

City of Phoenix Employees' Retirement System

ACTUARIAL VALUATION REPORT AS OF
June 30, 2019



October 8, 2019

Mr. Scott Steventon
Acting Retirement Program Administrator
City of Phoenix Employees' Retirement System
200 W. Washington Street, 10th Floor
Phoenix, Arizona 85003

Re: Actuarial Valuation of the City of Phoenix Employees' Retirement System as of June 30, 2019

Dear Scott:

We are pleased to present the Report on the actuarial valuation of the City of Phoenix Employees' Retirement System ("COPERS") as of June 30, 2019.

This Report presents the results of the June 30, 2019 actuarial valuation of COPERS. The Report describes the current actuarial condition of COPERS, determines annual employer contribution rates, and analyzes changes in these rates. In addition, the Report provides various summaries of the data. This report should not be relied on for any purpose other than the purpose described in the primary communication. Accounting information for purposes of complying with Governmental Accounting Standards Board (GASB) Statements Nos. 67 and 68 is provided in a separate report.

We certify that the information included herein and contained in the June 30, 2019 Actuarial Valuation Report is accurate and fairly presents the actuarial position of COPERS as of the valuation date.

Financing Objectives

The Actuarially Determined Contribution (ADC) is determined by taking the sum of the normal cost, a component to amortize the unfunded liability and a component to cover administrative expenses. The Board's current funding policy is to contribute an amount each year based on the most recently calculated Actuarially Determined Contribution.

The unfunded accrued liability is comprised of experience gains and losses, assumption changes and benefit changes. A base is established in each year for changes in the unfunded accrued liability arising from these sources. In September 2013, the Board adopted amortization payment methods that amortize the pre-assumption changes of July 1, 2013 over a closed 25-year period as a level percentage of payroll; amortizes the assumption change liability as of July 1, 2013 over a closed 25-year period as a level percentage of payroll with a four-year phase in, and amortizes future gains and losses over a closed 20 year period. Future gains cannot be amortized over a period shorter than the period remaining on the 25-year amortization schedule. The actuarially determined contribution has increased from 38.51% of pay to 38.62% of pay. The increase is primarily due to an increase in administrative expenses, salary increases greater than expected, and an asset loss.

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Assuming all actuarial assumptions are met, this method of payment of the unfunded liability will result in full funding in 20 years. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions. A schedule of each year's initial base and remaining outstanding balance is illustrated in Exhibit B.6.

Progress Toward Realization of Financing Objectives

The unfunded actuarial accrued liability and the funded ratio (ratio of the actuarial value of assets to the actuarial accrued liability) illustrate the progress toward the realization of certain financing objectives.

Based on the actuarial valuation as of June 30, 2019, COPERS has an unfunded liability of \$1,724.5 million and a funded ratio of 60.8%.

Although there were losses on the actuarial value of assets, the funded ratio on an actuarial value of assets basis increased from 60.6% to 60.8%. The funded ratio on a market value of assets basis decreased from 60.5% to 60.4%. This decrease was due primarily to liability and asset losses. A funded ratio less than 100% indicates an actuarially determined contribution that will require a normal cost and an amortization payment. If the contributions equal the ADC, and if all assumptions are met, the funded ratio should improve over time.

Benefit Provisions

All of the benefit provisions reflected in this valuation are those which were in effect on June 30, 2018. The benefit provisions are summarized in Section E of this Report.

Assumptions and Methods

The assumptions were adopted by the City of Phoenix Employees' Retirement System primarily upon the prior actuary's analysis. The most recent experience study had covered the period of July 1, 2009 through June 30, 2014. The new assumptions were adopted in August of 2015. Updated mortality assumptions were adopted in October of 2015. In 2017 the Board accepted GRS's recommendation in the economic assumption analysis and directed GRS to use a 7.25% discount rate, a 2.50% inflation assumption and a 3.0% payroll growth assumption. These assumptions and methods are detailed in Section F of this Report. The Board has sole authority to determine the actuarial assumptions used for COPERS. In our opinion, the actuarial assumptions used are reasonable.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as: 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 COPERS's funded status); and changes in plan provisions or applicable law. The actuarial calculations presented in this report are intended to provide information for rational decision making.



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Data

The valuation was based upon information as of June 30, 2019, furnished by City of Phoenix Employees' Retirement System staff, concerning Plan benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not otherwise audit the data. We are not responsible for the accuracy or completeness of the information provided by City of Phoenix Employees' Retirement System staff.

Certification

All of our work conforms with generally accepted actuarial principles and practices, and to the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of, where applicable, the Internal Revenue Code, and ERISA.

The signing actuaries are independent of COPERS sponsor. Leslie Thompson is an Enrolled Actuary. All signing actuaries are Members of the American Academy of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries. Finally, all of the undersigned are experienced in performing valuations for large public retirement systems.

Respectfully submitted,

Gabriel, Roeder, Smith & Company



Leslie Thompson, FSA, FCA, EA, MAAA
Senior Consultant



Paul Wood, ASA, FCA, MAAA
Consultant



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SECTION A

EXECUTIVE SUMMARY

Actuarial Valuation

Valuations are prepared annually, as of June 30 of each year. The primary purposes of the valuation report are to measure the plan's liabilities, to determine the contribution rate and to analyze changes in the City of Phoenix Employees' Retirement System actuarial position.

In addition, the report provides summaries of the member data, financial data, plan provisions, and actuarial assumptions and methods.

Financing Objectives

The employer contributions are intended to be sufficient to pay the normal cost and administrative expenses and to amortize the Unfunded Actuarial Accrued Liability (UAAL) as described on page B-6 of this report.

The contribution rate shown on pages B-4 and B-5 may be considered as a minimum contribution rate that complies with the Board's funding policy. Users of this report should be aware that contributions made at that rate do not guarantee benefit security. Given the importance of benefit security to any retirement system, we suggest that contributions to COPERS in excess of those presented in this report be considered.

The contribution rate in this report is determined using the actuarial assumptions and methods disclosed in Section G of this report. This report does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Assessment of risks was outside the scope of this assignment. We encourage a review and assessment of investment and other significant risks that may have a material effect on the plan's financial condition.

Assumption Changes

There were no changes to assumptions since the prior valuation. The assumptions are summarized in Section G of the report.

Experience During the Year

The plan experienced a contribution gain of \$2.0 million and a liability loss of \$39.4 million during fiscal year 2019. Details on the liability loss can be found on page B-8.

The plan experienced an asset loss of \$32.6 million during fiscal year 2019. As of June 30, 2019, the amount of outstanding assets losses not yet recognized in the actuarial value of assets was \$17.2 million. If the Plan does not earn investment earnings in excess of the assumed 7.25% per year, these losses will need to be recognized in future valuations. This will put downward pressure on the funded ratio and upward pressure on the Actuarially Determined Contribution.

Benefit Provision Changes

There were no changes to benefit provisions since the prior valuation. The benefit provisions are summarized in Section E of the report.

Financial Position and Summary of Results

The funded ratio on an actuarial value of assets basis increased from June 30, 2018 to June 30, 2019. On a market value of assets basis, the funded ratio decreased from June 30, 2018 to June 30, 2019.

| Exhibit A.1 City of Phoenix Employees' Retirement System Executive Summary | | |
|---|----------------------|----------------------|
| | June 30, 2019 | June 30, 2018 |
| 1. Total Actuarially Determined Contribution | | |
| a. Dollar Amount | \$ 223,534,984 | \$ 208,889,903 |
| b. As a % of Payroll | 38.62% | 38.51% |
| 2. Funded Status | | |
| a. Actuarial Accrued Liability | \$ 4,401,825,358 | \$ 4,226,045,811 |
| b. Actuarial Value of Assets (AVA) | 2,677,352,751 | 2,562,847,008 |
| c. Unfunded Liability (AVA-basis) | 1,724,472,607 | 1,663,198,803 |
| d. Funded Ratio (AVA-basis) | 60.82% | 60.64% |
| e. Market Value of Assets (MVA) | \$ 2,660,133,356 | \$ 2,554,513,709 |
| f. Unfunded Liability (MVA-basis) | 1,741,692,002 | 1,671,532,102 |
| g. Funded Ratio (MVA-basis) | 60.43% | 60.45% |
| 3. Summary of Census Data | | |
| a. Actives | | |
| i.(a) Tier 1 Count | 5,197 | 5,638 |
| i.(b) Tier 2 Count | 657 | 737 |
| i.(c) Tier 3 Count | 2,087 | 1,602 |
| i.(d) Total Active Count | 7,941 | 7,977 |
| ii. Total Annual Compensation | \$ 562,988,925 | \$ 527,160,824 |
| iii. Average Projected Compensation | 70,896 | 66,085 |
| iv. Average Age | 46.6 | 46.6 |
| v. Average Service | 12.2 | 12.4 |
| b. Deferred Vested Member Counts | 1,008 | 943 |
| c. Retiree Counts | 6,013 | 5,813 |
| d. Beneficiary and Alternate Payee Counts | 1,110 | 1,076 |
| e. Disability Counts | 245 | 249 |
| f. Total Members Included in Valuation | 16,317 | 16,058 |

The funded ratio may not be appropriate for assessing the need for future contributions. The funded ratio is not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations.

