems are choosing to amortizing the UAAL with an assumed payroll growth that is lower than the wage inflation assumption or even setting the assumption equal to the expected growth in the revenue of the sponsoring organization.

One consideration in setting a lower assumption has been that as older employees retire, new employees are being hired with lower salaries. In theory, there are internal promotions to fill the vacated positions, but this expected payroll growth has not always been realized, especially given the high proportion of baby boomers still in the work force. Because the youngest baby boomers are 55-years old, this potential impact may be around for a while although LACERA’s experience may vary from that of other public plans. We are not opposed to Milliman’s choice of using the wage inflation assumption as the payroll increase assumption, but we could also be comfortable with an assumption that was between price inflation and wage inflation.

Investment Return Assumption: In our opinion, the investment return assumption should represent the long-term compound rate of return expected on the plan assets, considering the asset allocation, the real rate of return on each asset class, and the underlying inflation rate, all net of expenses paid from the Trust.

The long term relationship between price inflation and investment return has long been recognized by economists. The basic principle is that the investor demands a more or less level “real return” – the excess of actual investment return over price inflation. If inflation rates are expected to be high, investment return rates are also expected to be high, while low inflation rates will result in lower expected investment returns, at least in the long run.

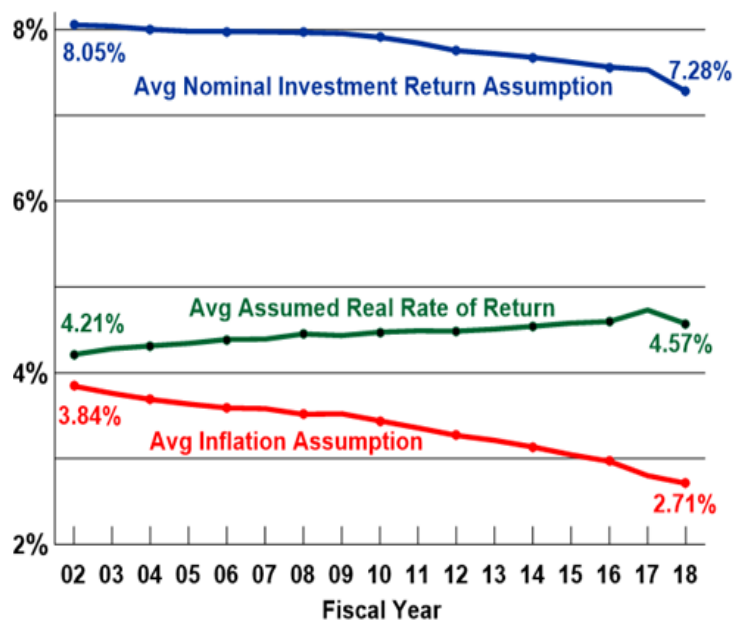


2. ACTUARIAL ASSUMPTIONS

The period considered for pension funding represents a very long time horizon. In reviewing this assumption, the actuary should consider asset allocation policy, historical returns, and expectations of future returns. Frequently, asset advisors focus on no more than the next 5 to 10 years since they are most concerned with how to invest the funds currently to maximize returns. The longer term is less relevant to them, but it is, of course, paramount to actuaries who are projecting benefits to be paid for the next 50 to 100 years. This difference in perspective can significantly influence how investment advisors and actuaries derive an investment return assumption.

Our preferred approach to setting the investment return assumption is called the “building block” approach. This approach develops a “real” return, or the return net of inflation, and then adds it to the inflation assumption. One advantage of this approach is that it assures that the total or “nominal” return is consistent with the inflation assumption, since it is determined as the sum of the price inflation assumption and the real rate of return. A second advantage is that it is helpful when comparing various sources of expected returns by eliminating any differences related to price inflation expectations as a source of variation in the nominal return assumptions. While we find this approach helpful, we also acknowledge that there are other reasonable approaches that may be used and are compliant with actuarial standards of practice.

This approach of looking at the real return can also be helpful in understanding broader trends as well. For instance, the following graph from the NASRA Public Fund Survey shows that across the universe of large public retirement systems, the reduction in the investment return assumption since the turn of the century has been largely a function of declining inflation assumptions. In fact, the real return assumption has actually increased over this time period. This does not mean that the real return for a given asset class has necessarily increased, since there are likely changes in asset allocation involved as well. In our opinion, separating the real return from the nominal return can be useful in developing the investment return assumption.





2. ACTUARIAL ASSUMPTIONS

In Milliman’s analysis of the expected return, they considered three sets of capital market assumptions regarding future expected returns. They also considered the general trend observed with respect to the investment return assumptions used by other large public systems, but primarily relied on the expected future return arising from these capital market assumptions. We believe their approach is appropriate as the asset allocations and risk perspective of each board influences the investment return used by the system, so the median return assumption would not necessarily be an appropriate basis to use in setting LACERA’s assumption. The three sources of capital market assumptions are:

- (1) Meketa, LACERA’s investment advisor,
- (2) Milliman’s internal investment experts, and
- (3) the 2019 Horizon Actuarial Services survey which reviews the assumptions of over 30 investment consulting firms (including Meketa) who work with defined benefit plans, providing a median return for each common asset class.

As was noted earlier, most investment advisors focus on a shorter timeframe than actuaries because they are using the assumptions for a different purpose. For instance, the 2019 Horizon survey included 34 advisors with capital market assumptions for the next 10-year period, but only 13 advisors with assumptions for periods of 20 years or more. Milliman’s discussion states they have given consideration to both the 10-year and 20-year time horizons, which we believe to be appropriate. As Milliman notes, LACERA is a mature retirement plan. One consequence is that annual benefit payments exceed annual contributions, so the difference must be made up from investment income. For LACERA, this shortfall is currently about 2% of the total trust fund, an amount that could likely be covered by income cash flows such as interest payments and stock dividends, rather than by selling assets. However, this net negative outflow means that the expected lower returns over the next ten years will diminish the corpus of the trust over this period so a comparatively lower trust fund balance will exist when the higher returns are earned. This will limit the ability of the higher returns on the LACERA trust fund in the long term to offset the impact of the lower returns in the next ten years, so we agree that it is appropriate to consider both the short and long horizons, as Milliman has done.

Milliman’s analysis, using our standard building block analysis, may be summarized as follows:

| | Meketa | Milliman | Horizon |
|--|-------------|-------------|-------------|
| <u>Based on 10-Year Assumptions</u> | | | |
| - Expected Total Return | 6.8% | 6.3% | 6.6% |
| - Expected Inflation | 2.1% | 2.3% | 2.2% |
| - Expected Real Return | 4.7% | 4.0% | 4.4% |
| <u>Based on 20-Year Assumptions</u> | | | |
| - Expected Total Return | 7.5% | 6.4% | 7.3% |
| - Expected Inflation | 2.6% | 2.3% | 2.3% |
| - Expected Real Return | 4.9% | 4.1% | 5.0% |



2. ACTUARIAL ASSUMPTIONS

Comparing the real rates of return illustrates the magnitude of differences in the expected return for the portfolio, absent inflation, of each source. Milliman's expected real return is considerably lower than both Meketa and the Horizon Survey in the short term and the long term. Based on conversations with Milliman, we understand that since the publication of these rates, Meketa has stated that they believe the nominal rates of return, based on current market conditions, would be around 0.50% lower. This reduction brings Meketa closer to Milliman's expected return, particularly over the next ten years. With that adjustment for Meketa, they are both noticeably lower than the Horizon average, likely because the survey data was collected based on capital market assumptions earlier in 2019 so there is a timing lag. We would point out that the range of views held by investment consultants is fairly broad, but we do not believe Milliman and Meketa are inappropriately low in their estimates. To the extent that these firms are trusted advisors of LACERA, it is reasonable for the Board to assign more credibility to their professional judgment, even if their expected returns are lower than estimates by other advisors.

Milliman does not directly develop a recommended real return, but rather recommends a nominal return of 6.75%. Because they propose two possible inflation assumptions with the same nominal return, this effectively creates two sets of economic assumptions:

- 1) Inflation of 2.50% and real return of 4.25%
- 2) Inflation of 2.75% and real return of 4.00%

We believe the same logic could lead to an alternative assumption of 2.50% inflation and 4.00% real return for a 6.50% nominal return, or yet another alternative assumption of 2.75% inflation and 4.25% real return for a 7.00% nominal return. If the Board ultimately selects the 2.50% inflation assumption, we would suggest consideration be given to using an assumption of 2.75% for purposes of developing the wage and COLA assumptions that reflects the Los Angeles area inflation.

In summary, there is a range of reasonable assumptions for the investment return assumption, and we believe the recommended assumption of 6.75% falls within that range. Other reasonable approaches could lead to different recommendations of which some might be lower than 6.75% and some might be higher. We believe it is certainly reasonable to choose a rate that is slightly lower to improve the likelihood of actual return reaching or exceeding that rate, and thereby reducing the likelihood of actuarial losses that will require additional funding.

Use of Investment Return Assumption for GASB Discount Rate: The investment return assumption used in the funding valuation is net of both investment and administrative expenses. GASB requires the use of an assumption regarding the expected return on assets that is net of investment expenses, but not administrative expenses. Administrative expenses are directly modeled in the projection of the Fiduciary Net Position for purposes of determining whether there is a depletion date of the plan assets in the future (called the crossover test). This test determines whether the assumption for the expected return on assets may be used for the GASB discount rate.

As part of the experience investigation, Milliman reviewed the actual administrative expenses for the past 10 years and estimated that these expenses have averaged about 0.13% of the asset value.



2. ACTUARIAL ASSUMPTIONS

Consequently, their recommendation for GASB 67 and 68 reporting is to use an investment return assumption that is 0.13% higher than the investment return assumption used for funding purposes. This approach has been used in the past, and we believe it is reasonable and appropriate to continue its use.

COLA: Closely related to the price inflation assumption is the Cost-of-Living Adjustment (COLA) assumption. The actual COLAs granted to LACERA members are based upon the change in the CPI-U for the Los Angeles metropolitan area. By law, there are upper limits on the COLA that may be granted each year (varying by plan), but to the extent that inflation exceeds the actual COLA granted in any year, there is a “carry-over” which future COLAs may use in years when inflation is lower than the cap. If inflation is less than 0% for a year, the member benefit may be reduced, but not below the original benefit. In these situations, it is also anticipated that the carry-over would be utilized to offset the negative inflation adjustment and perhaps even provide a positive COLA as well. Based on the design of the COLA, we believe Milliman’s recommendation to set the COLA assumption equal to the price inflation assumption (up to the capped level) is an appropriate model.



2. ACTUARIAL ASSUMPTIONS

DEMOGRAPHIC ASSUMPTIONS

The major demographic assumptions used in the valuation process are the assumed rates of retirement, termination of employment (with or without a vested benefit), disability, and mortality (death before or after retirement). Other non-economic assumptions that are typically evaluated include salary merit increases, election of refunds in lieu of a deferred benefit, and family composition (where applicable for death and some disability benefits).

General Comments

The purpose of a study of demographic experience is to compare what actually happened to the individual members of LACERA during the study period (July 1, 2016 through June 30, 2019) with what was expected to happen based on the actuarial assumptions, using the results as an important tool to evaluate whether some adjustment to the current assumptions is necessary.

The basic steps performed by most actuaries include the following:

- First, the number of members changing membership status, called decrements, during the study is tabulated by age, duration, gender, group, and membership class as appropriate (active, retired, etc.).
- Next, the number of members expected to change status is calculated by multiplying certain membership statistics, called exposure, by the expected rates of decrement.
- Finally, the number of actual decrements is compared with the number of expected decrements. The comparison is called the actual to expected ratio (A/E Ratio), and is expressed as a percentage.

The A/E ratio is a key indicator as to the *overall fit* of actual experience to that expected based on the assumptions. While this metric is an important measurement, the fit of the assumption at each individual age or service duration is also critical because experience that is higher at certain ages/durations does not typically offset the impact of experience that is lower at other ages/durations. The fit of the actual experience to the assumption at each age or duration is important in order to more accurately value the liabilities (present value of future benefits). The A/E ratio also provides a good way to easily evaluate the impact of the recommended assumption in comparison to the current assumption to determine how much the assumption was adjusted.

For the most part, Milliman's analysis develops these A/E ratios with compensation-weighted exposures and decrements (for actives) or benefit-weighted exposures and decrements (for retirees) rather than using the counts of members. This means, for example, that the influence of the higher-paid members on retirement rates is greater than lower-paid members. Since the higher-paid (and usually longer service) group also has greater liability, this aligns the assumptions better with actual experience of the plan liabilities and should reduce the dollar amount of actuarial gains



2. ACTUARIAL ASSUMPTIONS

and losses from year to year. We are very supportive of this approach, as we use it in our own practice.