SECTION B

VALUATION RESULTS

Exhibit B.1
City of Phoenix Employees' Retirement System
Actuarial Valuation Results
Actuarial Accrued Liability

| | June 30, 2019 | | | | June 30, 2018 |
|--|-------------------------|----------------------|----------------------|-------------------------|-------------------------|
| | Tier 1 | Tier 2 | Tier 3 | Total | Total |
| 1. Active Members | | | | | |
| a. Retirement Benefits | \$ 1,484,452,569 | \$ 30,244,151 | \$ 21,967,241 | \$ 1,536,663,961 | \$ 1,462,001,770 |
| b. Withdrawal Benefits | 24,444,040 | 2,057,519 | 2,245,634 | 28,747,193 | 28,471,166 |
| c. Disability Benefits | 15,040,374 | 594,279 | 378,964 | 16,013,617 | 15,421,027 |
| d. Death Benefits | 14,727,976 | 547,045 | 350,398 | 15,625,419 | 15,181,251 |
| e. Total | <u>\$ 1,538,664,959</u> | <u>\$ 33,442,994</u> | <u>\$ 24,942,237</u> | <u>\$ 1,597,050,190</u> | <u>\$ 1,521,075,214</u> |
| 2. Members with Deferred Benefits | | | | \$ 80,242,160 | \$ 70,812,660 |
| 3. Members Receiving Benefits | | | | \$ 2,724,533,008 | \$ 2,634,157,937 |
| 4. Total | | | | \$ 4,401,825,358 | \$ 4,226,045,811 |
| 5. Actuarial Value of Assets | | | | <u>\$ 2,677,352,751</u> | <u>\$ 2,562,847,008</u> |
| 6. Unfunded Actuarial Accrued Liability | | | | \$ 1,724,472,607 | \$ 1,663,198,803 |

Tier 1: Hired before July 1, 2013

Tier 2: Hired between July 1, 2013 and December 31, 2015

Tier 3: Hired on or after January 1, 2016

Exhibit B.2
City of Phoenix Employees' Retirement System
Actuarial Valuation Results
Normal Cost for Fiscal Year Ending June 30, 2021

| | Tier 1 | Tier 2 | Tier 3 | Total | Prior Year |
|--|----------------|---------------|----------------|----------------|----------------|
| 1. Dollar Normal Cost | | | | | |
| a. Retirement Benefits | \$ 49,562,819 | \$ 5,586,715 | \$ 11,629,652 | \$ 66,779,186 | \$ 60,524,582 |
| b. Withdrawal Benefits | 7,156,409 | 1,024,773 | 2,680,649 | 10,861,831 | 9,584,093 |
| c. Disability Benefits | 1,509,610 | 158,591 | 361,784 | 2,029,985 | 1,830,389 |
| d. Death Benefits | 1,013,620 | 133,304 | 301,245 | 1,448,169 | 1,315,803 |
| e. Total | \$ 59,242,458 | \$ 6,903,383 | \$ 14,973,330 | \$ 81,119,171 | \$ 73,254,867 |
| 2. Normal Cost as a Percentage of Pay | 14.68% | 16.75% | 12.78% | 14.44% | 14.56% |
| 3. Projected Payroll for FYE June 30, 2021 | \$ 415,669,317 | \$ 42,457,893 | \$ 120,668,866 | \$ 578,796,076 | \$ 542,466,970 |
| 4. Dollar Normal Cost for FYE June 30, 2021 | \$ 61,019,732 | \$ 7,110,484 | \$ 15,422,530 | \$ 83,552,746 | \$ 78,976,084 |

Tier 1: Hired before July 1, 2013

Tier 2: Hired between July 1, 2013 and December 31, 2015

Tier 3: Hired on or after January 1, 2016

Exhibit B.3
City of Phoenix Employees' Retirement System
Actuarial Valuation Results
Present Value of Projected Benefits

| | June 30, 2019 | | | | June 30, 2018 |
|--|-------------------|------------------|------------------|--------------------|--------------------|
| | Tier 1 | Tier 2 | Tier 3 | Total | Total |
| 1. Active Members | | | | | |
| a. Retirement Benefits | \$ 1,795,503,103 | \$ 86,566,188 | \$ 138,496,552 | \$ 2,020,565,843 | \$ 1,922,646,006 |
| b. Withdrawal Benefits | 70,803,958 | 14,193,797 | 33,079,963 | 118,077,718 | 109,929,774 |
| c. Disability Benefits | 24,763,191 | 2,434,212 | 4,425,412 | 31,622,815 | 30,122,857 |
| d. Death Benefits | <u>20,899,042</u> | <u>1,909,010</u> | <u>3,393,670</u> | <u>26,201,722</u> | <u>25,226,001</u> |
| e. Total | \$ 1,911,969,294 | \$ 105,103,207 | \$ 179,395,597 | \$ 2,196,468,098 | \$ 2,087,924,638 |
| 2. Members with Deferred Benefits | | | | \$ 80,242,160 | \$ 70,812,660 |
| 3. Members Receiving Benefits | | | | | |
| a. Healthy Retirees | | | | \$ 2,481,348,289 | \$ 2,393,502,724 |
| b. Disabled Retirees | | | | 45,880,108 | 47,719,285 |
| c. Beneficiaries | | | | <u>197,304,611</u> | <u>192,935,928</u> |
| d. Total | | | | \$ 2,724,533,008 | \$ 2,634,157,937 |
| 4. Total | | | | \$ 5,001,243,266 | \$ 4,792,895,235 |

Tier 1: Hired before July 1, 2013

Tier 2: Hired between July 1, 2013 and December 31, 2015

Tier 3: Hired on or after January 1, 2016

Exhibit B.4
City of Phoenix Employees' Retirement System
Development of the Actuarially Determined Contribution

| | June 30, 2019 | June 30, 2018 |
|---|----------------------|----------------------|
| 1. Present Value of Projected Benefits | | |
| a. Retirees and Beneficiaries | \$ 2,724,533,008 | \$ 2,634,157,937 |
| b. Deferred vested members | 80,242,160 | 70,812,660 |
| c. Active members | <u>2,196,468,098</u> | <u>2,087,924,638</u> |
| d. Total [(a) + (b) + (c)] | \$ 5,001,243,266 | \$ 4,792,895,235 |
| 2. Present Value of Future Normal Costs | \$ 599,417,908 | \$ 566,849,424 |
| 3. Entry Age Normal Accrued Liability [(1) - (2)] | \$ 4,401,825,358 | \$ 4,226,045,811 |
| 4. Actuarial Value of Assets | <u>2,677,352,751</u> | <u>2,562,847,008</u> |
| 5. Unfunded Actuarial Accrued Liability [(3) - (4)] | \$ 1,724,472,607 | \$ 1,663,198,803 |
| Development of the Actuarially Determined Contribution | | |
| Fiscal Year Ending | June 30, 2021 | June 30, 2020 |
| 6. Entry Age Normal Cost | \$ 83,552,746 | \$ 78,976,084 |
| 7. Administrative Expenses | 841,094 | 400,149 |
| 8. Amortization of UAAL | <u>139,141,144</u> | <u>129,513,670</u> |
| 9. Actuarially Determined Contribution [(6) + (7) + (8)] | \$ 223,534,984 | \$ 208,889,903 |
| 10. Projected Payroll | \$ 578,796,076 | \$ 542,466,970 |
| 11. Actuarially Determined Contribution as a Percent of Compensation | 38.621% | 38.507% |

Exhibit B.5
City of Phoenix Employees' Retirement System
Actuarial Valuation Results
Summary of Contribution Rates and Estimated Amounts

| Fiscal Year Ending | June 30, 2021 | June 30, 2020 |
|--|-----------------------|-----------------------|
| 1. Total Contribution Rate | | |
| a. Total Normal Cost Rate | 14.44% | 14.56% |
| b. Administrative Expense Rate | 0.15% | 0.07% |
| c. Total UAL Contribution Rate | 24.04% | 23.87% |
| d. Total Projected Rate | 38.62% | 38.51% |
| 2. Member Contribution Rates | | |
| a. Tier 1 | 5.00% | 5.00% |
| b. Tier 2 | 11.00% | 11.00% |
| c. Tier 3 | 11.00% | 11.00% |
| 3. City Contribution Rates | | |
| a. Tier 1 | 33.62% | 33.51% |
| b. Tier 2 | 27.62% | 27.51% |
| c. Tier 3 | 27.62% | 27.51% |
| 4. Projected Payroll | | |
| a. Tier 1 | \$ 415,669,317 | \$ 415,973,533 |
| b. Tier 2 | 42,457,893 | 42,701,304 |
| c. Tier 3 | 120,668,866 | 83,792,133 |
| d. Total | \$ 578,796,076 | \$ 542,466,970 |
| 5. Estimated Contribution Amounts | | |
| a. Memebrs | \$ 38,727,409 | \$ 34,712,955 |
| b. City | 184,807,575 | 174,176,949 |
| c. Total | \$ 223,534,984 | \$ 208,889,904 |

Development of Actuarially Determined Contribution (Continued)

The Actuarially Determined Contribution (ADC) is calculated in accordance with the Funding Policy adopted by the Board. The unfunded accrued liability is amortized according to the following schedule. Please see Section G of this report for a full description of the funding policy.

| Exhibit B.6 | | | | | |
|---|---------------------------------------|--|---------------------------------------|--|--|
| City of Phoenix Employees' Retirement System | | | | | |
| Amortization of Unfunded Actuarial Liability as of June 30, 2019 | | | | | |
| Base Year | Remaining Base as of June 30, 2019 | Years Remaining as of June 30, 2019 | Remaining Base as of June 30, 2020 | Years Remaining as of June 30, 2020 | Amortization Payment For FYE June 30, 2021 |
| 2013 UAL | \$ 1,118,310,525 | 19 | \$ 1,110,744,192 | 18 | \$ 88,163,163 |
| 2013 Assumption Changes | 476,852,808 | 19 | 473,626,488 | 18 | 37,593,183 |
| 2014 Experience Gain | (59,004,096) | 19 | (58,604,883) | 18 | (4,651,649) |
| 2015 Experience Gain | (3,015,576) | 19 | (2,995,173) | 18 | (237,736) |
| 2015 Assumption Changes | 295,514,948 | 16 | 290,574,060 | 15 | 26,222,750 |
| 2016 Experience Gain | (33,411,991) | 19 | (33,185,930) | 18 | (2,634,069) |
| 2016 Plan Changes | (3,450,809) | 19 | (3,427,462) | 18 | (272,048) |
| 2016 Assumption Changes | (74,185,906) | 19 | (73,683,975) | 18 | (5,848,522) |
| 2017 Experience Loss | 10,273,488 | 18 | 10,173,836 | 17 | 839,901 |
| 2017 Assumption Changes | 2,577,700 | 18 | 2,552,696 | 17 | 210,738 |
| 2018 Experience Gain | (75,937,752) | 19 | (75,423,968) | 18 | (5,986,631) |
| 2019 Experience Loss | 69,949,269 | 20 | 75,020,592 | 19 | 5,742,064 |
| Total | \$ 1,724,472,607 | | \$ 1,715,370,473 | | \$ 139,141,144 |

The payment of the 2015 assumption changes was phased-in over four years. The first year payment was one-fourth of the regularly calculated amortization payment, increasing each year until the end of the phase-in period. The outstanding balance at the end of the phase-in period is then amortized such that the full amount is paid off by the end of the remaining period.

Exhibit B.7
City of Phoenix Employees' Retirement System
Plan Experience for Fiscal Year 2019

Liabilities

| | |
|--|------------------|
| 1. Actuarial Accrued Liability at June 30, 2018 | \$ 4,226,045,811 |
| 2. Normal Cost during Fiscal Year 2019 | 73,254,867 |
| 3. Benefit Payments during Fiscal Year 2019 | 237,388,719 |
| 4. Interest on Items 1-3 to End of Year | 300,542,570 |
| 5. Change in Actuarial Accrued Liability Due to Assumption Changes | 0 |
| 6. Change in Actuarial Accrued Liability Due to Provision Changes | 0 |
| 7. Expected Actuarial Accrued Liability at June 30, 2019 | 4,362,454,529 |
| 8. Actual Actuarial Accrued Liability at June 30, 2019 | 4,401,825,358 |
| 9. Liability (Gain)/Loss | 39,370,829 |

Assets

| | |
|--|------------------|
| 10. Actuarial Value of Assets at June 30, 2018 | \$ 2,562,847,008 |
| 11. Benefit Payments and Administrative Expenses during Fiscal Year 2019 | 238,181,531 |
| 12. Expected Contributions during Fiscal Year 2019 | 198,859,780 |
| 13. Interest on Items 10-12 to End of Year | 184,405,934 |
| 14. Expected Actuarial Value of Assets at June 30, 2019 | 2,707,931,191 |
| 15. Actual Actuarial Value of Assets at June 30, 2019 | 2,677,352,751 |
| 16. Total Asset and Contribution (Gain)/Loss | 30,578,440 |
| 16.(a) Asset (Gain)/Loss | 32,628,026 |
| 16.(b) Contribution (Gain)/Loss | (2,049,586) |

Total

| | |
|-----------------------------------|----------------------|
| 17. Total (Gain)/Loss [9. + 16.] | \$ 69,949,269 |
|-----------------------------------|----------------------|

Exhibit B.8
City of Phoenix Employees' Retirement System
Plan Experience for Fiscal Year 2019
(Gain)/Loss by Source

| | | |
|--|----|-------------------|
| 1. Liability (Gain)/Loss | | |
| a. Salary (Gain)/Loss | | 62,913,963 |
| b. New Members and Rehire (Gain)/Loss | | 5,224,681 |
| c. Withdrawal (Gain)/Loss | | (878,518) |
| d. Retirement (Gain)/Loss | | (6,871,389) |
| e. Annuitant Mortality (Gain)/Loss | | (320,791) |
| f. Difference Between Expected and Actual COLA | | (26,975,312) |
| g. Other Demographic (Gain)/Loss | | 6,278,195 |
| h. Total | | 39,370,829 |
| 2. Asset (Gain)/Loss | \$ | 32,628,026 |
| 3. Contribution (Gain)/Loss | \$ | (2,049,586) |
| 4. Total (Gain)/Loss | \$ | 69,949,269 |

Exhibit B.9
City of Phoenix Employees' Retirement System
Schedule of Funding Progress

| Actuarial Valuation Date | Actuarial Value of Assets | Actuarial Accrued Liability (AAL) | Unfunded AAL (UAAL) | Funded Ratio | Covered Payroll | UAAL as a Percentage of Covered Payroll |
|---------------------------------|----------------------------------|--|----------------------------|---------------------|------------------------|--|
| (1) | (2) | (3) | (4)=(3)-(2) | (5)=(2)/(3) | (6) | (7)=(4)/(6) |
| 6/30/2008 | \$ 1,908,414 | \$ 2,413,365 | \$ 504,951 | 79.1% | \$ 566,512 | 89.1% |
| 6/30/2009 | 1,895,148 | 2,518,094 | 622,946 | 75.3% | 539,468 | 115.5% |
| 6/30/2010 | 1,868,093 | 2,697,288 | 829,195 | 69.3% | 550,175 | 150.7% |
| 6/30/2011 | 1,834,620 | 2,752,909 | 918,289 | 66.7% | 513,322 | 178.9% |
| 6/30/2012 | 1,827,528 | 2,939,374 | 1,111,845 | 62.2% | 506,017 | 219.7% |
| 6/30/2013 | 1,961,939 | 3,055,606 | 1,093,668 | 64.2% | 508,032 | 215.3% |
| 6/30/2014 | 2,120,700 | 3,614,784 | 1,494,084 | 58.7% | 509,267 | 293.4% |
| 6/30/2015 | 2,202,923 | 3,975,908 | 1,772,985 | 55.4% | 484,853 | 365.7% |
| 6/30/2016 | 2,283,216 | 3,984,137 | 1,700,921 | 57.3% | 496,333 | 342.7% |
| 6/30/2017 | 2,402,707 | 4,129,452 | 1,726,745 | 58.2% | 521,709 | 331.0% |
| 6/30/2018 | 2,562,847 | 4,226,046 | 1,663,199 | 60.6% | 527,161 | 315.5% |
| 6/30/2019 | 2,677,353 | 4,401,825 | 1,724,473 | 60.8% | 562,989 | 306.3% |

Amounts in thousands

Exhibit B.10
City of Phoenix Employees' Retirement System
Solvency Test

| Valuation Date | Aggregated Accrued Liabilities for | | | | Actuarial Value of Assets | Portion of Accrued Liabilities Covered by Reported Assets | | |
|----------------|------------------------------------|--|-------------------------------------|---------------|---------------------------|---|-------------------|-----|
| | Active Members Contributions | Retirees Beneficiaries and Vested Terminations | Members (Employer Financed Portion) | [(5)-(2)]/(3) | | [(5)-(2)]/(3) | [(5)-(2)-(3)]/(4) | |
| | (2) | (3) | (4) | | | | | (6) |
| June 30, 2008 | \$ 433,742 | \$ 1,066,886 | \$ 912,737 | \$ 1,908,414 | 100.0% | 100.0% | 44.7% | |
| June 30, 2009 | 446,039 | 1,193,391 | 878,664 | 1,895,148 | 100.0% | 100.0% | 29.1% | |
| June 30, 2010 | 445,141 | 1,311,929 | 940,217 | 1,868,093 | 100.0% | 100.0% | 11.8% | |
| June 30, 2011 | 446,456 | 1,431,877 | 874,576 | 1,834,620 | 100.0% | 96.9% | 0.0% | |
| June 30, 2012 | 443,964 | 1,525,152 | 970,258 | 1,827,528 | 100.0% | 90.7% | 0.0% | |
| June 30, 2013 | 396,583 | 1,881,123 | 1,201,741 | 1,962,533 | 100.0% | 83.2% | 0.0% | |
| June 30, 2014 | 393,754 | 2,099,274 | 1,121,756 | 2,120,700 | 100.0% | 82.3% | 0.0% | |
| June 30, 2015 | 383,029 | 2,465,862 | 1,127,017 | 2,202,923 | 100.0% | 73.8% | 0.0% | |
| June 30, 2016 | 393,626 | 2,522,989 | 1,067,522 | 2,283,216 | 100.0% | 74.9% | 0.0% | |
| June 30, 2017 | 406,651 | 2,638,084 | 1,084,717 | 2,402,707 | 100.0% | 75.7% | 0.0% | |
| June 30, 2018 | 417,314 | 2,704,971 | 1,103,761 | 2,562,847 | 100.0% | 79.3% | 0.0% | |
| June 30, 2019 | 420,431 | 2,804,775 | 1,176,619 | 2,677,353 | 100.0% | 80.5% | 0.0% | |

Amounts in thousands

Exhibit B.11
City of Phoenix Employees' Retirement System
Analysis of Financial Experience
Dollar Amounts in Thousands

| Fiscal Year | 2019 | 2018 | 2017 | 2016 | 2015 | 2014 | 2013 | 2012 | 2011 | 2010 |
|---|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|----------------|----------------|
| 1. UAAL at Start of Year | \$ 1,663,199 | 1,726,745 | 1,700,921 | 1,772,985 | 1,494,084 | 1,516,915 | 1,111,845 | 918,289 | 829,195 | 622,946 |
| 2. Normal Cost for Year* | 74,048 | 73,449 | 73,256 | 80,757 | 75,310 | 78,331 | 71,828 | 77,366 | 80,099 | 78,731 |
| 3. Expected Contributions | (198,860) | (187,324) | (183,023) | (178,288) | (157,314) | (153,885) | (143,502) | (133,822) | (119,613) | (116,482) |
| 4. Assumed Investment Income Accrual on (1), (2) and (3) | <u>116,137</u> | <u>121,133</u> | <u>123,527</u> | <u>129,383</u> | <u>109,037</u> | <u>110,987</u> | <u>86,136</u> | <u>71,248</u> | <u>64,652</u> | <u>48,228</u> |
| 5. Expected UAAL Before Changes | \$ 1,654,524 | 1,734,003 | 1,714,681 | 1,804,836 | 1,521,117 | 1,552,347 | 1,126,307 | 933,081 | 854,333 | 633,424 |
| 6. Effect of Assumption/Method Changes | 0 | 0 | 2,420 | (69,420) | 254,870 | 0 | 423,247 | 0 | 0 | 0 |
| 7. Effect of Benefit Changes | <u>0</u> | <u>0</u> | <u>0</u> | <u>(3,229)</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> |
| 8. Expected UAAL After Changes | \$ 1,654,524 | 1,734,003 | 1,717,101 | 1,732,187 | 1,775,987 | 1,552,347 | 1,549,554 | 933,081 | 854,333 | 633,424 |
| 9. Actual UAAL | <u>1,724,473</u> | <u>1,663,199</u> | <u>1,726,745</u> | <u>1,700,921</u> | <u>1,772,985</u> | <u>1,494,084</u> | <u>1,516,915</u> | <u>1,111,845</u> | <u>918,289</u> | <u>829,195</u> |
| 10. Gain / (Loss) [8. - 9.] | \$ (69,949) | 70,804 | (9,644) | 31,266 | 3,002 | 58,263 | 32,639 | (178,764) | (63,956) | (195,771) |
| 11. As % of AAL at Start of Year | -1.66% | 1.71% | -0.24% | 0.80% | 0.10% | 1.70% | 1.10% | -6.50% | -2.40% | -7.80% |