As part of our review of the demographic assumptions, Milliman provided us with the processed valuation data files for the 2016 through 2019 valuations. They also provided us with their detailed experience study results, including the number of exposures and observed decrements, broken down by LACERA plan, sex, and age or service as appropriate for each assumption. We used the valuation data files to replicate the exposure and decrement summary for active and retired members over the study period and matched the total number of decrements almost exactly. We also attempted to validate Milliman's results at each age or service data point. Due to rounding issues, we did not always match each cell exactly, but we were able to satisfy ourselves that Milliman's processing was performed with a sufficient degree of accuracy that the results are reliable for the assessment and development of actuarial assumptions.

In the following paragraphs, we make specific comments on the demographic assumptions.

Merit Salary Increases: In the economic assumptions section, we discussed Milliman's development of the general wage growth assumption. A second type of salary increase occurs at the individual level as a result of such things as promotion and longevity. Milliman examined these increases separately for General and Safety members, recognizing that the two groups have different patterns of salary increase through a typical member's career. They also studied the assumption as a function of years of service. We agree that these two factors are the most appropriate and commonly used approaches to model merit increases.

Total salaries are reported from year to year so, in order to isolate the merit component of the salary increases, Milliman compared the total salaries of each individual member in each consecutive year of employment, after removing the estimated general wage inflation observed in the actual LACERA data for each year. Based on our recommendation, Milliman has more fully described the details of this process in their report, including their methodology for identifying the general wage increase each year. We find this approach a reasonable way in which to isolate the salary increases due to merit and longevity.

For purposes of this analysis, Milliman used the last 15 years of actual salary increases. We note that this period is quite long and includes the recession of 2008 and subsequent recovery. From our perspective, a period that is too long may not be sensitive to recent changes or trends. For instance, with nearly all of the active membership being employed by the County, a change in the longevity compensation structure could quickly affect the merit scale but might not be easily detected with Milliman's longer time frame. We raised this issue with Milliman, but understand they prefer the use of the long period as they believe it provides a better estimate of long-term patterns. They also indicated that they did look at the most recent three years, even though that is not discussed in the report. We would suggest that in the next investigation of experience, Milliman comment on their analysis of both the long and short time periods to communicate that recent events and trends, as well as long-term patterns, are considered.



2. ACTUARIAL ASSUMPTIONS

Rates of Mortality: One of the most important demographic assumptions in the pension valuation is mortality because it projects how long benefit payments are expected to be made. The longer retirees live and receive benefits, the larger the liability of the system, thus increasing the contributions necessary to actuarially fund the system. In addition, if members live longer than anticipated by the assumption, the true cost of future benefit obligations will be understated and contributions will increase as the unfavorable experience unfolds. Because there are also death benefits payable for active members, it is also relevant to consider the patterns of death for active members, although this assumption has comparatively little impact on the valuation results due to the low probability of active member deaths.

In early 2019, the Society of Actuaries (SOA) published a new set of mortality tables (Pub-2010 Tables) that are based solely on the experience of public retirement systems rather than corporate pension plans (the source of data for past mortality tables published by the SOA). The new tables include mortality rates for active members, healthy retirees, disabled retirees, and beneficiaries of retirees, and also vary by membership type (general government, teachers, and public safety). They represent a significant improvement in the universe of mortality tables available to value public retirement systems. Although they have only recently been released, our experience indicates that these tables are, in general, a better fit to the mortality observed in public plans than prior tables that were available such as LACERA's current mortality assumption. Milliman used these new tables, with certain adjustments as appropriate, for their recommended mortality rates. We believe that Milliman's use of these tables is appropriate and reasonable.

In the past, mortality rates for those of retirement age have gradually declined each year. Because actuarial valuations are projecting many years into the future, it is reasonable to anticipate that mortality rates will continue to decline, so they will be lower in the future than they are now. In order to anticipate that improvement, Milliman uses an approach known as "generational mortality" in which the mortality rates at most ages are "improved" by a small amount each year in estimating an individual's future lifespan. The SOA publishes a projection scale each year which essentially grades recently observed mortality improvement into its long-term expected improvement over a short period of time. Milliman's assumption has been, and continues to be, a simplified version of the SOA-published mortality improvement scale that uses only the ultimate year of that projection scale. There is insufficient data from LACERA to statistically test this assumption, but we believe it is reasonable and have observed other systems using similar simplified mortality improvement assumptions.

Milliman uses separate mortality assumptions based on sex, membership type (General or Safety), and status (active, healthy retiree, and disabled retiree). For the most part, they use the corresponding table from the SOA Pub-2010 tables, scaled by a constant multiplier in some cases to achieve a better fit. For General disabled members, they blend the healthy and disabled retiree tables to achieve a table that more appropriately reflects LACERA experience. Overall, this approach to selecting mortality tables is a common actuarial practice. Further, they base their analysis on benefit-weighted amounts for retirees and compensation-weighted amounts for actives. This weighting is an appropriate way in which to reflect the observed patterns of mortality rates varying by benefits/compensation.



2. ACTUARIAL ASSUMPTIONS

While we do not disagree with Milliman's recommendations, we offer some considerations for the next investigation of experience. First, the SOA Pub-2010 Tables include beneficiary mortality tables. Milliman elected to use the General membership healthy retiree table for beneficiaries. This has been standard practice in the pension actuarial community and so we have no objection, but we would suggest Milliman consider the use of the Pub-2010 Beneficiary Table next time, recognizing that data to analyze beneficiary mortality may be limited.

Second, in our experience we have found that the quality of the fit of a mortality table can sometimes be improved by applying one scaling factor at younger ages and a different factor at older ages (with a blending around the transition age). We would suggest that Milliman consider whether or not such an approach might allow a better fit of the mortality assumption to observed experience across all ages. This approach is not as widely used in the pension actuarial profession, but for larger retirement systems, such as LACERA, may have some merit.

Rates of Retirement: Retirement is a decision that is usually planned by an individual at a time that is perceived as most beneficial from a personal and financial perspective. One significant factor is the interaction of the retirement eligibility provisions with the potential retirement date. Because the different LACERA retirement plans have different eligibility requirements and benefit provisions, it is not surprising that retirement behavior varies by plan. Milliman develops retirement rates for General plans A-C, plan D, plan E, and plan G, and for Safety plans A&B and plan C. The newer plans (General G and Safety C) do not have any meaningful retirement experience yet, and so the proposed rates are based on applying professional judgment to the experience observed in the other plans.

For each plan or group of plans, Milliman observed the actual and expected retirements, weighted by compensation, as described earlier. The assumption and analysis varies by age, a typical approach. In general, we believe that the proposed changes recommended by Milliman are an appropriate response to the observed retirement patterns.

In some plans, particularly in the public safety arena, the provisions for the availability and amount of benefits lead to patterns that are more influenced by years of service than age. If Milliman has not reviewed that potential correlation recently, we would suggest they consider including this analysis in their next investigation.

Rates of Termination: The termination of employment assumption is a service-based assumption which is the most commonly used format for other public retirement systems. Milliman examined General members and Safety members separately, which is reasonable given the different jobs and termination patterns of the two groups. General plan E is valued separately from plans D and G because experience has shown a different behavior by those who elected this option.

Milliman proposes some minor adjustments to some of the termination rates to improve the quality of the fit to actual experience. Their analysis considered compensation-weighting in the



2. ACTUARIAL ASSUMPTIONS

development of the A/E ratios, and we concur with that, even though it did not have a material effect on the analysis.

For General plans A-C, the termination assumption has no significant effect on estimating future obligations since there are few members left who are not currently retirement eligible. However, we would suggest that Milliman consider using the termination rates from the newer plans for General plans A-C because in calculating the normal cost, the Entry Age Normal cost method requires the use of retrospective termination rates. As these plan members retire, though, this becomes a less significant consideration.

Refund of Employee Contributions: In the valuation process, this assumption is applied to active members who are assumed to terminate employment after becoming vested. It anticipates the election of a refund of accumulated employee contributions by the member and the resulting forfeiture of any vested monthly benefit at retirement eligibility. As would be expected, the probability of electing a refund declines as service increases, and so Milliman studies this assumption as a function of service, with separate rates for General and Safety membership.

We find Milliman's analysis and proposed changes reasonable. There are some retirement systems where the valuation assumes that the decision of whether or not a refund is elected is based on which option is most valuable to the member, from the system's perspective (i.e., which has the higher present value). Such an approach is designed to value the worst case scenario to the system, regardless of how experience is expected to unfold. While we are not necessarily suggesting that Milliman change to this approach, we would suggest that in a future investigation they consider whether this alternate approach might be worth considering, particularly with active members covered by different plans and benefit provisions.

Rates of Disability: Disability is a relatively low occurrence event, and so the analysis of disability rates is generally challenging. Lack of data creates results with limited credibility. Milliman has considered disability separately for males and females and for General and Safety members, which is a very common and appropriate approach. (Because General plan E has no disability provision, those members are excluded.) Disability may be either service-connected or not-service-connected, so an analysis of both rates was conducted. For Safety members, all but one of over 430 observed disabilities was service-connected, so for practical purposes, the service-connection distinction is relevant only for the General membership.

In general, we believe that Milliman's analysis and proposed adjustments to the disability rates are reasonable and appropriate. Because of the limited number of disabilities, some of the graphs exhibit patterns that are hard to interpret with the results from the A/E ratios. Milliman may want to consider ways to present these results that would help resolve this, but we also recognize that the sparse nature of actual disablements will often lead to odd graphical representations.

The 2016 Investigation of Experience was audited by Segal. One of their comments related to the manner in which Milliman collected the data for the disability study and how that approach essentially discarded one of the three years of data. Based on discussions with Milliman, they used



2. ACTUARIAL ASSUMPTIONS

a different approach in evaluating the disability experience in the current study, so the data used now draws from all three years. We believe this was an appropriate improvement in response to Segal's comment.

Other Assumptions: There are some miscellaneous assumptions that were addressed in the experience study report. For the most part, these assumptions do not have a major impact on the valuation results, and we believe the recommendations are all reasonable. The assumptions include:

- Probability of retiring with an eligible survivor
- Beneficiary age
- Deferred vested member retirement age
- Reciprocity employment rates for deferred vested members



3. ACTUARIAL METHODS

ACTUARIAL COST METHOD

For all retirement plans, whether defined benefit or defined contribution, the basic retirement funding equation is:

$$C + I = B + E$$

Where:

- C = employer and member contributions
- I = investment income
- B = benefits paid
- E = expenses paid from the fund, if any.

As can be seen from the formula, for a given level of benefits and expenses the greater “I” is, the smaller “C” is. This is the underlying reason for advance funding a pension plan, and historically investment income pays for 65% to 75% of the benefit dollars received by plan members. In other words, for every dollar paid to a member only 25 to 35 cents comes from contributions. To determine what pattern of contributions is needed, plan sponsors hire actuaries to estimate the cost of their plans and to create a budget for systematic contributions to meet that cost.

Different actuarial cost methods can provide for more rapid funding, more level funding over time, or more flexibility in funding. The choice of an actuarial cost method will determine the pattern or pace of the funding and, therefore, should be linked to the long-term financing objectives of the system and benefit security considerations.

The actuarial cost method used by LACERA is the Entry Age Normal method. This cost method determines the normal cost as a level percentage of pay which, if paid from entry into the plan to the last assumed retirement age, will accumulate to an amount sufficient to pay the expected benefit payments. Entry Age Normal tends to result in stable normal cost rates, a feature that has helped make it the most commonly used cost method for public plans. An additional cost is determined by amortizing the unfunded actuarial accrued liability (discussed later in this section).

In our opinion, the actuarial cost method employed by the LACERA is appropriate and will systematically fund the prospective pension benefits on an actuarially sound basis, if all of the actuarial assumptions are realized and the actuarial required contributions are made.



3. ACTUARIAL METHODS

ASSET VALUATION METHOD

Since the purpose of actuarial funding is to build up an asset pool (remember the importance of “I” in “ $C + I = B + E$ ”) actuaries need to value the current asset pool on each valuation date. The market value could be used, but it would tend to create too much volatility from valuation date to valuation date, and a single day’s measurement is not necessarily indicative of the true underlying value of the investments held by the plan. Thus, most actuaries use an asset valuation method which smoothes out these fluctuations in pursuit of achieving more stable funding measures and (when relevant) developing more level contributions. A good asset valuation method places values on a plan’s assets which are related to current market value, but which will also produce a smooth pattern of costs.

The goal of the actuarial asset valuation method is thus to smooth or reduce investment market fluctuations. This is particularly important during periods of volatile capital markets in which abrupt changes in asset values, when factored into the funding valuation, produce sudden unnecessary changes in contribution levels. In this case, “unnecessary” implies that the change in asset values is not necessarily a true revaluing of the assets involved, but rather a fluctuation reflecting a current economic climate or a short-term reaction to specific news.