* Includes administrative expenses beginning in 2017

SECTION C

PLAN ASSETS

Exhibit C.1
City of Phoenix Employees' Retirement System
Statement of Plan Net Assets

| | June 30, 2019 |
|--|-------------------------|
| Assets | |
| Cash and Cash Equivalents | \$ 46,599,679 |
| Investments, at fair value: | |
| Fixed income | 524,355,967 |
| Equity securities | 1,154,774,533 |
| Hedge funds | 110,368,704 |
| Real estate investments | 373,565,422 |
| International equities | 461,591,649 |
| Total investments | \$ 2,624,656,275 |
| Receivables: | |
| Employer contributions | 6,198,527 |
| Employee contributions | 1,331,056 |
| Dividends and Interest | 3,711,026 |
| Unsettled transactions | 14,906,264 |
| Other | 8,131,326 |
| Total receivables | \$ 34,278,199 |
| Total assets | \$ 2,705,534,153 |
| Accounts Payable | |
| Accrued investment expenses | 2,498,245 |
| Unsettled transactions | 22,930,032 |
| Other | 19,972,520 |
| Total payables | \$ 45,400,797 |
| Net assets held in trust for pension benefits | \$ 2,660,133,356 |

Exhibit C.2
City of Phoenix Employees' Retirement System
Statement of Changes in Plan Net Assets

| | <u>Year Ended June 30, 2019</u> | <u>Year Ended June 30, 2018</u> |
|--|-------------------------------------|-------------------------------------|
| Additions to Net Assets Attributed to: | | |
| Contributions | | |
| Employer contributions | \$ 165,796,485 | \$ 229,006,261 |
| Plan members contributions | 35,042,394 | 33,339,957 |
| Inter-system transfers | 374,972 | 484,140 |
| Total | <u>\$ 201,213,851</u> | <u>\$ 262,830,358</u> |
| Net Investment Income | | |
| Net appreciation in fair value of investments | 113,554,279 | 150,962,881 |
| Interest and dividends | 39,577,284 | 30,559,354 |
| Other | 5,106,080 | 2,064,266 |
| | <u>158,237,643</u> | <u>183,586,501</u> |
| Less Investment expense | <u>(15,275,344)</u> | <u>(17,073,054)</u> |
| Net investment income | <u>\$ 142,962,299</u> | <u>\$ 166,513,447</u> |
| Total additions | <u>\$ 344,176,150</u> | <u>\$ 429,343,805</u> |
| Deductions to Net Assets Attributed to: | | |
| Benefit payments | 234,301,348 | 224,453,753 |
| Refunds | 3,011,713 | 3,472,481 |
| Inter-system transfers | 450,630 | 134,013 |
| Administrative expenses | 792,812 | 377,179 |
| Total deductions | <u>\$ 238,556,503</u> | <u>\$ 228,437,426</u> |
| Change in net assets | 105,619,647 | 200,906,379 |
| Net assets held in trust for benefits: | | |
| Beginning of year | <u>2,554,513,709</u> | <u>2,353,607,330</u> |
| End of year | <u>\$ 2,660,133,356</u> | <u>\$ 2,554,513,709</u> |

Exhibit C.3
City of Phoenix Employees' Retirement System
Development of the Actuarial Value of Assets

| Item | Year Ending June 30, 2019 |
|--|------------------------------|
| 1. Actuarial Value of Assets, Beginning of Year | \$ 2,562,847,008 |
| 2. Net Cash Flow | \$ (37,342,652) |
| 3. Expected return | \$ 184,476,421 |
| 4. Actual Return | \$ 142,962,299 |
| 5. Excess return [(4) - (3)] | \$ (41,514,122) |
| 6. Gains/(Losses) | |
| a. Current Year | (41,514,122) |
| b. Prior Year | (8,907,765) |
| c. 2nd Prior Year | 73,480,315 |
| d. 3rd Prior Year | <u>(153,570,531)</u> |
| e. Total | (130,512,103) |
| 7. Phase-In Amount [25% of 6.e.] | \$ (32,628,026) |
| 8. Actuarial Value of Assets, End of Year [(1) + (2) + (3) + (7)] | \$ 2,677,352,751 |
| 9. Estimated Rate of Return | 5.97% |
| 10. Ratio of Actuarial to Market Value of Assets | 100.6% |

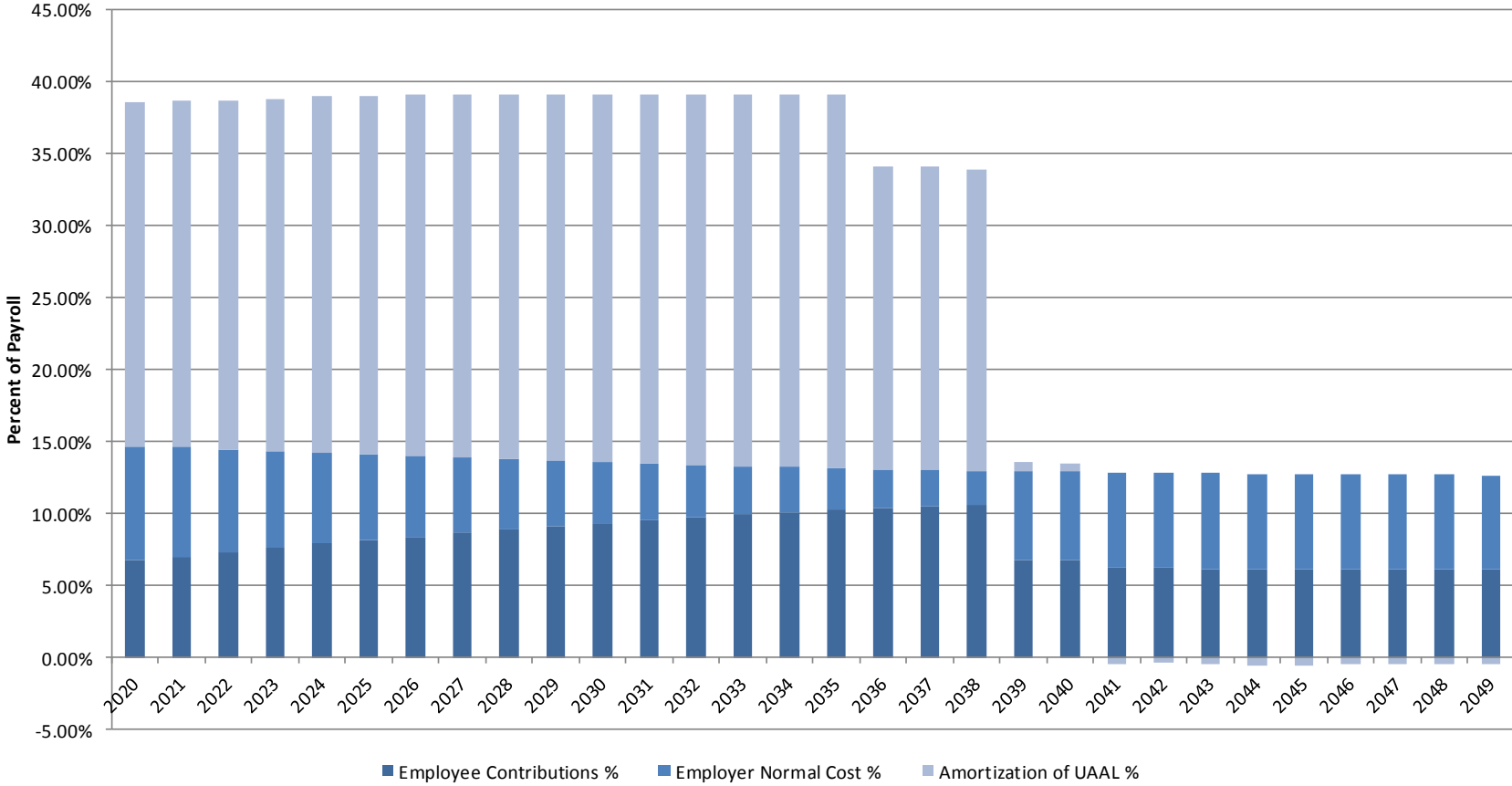
SECTION D

PROJECTIONS

**City of Phoenix Employees Retirement System
Projection Results Based on June 30, 2019 Actuarial Valuation**

| Valuation as of June 30, | Contribution for Fiscal Year End June 30, | Market Return for FY Beginning on Valuation Date | Payroll (in Millions) | Employee Contribution (%) of Payroll | Employer Normal Cost (% of Payroll) | Employer Amortization Payment (% of Payroll) | Total Employer Contribution (6)+(7) (% of Payroll) | Total Contribution (5)+(8) (% of Payroll) | Employee Contribution (4)*(5) (in Millions) | Employer Contribution (4)*(8) (in Millions) | Total Contribution (10)+(11) (in Millions) | Actuarial Accrued Liability (AAL, in Millions) | Actuarial Value of Assets (AVA, in Millions) | Unfunded Actuarial Accrued Liability (UAAL, in Millions) | Funded Ratio | Projected Benefit Payments in FY Following Val Date (in Millions) |
|--------------------------|---|--|-----------------------|--------------------------------------|-------------------------------------|--|--|---|---|---|--|--|--|--|--------------|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
| 2019 | 2020 | 7.25% | \$562 | 6.74% | 7.90% | 23.87% | 31.77% | 38.51% | \$38 | \$179 | \$216 | \$4,402 | \$2,677 | \$1,724 | 60.80% | \$247 |
| 2020 | 2021 | 7.25% | 579 | 7.02% | 7.57% | 24.04% | 31.60% | 38.62% | 41 | 183 | 224 | 4,547 | 2,845 | 1,703 | 62.60% | 262 |
| 2021 | 2022 | 7.25% | 589 | 7.32% | 7.11% | 24.18% | 31.29% | 38.61% | 43 | 184 | 228 | 4,688 | 2,997 | 1,691 | 63.90% | 276 |
| 2022 | 2023 | 7.25% | 601 | 7.60% | 6.70% | 24.46% | 31.16% | 38.76% | 46 | 187 | 233 | 4,826 | 3,152 | 1,674 | 65.30% | 290 |
| 2023 | 2024 | 7.25% | 614 | 7.88% | 6.30% | 24.78% | 31.08% | 38.95% | 48 | 191 | 239 | 4,960 | 3,319 | 1,641 | 66.90% | 303 |
| 2024 | 2025 | 7.25% | 628 | 8.14% | 5.92% | 24.94% | 30.85% | 38.99% | 51 | 194 | 245 | 5,092 | 3,492 | 1,600 | 68.60% | 316 |
| 2025 | 2026 | 7.25% | 642 | 8.39% | 5.55% | 25.07% | 30.63% | 39.01% | 54 | 197 | 250 | 5,220 | 3,670 | 1,550 | 70.30% | 330 |
| 2026 | 2027 | 7.25% | 657 | 8.63% | 5.20% | 25.19% | 30.39% | 39.02% | 57 | 200 | 256 | 5,346 | 3,853 | 1,493 | 72.10% | 343 |
| 2027 | 2028 | 7.25% | 673 | 8.86% | 4.86% | 25.30% | 30.17% | 39.03% | 60 | 203 | 263 | 5,468 | 4,041 | 1,427 | 73.90% | 357 |
| 2028 | 2029 | 7.25% | 689 | 9.09% | 4.54% | 25.43% | 29.96% | 39.05% | 63 | 206 | 269 | 5,586 | 4,235 | 1,351 | 75.80% | 371 |
| 2029 | 2030 | 7.25% | 705 | 9.31% | 4.22% | 25.53% | 29.76% | 39.07% | 66 | 210 | 276 | 5,700 | 4,436 | 1,264 | 77.80% | 384 |
| 2030 | 2031 | 7.25% | 723 | 9.52% | 3.93% | 25.63% | 29.56% | 39.08% | 69 | 214 | 282 | 5,810 | 4,644 | 1,166 | 79.90% | 398 |
| 2031 | 2032 | 7.25% | 741 | 9.72% | 3.64% | 25.72% | 29.37% | 39.08% | 72 | 218 | 290 | 5,915 | 4,860 | 1,056 | 82.20% | 411 |
| 2032 | 2033 | 7.25% | 760 | 9.90% | 3.38% | 25.81% | 29.19% | 39.09% | 75 | 222 | 297 | 6,017 | 5,085 | 932 | 84.50% | 424 |
| 2033 | 2034 | 7.25% | 779 | 10.07% | 3.13% | 25.88% | 29.01% | 39.09% | 78 | 226 | 305 | 6,115 | 5,321 | 793 | 87.00% | 436 |
| 2034 | 2035 | 7.25% | 800 | 10.23% | 2.91% | 25.94% | 28.85% | 39.07% | 82 | 231 | 313 | 6,209 | 5,570 | 639 | 89.70% | 447 |
| 2035 | 2036 | 7.25% | 822 | 10.37% | 2.71% | 21.01% | 23.72% | 34.08% | 85 | 195 | 280 | 6,301 | 5,833 | 468 | 92.60% | 458 |
| 2036 | 2037 | 7.25% | 845 | 10.49% | 2.52% | 21.03% | 23.55% | 34.04% | 89 | 199 | 288 | 6,391 | 6,070 | 320 | 95.00% | 468 |
| 2037 | 2038 | 7.25% | 868 | 10.60% | 2.36% | 20.85% | 23.20% | 33.80% | 92 | 201 | 294 | 6,479 | 6,322 | 157 | 97.60% | 477 |
| 2038 | 2039 | 7.25% | 893 | 6.77% | 6.14% | 0.63% | 6.77% | 13.53% | 60 | 60 | 121 | 6,568 | 6,589 | (21) | 100.30% | 484 |
| 2039 | 2040 | 7.25% | 920 | 6.74% | 6.13% | 0.61% | 6.74% | 13.47% | 62 | 62 | 124 | 6,658 | 6,689 | (31) | 100.50% | 491 |
| 2040 | 2041 | 7.25% | 947 | 6.17% | 6.65% | -0.48% | 6.17% | 12.35% | 58 | 58 | 117 | 6,751 | 6,792 | (41) | 100.60% | 497 |
| 2041 | 2042 | 7.25% | 976 | 6.21% | 6.59% | -0.38% | 6.21% | 12.41% | 61 | 61 | 121 | 6,848 | 6,890 | (42) | 100.60% | 502 |
| 2042 | 2043 | 7.25% | 1,006 | 6.16% | 6.60% | -0.44% | 6.16% | 12.32% | 62 | 62 | 124 | 6,951 | 6,994 | (43) | 100.60% | 506 |
| 2043 | 2044 | 7.25% | 1,038 | 6.08% | 6.65% | -0.57% | 6.08% | 12.16% | 63 | 63 | 126 | 7,060 | 7,104 | (43) | 100.60% | 510 |
| 2044 | 2045 | 7.25% | 1,071 | 6.08% | 6.64% | -0.56% | 6.08% | 12.16% | 65 | 65 | 130 | 7,177 | 7,220 | (42) | 100.60% | 514 |
| 2045 | 2046 | 7.25% | 1,104 | 6.08% | 6.61% | -0.53% | 6.08% | 12.17% | 67 | 67 | 134 | 7,303 | 7,344 | (41) | 100.60% | 519 |
| 2046 | 2047 | 7.25% | 1,138 | 6.09% | 6.59% | -0.50% | 6.09% | 12.18% | 69 | 69 | 139 | 7,436 | 7,476 | (41) | 100.50% | 525 |
| 2047 | 2048 | 7.25% | 1,173 | 6.09% | 6.57% | -0.48% | 6.09% | 12.18% | 71 | 71 | 143 | 7,576 | 7,616 | (40) | 100.50% | 533 |
| 2048 | 2049 | 7.25% | 1,208 | 6.09% | 6.55% | -0.46% | 6.09% | 12.19% | 74 | 74 | 147 | 7,723 | 7,763 | (40) | 100.50% | 541 |
| 2049 | 2050 | 7.25% | 1,244 | 6.10% | 6.54% | -0.44% | 6.10% | 12.20% | 76 | 76 | 152 | 7,876 | 7,915 | (39) | 100.50% | 550 |

Projected Contribution Rate for FYE June 30,



SECTION E

SUMMARY OF BENEFIT PROVISIONS

SUMMARY OF BENEFIT PROVISIONS

Membership

Full-time employees of the City of Phoenix other than police officers, firefighters, or elected officials who are covered by another retirement system to which the City contributes.

Members who were hired before July 1, 2013, as well as members who join the City after July 1, 2013 who were members of ASRS prior to July 1, 2011 and did not withdraw their contributions are Tier 1 members.

Members hired into employment with the City between July 1, 2013 and December 31, 2015 who are not Tier 1 members are Tier 2 members.

Members hired into employment with the City on or after January 1, 2016 who are not Tier 1 members or Tier 2 members are Tier 3 members.

Final Average Compensation (FAC)

Tier 1/Tier 2

The average of annual compensation for the period of 3 consecutive years producing the highest average contained within the last 10 years immediately preceding retirement.

Tier 3

The average of annual compensation for the period of 5 consecutive years producing the highest average contained within the last 10 years immediately preceding retirement. Annual compensation will be limited to the first \$125,000 of compensation, indexed to inflation (Phoenix Area CPI-U) each January 1, commencing on January 1, 2017.

Credited Service

Credited service is determined based on Section 14 of Chapter XXIV of the Phoenix City Charter as well as COPERS administrative policy number 43. In no case is more than a year of service credited to any member for all service rendered in any calendar year. The amount of service credited to members varies by Tier, as detailed below.

Tier 1

A member is credited with a month of service for each calendar month in which the member performs at least 10 days of City service. A member is credited with a year of service for any calendar year in which the member has at least 10 months of credited service. If a member has less than 10 months of credited service for any calendar year, they are credited for the actual number of months.

Tier 2/Tier 3

A member is credited with a month of service for each calendar month in which the member performs at least 20 days of City service. A member is credited with a year of service for any calendar year in which the member has at least 12 months of credited service. If a member has less than 12 months of credited service for any calendar year, they are credited for the actual number of months.

Voluntary Retirement (no reduction for age)

Tier 1

Eligibility:

Sum of age and credited service equals 80 or more, age 60 with 10 or more years of credited service or age 62 with 5 or more years of credited service.

Annual Benefit:

Unused sick leave service multiplied by 2% of FAC plus 2% of FAC times credited service up to 32.5 years plus 1% of FAC times service in excess of 32.5 years plus 0.5% of FAC times service in excess of 35.5 years. Minimum monthly pension is \$250 (\$500 if member has 15 or more years of service).

Tier 2/Tier3

Eligibility:

Sum of age and credited service equals 87 or more, age 60 with 10 or more years of credited service or age 62 with 5 or more years of credited service.

Annual Benefit:

Unused sick leave service multiplied by 2% of FAC for Tier 2 members only plus FAC times credited service times the corresponding accrual rate:

| Tier 2 | | Tier 3 | |
|------------------|--------------|------------------|--------------|
| Years of Service | Accrual Rate | Years of Service | Accrual Rate |
| 0<Service≤20 | 2.10% | 0<Service≤10 | 1.85% |
| 20<Service≤25 | 2.15% | 10<Service≤20 | 1.90% |
| 25<Service≤30 | 2.20% | 20<Service≤30 | 2.00% |
| Service>30 | 2.30% | Service>30 | 2.10% |

Note that for Tier 2 and Tier 3, the same accrual rate will apply for each year of service based on the total years of service.

Deferred Vested Retirement

Eligibility:

Termination of City employment prior to age 62 with 5 or more years of credited service.

Annual Benefit:

Accrued regular retirement amount based on credited service, unused sick leave service, and FAC at time of termination, payable beginning at age 62.