LACERA Asset Valuation Method: The asset valuation method used by Milliman in the valuation is a variant of methods commonly used by other public sector retirement systems. The smoothing method finds the difference between the actual investment return and the expected investment return on the market value of assets. The dollar amount of this difference is then recognized equally over five years. This is the most common asset valuation method used by public systems.

Compliance with ASOP 44

Actuarial Standard of Practice Number 44, “*Selection and Use of Asset Valuation Methods for Pension Valuations*”, provides guidance to the actuary when selecting an asset valuation method for purposes of a defined benefit pension plan actuarial valuation. Several of the terms in the criteria of ASOP 44 such as “reasonable” and “sufficiently narrow” are not well defined. As a result, actuaries can differ in their opinion on these matters. As we consider the current asset valuation method used by LACERA in light of ASOP 44, we believe it satisfies these requirements.

We find LACERA’s asset valuation method to be reasonable and appropriate and compliant with ASOP 44.



3. ACTUARIAL METHODS

AMORTIZATION OF UNFUNDED ACTUARIAL ACCRUED LIABILITY METHOD

Currently, the unfunded actuarial accrued liability is amortized using a layered base approach. Following the establishment of the initial UAAL base, each year gains or losses arising from asset and demographic experience are amortized over a new 30-year period with payments that are determined as a level percentage of payroll. Milliman proposes that future amortization bases be amortized over 20 years.

The layered amortization approach has rapidly become the most common amortization method used by public retirement systems, and we believe this method is reasonable for amortizing LACERA's UAAL. It is also worth noting that, as LACERA does, most public retirement systems develop UAAL payments that are intended to be level, as a percentage of payroll, in the future. This general amortization methodology is very mainstream.

However, it is worth noting that the amortization periods have generally become shorter over the last five to ten years based on guidance from organizations such as the Conference of Consulting Actuaries (CCA), Society of Actuaries (SOA), California Actuary Advisory Panel (CAAP), and the Government Finance Officers' Association (GFOA). For most systems, the amortization periods for newly established amortization bases is in the range of 20 to 25 years. Therefore, we agree with Milliman that the current 30-year amortization of new layers is longer than desirable. Their recommendation is to move to 20 years which provides a reasonable balance between stability in contributions and moving the system toward being 100% funded.

Milliman also recommends the possible consolidation and re-amortization over 22 years of the existing amortization bases with more than 22 years remaining. We are comfortable with the proposed plan to eliminate the longer existing bases, but we also believe that it would be appropriate to continue to pay the bases down over their original period. The ultimate decision is dependent on which contribution pattern, and resulting funding progress, is most acceptable to the Board.



SECTION 4 – INVESTIGATION OF EXPERIENCE REPORT REVIEW

GENERAL OBSERVATIONS

Because of the diversity of public retirement systems and their actuaries, along with the scope and frequency of experience studies, the reports are also very diverse, ranging from extensive formal reports with many charts and tables to a simple slide presentation. Actuarial Standards of Practice provide only minimal guidance on the contents of these reports, so much of the report depends upon the style and preference of both the actuary and the retirement system. Milliman's report is on the more complete end of the spectrum, including some degree of numerical detail and graphical illustration along with narrative explanation.

In offering the following ideas, we are by no means suggesting that these are necessary or that the current report is inadequate. Rather, we are sharing some ideas from our years of experience that we believe might be useful to LACERA and Milliman. Ultimately, they will decide if any of these ideas are worth pursuing in future studies.

At the end of the report, Milliman includes an appendix that contains the proposed assumptions, with the assumption changes highlighted. While this approach makes it very easy to identify which rates were changed, it is not clear how they have changed. As an alternative, they could consider an additional appendix which includes the current assumptions, allowing an easy way to compare not only what rates were changed, but how they were changed.

Generally, Milliman has presented graphs with quinquennial grouped data. This has the advantage of smoothing out some of the variability that exists without the grouping, but it may also make the shape of assumption and its fit at each age/duration harder to observe, particularly for an assumption like retiree mortality which ranges from low rates to high rates. It might be worth considering whether some of the graphs would better communicate the results if they were not grouped.

Another idea for improvement would be to provide tables to show the exposure, actual decrements, expected decrements and proposed decrements, and resulting A/E ratios for each key assumption. Viewing the data graphically does not tell the reader which rates are based on more underlying data and, therefore, are more credible. In our opinion, including tables with the details of the underlying calculation of the results would improve the technical aspect of the report.

REVIEW OF PRIOR AUDIT

Segal Consulting prepared an audit report of the 2016 Milliman Investigation of Experience which included the following suggestions for future experience studies:

- (1) For the investment return assumption, review the methodology regarding the treatment of investment expenses in conjunction with ASOP 27.
- (2) For the real wage growth assumption, consider increases in this assumption if future recommendation are made to decrease the price inflation assumption.



SECTION 4 – INVESTIGATION OF EXPERIENCE REPORT REVIEW

- (3) For the merit and promotional salary assumption, consider increasing the rates that apply for all members below 10 years of service and the ultimate rate that applies after 15 years of service for Safety member as recent experience shows that an increase may be justified.
- (4) For the service retirement assumption, consider extending the analysis shown in the report to include General members retiring at ages 44 to 49 and 70 to 75. In addition, consider eliminating retirement rates below age 45 from the General Plans as they are not needed and reducing the General Plan G retirement rates below age 55 to reflect significant differences between the Plan G benefit formula as compared to Plan D.
- (5) For the retirement age assumption for deferred vested members, consider using one assumed retirement age for Safety Plan A and B.
- (6) For the post-retirement mortality rates, consider using the two-dimensional improvement scale in the generational projection together with using a more recent projection scale that reflects more recent mortality improvement experience.
- (7) For the disability retirement rates, consider using the data from the third year of the previous investigation period along with the first two years' data from the current investigation period.
- (8) For the assumption the for percentage of members assumed to work for a reciprocal employer, consider obtaining data on what percentage of terminated members went on to work for a reciprocal employer during both the investigation period and also for the entire current terminated member population. This may further validate this assumption, which is based on experience for members retiring from deferred status during the investigation period. In addition, the assumption for future salary increases for reciprocal terminated members should be discussed in the body of the report.

We reviewed Milliman's current report to ensure that all of Segal's comments in the current experience investigation were addressed. Milliman has addressed most of Segal's suggestions, as outlined below:

- (1) Milliman reflected a 0.05% passive investment expense as part of the development of the investment return assumption.
- (2) Milliman's recommendation for the real wage growth assumption was 0.50% for both the alternative with price inflation at 2.75% and 2.50%. There is no discussion in their report to indicate they considered Segal's suggestion to increase the real wage growth assumption if price inflation is lowered.
- (3) Milliman made adjustments to the merit salary scale that are consistent with both the observed experience and Segal's recommendation.
- (4) It appears Segal's recommendation for extending the retirement rates to age 75 for General members was implemented in the last study. In the current study, Milliman considers how General plan G might differ from plan D in its development of retirement rates, reflecting Segal's suggestion.
- (5) In their report, Milliman explains that there are very few deferred vested Safety Plan A members so the assumption is deemed not to be material. Therefore, no change is recommended in the 2019 Study.



SECTION 4 – INVESTIGATION OF EXPERIENCE REPORT REVIEW

- (6) In the current study, Milliman discusses the basis of their recommendation for continued use of the ultimate MP-2014 projection scale. Although it is not consistent with Segal's recommendation, Milliman has provided sufficient information to support their recommendation, in our opinion.
- (7) Based on Milliman's explanation of the change in their approach for analyzing disability experience, we believe Segal's concerns have been addressed.
- (8) It does not appear that Milliman addressed Segal's recommendations with respect to validating the assumption regarding the percentage of members assumed to work for reciprocal employers or the recommendation to discuss the assumption for future salary increases for these members in the body of the report.

SUMMARY OF CMC SUGGESTIONS FOR FUTURE INVESTIGATIONS OF EXPERIENCE

Throughout this report, we have identified several items that we believe could improve the next Investigation of Experience. We have summarized these items below for convenience:

- We suggest that Milliman consider the use of separate assumptions for Los Angeles inflation (for wage growth and COLA) and national inflation (for the investment assumption).
- For Milliman's analysis of actual wage inflation observed by LACERA, we would encourage them to consider how this analysis might be influenced by changes in workforce composition over the last 30 years.
- We recommend that Milliman and LACERA consider whether the amortization of the UAAL should be based on the wage inflation assumption, or if a lower rate might be more appropriate in case total wages grow slower than wage inflation. In fact, if County revenue growth reflects price inflation more than wage inflation, the use of a lower growth assumption for amortization could come closer to matching the amortization growth to revenue growth.
- Milliman's analysis of the total investment return assumption is a reasonable method, but we would suggest that they consider directly developing an assumption for the real rate of return to make the analysis of total return more transparent. This would also allow the inflation and real return assumptions to be decoupled.
- For the salary merit scale analysis, we suggest that Milliman comment on their analysis of periods shorter than 15 years. We do not object to also considering the longer-term analysis, but believe that solely relying on it will delay the detection of new patterns.
- We suggest that Milliman consider the use of the Society of Actuaries beneficiary tables rather than simply using the same tables as the members.
- We encourage Milliman to consider if the quality of fit of mortality tables could be improved by scaling the younger and older ages differently.
- We encourage Milliman to see if there are any discernible service-related patterns in regards to retirement rates that would provide an improved modeling of future experience.



SECTION 4 – INVESTIGATION OF EXPERIENCE REPORT REVIEW

- We suggest using the termination rates for General plans A-C that include rates from current plans D and G members at lower service levels to better accommodate the Entry Age Normal cost method. We also note that the declining number of members in plans A-C will make this increasing less important.
- We recommend that Milliman consider whether the refund of member contributions assumption should be replaced by assuming members choose the most valuable option.
- We suggest that Milliman consider presenting both current and proposed rates in the appendices so that a reader can more easily see the magnitude of recommended changes.
- Where appropriate, we believe it could be useful if some of Milliman's graphs displayed age-by-age information rather than grouping the results quinquennially.
- When there are graphical results presented in the report, we think that there are opportunities for Milliman to enhance the report by including tables with supporting data that would assist more technical readers.

Attachment V

Milliman's Presentation Slides



LACERA

June 30, 2019 Actuarial Valuation

Nick Collier and Craig Glyde
March 16, 2020

Overview



■ Significant results

- Increase in employer contribution rate
 - Primarily due to assumption and amortization changes
 - Increase due to assumption and amortization changes is phased in over 3 years
- Increases in member contribution rates
- Decrease in Funded Ratio

■ Changes since last year

- New assumptions adopted earlier this year
- Shorter amortization period
- New section added to report in accordance with Actuarial Standard of Practice #51

Summary of Results

Assets & Liabilities

| (in \$millions) | June 30th Valuation | |
|---------------------------------------|---------------------|-----------|
| | 2019 | 2018 |
| Actuarial Accrued Liability (AAL): | | |
| Active Members | \$ 32,400 | \$ 29,335 |
| Retired Members | 41,021 | 38,087 |
| Vested Terminated Members | 1,214 | 1,105 |
| Total AAL | \$ 74,635 | \$ 68,527 |
| Valuation Assets | \$ 57,617 | \$ 55,233 |
| Unfunded AAL | \$ 17,018 | \$ 13,294 |
| Funded Ratio (Valuation Assets / AAL) | 77.2% | 80.6% |

Summary of Results

Member Contribution Rates beginning July 1, 2020

- Updated member contribution rates for all contributory plans reflecting new assumptions
 - See Appendix D for full listing of member contribution rates

| Entry Age | Member Contribution Rates | | | |
|------------------|---------------------------|--------|----------|---------------------------|
| | Current | New | Increase | |
| | | | % of Pay | Average \$ ⁽¹⁾ |
| General D | | | | |
| 25 | 6.27% | 6.95% | 0.68% | \$ 50 |
| 35 | 7.83% | 8.56% | 0.73% | \$ 54 |
| 45 | 9.78% | 10.49% | 0.71% | \$ 52 |
| General G | | | | |
| All Ages | 8.43% | 9.11% | 0.68% | \$ 36 |
| Safety B | | | | |
| 25 | 11.00% | 12.61% | 1.61% | \$ 174 |
| 35 | 13.57% | 14.99% | 1.42% | \$ 153 |
| 45 | 16.20% | 17.83% | 1.63% | \$ 176 |
| Safety C | | | | |
| All Ages | 13.69% | 14.54% | 0.85% | \$ 64 |