Duty Disability Retirement

Eligibility:

Total and permanent disability incurred in line of duty with the City.

Annual Benefit:

Computed in the same manner as the regular retirement amount base on FAC and credited service at time of disability retirement. Minimum is 15% of FAC for Tier 1 members and 15.75% for Tier 2 and Tier 3 members. Maximum during worker's compensation period is difference between final compensation and annualized workers compensation. At expiration of worker's compensation period, amount is recomputed to include years during which worker's compensation was paid.

Non-Duty Disability Retirement

Eligibility:

Total and permanent disability after 10 or more years of credited service.

Annual Benefit:

Computed in the same manner as the regular retirement amount base on FAC and credited service at time of disability retirement.

Pre-Retirement Duty Death Benefit

Eligibility:

Death in line of duty with the City and compensable under worker's compensation.

Annual Benefit:

To the spouse: Joint and 100% survivor actuarial equivalent of accrued regular retirement amount based on FAC and credited service and unused sick leave service at time of death. Minimum of 10 years of service is credited. To the children of a deceased member with 10 or more years of credited service: each child shall receive a monthly pension of \$200 until adoption, marriage, death or attainment of age 18.

Pre-Retirement Non-Duty Death Benefit

Eligibility:

10 or more years of credited service.

Annual Benefit:

Same as Pre-Retirement Duty Death Benefit.

Refund of Contributions

Eligibility:

Termination of covered service employment prior to eligibility for any other benefits.

Annual Benefit:

Accumulated member contribution with interest at no more than 3.75% annually after July 1, 2016.

Pension Equalization Reserve (PER)

The PER is credited with Excess Earnings, if any, each calendar year. Excess Earnings are defined as the excess over 8.0% of the annual average of the time-weighted rates of return for the immediately preceding five calendar years. The amounts credited to the PER are either used to fund percentage increases to pension amounts or one-time post retirement distribution benefits (13th checks).

On July 1 of each year, persons in receipt of a pension for at least 36 months receive a percentage increase based on the lesser of:

- i. Phoenix area Consumer Price Index (CPI) and
- ii. The amount the balance in the PER can fully fund

The increase, subject to the availability of funds in the PER, is payable beginning with the April 1 payment each year, retroactive to January 1 of the same year.

Also, after each plan year's return is known, all pensioners (excluding minors) as of the end of the plan year are eligible to receive a one-time post retirement distribution (13th check). The 13th check is a percentage of the pensioner's annual benefits based on the lesser of:

- i. One half of the Phoenix area Consumer Price Index (CPI) and
- ii. The excess of the rate of return over the assumed interest rate

The percentage cannot be more than three percent, but must be at least one percent and is subject to the availability of funds in the PER. The 13th check is payable on December 1.

The PER is only applicable for Tiers 1 and 2.

Projected Percentage

Actuarially determined normal cost rate plus an amortization rate on the unfunded actuarial liability and a rate for administrative expenses, stated as a percentage of projected member compensation.

Member Contribution Rates

Tier 1: 5% of pay
Tier 2/Tier 3: 50% of the Projected Percentage not to exceed 11% of pay on or after January 1, 2016

City Contribution Rates

Total Projected Percentage less Member Contribution Rates for each Tier.

Note: The summary of plan provisions is designed to outline principal plan benefits. If COPERS should find the plan summary not in accordance with the actual plan provisions, the actuary should immediately be alerted so the proper provisions are valued.

SECTION F

SUMMARY OF PARTICIPANT DATA

Exhibit F.1
City of Phoenix Employees' Retirement System
Summary of Census Data

| | June 30, 2019 | June 30, 2018 |
|---|----------------|----------------|
| 1. Active Members | | |
| a. Counts | 7,941 | 7,977 |
| b. Annual Compensation | \$ 562,988,925 | \$ 527,160,824 |
| c. Average Annual Compensation | \$ 70,896 | \$ 66,085 |
| d. Average Age | 46.6 | 46.6 |
| e. Average Service | 12.2 | 12.4 |
| 2. Deferred Vested Members | | |
| a. Counts | 1,008 | 943 |
| b. Annual Deferred Benefits | \$ 13,619,208 | \$ 12,167,691 |
| c. Average Benefit | \$ 13,511 | \$ 12,903 |
| 3. Retired Members | | |
| a. Counts | 6,013 | 5,813 |
| b. Annual Benefits | \$ 210,707,173 | \$ 202,550,837 |
| c. Average Benefit | \$ 35,042 | \$ 34,844 |
| 4. Disability | | |
| a. Counts | 245 | 249 |
| b. Annual Deferred Benefits | \$ 3,963,226 | \$ 4,069,714 |
| c. Average Benefit | \$ 16,176 | \$ 16,344 |
| 5. Beneficiaries and QDROs | | |
| a. Counts | 1,110 | 1,076 |
| b. Annual Benefits | \$ 22,007,859 | \$ 21,231,243 |
| c. Average Benefit | \$ 19,827 | \$ 19,732 |
| 6. Total Members Included in Valuation | 16,317 | 16,058 |

Exhibit F.2
Summary of Changes in Participant Status
During Fiscal Year 2019

| | Active Participants | With Deferred Benefits | Retirees | Disability | QDROs | Beneficiaries | Total |
|-------------------------------|---------------------|------------------------|----------|------------|-------|---------------|--------|
| A. Number as of June 30, 2018 | 7,977 | 943 | 5,813 | 249 | 164 | 912 | 16,058 |
| 1. Age Retirements | (309) | (37) | 346 | | | | 0 |
| 2. Disability | (2) | (2) | | 4 | | | 0 |
| 3. Deceased | (9) | | (147) | (8) | (8) | (36) | (208) |
| 4. New Beneficiary | | | | | 20 | 64 | 84 |
| 5. Terminated - Vested | (135) | 135 | | | | | 0 |
| 6. Terminated - Nonvested | (309) | | | | | | (309) |
| 7. Cashouts | | (14) | | | | | (14) |
| 8. Benefits Expired | | | | | (3) | (3) | (6) |
| 9. Rehired as Active | 16 | (16) | | | | | 0 |
| 10. New Members | 712 | | | | | | 712 |
| 11. Data Corrections | | (1) | 1 | | | | 0 |
| B. Number as of June 30, 2019 | 7,941 | 1,008 | 6,013 | 245 | 173 | 937 | 16,317 |

Exhibit F.3
Active Member Counts by Age and Service
as of June 30, 2019

| Age | Service | | | | | | | Total |
|-----------------|---------|-----|-------|-------|-------|-------|---------|-------|
| | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | Over 30 | |
| Under 20 | 4 | | | | | | | 4 |
| 20-24 | 150 | | | | | | | 150 |
| 25-29 | 414 | 26 | 2 | | | | | 442 |
| 30-34 | 429 | 90 | 117 | 6 | | | | 642 |
| 35-39 | 389 | 105 | 265 | 111 | 6 | | | 876 |
| 40-44 | 347 | 116 | 252 | 251 | 108 | 1 | | 1,075 |
| 45-49 | 320 | 104 | 271 | 331 | 228 | 75 | 5 | 1,334 |
| 50-54 | 240 | 90 | 229 | 285 | 257 | 170 | 41 | 1,312 |
| 55-59 | 202 | 87 | 217 | 250 | 234 | 110 | 87 | 1,187 |
| 60-64 | 112 | 48 | 127 | 155 | 100 | 58 | 65 | 665 |
| Over 65 | 32 | 10 | 59 | 49 | 42 | 28 | 34 | 254 |
| Total | 2,639 | 676 | 1,539 | 1,438 | 975 | 442 | 232 | 7,941 |

Exhibit F.4
Active Member Average Salary by Age and Service
as of June 30, 2019

| Age | Service | | | | | | | Total |
|-----------------|----------|--------|--------|--------|--------|--------|---------|----------|
| | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | Over 30 | |
| Under 20 | \$41,626 | | | | | | | \$41,626 |
| 20-24 | 44,659 | | | | | | | 44,659 |
| 25-29 | 50,934 | 59,850 | * | | | | | 50,903 |
| 30-34 | 54,748 | 70,411 | 65,420 | 70,566 | | | | 59,037 |
| 35-39 | 56,924 | 71,314 | 72,895 | 75,875 | 77,420 | | | 66,576 |
| 40-44 | 60,351 | 73,938 | 75,698 | 79,693 | 80,315 | * | | 71,923 |
| 45-49 | 61,347 | 72,990 | 72,905 | 83,080 | 87,018 | 93,221 | 92,618 | 76,378 |
| 50-54 | 62,285 | 70,283 | 72,092 | 74,958 | 85,475 | 89,765 | 92,565 | 76,392 |
| 55-59 | 61,225 | 73,067 | 68,401 | 75,562 | 80,684 | 83,048 | 81,690 | 73,723 |
| 60-64 | 72,472 | 83,369 | 71,729 | 74,615 | 77,256 | 88,544 | 85,362 | 77,212 |
| Over 65 | 62,261 | 88,125 | 71,923 | 72,105 | 77,163 | 80,139 | 86,309 | 75,261 |
| Total | \$58,073 | 72,654 | 71,887 | 77,677 | 82,864 | 87,885 | 85,553 | \$70,896 |

*Average salary not shown for fields with less than four active members.

Exhibit F.5
Summary of Inactive Vested Members

| Age | Number of Members | Monthly Benefit |
|------------|--------------------------|------------------------|
| <30 | 4 | \$2,045 |
| 30-34 | 53 | 35,320 |
| 35-39 | 107 | 89,509 |
| 40-44 | 152 | 174,722 |
| 45-49 | 202 | 240,040 |
| 50-54 | 211 | 264,525 |
| 55-59 | 194 | 238,999 |
| 60-64 | 82 | 87,585 |
| 65& Up | 3 | 2,188 |

**Exhibit F.6
Summary of Members in Pay Status**

| Age | Service Retirees | | Disabled Retirees | | Beneficiaries/QDROs | |
|---------|-------------------|----------------|-------------------|----------------|---------------------|----------------|
| | Number of Members | Annual Benefit | Number of Members | Annual Benefit | Number of Members | Annual Benefit |
| <55 | 168 | \$8,337,522 | 39 | \$739,093 | 73 | \$1,027,035 |
| 55-59 | 594 | \$27,975,555 | 39 | \$675,211 | 44 | \$1,012,484 |
| 60-64 | 1178 | \$46,738,047 | 53 | \$806,213 | 58 | \$1,556,275 |
| 65-69 | 1499 | \$51,740,803 | 53 | \$895,837 | 122 | \$2,576,634 |
| 70-74 | 1193 | \$38,560,397 | 24 | \$330,842 | 134 | \$3,254,087 |
| 75-79 | 689 | \$20,062,055 | 14 | \$179,002 | 148 | \$3,534,062 |
| 80-84 | 390 | \$10,139,844 | 15 | \$230,576 | 139 | \$2,817,916 |
| 85-89 | 186 | \$4,771,025 | 7 | \$85,018 | 141 | \$2,532,783 |
| 90 & Up | 116 | \$2,381,925 | 1 | \$21,434 | 78 | \$1,359,130 |

Exhibit F.7
Schedule of Retired Members Added to and Removed from Rolls
as of June 30, 2019

| Year Ended | Added to Rolls | | Removed | | Total | | Average Annual Pensions | % Increase in Pensions |
|------------|----------------|-----------------|---------|-----------------|-------|-----------------|-------------------------|------------------------|
| | Count | Annual Pensions | Count | Annual Pensions | Count | Annual Pensions | | |
| 6/30/2010 | 432 | 15,259 | 170 | 3,206 | 4,931 | 138,273 | 28,042 | 9.5% |
| 6/30/2011 | 444 | 15,251 | 184 | 3,574 | 5,191 | 149,950 | 28,887 | 8.4 |
| 6/30/2012 | 448 | 14,488 | 161 | 4,174 | 5,478 | 160,264 | 29,256 | 6.9 |
| 6/30/2013 | 426 | 12,574 | 201 | 3,996 | 5,703 | 168,843 | 29,606 | 5.4 |
| 6/30/2014 | 597 | 21,948 | 145 | 3,232 | 6,155 | 187,559 | 30,473 | 11.1 |
| 6/30/2015 | 578 | 22,483 | 192 | 4,225 | 6,541 | 205,816 | 31,466 | 9.7 |
| 6/30/2016 | 375 | 11,573 | 182 | 4,329 | 6,734 | 213,061 | 31,640 | 3.5 |
| 6/30/2017 | 321 | 9,317 | 233 | 4,395 | 6,822 | 218,364 | 32,009 | 2.5 |
| 6/30/2018 | 370 | 11,314 | 218 | 4,825 | 6,974 | 225,644 | 32,355 | 3.3 |
| 6/30/2019 | 417 | 13,109 | 196 | 4,398 | 7,195 | 234,341 | 32,570 | 3.9 |

Note: The dollar amounts of the pensions added to and removed from the rolls for years prior to June 30, 2017 were determined by prior actuaries. The amounts added to the rolls includes additions and deletions due to PER increases, in addition to the annual pensions for new retirees.

Exhibit F.8
Schedule of Retired Members by Type
as of June 30, 2019

| Monthly Benefit | # of Retirees | Type of Retirement | | | | | | |
|-------------------|---------------|--------------------|---------------------|-----------------|---------------------|------------------|---------------|-----------------|
| | | Deferred | Normal or Voluntary | Duty Disability | Non-Duty Disability | Survivor Payment | Death Benefit | Alternate Payee |
| Deferred | 1,008 | 1,008 | | | | | | |
| \$1 - \$300 | 92 | | 45 | 1 | 0 | 14 | 19 | 13 |
| \$301 - \$400 | 135 | | 88 | 5 | 1 | 28 | 3 | 10 |
| \$401 - \$500 | 138 | | 93 | 6 | 2 | 29 | 1 | 7 |
| \$501 - \$600 | 142 | | 96 | 4 | 4 | 25 | 3 | 10 |
| \$601 - \$700 | 165 | | 87 | 3 | 9 | 48 | 5 | 13 |
| \$701 - \$800 | 177 | | 103 | 2 | 12 | 38 | 8 | 14 |
| \$801 - \$900 | 189 | | 114 | 5 | 21 | 32 | 8 | 9 |
| \$901 - \$1,000 | 182 | | 103 | 1 | 13 | 48 | 4 | 13 |
| \$1,001 - \$1,100 | 208 | | 120 | 4 | 13 | 48 | 10 | 13 |
| \$1,101 - \$1,200 | 203 | | 133 | 1 | 15 | 35 | 5 | 14 |
| \$1,201 - \$1,300 | 173 | | 121 | 1 | 15 | 24 | 4 | 8 |
| \$1,301 - \$1,400 | 183 | | 119 | 0 | 16 | 32 | 7 | 9 |
| \$1,401 - \$1,500 | 177 | | 130 | 3 | 5 | 27 | 9 | 3 |
| \$1,501 - \$2,000 | 836 | | 648 | 14 | 37 | 87 | 32 | 18 |
| \$2,001 - \$2,500 | 903 | | 771 | 1 | 12 | 97 | 12 | 10 |
| \$2,501 - \$3,000 | 800 | | 719 | 0 | 9 | 56 | 11 | 5 |
| \$3,001 - \$4,000 | 1,224 | | 1,145 | 0 | 8 | 57 | 13 | 1 |
| \$4,001 - \$5,000 | 704 | | 675 | 0 | 2 | 19 | 6 | 2 |
| \$5,001 + | 737 | | 703 | 0 | 0 | 30 | 3 | 1 |
| Total | 8,376 | 1,008 | 6,013 | 51 | 194 | 774 | 163 | 173 |

SECTION G

ACTUARIAL ASSUMPTIONS AND METHODS

SUMMARY OF ACTUARIAL METHODS AND ASSUMPTIONS

I. Valuation Date

The valuation date is June 30th of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

II. Actuarial Cost Method

The actuarial valuation uses the Entry Age Normal actuarial cost method. Under this method, the employer contribution rate is the sum of (i) the employer normal cost rate, and (ii) a rate that will amortize the unfunded actuarial liability.

1. The valuation is prepared on the projected benefit basis. The present value of each participant's expected benefit payable at retirement or termination is determined, based on age, service, sex, compensation, and the interest rate assumed to be earned in the future (7.25%). The calculations take into account the probability of a participant's death or termination of employment prior to becoming eligible for a benefit, as well as the possibility of his terminating with a service benefit. Future salary increases are also anticipated. The present value of the expected benefits payable on account of the active participants is added to the present value of the expected future payments to retired participants and beneficiaries to obtain the present value of all expected benefits payable from the Plan on account of the present group of participants and beneficiaries.
2. The employer contributions required to support the benefits of the Plan are determined following a level percent of pay funding approach, and consist of a normal cost contribution and an unfunded accrued liability contribution, plus a component to cover administrative expenses.
3. The normal cost and the allocation of benefit values between service rendered before and after the valuation date were determined using the individual entry age actuarial cost method having the following characteristics of (i) the annual normal costs for each active member, payable from the date of entry into the system to the date of retirement, are sufficient to accumulate the value of the member's benefit at the time of retirement, and (ii) each annual normal cost is constant percentage of the member's year-by-year projected covered pay.
4. The unfunded accrued liability contributions are determined by subtracting the actuarial value of assets from the actuarial accrued liability. Amortization bases are established each year and amortized over periods in accordance with the following amortization methods.
 - a. The UAL as of June 30, 2013, developed prior to implementing the September 2013 assumption changes, is amortized over a closed 25-year period as a level percentage of payroll.

- b. The impact of the September 2013 assumption changes on the UAL is amortized over a closed 25-year period as a level percentage of payroll with a four-year phase-in to the full amortization rate. The phase-in is calculated by multiplying the first year amortization payment by 25 percent. For the second year, the amortization schedule is recalculated reflecting the 25 percent payment in the first year and the remaining 24-year period and the calculated amortization payment is then multiplied by 50 percent. The process is repeated until the full amortization payment is made beginning in the fourth year of the 25-year period.
- c. The impact of the August 2015 assumption changes on the UAL is amortized over a closed 20-year period as a level percentage of payroll with a four-year phase-in to the full amortization rate. The phase-in is calculated by multiplying the first year amortization payment by 25 percent. For the second year, the amortization schedule is recalculated reflecting the 25 percent payment in the first year and the remaining 19-year period and the calculated amortization payment is then multiplied by 50 percent. The process is repeated until the full amortization payment is made beginning in the fourth year of the 20-year period.
- d. Future gains and losses are amortized over closed 20-year periods as a level percentage of payroll from the valuation date in which they are first recognized. However, gains will not be amortized over a shorter period than the remaining period on the amortization of the 2013 UAL.

III. Actuarial Value of Assets

The actuarial value of assets is determined by recognizing market value gains and losses over a four-year period. Gain and loss bases to be spread over the four-year period are determined by comparing expected returns based on the market value of assets and cash flows during the year to actual investment returns. The actuarial value of assets must be between 80 and 120% of market value.

IV. Actuarial Assumptions

A. Economic Assumptions

1. Investment return: 7.25% per annum, compounded annually. Inflation is assumed to be 2.50%.
2. Salary increase rate: Individual salary increases are composed of a price inflation component, a real wage growth component, and a merit or longevity component that varies by age. The table below combines the various components of salary increases for sample ages. Growth in the total payroll is assumed to be 3.00%.

| Sample Attained Age | Percentage Increase in Salary | | | |
|---------------------|-------------------------------|------------------|--------------------|--------|
| | Price Inflation | Real Wage Growth | Merit or Longevity | Total |
| 20 | 2.50 % | 0.50 % | 6.60 % | 9.60 % |
| 25 | 2.50 | 0.50 | 5.00 | 8.00 |
| 30 | 2.50 | 0.50 | 3.65 | 6.65 |
| 35 | 2.50 | 0.50 | 2.60 | 5.60 |
| 40 | 2.50 | 0.50 | 1.85 | 4.85 |
| 45 | 2.50 | 0.50 | 1.25 | 4.25 |
| 50 | 2.50 | 0.50 | 0.75 | 3.75 |
| 55 | 2.50 | 0.50 | 0.40 | 3.40 |
| 60 | 2.50 | 0.50 | 0.15 | 3.15 |
| 65 | 2.50 | 0.50 | 0.00 | 3.00 |

3. COLA Due to Pension Equalization Reserve (PER): In September 2013, the Board first adopted an assumption valuing future benefits payable through the PER as a 1.5% annual compound cost-of-living adjustment (COLA). The PER only applies to Tier 1 and Tier 2 benefits. In August 2017, the assumption was lowered to 1.25% effective with the June 30, 2017 valuation.
4. Administrative expenses are assumed to be equal to the prior year's amount, increased by 3.00%.
5. Tier 3 capped pay was assumed to be \$132,649 at the valuation date.