Summary of Results

Employer Contribution Rates

| | June 30th Valuation | | |
|--|---------------------|--------|--------|
| | 2019 | 2018 | Change |
| Gross Normal Cost Rate | 18.54% | 16.80% | 1.74% |
| Member Contribution Rate ⁽¹⁾ | -7.68% | -6.88% | -0.80% |
| Employer Normal Cost Rate | 10.86% | 9.92% | 0.94% |
| UAAL Rate | 13.92% | 10.99% | 2.93% |
| Preliminary Employer Rate | 24.78% | 20.91% | 3.87% |
| Deferred Recognition of new assumptions | -2.19% | 0.00% | -2.19% |
| Employer Contribution Rate with phase-in | 22.59% | 20.91% | 1.68% |

1. Includes non-contributory members.

- 22.59% is a weighted average of all plans
 - Details by plan in Exhibit 11 (page 32) of Milliman's June 30, 2019 valuation report
 - Employer rate would be 0.52% higher if STAR Reserve was excluded

Summary of Results

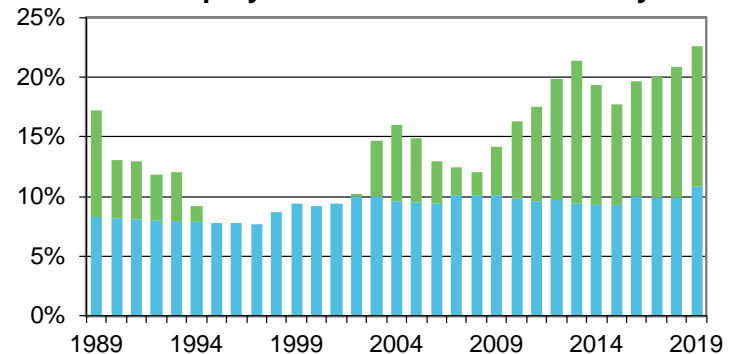
Analysis of changes since last year

| Sources of Change | Employer Contribution Rate | Funded Ratio |
|--|----------------------------|--------------|
| June 30, 2018 Actuarial Valuation | 20.91% | 80.6% |
| Expected Year-to-Year Change | 0.00% | 0.7% |
| Assumption Changes | 3.29% | -2.8% |
| Investment Return < Assumed | 0.42% | -0.7% |
| Payroll Increase > Assumed | -0.14% | 0.0% |
| <u>Liability Gain / Loss</u> | | |
| Salary Increase > Assumed | 0.43% | -0.5% |
| Other | -0.13% | -0.1% |
| Deferred Recognition of 2019 Assumptions | -2.19% | 0.0% |
| Total Change | 1.68% | -3.4% |
| June 30, 2019 Actuarial Valuation | 22.59% | 77.2% |

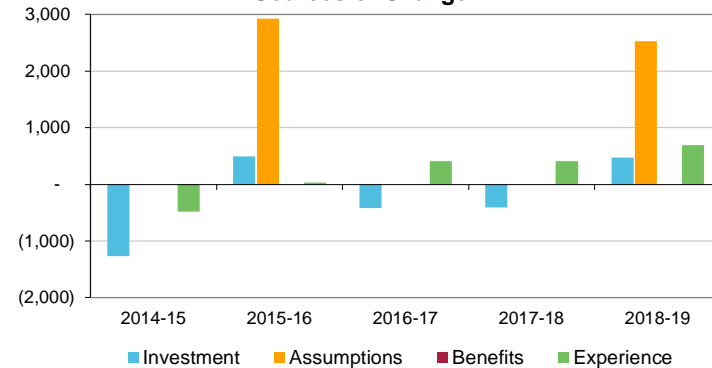
Actuarial Standard of Practice #51

- Assessment and disclosure of risk
 - First year shown in report
 - Previously discussed at Jan 2019 BOI
 - Strictly a disclosure requirement; no impact on the valuation calculations
- Key provisions of ASOP 51
 - Identification of risks
 - Assessment of risks
 - Plan maturity measures
 - Historical information
- Primary risk for LACERA is likely to be investment risk
 - If returns fall short of assumption, this puts stress on employers
- Separate comprehensive report will be provided at a future meeting

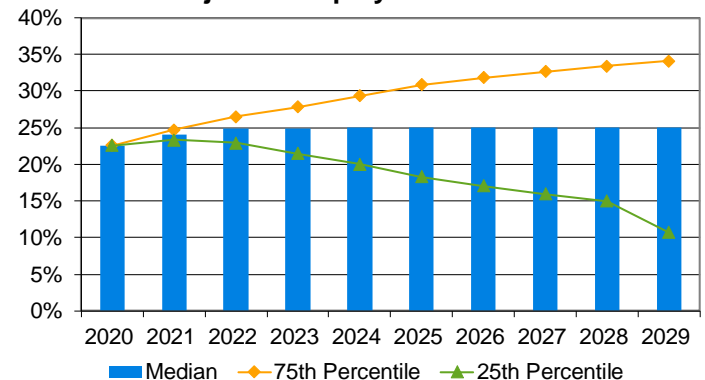
Employer Contribution Rate History



Sources of Change



Projected Employer Contribution Rate



Actuarial Review Comments (Cavanaugh Macdonald)

Looking Ahead

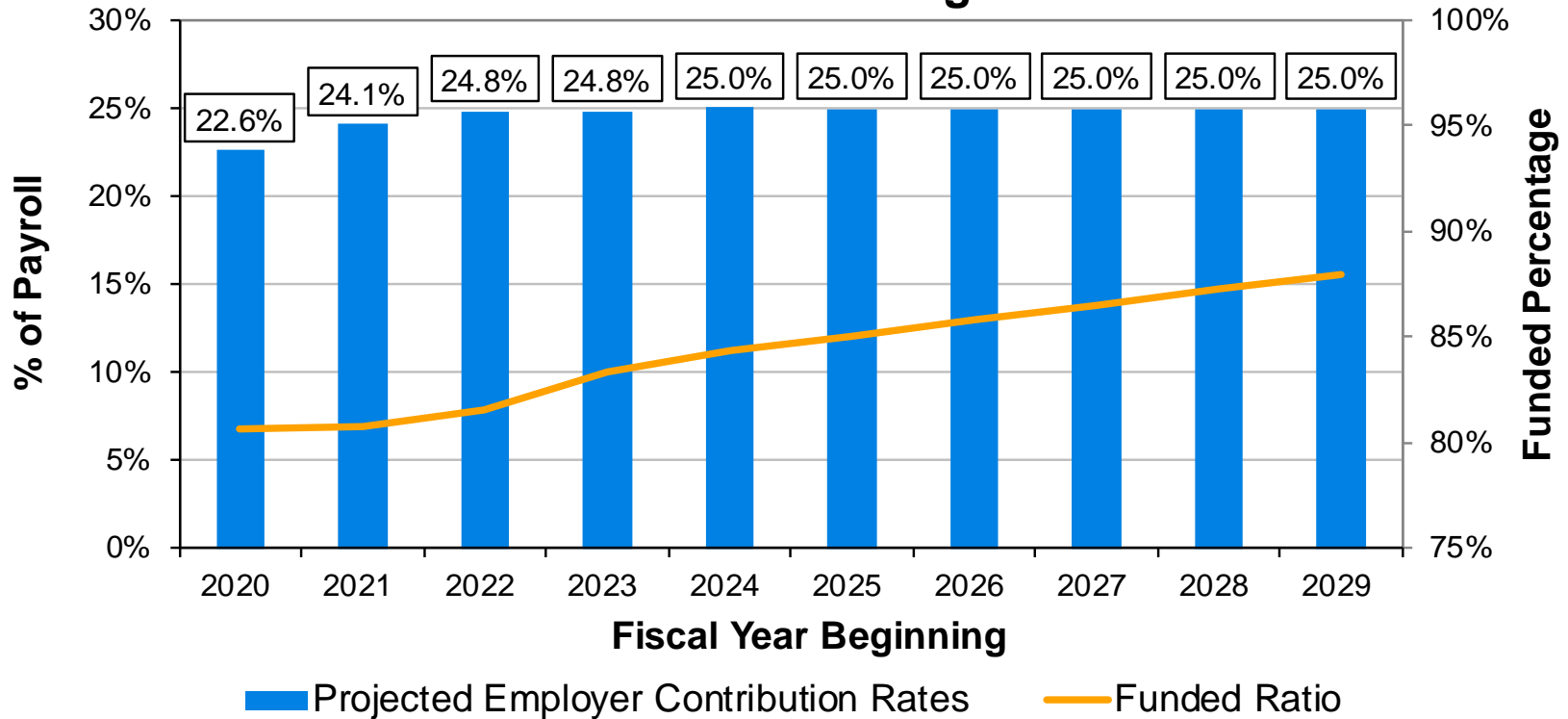
- Projection: 1 Year
 - Increase in employer contribution rate next valuation projected to be about 1.5% of pay if LACERA earns 7.00% for FYE 2021
 - Increase is primarily due to second step of phase-in of new assumption costs
 - Actual rate will be dependent on other factors

- Projection: 10 Years
 - Future required employer contribution rates and funded ratios will be dependent on investment returns and other factors
 - Baseline projection shows projection with:
 - All assumptions met, no changes in assumptions
 - Alternate projection includes:
 - 25th and 75th percentile returns for 10 years

** Projections based on June 30, 2019 valuation and do not reflect actual investment returns since that date.*

Looking Ahead - Baseline

Projected Employer Contribution Rate and Funded Percentage

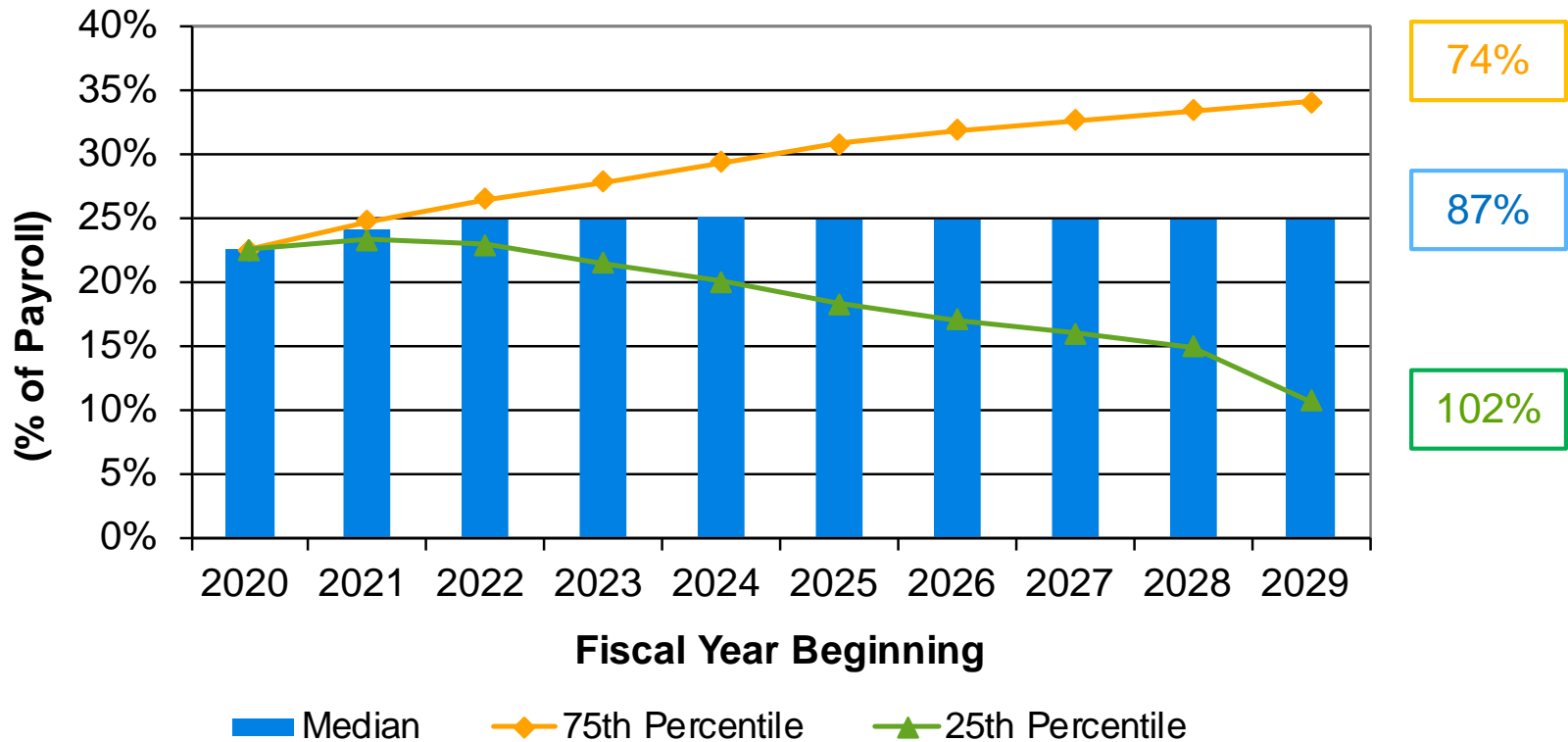


Projections assume that all actuarial assumptions are met after June 30, 2019, and reflect the phasing in of the new assumption costs and the scheduled recognition of asset gains and losses currently being deferred. Actual results will vary.

Looking Ahead – Good & Bad Returns

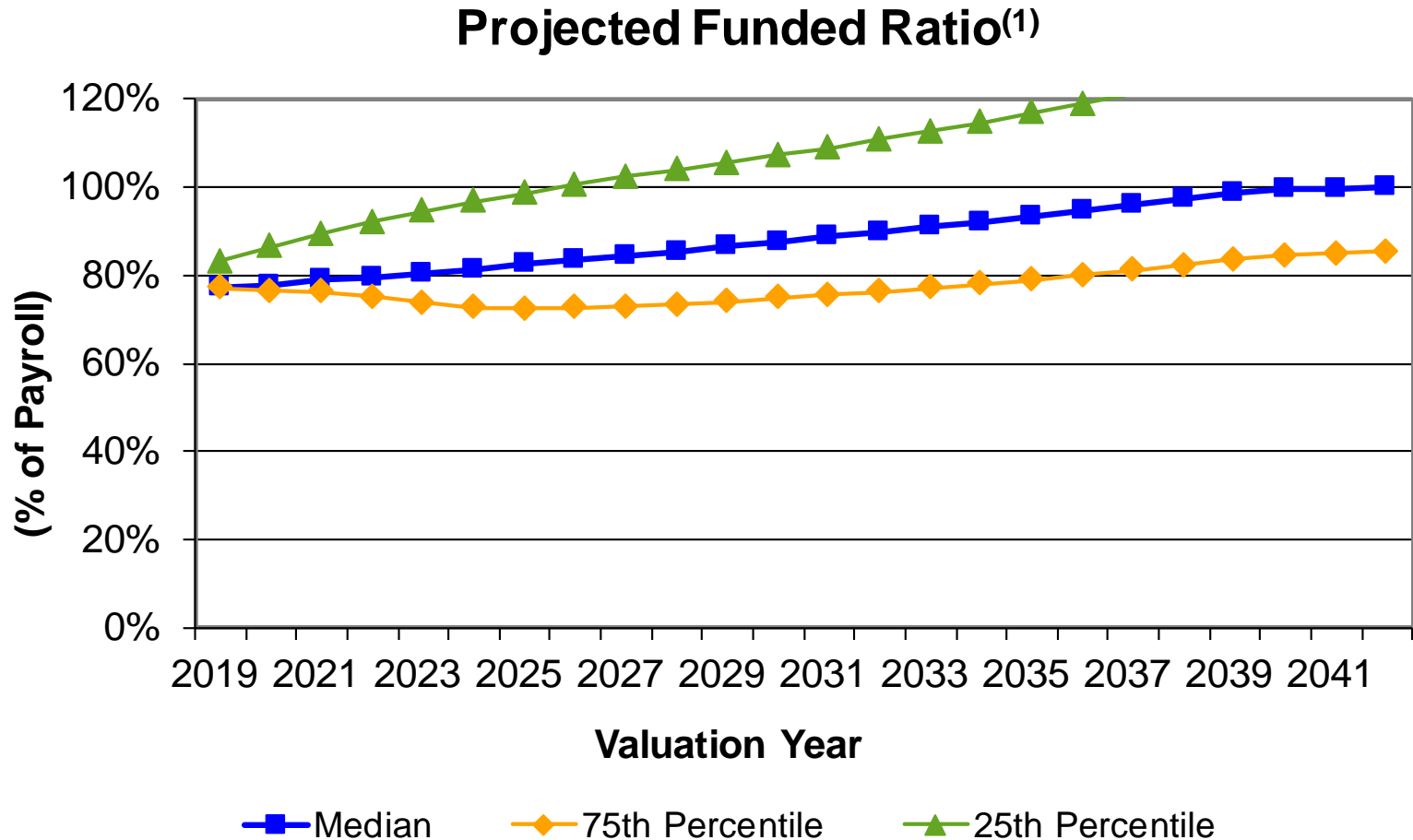
Funded ratio at end of 10-year period under alternative scenarios

Projected Employer Contribution Rate⁽¹⁾



1. Projections assume that all actuarial assumptions are met after June 30, 2019 (except alternate returns where noted) and reflect the scheduled recognition of asset gains and losses currently being deferred. Actual results will vary.

Projected Funded Ratio – Good & Bad Returns



1. Projections assume that all actuarial assumptions are met after June 30, 2019 (except alternate returns where noted) and reflect the scheduled recognition of asset gains and losses currently being deferred. Actual results will vary.

New Draft Actuarial Standards of Practice #4

- Some changes, but overall similar to the prior draft
- In particular, it still includes a requirement to disclose a market-related liability
 - This would be a much higher number than LACERA's current AAL as it would be based on a currently very low discount rate
 - A number of comments were received about the requirement, but the Actuarial Standards Board did not appear to be significantly moved by them, although they did change the name
 - "Investment Risk Defeasement Measure" (IRDM) → Low-Default-Risk Obligation Measure (LDROM)
- Of the remaining changes proposed in the ASOP that LACERA might be interested in, the new language appears consistent with LACERA's approach
 - Phasing in contribution rate changes not assumption changes
 - Moving away from negative amortization
- Comment deadline is April 30, 2020

Recommendation

For the fiscal year beginning July 1, 2020:

- Adopt new employer contribution rates shown in Exhibit 11 (page 32) of Milliman's June 30, 2019 valuation report
- Adopt new member contributions rates for all plans:
 - Detail shown in Exhibit D-2 of valuation report

Questions?



Caveats and Disclaimers

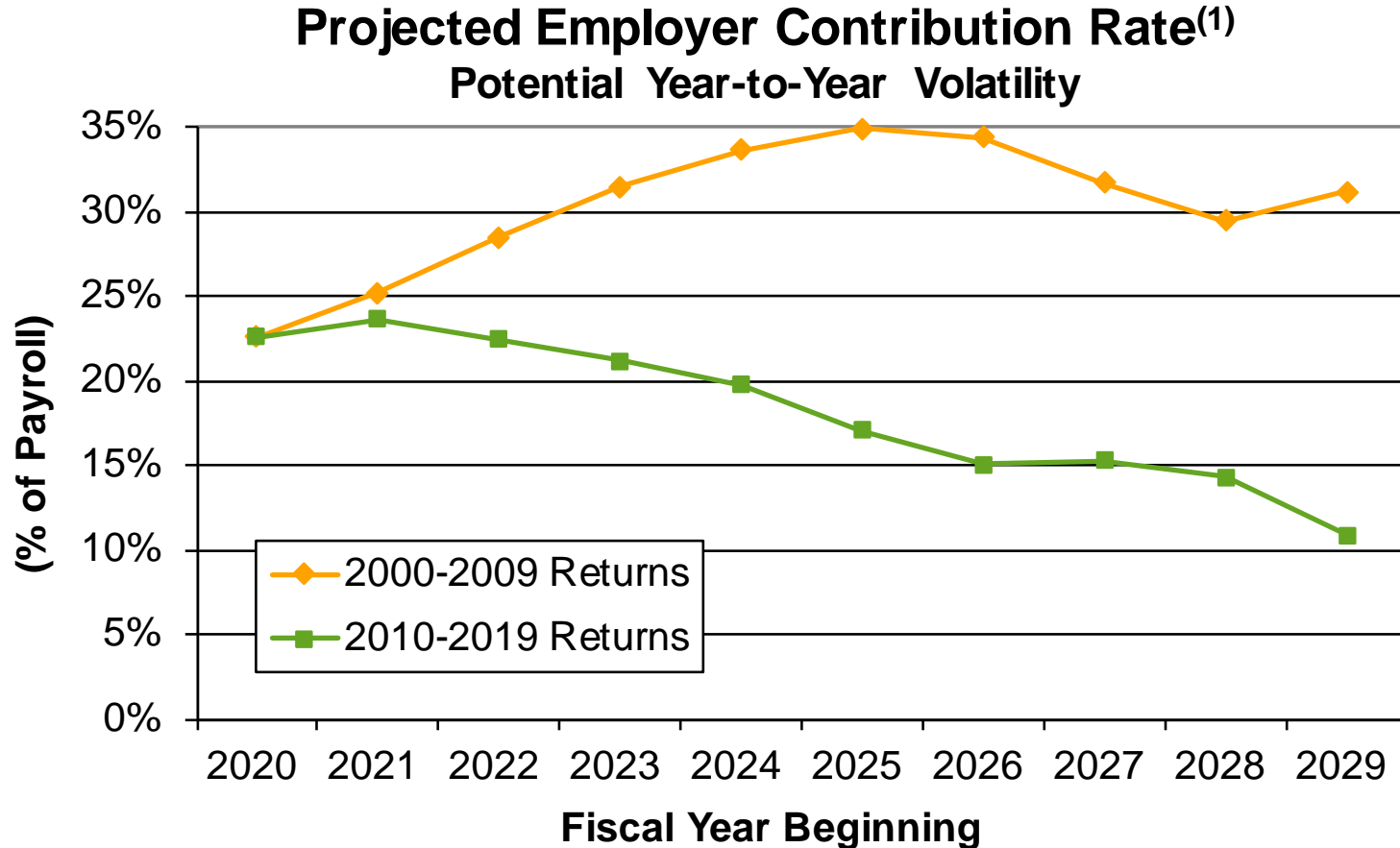
This presentation is based on the data, methods, assumptions and plan provisions described in our actuarial valuation report dated March 2, 2020. The statements of reliance and limitations on the use of this material is reflected in the actuarial report and still apply to this presentation.

These statements include reliance on data provided, on actuarial certification, and the purpose of the report.

Milliman's work product was prepared exclusively for LACERA for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning LACERA's operations, and uses LACERA's data, which Milliman has not audited. It is not for the use or benefit of any third party for any purpose. Any third party recipient of Milliman's work product who desires professional guidance should not rely upon Milliman's work product, but should engage qualified professionals for advice appropriate to its own specific needs.

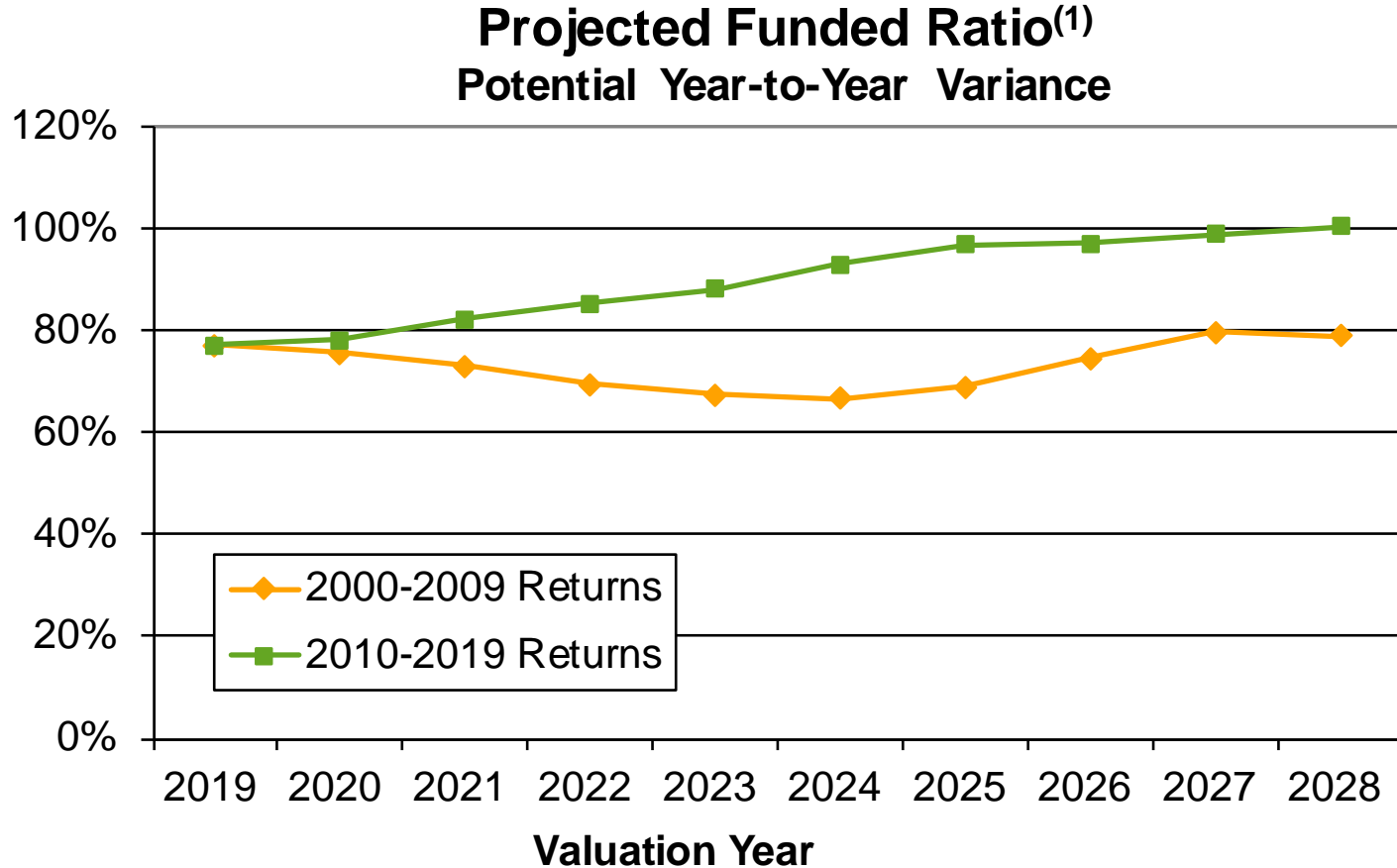
Supplemental Exhibits

Potential Year-to-Year Volatility – Employer Rates



1. Projections assume that all actuarial assumptions are met after June 30, 2019 (except for alternate returns) and reflect the scheduled recognition of asset gains and losses currently being deferred. Actual results will vary.

Potential Year-to-Year Volatility – Funded Ratio




1. Projections assume that all actuarial assumptions are met after June 30, 2019 (except for alternate returns) and reflect the scheduled recognition of asset gains and losses currently being deferred. Actual results will vary.

FOR INFORMATION ONLY

March 18, 2020

TO: Trustees – Board of Investments

FROM: Jonathan Grabel 
Chief Investment Officer

FOR: March 23, 2020 Board of Investments Meeting

SUBJECT: **CIO Interim Report Regarding Market Environment and Fund Positioning**

The following report is intended to provide Trustees with a transparent and candid overview of LACERA’s current Total Fund position, in light of the global coronavirus pandemic and market developments. During the last three months, global production volume has significantly decreased, market conditions have rapidly deteriorated, and equity gains from recent years have been erased. It is clear that COVID-19 is impacting and reshaping daily lives, institutions, and the markets.

COVID-19 has affected global supply chains and consumer behavior leading to the potential for a global recession. These recessionary concerns have been exacerbated by actions taken by oil producing countries to increase output, thereby prompting oil prices to collapse to levels last experienced nearly two decades ago. The combined impact of these exogenous shocks has been increased market volatility and a flight to safer assets, driving government bond yields to historically low levels (albeit with unusual volatility).

Table 1 highlights several changes among key market indicators on a year-to-date and month-to-date basis. The table is a non-exhaustive list of assets impacted by recent market activity that is meant to demonstrate the stark decline in several categories and the rapid rise of risk aversion.

Table 1
Changes in Asset Values and Measures of Risk in 2020 – as of March 17, 2020¹

| | 1/2/20 | 3/2/20 | 3/17/20 | Month to Date Changes | Quarter to Date Changes |
|-------------------------------------|---------|---------|---------|-----------------------|-------------------------|
| 10 Year Treasury Yield ¹ | 1.88% | 1.10% | 1.02% | -7% | -46% |
| High Yield Spreads ² | 3.56% | 4.97% | 8.41% | 69% | 136% |
| Russell 3000 Index | 1,907 | 1,806 | 1,451 | -20% | -24% |
| MSCI ACWI IMI ³ | 1,449 | 1,339 | 1,064 | -21% | -27% |
| NYMEX Crude Oil - \$/barrel | \$61 | \$47 | \$27 | -42% | -55% |
| COMEX Gold - \$/ounce | \$1,528 | \$1,595 | \$1,526 | -4% | 0% |
| CBOE Volatility Index (VIX) | 12 | 33 | 76 | 127% | 509% |

1) 10-Year Treasury Constant Maturity Rate

2) ICE Bank of America US High Yield Index Option-Adjusted Spread

3) MSCI All Country World Index - Investible Market Index

Sources: S&P CapitalIQ; Federal Reserve Economic Data

¹ Updated on March 18, 2020 with information as of close of March 17, 2020.

Noteworthy year-to-date changes include: (i) a 509% increase in the CBOE Volatility (“VIX”) index² from 12 to 76, (ii) a 136% increase in high yield spreads³ from 3.6% to 8.4%, and (iii) a 52% decline in crude oil from \$61 per barrel to \$27 per barrel. Moreover, both the Russell 3000 Index and MSCI All Country World Index – Investible Market Index (MSCI ACWI IMI) dropped 20% and 21% so far in March, respectively. Finally, volatility on March 17th, as measured by the VIX, reached 83, surpassing the previous peak of 79 observed during the Great Financial Crisis.

In response to these significant market fluctuations, central banks have taken drastic actions to prevent a global liquidity crisis. This week, central banks coordinated efforts aimed at easing the negative impact of the pandemic and related economic turmoil. The U.S. Federal Reserve cut the federal funds rate twice in March by a combined 1.50% to a range of zero to 0.25%, implemented \$700 billion of quantitative easing, and invoked its powers to establish lending facilities that issue loans directly to American corporations seeking liquidity. Global central banks took accommodative actions as well, including: (i) Bank of Japan increased its asset purchase targets; (ii) Bank of Korea cut its rates by 0.50% to a level of 0.75%; (iii) Reserve Bank of Australia injected additional liquidity; (iv) Bank of Canada cut interest rates by 0.50%; and (v) European Central Bank has announced a €750 billion asset purchase program. These decisive actions are an attempt to mitigate the risk of another 2008-like recession.

LACERA’s portfolio has not been spared from the market turmoil, nor is it intended to be. Rather, the portfolio has been carefully designed and implemented with three goals in mind: (i) provide long-term growth in order to pay benefits into the future, (ii) provide risk mitigating characteristics, which are particularly important in times of market volatility, and (iii) provide continuous liquidity to ensure the ability to pay current benefits. As noted throughout this report, these objectives are addressed through the combination of LACERA’s functional asset classes working in concert. Total Fund and functional asset category returns are demonstrated in **Table 2**.

Table 2
Estimated LACERA Portfolio Returns as of March 17, 2020⁴

| LACERA Portfolio | Value as of 3/17/20* | Month to Date Changes | Quarter to Date Changes |
|---|-------------------------|--------------------------|----------------------------|
| Total Fund Return | \$53,633 | -9% | -12% |
| <i>Functional Asset Category Returns:</i> | | | |
| Growth | \$24,568 | -13% | -19% |
| Credit | \$6,594 | -8% | -8% |
| Real Assets and Inflation Hedges | \$9,093 | -8% | -11% |
| Risk Reduction and Mitigation | \$13,378 | -2% | 1% |

*\$ in millions

² The Chicago Board Options Exchange Volatility (CBOE Volatility) Index is a real-time market index that represents the market’s expectation of 30-day forward-looking volatility and is used to measure the level of stress in the equity market.

³ A bond spread is the difference in the yield between a non-Treasury bond and a Treasury bond; is indicative of the amount of excess return required to take additional credit risk (in this case high yield credit risk).

⁴ LACERA’s portfolio includes private assets, which do not price on a daily basis.

Overall LACERA's Total Fund is down an estimated 9% on a month-to-date basis and approximately 12% since January 1, 2020, as of March 17, 2020. LACERA's portfolio construction, which relies on its functional asset categories working together to enhance diversification, has exhibited both negative and positive performance. For example, while LACERA's growth strategies are down about 19% since the beginning of the calendar year, LACERA's risk reduction and mitigation asset category is up about 1% over the same period. In addition, LACERA's real assets and credit categories have exhibited less than half of the drawdowns experienced by the MSCI ACWI IMI. LACERA's carefully constructed asset allocation and strategic implementation aim to allow the portfolio to weather market shocks, while also being able to take advantage of long-term growth trends.

Total Fund Position and Liquidity

The Total Fund market value was \$53.6 billion, as of close of business on March 17, 2020. Note that valuations for LACERA's private market assets (such as private equity and real estate) lag by three months and the impact of recent market developments on these assets will not be known for approximately three months. With that said, the indicative return for the Total Fund as of yesterday was -9.0% month-to-date.

LACERA currently holds \$2.2 billion in cash. LACERA targets a cash weight of 0.5%, per its strategic asset allocation, but currently holds approximately 4%. The higher cash position is due to recent mandate terminations, cash inflows, and the anticipated funding of new, upcoming mandates. When LACERA has a cash position over the 0.5% target—as we currently do—the excess cash is invested in the cash “overlay” program. The overlay program allows the Fund to maintain approved policy targets by gaining market exposure at the functional asset category level. The overlay strategy rebalances this exposure on a daily basis to the most underweight asset category, while also maintaining the liquidity of cash.

In addition to our cash position, LACERA has approximately \$32 billion—or almost 60% of the Total Fund—in assets that are more liquid in nature and could be converted to cash in a relatively short timeframe. These investments are LACERA's public equity, investment-grade fixed income, Treasury Inflation-Protected Securities (“TIPS”), and real asset completion portfolios.

LACERA has a two-pronged rebalancing program, where both the approved asset allocation and our liquidity position are examined daily. The first is LACERA's Total Fund cash overlay strategy as mentioned above. The overlay provides liquidity while adhering to LACERA's strategic asset allocation. The second approach is overseen internally. The Fund's allocation is reviewed daily versus policy weights and physical assets are rebalanced if the policy bands are breached at the functional asset category and sub-category levels. Both approaches are systematic. Future cash needs are projected over a month period.

LACERA's cash management positions us to retain adequate liquidity to meet obligations.

OPEB Master Trust

The OPEB Master Trust (“OPEB”) is comprised of three separate sub-trusts: 1) Los Angeles County, 2) LACERA, and 3) Superior Court. OPEB assets are allocated to four functional categories: Growth, Credit, Real Assets and Inflation Hedges, and Risk Reduction and Mitigation. Within each functional category, assets are primarily invested in passive funds with the exception of a separately managed enhanced cash account in the Risk Reduction and Mitigation category.

As of the market close on March 17, 2020, OPEB declined 14.4% month-to-date and 19.4% year-to-date, primarily driven by the large drawdowns in the OPEB Growth and OPEB Real Assets and Inflation Hedges functional categories. The OPEB Growth category is comprised of a global equity MSCI All Country World IMI fund. As expected, Growth was the biggest detractor, declining 18.1% month-to-date and 25.8% year-to-date. The OPEB Credit category consists of three funds: high yield bonds, bank loans, and emerging markets debt (local currency). With credit spreads widening, Credit fell 11.0% month-to-date and 12.9% year-to-date with all three underlying funds posting negative returns mid-month. The OPEB Real Assets and Inflation Hedges category is a combination of commodities, real estate investment trusts (“REITs”), and treasury inflation-protected securities (“TIPS”). The composite declined 15.5% month-to-date and 20.1% year-to-date, led by greater than 20% losses suffered in the REITs fund for both month-to-date and year-to-date periods. Returns were slightly cushioned by the muted losses experienced in the TIPS fund. The OPEB Risk Reduction and Mitigation category includes an investment grade bond fund as well as a separately managed enhanced cash account. The composite fell 1.6% month-to-date, but remains modestly positive at 1.5% year-to-date. The enhanced cash account is currently yielding 2.3%, but is expected to trim down once the Fed rate cut is reflected.

Concluding Comments

As a multi-generation plan focused on the ultimate mission to pay benefits today, tomorrow, and into the future, LACERA has a deliberate investment approach to ensure the Total Fund can meet current and future obligations. As such, LACERA has intentionally developed and pursued an investment strategy that aims to navigate both positive and negative market environments. LACERA is guided by the Investment Beliefs that shape its Investment Policy Statement and strategic asset allocation. This foundation is designed to participate in growth during expansionary economic periods and protect the corpus of the portfolio in volatile markets.

Markets have had a tumultuous start to 2020. Some market observers have characterized current market dynamics as a “hundred-year event”. Nevertheless, LACERA and its staff remain vigilant, engaged, and responsive to understand, invest, and protect the Total Fund’s assets. We rely on the years of careful portfolio construction and preparation to build a stronger, more resilient asset allocation and we are committed to doing everything that is in our immediate control to ensure that LACERA continues to pay benefits now and for future generations to come.

In the Investments Division, we are committed to meeting any challenges that the current market environment presents and will continue to monitor the investment portfolio with prudence and care as LACERA’s stakeholders deserve. LACERA has established policies, practices, and strategy that guide our actions. In turbulent times, such as in recent weeks, we draw guidance from our

Trustees – Board of Investments

March 18, 2020

Page 5 of 5

Investment Policy Statement (including Investment Beliefs), strategic asset allocation and asset category structure reviews. The 2020 Work Plan also informs our actions. While market events and new information may adjust our future activity, our long-term, strategic course remains intact. We will preserve an adequate cash position to pay near-term benefits and further strive to identify investment opportunities that can position the portfolio to grow in the future to support long-term liabilities.

Attached to this memo is a description of how recent events have impacted segments of LACERA's portfolio. The attachment prioritizes timeliness of information, as we are dedicated to keeping you informed about portfolio developments during this period of market volatility. We note, however, that the market environment remains dynamic and, as such, any information may be outdated as developments continue to unfold. We will endeavor to keep the Trustees apprised of developments in a timely and thoughtful manner.

Now more than ever, our team approach in the Investments Division is crucial. We are available to address any comments or concerns.

Fund Position By Functional Asset Class Category

Please find below information and analysis of recent performance and market positioning for each of LACERA's functional asset class categories.

Growth (*47.4% of Total Fund as of February 29, 2020*)

LACERA's "growth" assets are expected to be the primary driver of total returns for the Fund over the long-term. As outlined in the IPS, growth assets are highly sensitive to economic conditions.

Global Equity

Global equity markets have been volatile since February, driven by a growing fear of the coronavirus pandemic disrupting supply chains and consumer demands, as well as recent Saudi-Russian oil price tension. Month-to-date, the MSCI ACWI IMI Index is down 18.1% as of March 17, 2020. By regions, the U.S. market, as measured by the MSCI US IMI Index, is down 16.1%, and Non-U.S. markets, as measured by the MSCI ACWI ex-US IMI Index, are down 20.7%. Within Non-U.S. markets, Emerging Markets fell 18.2%.

Portfolio Positioning

The global equity market downturn has been broad-based with each of the eleven Global Industry Classification Standard ("GICS") sectors generating negative returns year-to-date through March 17, 2020. The primary objective of the global equities portfolio is to provide equity market exposure (as measured by the MSCI ACWI IMI Index) with a secondary objective of generating alpha.

During this sell-off, the global equity portfolio performance has generally mirrored that of the broader equity markets. The portfolio is somewhat overweight smaller cap stocks and underweight the larger cap stocks, relative to the MSCI ACWI IMI benchmark. Given that small cap stocks have trailed large cap stocks by about 11% year-to-date, staff expects a modest drag to performance. The portfolio's slight overweight to emerging markets is expected to provide some relief since emerging market equities have moderately outperformed their developed markets counterparts during this downturn.

At the sector level, more cyclically sensitive sectors—such as energy, financials, materials and industrials—have been hit the hardest. The portfolio's underweight to these sectors has provided some protection, but not enough to offset the portfolio's underweight to the larger technology stocks, which have outperformed on a relative basis.

Reaction to Market and Related Mitigants

In December 2019, the Board established market cap and geographic ranges of +/- 5% relative to the global equity benchmark. To bring the portfolio's exposures more in-line with the MSCI ACWI IMI index and within Board-approved ranges, staff plans to propose recommendations to the Board to address the portfolio's underweight to larger cap stocks and to reduce the portfolio's volatility.

LACERA's latest global equities structure review sets a 15% target allocation to Factor-Based strategies.

The factor-based strategy mandate, planned for the March BOI meeting, is intended to provide a more cost-efficient means to capture returns associated with well-researched, persistent equity factors, while reducing volatility. Staff is contemplating modifications through upcoming Board recommendations to lower portfolio tracking error, consolidate manager line-up, and improve portfolio efficiency.

In a period of extreme market volatility and uncertainty around the duration and depth of the market sell-off, LACERA is maintaining a long-term focus and adhering to the strategic allocation approved in the latest structure review. Over the long-term, LACERA expects global equity risk commensurate with overall market beta, but with higher risk-adjusted returns.

Private Equity

The current market turmoil is not isolated to public equities; ramifications from COVID-19 may be a potential tipping point into a prolonged global economic downturn and may economically and operationally impact LACERA's private equity portfolio as well. The full impact of COVID-19 on private equity backed-companies is too early to fully assess since private equity assets are generally valued only four times per year, creating an inherent valuation lag. This may provide the benefit of time for price discovery to value assets correctly while also potentially smoothing returns across multiple reporting periods.

That said, COVID-19 and current economic uncertainty may lead to a pull back on mergers and acquisitions ("M&A") activity in the market. Supply chain disruptions, decreased customer demand, labor shortages, and volatility in the private equity market may place downward pressure on M&A pricing, leading to a disconnect between buyers who seek lower valuations and sellers who demand a specific price target. Private equity funds may find it difficult to execute exit strategies for their existing portfolio companies and may wait until there is more stability in the market. Operational constraints—such as travel restrictions and virus-related containment measures—may make it difficult for private equity firms to source and diligence deals. Accordingly, fund sponsors may need more time to deploy committed capital. Similarly, the inability for investors to conduct in-person diligence meetings with potential private equity managers may lead to a slowdown in fundraising. Private equity firms may postpone fundraising until travel is back to normal and virus containment policies have been relaxed.

Tightening of credit markets may reduce M&A activity. Companies are drawing on credit lines to cope with market volatility and dwindling corporate cash flows, putting pressure on lenders. Coupled with the increased risk of corporate downgrades and defaults, lenders may be conservative in extending credit. Private equity funds trying to execute an M&A deal may find credit more expensive and difficult to obtain and with more financial covenants than recent years.

Portfolio Positioning

While not completely insulated, the private equity portfolio is relatively well-positioned for a short to medium-term downturn given LACERA's historical focus on portfolio intentionality and diversification. Moreover, while the portfolio is currently overweight in the information

technology (“IT”) sector, LACERA’s IT investments generally possess business models that are more economically resilient. For instance, a significant portion of these investments utilize software as a service (“SaaS”) business models that provide essential services which are deeply embedded in their customers’ organizations. The mission critical nature of these businesses may create high switching costs for customers, potentially putting SaaS companies in a better position to retain customers and generate recurring revenues during an economic downturn than companies with more traditional business models.

Secondly, LACERA’s preference for investing with general partners who are sector specialists should translate into enhanced management of our private equity investments. Possessing sector-specific knowledge and operational capabilities should allow managers to navigate sector-specific issues and idiosyncrasies, both of which tend to escalate during periods of economic uncertainty.

Finally, with the recent execution of several co-investments and secondary purchases, LACERA has expanded its investing capabilities. This may position LACERA to capture near-term opportunities—such as prospective investments that may outperform despite weak market conditions. These may include investments that possess recession-resistant characteristics in highly defensive sectors such as consumer staples and healthcare. For new fund commitments, LACERA also plans to adopt a similar sector and investment philosophy but with a renewed interest in committing to distressed, special situations, and value-oriented managers who have demonstrated an ability to invest capital during past dislocations.

Market Opportunities

While every market downturn is different, LACERA may also draw from lessons learned during the Global Financial Crisis (“GFC”). For example, as the GFC was unfolding, LACERA temporarily suspended new private equity fund commitments (as did other limited partners). Looking back, LACERA would have been better served maintaining a consistent investment pace. The 2009 vintage year has been one of the best performing vintage years in private equity over the past two decades. Though we cannot predict the duration and severity of the COVID-19 pandemic, we can learn from the past and sustain our deployment pace in both good markets and bad.

Similarly, 2009 was a great time to be a buyer in the private equity secondaries market with an average pricing discount of nearly 45% of net asset value for leveraged buyout (“LBO”) transactions according to Setter Capital. Many limited partners, including leading endowments, reduced their private equity exposure during the GFC due to the significant losses incurred in other parts of their portfolio. Others were in need of liquidity, and therefore were motivated sellers willing to accept a significant discount to their portfolios. Notably, this attractive “window of opportunity” only lasted about a year, as average pricing discounts for these secondary LBO purchase transactions dropped from 45% to 20% by 2010. Thus, only those investors who were nimble and able to recognize that these discounts were driven by limited-partner specific issues, rather than portfolio impairments, were rewarded.

With the GFC learnings in mind, LACERA anticipates maintaining its investment pace and opportunistically scanning the private equity landscape to help the Total Fund access equity exposures that are either mispriced, difficult to find, and/or unavailable in public markets. Some

of these structures (e.g., stapled secondaries,⁵ general partner stakes,⁶ preferred equity⁷) might be new and/or require delegated authority in order to meet tight transaction deadlines. We anticipate facilitating Board education and deliberation on these structures in the future in order to prospectively position LACERA to act when opportunities arise during this and future downturns.

Risk Reduction and Mitigation *(26.7% of the Total Fund as of February 29, 2020)*

The objective of this asset category is to produce modest returns with a low level of volatility and a low correlation to growth assets. In the event of an overall market downturn, this asset category can be a source of liquidity for benefit payments. The category consists of three segments: cash, investment grade bonds, and hedge funds.

Cash

The cash portfolio is invested in high-quality, short-term fixed income instruments. Given its market value of about \$2.2 billion, the cash portfolio provides ample liquidity to the Total Fund to support near-term cash obligations, including member benefits. Looking within the cash portfolio, there is plenty of liquidity, with approximately 25% readily accessible overnight. The portfolio's duration is less than 0.5 years—meaning there is a relatively low degree of interest rate risk—and 60% of the cash portfolio matures within six months. The Fed has taken a number of steps in an effort to inject liquidity into the financial system. These steps include cutting overnight lending rates to essentially zero. Although the rate cut is immediate, the cash portfolio benefits from the higher yield of cash instruments purchased prior to the cut. Therefore, the portfolio's yield as of March 17th was 1.6%. This will decline as positions mature and proceeds are reinvested.

Investment Grade Bonds

Recession concerns caused by the pandemic have triggered a flight to assets viewed to be high quality, resulting in a dramatic decline in U.S. Treasury yields. The 10-year Treasury yield started the year at 1.92%, fell to a historic low of 0.31% on March 9th, but has since rebounded to 1.24%. That is still a significant 0.68% yield decline (price rally). But looking only at the beginning and ending yields masks the significant rise in volatility. This volatility impacts the Treasury market directly, but it also indirectly impacts all other bond sectors, because all other sectors are priced relative to Treasury securities.

Since bonds do not trade on an exchange, price discovery is always somewhat of a challenge. The large and swift yield changes experienced this year exacerbated the situation, resulting in an even more opaque market.

The investment grade bond markets have held up reasonably well during the market turbulence. The primary reason is that the benchmark for this segment is the Bloomberg Barclays U.S. Aggregate Bond Index, a broad measure of all fixed-rate, U.S. dollar-denominated, investment

⁵ Stapled Secondary: combines the acquisition of the existing portfolio of fund asset(s) with an agreement by the acquirer (e.g., LACERA) to provide a capital commitment to the general partner's next fund.

⁶ GP Stakes: direct equity investments representing a minority ownership position in a general partner's underlying management company.

⁷ Preferred Equity: a fund-level financing that establishes a senior class of limited partner interests with preferential terms.

grade bonds with a maturity greater than one year. The following table shows that Treasury bonds comprise over 40% of this index, and mortgage-backed securities backed by government guarantees represent almost 26%. Adding in almost 6% for government-related bonds issued by Agencies and quasi-governmental entities, means that over 70% of the index has some degree of a government guarantee. Therefore, these sectors benefit from a flight to quality. In contrast, the hardest-hit sector is corporate bonds. The demand shock caused by the pandemic hurts top-line revenue for corporations, and causes all fundamental financial metrics to deteriorate. As a result, delinquencies and defaults are expected to increase, and these concerns are reflected in corporate bond prices. All told, the Aggregate bond index is up 1.75% year-to-date, despite a negative return this month, as shown in the following table.

| Index Component | % of Index | MTD Return | YTD Return |
|------------------------|-------------------|-------------------|-------------------|
| Treasury | 40.6% | 0.8% | 6.0% |
| Gov-Related | 5.9% | -3.3% | 0.3% |
| MBS | 25.9% | -0.1% | 1.6% |
| Other Securitized | 2.6% | 0.6% | 1.3% |
| Inv. Grade Corporate | 25.0 | -7.9% | -4.4% |
| AGGREGATE INDEX | 100.0% | -1.9% | 1.8% |

LACERA's portfolio has performed as expected in this volatile environment. Approximately 75% of LACERA's bond portfolio is Core bond strategies, 80% of which is invested in an index fund. The remaining 25% is in Core Plus strategies. The index fund has tracked the index closely, performing within a basis point of the index. The Core portfolio is up 1.5% for the year, underperforming the index by 0.3%. The Core Plus strategies have lagged the most, as they have a slightly higher risk profile. The Core Plus portfolios are down 2.2% for the year. Combined, the investment grade bond portfolio return is down 2.9% month-to-date and up 0.6% year-to-date.

Hedge Funds

The current hedge funds portfolio has a low degree of growth risk and market directionality by design. However, widespread market volatility can affect the hedge funds portfolio, especially in the short-term. The broad selling of risk assets that has occurred in early March has resulted in losses for the hedge funds portfolio.

After discussions with each direct manager in the portfolio, we estimate that the hedge funds portfolio has lost approximately 3-4% month-to-date. This estimate of LACERA's portfolio is modestly better than broad hedge fund indices. The relative outperformance is likely a result of the broad hedge fund indices having exposure to a higher degree of equity risk, which LACERA strives to substantially limit. LACERA's hedge funds portfolio intentionally includes relative value and arbitrage strategies that have outperformed broad hedge fund indices so far in March. Additionally, managers across the direct program were generally cautious going into this drawdown and are now investing available cash.

LACERA is currently under-allocated to hedge funds by approximately \$1.5 billion (this incorporates the upcoming redemptions of the remaining \$300 million across two hedge fund-of-funds). Given the current market conditions and under allocation of the portfolio, market conditions may enable LACERA to deploy additional capital to existing managers in a manner that is consistent with the current structure review. These managers have experience investing

through volatile markets and multiple market cycles. Additional allocations to these existing managers would not substantially add directional growth or credit risk.

Staff has a manager recommendation scheduled for the next BOI meeting and is considering two additional manager recommendations for future months. As long-term investors, LACERA anticipates continuing to buildout the direct hedge funds portfolio.

Real Assets *(16.8% of the Total Fund as of February 29, 2020)*

LACERA's real assets investments are intended to provide income as well as hedge against inflation, while diversifying the Fund due to the low correlation of returns between these assets and other asset categories. Real assets include investments in real estate, natural resources, commodities, and TIPs.

Real Estate

Supply and demand fundamentals have been in a reasonable state of balance. The COVID-19 pandemic is negatively impacting demand for some property types, especially for the retail sector. However, some e-retailers, such as Amazon, are being positively impacted by the pandemic as more shoppers use online shopping. Amazon has announced plans to hire 100,000 additional workers in the United States to fuel e-commerce deliveries. Small businesses and restaurants are likely to be negatively impacted, potentially leading to rental delinquencies.

Even though prices have been high and yields low, capital markets demand for real estate has been strong. It will take some time to determine how the pandemic impacts transaction pace and valuations. However, conversations with active buyers and lenders suggest that buyers are nervous and pulling back. Similarly, lenders are repricing quotes or declining to quote on loan requests. Multifamily and industrial properties remain favorites for lenders.

Status of Investments

Real estate assets are marked to market on a quarterly basis by the external managers/general partners and annually by third-party appraisers. Therefore, there is not yet any valuation information that reflects the COVID-19 pandemic. It is likely that the market uncertainty may lead to an increase in capitalization rates, which would cause values to decline. Any increase in cap rates should be tempered by the decrease in government bond yields. The historical (20-year average) spread between cap rates and 10-year treasury yields have been about 250 basis points. Since the yield on 10-year Treasuries has fallen, this should help sustain pricing for real estate. Notably, the REIT sector is down 28.9% quarter-to-date, as of March 17, 2020. The REIT sector is sometimes a leading indicator of pricing for private real estate.

A particularly vulnerable segment of the portfolio may be the student housing properties. LACERA owns six such assets valued at approximately \$325 million. Occupancy for these student housing assets has dropped below 50% as schools shut down early and students return home. A key factor will be how the virus impacts leasing for the next school year.

Portfolio Positioning

With a high concentration of stabilized assets, low leverage, and deliberate property type under/over-weights, LACERA's real estate portfolio is relatively well-positioned for a potential economic downturn. Close to 80% of the real estate portfolio is in Real Assets and Inflation Hedges, comprised of 74.1% Core stabilized properties and 5.6% Value-Add assets. Real estate portfolio leverage is approximately 31.1%, comprised of mainly fixed interest rate debt. Core levered assets in the separate account portfolio have an average debt service coverage ratio of 2.7x. Compared to the ODCE benchmark, LACERA is underweight office by 11.4% and overweight apartments by 6.8%.

Opportunities

Lower pricing may occur in real estate. However, LACERA's asset allocation may limit the Total Fund's ability to purchase at lower prices due to the existing over-allocation to real estate. To the extent that real estate valuations decline, LACERA's entry price in open-end commingled funds will be lower. LACERA is also under-allocated to "growth" opportunities in real estate. Current market volatility may present attractive entry pricing for the Total Fund.

TIPS

The prices for Treasury Inflation Protected Securities ("TIPS") have come down this month despite their safe haven status as government-backed treasury bonds. This has been due to a rapid drop in inflation expectations to below 1%. LACERA's TIPS portfolio is down about 4% month-to-date and flat year-to-date. LACERA is somewhat underweight TIPS, with a current allocation of 2% and a policy allocation of 3%. TIPS are intended to provide a hedge against increasing inflation expectations. Current market conditions seem unlikely to result in inflation, although certain developments—such as fiscal stimulus—may induce some inflationary pressure.

Commodities

Commodities have suffered losses this year as global growth expectations have evaporated, beginning with China. China accounts for a large share of global commodity market demand and the rapid slowdown there moved markets lower starting in January. Further spreading of demand weakness to the rest of the world led commodities markets lower through the remainder of the quarter to date. LACERA's commodities portfolio is down about 12% month-to-date and 23% year-to-date.

In addition to the demand dynamics negatively affecting nearly all commodities, oil has faced an additional price pressure from the response of two of the world's largest global suppliers—Saudi Arabia and Russia—to maintain or increase production despite weaker demand. Saudi Arabia started a price war by ramping up production from 9 MB/D (million barrels per day) to 12 MB/D, causing crude oil prices to decline 30% in one day to below \$30/barrel for U.S. traded oil futures and have reached as low as \$20/barrel, as of March 18, 2020. Saudi Arabia and Russia's objective is to drive out U.S. shale production, which has grown sharply in recent years, by maintaining an oil price below the lowest cost of new U.S. production. It is estimated that the lowest cost shale oil development is around \$40/barrel and the variable cost of already-developed shale production is between \$20 to \$25/barrel. Prices are likely to stay in a range between \$20 to \$40/barrel for the

near future. The pressure to eventually increase prices may be led by the effect of low prices on Russia's and Saudi Arabia's own domestic economies or by a measurable decline in U.S. shale production shut in by lower prices.

The only exception among market dynamics in commodities is gold, which has generally been stable and has served as a relative safe haven. Gold has remained attractive within the Fund's commodities allocation despite reduced inflation expectations.

Real Assets Completion Portfolio

LACERA's Real Asset completion portfolio of equities (e.g., infrastructure and natural resources) has dropped 19% month-to-date and 27% year-to-date. LACERA's portfolio takes modest tilts between infrastructure and natural resources and was positioned more defensively by overweighting infrastructure and underweighting energy leading into the market weakness which led to modest gains over the benchmark of 2-3%. Going forward, the positioning continues to be somewhat defensive given the lingering uncertainty around the impact of COVID-19 and the ongoing supply and demand dynamics depressing crude oil prices.

LACERA is considering its first private investment in infrastructure and expects to bring forth a recommendation in the coming months. Valuation of infrastructure assets will have to be underwritten to understand the impacts of changes in discount rates. Lower discount rates lead to higher valuations. It is still uncertain if lower discount rates being led by lower interest rates, will be offset by higher equity risk premiums resulting from more market uncertainty. Additionally, demand or revenue forecasts for infrastructure assets may need to be updated as the result of market shifts or idiosyncratic effects.

We continue to review the landscape for private natural resources. Given the decline in oil prices, the timing to build a portfolio in energy investments is less susceptible to downside risk going forward. LACERA is looking at the opportunity set of private investment in the space and expects that there may be motivated sellers in the private secondary markets of energy funds or in the private market for currently-producing oil and gas assets. LACERA's liquidity may enable us to make private investments in this environment, replacing capital already invested in public market assets as described in the recently approved structure review.

Credit (8.6% of the Total Fund as of February 29, 2020)

The credit portfolio's objective is to produce income and generate moderate long-term returns while incurring moderate levels of risk. This asset category consists of four segments: high yield, bank loans, emerging market debt, and illiquid credit. These segments have a moderate level of correlation to equity markets; as a result, they have generated negative returns for the month and year. However, the decline in prices means that the yield in these markets is now significantly higher than LACERA's actuarial target return.

Below-Investment-Grade Credit (High Yield Bonds / Bank Loans / Emerging Market Debt)

Liquidity has been a challenge across the high yield bond, bank loan, and emerging market debt markets. Little trading has occurred in these markets in light of the increased volatility in equity

and Treasury securities. Price discovery for these assets has been challenged and bid/ask spreads (the difference between quoted buy/sell prices for a security) have widened significantly.

As the coronavirus outbreak continues, business disruption is expected to negatively impact corporate revenue, net income, and corporate financial ratios. At the industry level, the largest sell-offs occurred in the debt of commodity-related (energy), transportation (airlines), and leisure (cruise lines, hotels, entertainment) companies. This risk-off phenomenon is rippling to other industries as the reality of significant disruptions in day-to-day business operations globally leaves very few companies unscathed. Consequently, loan default rates are expected to increase. This is reflected in the yields and yield spreads of high yield bond and bank loan indices. Yield spreads refer to the difference in the yield between a non-Treasury bond and a Treasury bond and are indicative of the amount of excess return an investor requires to take additional credit risk (in this case high yield and bank loan credit risk).

| | 12/31/2019 | | 3/17/2020 | |
|-------------------|-------------------|--------------|-------------------|--------------|
| | Yield to Maturity | Yield Spread | Yield to Maturity | Yield Spread |
| High Yield Credit | 6.0% | 3.4% | 9.4% | 8.5% |
| Bank Loans | 6.1% | 4.6% | 9.7% | 9.0% |

As shown in the table above, the average yield of the high yield index increased from just under 6% at the start of the year, to over 9% as of March 17th. As a result, the high yield index total return for the month-to-date is down 11.5%, and the year-to-date return is down 12.7%. As these returns indicate, most of the damage has occurred in March. Bank loan yield spreads have also increased, albeit at a lesser rate, reflecting their higher position in the capital structure and the fact that loans are secured by collateral. The bank loan index return is down 10.5% month-to-date and down 11.2% year-to-date. Consequently, the primary market for bonds and loans has essentially shut down, with few issuers coming to market in this volatile environment.

Emerging Market Debt has also declined in price, in light of the important role of commodities to many emerging market economies and heightened geopolitical concerns. Dollar-denominated bonds, issued by both sovereigns and corporations are down about 12% for the year, while bonds denominated in local currencies are down approximately 6% for the year.

LACERA's portfolio of high yield bonds, loans, and emerging market debt, has performed slightly better than the indices, with returns of -9.6% month-to-date and -10.3% year-to-date.

Illiquidity and fear in the credit markets have historically created opportunity for long-term investors. Given the current environment, maintaining the course charted during the credit structure review is prudent. The higher yield in below-investment-grade credit means that yields are at attractive levels. Staff will look to opportunistically add to high yield bonds, loans, and emerging market debt, consistent with the approved allocation ranges.

Illiquid Credit

In drawdowns that include a widespread decrease in investor risk appetite (such as in early March), illiquid credit portfolios can decline as much or more than public credit/equity markets. Given the nature of this drawdown and the existing portfolio, we expect the illiquid credit portfolio is down 7-10% month-to-date. The lagged valuation and reporting conventions in this asset category make estimating performance challenging.

LACERA's current illiquid credit portfolio includes \$866 million of legacy positions from multiple asset categories (as of February month-end). The portfolio has breadth across corporate credit, consumer credit and asset-backed credit including real estate debt. Favorably, there is not a focus on either energy-related credits or distressed/lower quality investments, as these investments have underperformed in the current drawdown.

LACERA is under allocated to illiquid credit by approximately \$1 billion. Looking forward and given the current dislocation, there is an opportunity to build-out the portfolio in the near future at pricing that is more attractive today compared to recent periods. There is currently \$530 million of "dry powder" in the form of undrawn capital commitments to existing illiquid credit managers. Most notably, \$425 million is available for a recently approved manager to invest in the coming weeks and months as opportunities arise across illiquid credit markets. We are conducting late-stage due diligence on at least two additional illiquid credit managers that would complement the existing portfolio and be well-positioned to source opportunities in the current drawdown. These two potential managers could fill some of the underweight to illiquid credit.

As a reminder, illiquid credit is a part of the portfolio where we seek to profit from idiosyncratic yields generated by assets, companies, and securities that are not widely available to the public markets. Accordingly, this asset category is less liquid and we should adopt a long-term investor's mindset to this part of the portfolio. Illiquid credit is not a primary source of liquidity for the Total Fund. Should the stressed market environment continue over a longer time period and pending further diligence, we would consider a modest overweight allocation to illiquid credit.