B. Demographic Assumptions

1. Rates of Mortality for Healthy and Disabled Lives: Mortality rates are based on the sex-distinct employee and annuitant mortality tables described below, including adjustment factors applied to the published tables for each group. Half of active member deaths are assumed to be duty related. Future mortality improvements are reflected by applying the MP-2015 projection scale on a generational basis to the adjusted base tables from the base year shown below.

(i) Non-Annuitant – CalPERS employee mortality table without scale BB projection

| Gender | Adjustment Factor | Base Year |
|---------------|-------------------|-----------|
| <i>Male</i> | 1.054 | 2009 |
| <i>Female</i> | 1.112 | 2009 |

(ii) Healthy Annuitant – CalPERS healthy annuitant mortality table without scale BB projection

| Gender | Adjustment Factor | Base Year |
|---------------|-------------------|-----------|
| <i>Male</i> | 1.019 | 2009 |
| <i>Female</i> | 1.061 | 2009 |

(iii) Disabled Annuitant –RP-2014 Disabled Annuitant Mortality Tables without MP-2014 projection

| Gender | Adjustment Factor | Base Year |
|---------------|-------------------|-----------|
| <i>Male</i> | 0.984 | 2006 |
| <i>Female</i> | 1.038 | 2006 |

Sample rates, including projections to 2019, are shown below (not including adjustment factors).

| Sample Attained Ages | Probability of Death Pre-Retirement | |
|----------------------|-------------------------------------|---------|
| | Men | Women |
| 20 | 0.024 % | 0.016 % |
| 25 | 0.032 | 0.020 |
| 30 | 0.041 | 0.023 |
| 35 | 0.050 | 0.036 |
| 40 | 0.065 | 0.049 |
| 45 | 0.090 | 0.065 |
| 50 | 0.130 | 0.091 |
| 55 | 0.206 | 0.140 |
| 60 | 0.322 | 0.207 |
| 65 | 0.468 | 0.295 |
| 70 | 0.631 | 0.405 |
| 75 | 0.843 | 0.581 |
| 80 | 1.175 | 0.918 |
| 85 | 8.340 | 5.952 |
| 90 | 14.360 | 11.010 |

| Sample Attained Ages | Probability of Death Post-Retirement | |
|----------------------|--------------------------------------|---------|
| | Men | Women |
| 20 | 0.019 % | 0.013 % |
| 25 | 0.023 | 0.018 |
| 30 | 0.032 | 0.026 |
| 35 | 0.053 | 0.047 |
| 40 | 0.096 | 0.089 |
| 45 | 0.193 | 0.184 |
| 50 | 0.420 | 0.425 |
| 55 | 0.540 | 0.423 |
| 60 | 0.742 | 0.496 |
| 65 | 0.970 | 0.674 |
| 70 | 1.573 | 1.098 |
| 75 | 2.607 | 1.903 |
| 80 | 4.629 | 3.271 |
| 85 | 8.340 | 5.952 |
| 90 | 14.360 | 11.010 |

| Sample Attained Ages | Probability of Death Post-Disability | |
|----------------------|--------------------------------------|---------|
| | Men | Women |
| 20 | 0.580 % | 0.190 % |
| 25 | 0.663 | 0.192 |
| 30 | 0.599 | 0.237 |
| 35 | 0.760 | 0.394 |
| 40 | 1.011 | 0.580 |
| 45 | 1.581 | 0.869 |
| 50 | 1.762 | 1.021 |
| 55 | 2.011 | 1.345 |
| 60 | 2.480 | 1.769 |
| 65 | 3.250 | 2.211 |
| 70 | 4.200 | 2.848 |
| 75 | 5.623 | 4.084 |
| 80 | 7.952 | 6.196 |
| 85 | 11.688 | 9.347 |
| 90 | 17.508 | 13.685 |

3. Disability rates. The disability incidence rates are 0.960 times the CalPERS Public Agency Miscellaneous Ordinary Disability Incidence table for Males. Half of disabilities are assumed to be duty related. Sample disability rates of active members are provided in the table below. There rates apply to both male and female COPERS member.

| Sample Attained Ages | Probability of Disablement |
|----------------------|----------------------------|
| 25 | 0.0163 % |
| 30 | 0.0183 |
| 35 | 0.0471 |
| 40 | 0.1172 |
| 45 | 0.1834 |
| 50 | 0.2046 |
| 55 | 0.2122 |
| 60 | 0.2132 |

4. Termination rates (for causes other than death, disability or retirement): Termination rates are based on age and service. Termination rates are not applied after a member becomes eligible for a retirement benefit. Rates at selected ages are shown:

| Probability of Termination | | | | | | |
|----------------------------|------------------|---------|--------|--------|--------|--------|
| Age | Years of Service | | | | | |
| | 0 | 1 | 2 | 3 | 4 | 5+ |
| 20 | 17.00 % | 15.00 % | 9.00 % | 8.00 % | 6.25 % | 5.50 % |
| 25 | 17.00 | 15.00 | 9.00 | 8.00 | 6.25 | 5.50 |
| 30 | 15.00 | 11.25 | 8.00 | 6.75 | 5.25 | 4.50 |
| 35 | 15.00 | 8.75 | 7.00 | 5.50 | 4.50 | 3.50 |
| 40 | 15.00 | 7.50 | 6.25 | 4.50 | 4.00 | 2.75 |
| 45 | 15.00 | 6.50 | 5.50 | 4.50 | 4.00 | 2.25 |
| 50 | 15.00 | 6.50 | 5.50 | 4.50 | 4.00 | 2.00 |
| 55 | 15.00 | 6.50 | 5.50 | 4.50 | 4.00 | 2.00 |
| 60 | 15.00 | 6.50 | 5.50 | 4.50 | 4.00 | 2.00 |

5. Retirement rates.

| Probability of Retirement | | | | |
|---------------------------|------------------|--------|---------|---------|
| Age | Years of Service | | | |
| | <15 | 15-24 | 25-31 | >31 |
| 50-51 | 0.00 % | 0.00 % | 40.00 % | 40.00 % |
| 52 | 0.00 | 0.00 | 35.00 | 40.00 |
| 53 | 0.00 | 0.00 | 32.50 | 32.50 |
| 54 | 0.00 | 22.50 | 27.50 | 32.50 |
| 55-58 | 0.00 | 22.50 | 22.50 | 32.50 |
| 59 | 0.00 | 22.50 | 22.50 | 42.50 |
| 60 | 10.00 | 22.50 | 27.50 | 42.50 |
| 61 | 17.00 | 22.50 | 32.50 | 42.50 |
| 62 | 17.00 | 30.00 | 32.50 | 42.50 |
| 63 | 17.00 | 25.00 | 32.50 | 42.50 |
| 64 | 17.00 | 25.00 | 37.50 | 42.50 |
| 65 | 30.00 | 32.50 | 40.00 | 42.50 |
| 66-69 | 25.00 | 32.50 | 40.00 | 42.50 |
| 70 | 100.00 | 100.00 | 100.00 | 100.00 |

C. Other Assumptions

1. Percent married: 90% of employees are assumed to be married.
2. Age difference: Male members are assumed to be three years older than their spouses, and female members are assumed to be three years younger than their spouses.
3. Unused Vacation and Compensatory Time: For Tier 1 and Tier 2 members, compensatory service credits and lump sum payments for unused vacation and compensatory time are assumed to increase the present value of normal retirement benefits by 9.0%. No increase to the present value of normal retirement benefits was assumed for Tier 3 members.
4. Member Contribution Crediting Rate: Member contributions are credited with interest at 3.75% per annum.

SECTION H

RISKS ASSOCIATED WITH MEASURING THE ACCRUED LIABILITY

Risks Associated With Measuring the Accrued Liability and Actuarially Determined Contribution

The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

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 due to changing conditions; 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. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

1. Investment risk – actual investment returns may differ from the expected returns;
2. Asset/Liability mismatch – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. Contribution risk – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. Salary and Payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. Longevity risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed;
6. Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

The computed contribution rate shown on Exhibit B.5 may be considered as a minimum contribution rate that complies with the Board’s funding policy. The timely receipt of the actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

Plan Maturity Measures

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures include the following:

| | <u>June 30, 2019</u> | <u>June 30, 2018</u> |
|--|----------------------|----------------------|
| Ratio of the market value of assets to total payroll | 4.6 | 4.7 |
| Ratio of actuarial accrued liability to payroll | 7.6 | 7.8 |
| Ratio of actives to retirees and beneficiaries | 1.1 | 1.1 |
| Ratio of net cash flows to market value of assets | -1% | 1% |
| Duration of the actuarial accrued liability | 12.1 | 12.1 |

Ratio of Market Value of Assets to Payroll

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 4.0 times the payroll, a return on assets 5% different than assumed would equal 20% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

Ratio of Actuarial Accrued Liability to Payroll

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

The ratio of liability to payroll may also be used as a measure of sensitivity of the liability itself. For example, if the actuarial accrued liability is 5.5 times the payroll, a change in liability 2% other than assumed would equal 11% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

Ratio of Actives to Retirees and Beneficiaries

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

Ratio of Net Cash Flow to Market Value of Assets

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

Duration of Actuarial Accrued Liability

The duration of the actuarial accrued liability may be used to approximate the sensitivity to a 1% change in the assumed rate of return. For example, duration of 10 indicates that the liability would increase approximately 10% if the assumed rate of return were lowered 1%.

Additional Risk Assessment

Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability