City of Phoenix Employees' Retirement System

ACTUARIAL VALUATION REPORT AS OF

June 30, 2022

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September 30, 2022

Mr. Scott Steventon
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, 2022

Dear Scott:

The results of the June 30, 2022 Annual Actuarial Valuation of the City of Phoenix Employees' Retirement System ("COPERS") are presented in this report.

This report was prepared at the request of the Board and is intended for use by COPERS and those designated or approved by the Board. This report may be provided to parties other than COPERS only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report.

The purposes of the valuation are to measure the COPERS's funding progress, to determine the employer contribution rate, and analyze changes in this rate. In addition, the report provides various summaries of the data. This report should not be relied on for any purpose other than the purposes described herein. Determinations of financial results, associated with the benefits described in this report, for purposes other than those identified above may be significantly different. Accounting information for purposes of complying with Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68 is provided in a separate report.

The contribution rate in this report is determined using the actuarial assumptions and methods disclosed in Section G of this report. This report includes risk metrics in Section H, but does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

This valuation assumed the continuing ability of the plan sponsor to make the contributions necessary to fund this plan. A determination regarding whether or not the plan sponsor is actually able to do so is outside our scope of expertise and was not performed.

This report was prepared using assumptions adopted by the Board. All actuarial assumptions used in this report are reasonable for the purposes of this valuation. All actuarial assumptions and methods used in the valuation follow the guidance in the applicable Actuarial Standards of Practice.

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This report was prepared using our proprietary valuation model which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

We certify that the information contained in this 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 34.14% of pay to 35.24% of pay. The increase is primarily due to asset and liability losses.

Assuming all actuarial assumptions are met, this method of payment of the unfunded liability will result in full funding in 15 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, 2022, COPERS has an unfunded liability of $1,362 million and a funded ratio of 71.17%.

The funded ratio on an actuarial value of assets basis increased from 70.70% to 71.17% and the funded ratio on a market value of assets basis decreased from 75.70% to 68.65%. The decrease on a market value of assets basis was primarily due to investments earning less than the assumed 7.00%. 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, 2022. The benefit provisions are summarized in Section E of this Report.

Assumptions and Methods

The assumptions and methods used in this valuation are those that were adopted by the Board during 2020 based on the most recent experience study that analyzed data from July 1, 2014 through June 30, 2019. The assumptions and methods are detailed in Section G 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.

Data

The findings in this report are based on data and other information through June 30, 2022. The valuation was based upon information furnished by the City of Phoenix Employees' Retirement System staff, concerning Retirement System benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal reasonability and year-to-year consistency, but did not 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

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge the information contained in this report is accurate and fairly presents the actuarial position of the City of Phoenix Employees' Retirement System as of the valuation date. All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

Paul Wood and Bill Detweiler are members of the American Academy of Actuaries. These actuaries meet the Academy's Qualification Standards to render the actuarial opinions contained herein. The signing actuaries are independent of the plan sponsor.

Gabriel, Roeder, Smith & Company will be pleased to review this valuation and Report with the Board of Trustees and to answer any questions pertaining to the valuation.

Respectfully submitted,

Gabriel, Roeder, Smith & Company

Paul Wood, ASA, FCA, MAAA	Bill Detweiler, ASA, EA, FCA, MAAA
Senior Consultant	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 $13.7 million and a liability loss of $52.6 million during fiscal year 2022. Details on the liability gain can be found on page B-8.

The plan experienced an asset loss of $39.4 million during fiscal year 2022. As of June 30, 2022, the amount of outstanding asset losses not yet recognized in the actuarial value of assets was $118.7 million.

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 increased on an actuarial value of assets basis and decreased on a market value of assets basis from June 30, 2021 to June 30, 2022.

Exhibit A.1
City of Phoenix Employees' Retirement System
Executive Summary

	June 30, 2022	June 30, 2021
1. **Total Actuarially Determined Contribution**		
a. Dollar Amount	$ 215,036,318	$ 203,110,931
b. As a % of Payroll	35.24%	34.14%
2. **Funded Status**		
a. Actuarial Accrued Liability	$ 4,723,290,827	$ 4,541,798,567
b. Actuarial Value of Assets (AVA)	3,361,409,190	3,211,142,294
c. Unfunded Liability (AVA-basis)	1,361,881,637	1,330,656,273
d. Funded Ratio (AVA-basis)	71.17%	70.70%
e. Market Value of Assets (MVA)	$ 3,242,686,938	$ 3,438,026,681
f. Unfunded Liability (MVA-basis)	1,480,603,889	1,103,771,886
g. Funded Ratio (MVA-basis)	68.65%	75.70%
3. **Summary of Census Data**		
a. Actives		
i.(a) Tier 1 Count	4,110	4,522
i.(b) Tier 2 Count	541	587
i.(c) Tier 3 Count	3,287	2,860
i.(d) Total Active Count	7,938	7,969
ii. Total Annual Compensation	$ 595,761,181	$ 580,866,220
iii. Average Projected Compensation	75,052	72,891
iv. Average Age	46.7	46.8
v. Average Service	11.8	12.2
b. Deferred Vested Member Counts	1,109	1,053
c. Retiree Counts	6,363	6,183
d. Beneficiary and Alternate Payee Counts	1,195	1,171
e. Disability Counts	222	233
f. Total Members Included in Valuation	16,827	16,609

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, 2022				June 30, 2021
	Tier 1	**Tier 2**	**Tier 3**	**Total**	**Total**
1. **Active Members**					
a. Retirement Benefits	$ 1,434,120,560	$ 48,867,376	$ 77,743,651	$ 1,560,731,587	$ 1,557,824,440
b. Withdrawal Benefits	11,781,586	1,738,187	3,470,822	16,990,595	17,541,006
c. Disability Benefits	5,070,398	374,611	538,959	5,983,968	6,003,223
d. Death Benefits	12,374,964	890,856	1,333,252	14,599,072	14,765,925
e. Total	$ 1,463,347,508	$ 51,871,030	$ 83,086,684	$ 1,598,305,222	$ 1,596,134,594
2. **Members with Deferred Benefits**				$ 103,635,590	$ 93,080,252
3. **Members Receiving Benefits**				$ 3,021,350,015	$ 2,852,583,721
4. **Total**				$ 4,723,290,827	$ 4,541,798,567
5. **Actuarial Value of Assets**				$ 3,361,409,190	$ 3,211,142,294
6. **Unfunded Actuarial Accrued Liability**				$ 1,361,881,637	$ 1,330,656,273

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, 2024

	Tier 1	Tier 2	Tier 3	Total	Prior Year
1. **Dollar Normal Cost**					
a. Retirement Benefits	$ 40,250,238	$ 5,478,942	$ 22,066,775	$ 67,795,955	$ 66,568,439
b. Withdrawal Benefits	6,185,054	966,185	4,546,785	11,698,024	11,260,504
c. Disability Benefits	434,048	56,838	227,299	718,185	704,736
d. Death Benefits	747,289	118,984	483,014	1,349,287	1,334,911
e. Total	$ 47,616,629	$ 6,620,949	$ 27,323,873	$ 81,561,451	$ 79,868,590
2. **Normal Cost as a Percentage of Pay**	13.69%	16.54%	13.17%	13.70%	13.76%
3. **Projected Payroll for FYE June 30, 2024**	$ 356,452,810	$ 41,021,915	$ 212,711,946	$ 610,186,671	$ 594,962,682
4. **Dollar Normal Cost for FYE June 30, 2024**	$ 48,807,045	$ 6,786,473	$ 28,006,969	$ 83,600,487	$ 81,865,305

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, 2022				June 30, 2021
	Tier 1	**Tier 2**	**Tier 3**	**Total**	**Total**
1. **Active Members**					
a. Retirement Benefits	$ 1,655,150,259	$ 99,033,774	$ 300,721,089	$ 2,054,905,122	$ 2,041,740,407
b. Withdrawal Benefits	47,460,848	12,287,002	55,737,475	115,485,325	111,316,206
c. Disability Benefits	7,508,468	972,515	3,104,195	11,585,178	11,460,719
d. Death Benefits	16,409,867	2,023,924	6,352,847	24,786,638	24,772,113
e. Total	$ 1,726,529,442	$ 114,317,215	$ 365,915,606	$ 2,206,762,263	$ 2,189,289,445
2. **Members with Deferred Benefits**				$ 103,635,590	$ 93,080,252
3. **Members Receiving Benefits**					
a. Healthy Retirees				$ 2,741,548,387	$ 2,584,941,765
b. Disabled Retirees				45,308,443	45,223,322
c. Beneficiaries				234,493,185	222,418,634
d. Total				$ 3,021,350,015	$ 2,852,583,721
4. **Total**				$ 5,331,747,868	$ 5,134,953,418

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, 2022	June 30, 2021
1. Present Value of Projected Benefits		
a. Retirees and Beneficiaries	$3,021,350,015	$2,852,583,721
b. Deferred vested members	103,635,590	93,080,252
c. Active members	2,206,762,263	2,189,289,445
d. Total [(a) + (b) + (c)]	$5,331,747,868	$5,134,953,418
2. Present Value of Future Normal Costs	$ 608,457,041	$ 593,154,851
3. Entry Age Normal Accrued Liability [(1) - (2)]	$4,723,290,827	$4,541,798,567
4. Actuarial Value of Assets	3,361,409,190	3,211,142,294
5. Unfunded Actuarial Accrued Liability [(3) - (4)]	$1,361,881,637	$1,330,656,273

Development of the Actuarially Determined Contribution

Fiscal Year Ending	June 30, 2024	June 30, 2023
6. Entry Age Normal Cost	$ 83,600,487	$ 81,865,305
7. Administrative Expenses	2,693,992	2,027,961
8. Amortization of UAAL	128,741,839	119,217,665
9. Actuarially Determined Contribution [(6) + (7) + (8)]	$ 215,036,318	$ 203,110,931
10. Projected Payroll	$ 610,186,671	$ 594,962,682
11. Actuarially Determined Contribution as a Percent of Compensation	35.241%	34.138%

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

Fiscal Year Ending	June 30, 2024	June 30, 2023
1. **Total Contribution Rate**		
a. Total Normal Cost Rate	13.70%	13.76%
b. Administrative Expense Rate	0.44%	0.34%
c. Total UAL Contribution Rate	21.10%	20.04%
d. Total Projected Rate	**35.24%**	**34.14%**
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	30.24%	29.14%
b. Tier 2	24.24%	23.14%
c. Tier 3	24.24%	23.14%
4. **Projected Payroll**		
a. Tier 1	$ 356,452,810	$ 376,464,873
b. Tier 2	41,021,915	42,473,152
c. Tier 3	212,711,946	176,024,657
d. Total	**$ 610,186,671**	**$ 594,962,682**
5. **Estimated Contribution Amounts**		
a. Members	$ 45,733,365	$ 42,858,003
b. City	169,302,953	160,252,927
c. Total	**$ 215,036,318**	**$ 203,110,930**

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, 2022

Base Year	Remaining Base as of June 30, 2022	Years Remaining as of June 30, 2022	Remaining Base as of June 30, 2023	Years Remaining as of June 30, 2023	Amortization Payment For FYE June 30, 2024
2013 UAL	$ 1,077,252,674	16	$ 1,055,151,153	15	$ 96,622,353
2013 Assumption Changes	459,345,549	16	449,921,358	15	41,200,221
2014 Experience Gain	(56,837,809)	16	(55,671,693)	15	(5,097,971)
2015 Experience Gain	(2,904,862)	16	(2,845,264)	15	(260,547)
2015 Assumption Changes	275,015,446	13	265,349,117	12	28,654,403
2016 Experience Gain	(32,185,298)	16	(31,524,966)	15	(2,886,806)
2016 Plan Changes	(3,324,116)	16	(3,255,917)	15	(298,151)
2016 Assumption Changes	(71,462,231)	16	(69,996,072)	15	(6,409,684)
2017 Experience Loss	9,797,458	15	9,555,237	14	919,603
2017 Assumption Changes	2,458,260	15	2,397,485	14	230,736
2018 Experience Gain	(73,149,760)	16	(71,648,979)	15	(6,561,044)
2019 Experience Loss	73,215,314	17	71,983,598	16	6,298,973
2020 Assumption Changes	(66,041,564)	18	(65,146,225)	17	(5,468,059)
2020 Experience Gain	(52,965,736)	18	(52,247,669)	17	(4,385,416)
2021 Additional City Contributions	(191,842,901)	19	(189,799,591)	18	(15,331,591)
2021 Experience Gain	(62,926,357)	19	(62,256,131)	18	(5,028,913)
2022 Additional City Contributions	(10,476,408)	20	(11,209,757)	19	(874,005)
2022 Experience Loss	88,913,978	20	95,137,956	19	7,417,737
Total	**$ 1,361,881,637**		**$ 1,333,893,640**		**$ 128,741,839**

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 2022

	Liabilities	
1.	Actuarial Accrued Liability at June 30, 2021	$ 4,541,798,567
2.	Normal Cost during Fiscal Year 2022	79,868,590
3.	Benefit Payments during Fiscal Year 2022	262,660,407
4.	Interest on Items 1-3 to End of Year	311,636,391
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, 2022	4,670,643,141
8.	Actual Actuarial Accrued Liability at June 30, 2022	4,723,290,827
9.	Liability (Gain)/Loss	52,647,686
	Assets	
10.	Actuarial Value of Assets at June 30, 2021	$ 3,211,142,294
11.	Benefit Payments and Administrative Expenses during Fiscal Year 2022	265,224,587
12.	Expected Contributions during Fiscal Year 2022	218,122,110
13.	Interest on Items 10-12 to End of Year	223,159,257
14.	Expected Actuarial Value of Assets at June 30, 2022	3,387,199,074
15.	Actual Actuarial Value of Assets at June 30, 2022	3,361,409,190
16.	Total Asset and Contribution (Gain)/Loss	25,789,884
	16.(a) Asset (Gain)/Loss	39,442,787
	16.(b) Contribution (Gain)/Loss	(13,652,903)
	Total	
17.	Total (Gain)/Loss [9. + 16.]	**$ 78,437,570**

Exhibit B.8
City of Phoenix Employees' Retirement System
Plan Experience for Fiscal Year 2022
(Gain)/Loss by Source

1. Liability (Gain)/Loss		
a. Salary (Gain)/Loss		20,194,341
b. New Members and Rehire (Gain)/Loss		5,977,171
c. Withdrawal (Gain)/Loss		(2,047,463)
d. Retirement (Gain)/Loss		(3,510,078)
e. Annuitant Mortality (Gain)/Loss		(11,249,815)
f. Difference Between Expected and Actual COLA		41,760,350
h. Other Demographic (Gain)/Loss		1,523,180
i. Total		52,647,686
2. Asset (Gain)/Loss	$	39,442,787
3. Contribution (Gain)/Loss	$	(13,652,903)
4. Total (Gain)/Loss	**$**	**78,437,570**

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

Actuarial Valuation Date (1)	Actuarial Value of Assets (2)	Actuarial Accrued Liability (AAL) (3)	Unfunded AAL (UAAL) (4)=(3)-(2)	Funded Ratio (5)=(2)/(3)	Covered Payroll (6)	UAAL as a Percentage of Covered Payroll (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%
6/30/2020	2,811,163	4,414,114	1,602,951	63.7%	568,646	281.9%
6/30/2021	3,211,142	4,541,799	1,330,656	70.7%	580,866	229.1%
6/30/2022	3,361,409	4,723,291	1,361,882	71.2%	595,761	228.6%

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

	Aggregated Accrued Liabilities for				Portion of Accrued Liabilities Covered by Reported Assets		
Valuation Date	Active Members Contributions	Retirees Beneficiaries and Vested Terminations	Members (Employer Financed Portion)	Actuarial Value of Assets	(5)/(2) Max 100%	[(5)-(2)]/(3) Max 100%	[(5)-(2)-(3)]/ (4)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
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%
June 30, 2020	437,719	2,857,254	1,119,141	2,811,163	100.0%	83.1%	0.0%
June 30, 2021	453,509	2,945,664	1,142,626	3,211,142	100.0%	93.6%	0.0%
June 30, 2022	456,197	3,124,986	1,142,108	3,361,409	100.0%	93.0%	0.0%

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

Fiscal Year	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
1. UAAL at Start of Year	$ 1,330,656	$ 1,602,951	$1,724,473	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
2. Normal Cost for Year*	82,433	80,573	83,628	74,048	73,449	73,256	80,757	75,310	78,331	71,828	77,366	80,099
3. Expected Contributions	(218,122)	(222,103)	(213,142)	(198,860)	(187,324)	(183,023)	(178,288)	(157,314)	(153,885)	(143,502)	(133,822)	(119,613)
4. Assumed Investment Income Accrual on (1), (2) and (3)	88,477	107,337	120,412	116,137	121,133	123,527	129,383	109,037	110,987	86,136	71,248	64,652
5. Expected UAAL Before Changes	$ 1,283,444	$ 1,568,758	$1,715,371	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
6. Effect of Assumption/Method Changes	0	0	(62,386)	0	0	2,420	(69,420)	254,870	0	423,247	0	0
7. Effect of Benefit Changes	0	0	0	0	0	0	(3,229)	0	0	0	0	0
8. Expected UAAL After Changes	$ 1,283,444	$ 1,568,758	$1,652,985	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
9. Actual UAAL	1,361,882	1,330,656	1,602,951	1,724,473	1,663,199	1,726,745	1,700,921	1,772,985	1,494,084	1,516,915	1,111,845	918,289
10. Gain / (Loss) [8. - 9.]	$ (78,438)	$ 238,102	$50,034	(69,949)	70,804	(9,644)	31,266	3,002	58,263	32,639	(178,764)	(63,956)
11. As % of AAL at Start of Year	-1.73%	5.39%	1.14%	-1.66%	1.71%	-0.24%	0.80%	0.10%	1.70%	1.10%	-6.50%	-2.40%

* 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, 2022
Assets		
Cash and Cash Equivalents	$	183,914,666
Investments, at fair value:		
Fixed income	$	487,947,580
Equity securities		1,128,916,133
Hedge funds		140,951,495
Real estate investments		510,347,446
International equities		795,841,927
Total investments	$	3,064,004,581
Receivables:		
Employer contributions	$	19,253,043
Employee contributions		2,179,347
Dividends and Interest		4,044,483
Unsettled transactions		8,112,350
Other		0
Total receivables	$	33,589,223
Total assets	$	3,281,508,470
Accounts Payable		
Accrued investment expenses	$	2,999,005
Unsettled transactions		10,888,422
Other		24,934,105
Total payables	$	38,821,532
Net assets held in trust for pension benefits	$	3,242,686,938

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

	Year Ended June 30, 2022	Year Ended June 30, 2021
Additions to Net Assets Attributed to:		
Contributions		
Employer contributions	$ 178,319,160	$ 357,381,984
Plan members contributions	53,350,192	40,560,795
Retirement office administration	2,122,393	2,047,000
Other	0	0
Total	$ 233,791,745	$ 399,989,779
Net Investment Income		
Net appreciation in fair value of investments	$ (198,038,743)	$ 581,813,491
Interest and dividends	37,242,421	35,089,291
Net income from security lending activities	87,941	130,970
Other	16,959,093	10,254,758
	$ (143,749,288)	$ 627,288,510
Less Investment expense	(18,035,220)	(16,734,647)
Net investment income	$ (161,784,508)	$ 610,553,863
Total additions	$ 72,007,237	$ 1,010,543,642
Deductions to Net Assets Attributed to:		
Benefit payments	$ 257,781,916	$ 246,214,101
Refunds	4,436,223	3,046,813
Retirement office administration	2,122,393	2,047,000
Inter-system transfers	442,268	451,803
Administrative expenses	2,564,180	1,930,242
Total deductions	$ 267,346,980	$ 253,689,959
Change in net assets	$ (195,339,743)	$ 756,853,683
Net assets held in trust for benefits:		
Beginning of year	$ 3,438,026,681	$ 2,681,172,998
End of year	$ 3,242,686,938	$ 3,438,026,681

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

	Item		Year Ending June 30, 2022
1.	Actuarial Value of Assets, Beginning of Year	$	3,211,142,294
2.	Net Cash Flow	$	(33,555,235)
3.	Expected return	$	223,264,918
4.	Actual Return	$	(161,784,508)
5.	Excess return [(4) - (3)]	$	(385,049,426)
6.	Gains/(Losses)		
	a. Current Year	$	(385,049,426)
	b. Prior Year		411,466,870
	c. 2nd Prior Year		(142,674,469)
	d. 3rd Prior Year		(41,514,122)
	e. Total	$	(157,771,147)
7.	Phase-In Amount [25% of 6.e.]	$	(39,442,787)
8.	Actuarial Value of Assets, End of Year [(1) + (2) + (3) + (7)]	$	3,361,409,190
9.	Estimated Rate of Return		5.76%
10.	Ratio of Actuarial to Market Value of Assets		103.7%

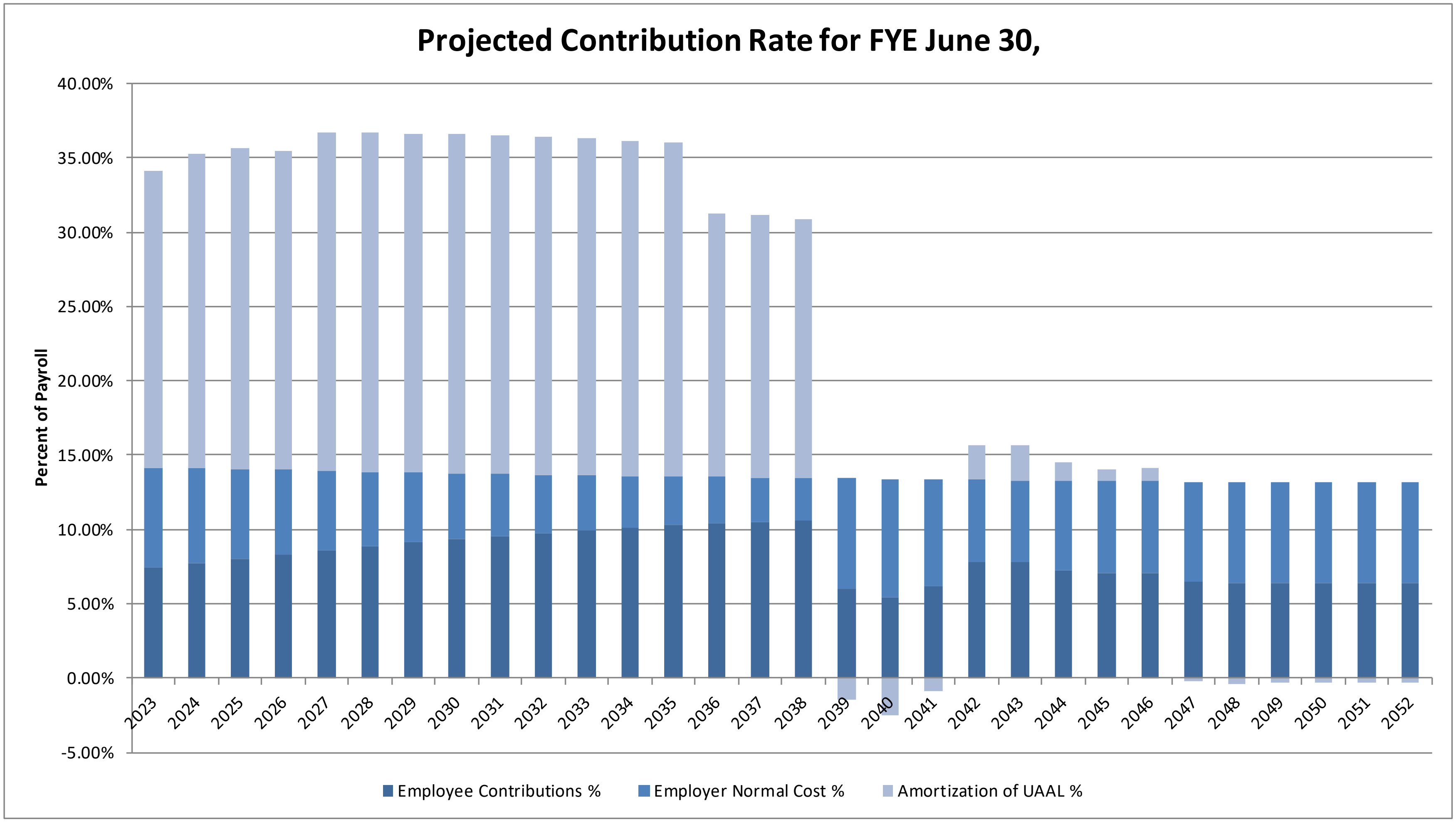
[1] *The expected return does not include interest on the receivable of $10,476,408.*

SECTION D

PROJECTIONS

City of Phoenix Employees Retirement System
Projection Results Based on June 30, 2022 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)
2022	2023	7.00%	$595	7.48%	6.63%	20.04%	26.66%	34.14%	$44	$159	$203	$4,723	$3,361	$1,362	71.2%	$274
2023	2024	7.00%	610	7.75%	6.39%	21.10%	27.49%	35.24%	47	168	215	4,853	3,490	1,363	71.9%	287
2024	2025	7.00%	624	8.06%	6.00%	21.60%	27.61%	35.67%	50	172	222	4,980	3,660	1,320	73.5%	300
2025	2026	7.00%	638	8.34%	5.66%	21.51%	27.17%	35.51%	53	173	226	5,104	3,732	1,373	73.1%	313
2026	2027	7.00%	653	8.61%	5.33%	22.75%	28.08%	36.69%	56	183	240	5,224	3,894	1,330	74.5%	327
2027	2028	7.00%	669	8.87%	5.01%	22.87%	27.88%	36.75%	59	187	246	5,341	4,070	1,271	76.2%	340
2028	2029	7.00%	685	9.12%	4.71%	22.81%	27.52%	36.64%	63	189	251	5,454	4,252	1,201	78.0%	354
2029	2030	7.00%	703	9.36%	4.42%	22.79%	27.21%	36.57%	66	191	257	5,563	4,441	1,122	79.8%	367
2030	2031	7.00%	721	9.58%	4.15%	22.75%	26.90%	36.48%	69	194	263	5,667	4,634	1,033	81.8%	381
2031	2032	7.00%	740	9.78%	3.90%	22.70%	26.60%	36.38%	72	197	269	5,767	4,834	933	83.8%	393
2032	2033	7.00%	760	9.97%	3.67%	22.64%	26.31%	36.28%	76	200	276	5,863	5,040	823	86.0%	406
2033	2034	7.00%	780	10.14%	3.47%	22.58%	26.05%	36.18%	79	203	282	5,955	5,255	700	88.2%	418
2034	2035	7.00%	801	10.29%	3.28%	22.50%	25.78%	36.07%	82	207	289	6,044	5,479	565	90.6%	429
2035	2036	7.00%	824	10.42%	3.11%	17.75%	20.86%	31.28%	86	172	258	6,131	5,715	416	93.2%	439
2036	2037	7.00%	847	10.54%	2.96%	17.68%	20.64%	31.18%	89	175	264	6,215	5,923	292	95.3%	449
2037	2038	7.00%	870	10.64%	2.83%	17.42%	20.25%	30.89%	93	176	269	6,298	6,142	156	97.5%	457
2038	2039	7.00%	895	5.98%	7.46%	-1.47%	5.98%	11.97%	54	54	107	6,382	6,373	8	99.9%	465
2039	2040	7.00%	921	5.46%	7.95%	-2.50%	5.46%	10.91%	50	50	100	6,466	6,445	21	99.7%	471
2040	2041	7.00%	947	6.23%	7.15%	-0.92%	6.23%	12.46%	59	59	118	6,553	6,509	44	99.3%	477
2041	2042	7.00%	975	7.84%	5.51%	2.32%	7.84%	15.67%	76	76	153	6,643	6,589	54	99.2%	482
2042	2043	7.00%	1,003	7.81%	5.51%	2.30%	7.81%	15.62%	78	78	157	6,738	6,705	33	99.5%	487
2043	2044	7.00%	1,031	7.28%	6.01%	1.26%	7.28%	14.55%	75	75	150	6,838	6,828	9	99.9%	491
2044	2045	7.00%	1,060	7.03%	6.23%	0.81%	7.03%	14.07%	75	75	149	6,943	6,948	(5)	100.1%	496
2045	2046	7.00%	1,090	7.07%	6.16%	0.91%	7.07%	14.15%	77	77	154	7,055	7,071	(17)	100.2%	501
2046	2047	7.00%	1,120	6.48%	6.73%	-0.25%	6.48%	12.97%	73	73	145	7,172	7,203	(30)	100.4%	507
2047	2048	7.00%	1,151	6.40%	6.79%	-0.39%	6.40%	12.80%	74	74	147	7,296	7,328	(32)	100.4%	514
2048	2049	7.00%	1,182	6.42%	6.76%	-0.33%	6.42%	12.84%	76	76	152	7,425	7,457	(32)	100.4%	521
2049	2050	7.00%	1,213	6.42%	6.75%	-0.33%	6.42%	12.83%	78	78	156	7,560	7,592	(32)	100.4%	528
2050	2051	7.00%	1,246	6.41%	6.74%	-0.33%	6.41%	12.82%	80	80	160	7,700	7,733	(33)	100.4%	536
2051	2052	7.00%	1,279	6.41%	6.74%	-0.32%	6.41%	12.83%	82	82	164	7,847	7,880	(33)	100.4%	544
2052	2053	7.00%	1,314	6.41%	6.73%	-0.32%	6.41%	12.83%	84	84	169	7,999	8,033	(34)	100.4%	553


Projected Contribution Rate for FYE June 30,
Percent of Payroll
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
-5.00%
2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052
Employee Contributions %
Employer Normal Cost %
Amortization of UAAL %

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 (13^{th} 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 (13^{th} check). The 13^{th} 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 13^{th} 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, 2022	June 30, 2021
1. Active Members		
a. Counts	7,938	7,969
b. Annual Compensation	$ 595,761,181	$ 580,866,220
c. Average Annual Compensation	$ 75,052	$ 72,891
d. Average Age	46.7	46.8
e. Average Service	11.8	12.2
2. Deferred Vested Members		
a. Counts	1,109	1,053
b. Annual Deferred Benefits	$ 15,707,186	$ 14,506,046
c. Average Benefit	$ 14,163	$ 13,776
3. Retired Members		
a. Counts	6,363	6,183
b. Annual Benefits	$ 234,156,480	$ 221,252,111
c. Average Benefit	$ 36,800	$ 35,784
4. Disability		
a. Counts	222	233
b. Annual Deferred Benefits	$ 3,885,565	$ 3,898,236
c. Average Benefit	$ 17,503	$ 16,731
5. Beneficiaries and QDROs		
a. Counts	1,195	1,171
b. Annual Benefits	$ 25,842,433	$ 24,608,323
c. Average Benefit	$ 21,625	$ 21,015
6. Total Members Included in Valuation	16,827	16,609

Exhibit F.2
Summary of Changes in Participant Status
During Fiscal Year 2022

	Active Participants	With Deferred Benefits	Retirees	Disability	QDROs	Beneficiaries	Total
A. Number as of June 30, 2021	7,969	1,053	6,183	233	181	990	16,609
1. Age Retirements	(341)	(37)	378				0
2. Disability	(2)	(2)		4			0
3. Deceased	(21)	(4)	(191)	(15)	(8)	(71)	(310)
4. New Beneficiary					11	89	100
5. Terminated - Vested	(139)	139					0
6. Terminated - Nonvested	(377)						(377)
7. Cashouts	(5)	(20)					(25)
8. Benefits Expired			(7)			(3)	(10)
9. Rehired as Active	38	(21)					17
10. New Members	816						816
11. Data Corrections*		1				6	7
B. Number as of June 30, 2022	**7,938**	**1,109**	**6,363**	**222**	**184**	**1,011**	**16,827**

Exhibit F.3
Active Member Counts by Age and Service
as of June 30, 2022

Age	Service							
	0-4	5-9	10-14	15-19	20-24	25-29	Over 30	Total
Under 20	3							3
20-24	195	1						196
25-29	425	57						482
30-34	399	172	29	5				605
35-39	403	218	91	141	2			855
40-44	344	210	112	281	109	4		1,060
45-49	285	198	92	284	269	78	2	1,208
50-54	254	171	110	291	294	201	34	1,355
55-59	225	154	88	223	247	136	78	1,151
60-64	132	111	74	173	114	76	64	744
Over 65	38	43	20	68	40	31	39	279
Total	**2,703**	**1,335**	**616**	**1,466**	**1,075**	**526**	**217**	**7,938**

Exhibit F.4
Active Member Average Salary by Age and Service
as of June 30, 2022

Age	Service							
	0-4	5-9	10-14	15-19	20-24	25-29	Over 30	Total
Under 20	*							*
20-24	$46,933	*						$46,933
25-29	$54,579	$61,115						$53,114
30-34	$58,625	$69,259	$70,195	$72,464				$62,318
35-39	$64,558	$72,592	$75,818	$76,669	*			$68,959
40-44	$65,794	$77,155	$85,729	$82,872	$84,731	$106,654		$76,016
45-49	$66,543	$75,109	$80,470	$87,323	$90,944	$95,292	*	$80,756
50-54	$71,397	$74,324	$78,333	$85,091	$88,426	$98,039	$87,880	$82,756
55-59	$69,727	$77,794	$79,855	$79,535	$83,228	$89,959	$91,203	$79,750
60-64	$79,766	$78,413	$84,851	$77,656	$80,780	$87,531	$85,272	$80,233
Over 65	$75,691	$72,874	$102,322	$78,459	$78,715	$87,337	$81,442	$80,359
Over 70								
Total	**$64,316**	**$74,075**	**$81,022**	**$82,215**	**$86,264**	**$93,459**	**$87,029**	**$75,052**

*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	7	$3,638
30-34	43	$28,490
35-39	114	$104,998
40-44	167	$184,624
45-49	199	$258,976
50-54	251	$324,650
55-59	217	$273,662
60-64	100	$115,448
65& Up	11	$14,446

Exhibit F.6 Summary of Members in Pay Status						
	Service Retirees		Disabled Retirees		Beneficiaries/QDROs	
Age	**Number of Members**	**Annual Benefit**	**Number of Members**	**Annual Benefit**	**Number of Members**	**Annual Benefit**
<55	109	$5,591,961	30	$607,561	94	$1,479,589
55-59	535	$26,226,192	30	$623,962	71	$1,422,261
60-64	1146	$47,156,845	43	$743,464	108	$2,425,445
65-69	1521	$56,430,317	51	$864,813	149	$3,298,378
70-74	1455	$50,154,962	35	$535,793	207	$4,690,280
75-79	847	$27,886,633	16	$241,448	190	$4,660,908
80-84	441	$12,756,977	9	$118,491	168	$3,650,133
85-89	195	$5,192,182	8	$150,032	105	$2,178,544
90 & Up	114	$2,760,411	0	$0	103	$2,036,898

Exhibit F.7
Schedule of Retired Members Added to and Removed from Rolls
as of June 30, 2022

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
6/30/2020	378	12,025	251	6,530	7,322	239,836	32,756	2.3
6/30/2021	396	14,487	309	7,105	7,409	247,218	33,367	3.1
6/30/2022	477	21,208	287	7,196	7,599	261,231	34,377	5.7

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, 2022

Monthly Benefit	# of Retirees	Type of Retirement						
		Deferred	Normal or Voluntary	Duty Disability	Non-Duty Disability	Survivor Payment	Death Benefit	Alternate Payee
Deferred	1,109	1,109						
$1 - $300	83		40	0	0	15	17	11
$301 - $400	120		81	4	1	22	1	11
$401 - $500	124		76	5	2	29	0	12
$501 - $600	146		101	5	5	22	3	10
$601 - $700	158		88	3	5	47	3	12
$701 - $800	174		100	1	8	47	6	12
$801 - $900	172		94	3	19	34	7	15
$901 - $1,000	163		107	1	8	32	6	9
$1,001 - $1,100	197		124	3	13	36	7	14
$1,101 - $1,200	206		130	2	12	41	8	13
$1,201 - $1,300	173		116	1	14	32	2	8
$1,301 - $1,400	174		117	0	12	30	6	9
$1,401 - $1,500	184		137	0	12	24	7	4
$1,501 - $2,000	867		645	14	32	120	37	19
$2,001 - $2,500	903		767	1	12	99	15	9
$2,501 - $3,000	882		781	0	12	69	12	8
$3,001 - $4,000	1,322		1,216	0	8	76	19	3
$4,001 - $5,000	829		788	0	4	28	6	3
$5,001 +	903		855	0	0	43	3	2
Total	**8,889**	**1,109**	**6,363**	**43**	**179**	**846**	**165**	**184**

SECTION G

ACTUARIAL COST METHODS AND ASSUMPTIONS

SUMMARY OF ACTUARIAL COST 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 including administrative expenses, 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 (7.00%). 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: 7.00% per annum, compounded annually. Inflation is assumed to be 2.30%.

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 service. The table below combines the various components of salary increases. Growth in the total payroll is assumed to be 2.50%.

Attained Service	Percentage Increase in Salary			
	Price Inflation	Real Wage Growth	Merit or Longevity	Total
1-7	2.30 %	0.50 %	4.20 %	7.00 %
8-14	2.30	0.50	1.30	4.10
15+	2.30	0.50	0.00	2.80

3. COLA Due to Pension Equalization Reserve (PER): The PER only applies to Tier 1 and Tier 2 benefits. Future benefits payeble through the PER are valued as an annual compound cost-of-living adjustment (COLA) payable January 1, equal to 0.50% through 2024, 1.00% from 2025-2029, and then 1.25% thereafter.

4. Administrative expenses are assumed to be equal to the prior year's amount, increased by 2.50%.

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-2019 Ultimate projection scale on a generational basis to the adjusted base tables from the base year shown below.

   i) Non-Annuitant – Pub-2010, Amount-Weighted, General, Employee mortality table

Gender	Adjustment Factor	Base Year
Male	1.000	2010
Female	1.000	2010

   (i) Healthy Annuitant – Pub-2010, Amount-Weighted, General, Healthy Retiree mortality table

Gender	Adjustment Factor	Base Year
Male	1.090	2010
Female	1.040	2010

   (ii) Disabled Annuitant – Pub-2010, Amount-Weighted, General, Disabled Retiree mortality tables

Gender	Adjustment Factor	Base Year
Male	1.000	2010
Female	1.000	2010

Sample rates, including projections to 2022, are shown below (not including adjustment factors).

Sample Attained Ages	Probability of Death Pre-Retirement	
	Men	Women
20	0.033 %	0.012 %
25	0.025	0.008
30	0.032	0.013
35	0.042	0.020
40	0.059	0.032
45	0.087	0.050
50	0.132	0.074
55	0.194	0.109
60	0.283	0.165
65	0.415	0.262
70	0.623	0.433
75	0.971	0.716
80	1.533	1.179
85	6.402	4.727
90	13.116	10.269

Sample Attained Ages	Probability of Death Post-Retirement	
	Men	Women
20	0.036 %	0.012 %
25	0.027	0.008
30	0.035	0.014
35	0.045	0.021
40	0.064	0.033
45	0.106	0.060
50	0.288	0.205
55	0.416	0.264
60	0.594	0.354
65	0.882	0.565
70	1.474	0.980
75	2.581	1.736
80	4.612	3.097
85	8.300	5.720
90	14.296	10.679

Sample Attained Ages	Probability of Death Post-Disability	
	Men	Women
20	0.365 %	0.207 %
25	0.246	0.145
30	0.314	0.228
35	0.406	0.355
40	0.572	0.558
45	0.893	0.873
50	1.423	1.315
55	1.874	1.544
60	2.219	1.734
65	2.698	2.000
70	3.458	2.537
75	4.602	3.548
80	6.513	5.325
85	9.586	8.271
90	14.529	12.216

2. Disability rates. The disability incidence rates are 20% of the Arizona State Retirement Sytem disability table. 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	0.0100 %
30	0.0121
35	0.0185
40	0.0294
45	0.0454
50	0.0677
55	0.0794
60	0.0863

3. 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	19.00 %	17.00 %	11.00 %	10.00 %	8.25 %	8.00 %
25	19.00	17.00	11.00	10.00	8.25	8.00
30	17.00	13.25	10.00	8.75	7.25	5.00
35	17.00	10.75	9.00	7.50	6.50	4.00
40	17.00	9.50	8.25	6.50	6.00	3.10
45	17.00	8.50	7.50	6.50	6.00	2.10
50	14.00	9.00	5.00	5.00	4.50	1.50
55	14.00	9.00	5.00	5.00	4.50	1.50
60	14.00	9.00	5.00	5.00	4.50	1.50

4. Retirement rates.

Probability of Retirement				
Age	Years of Service			
	<15	15-24	25-31	>31
50-51	0.00 %	0.00 %	40.00 %	42.50 %
52	0.00	0.00	40.00	35.00
53	0.00	0.00	40.00	27.50
54	0.00	0.00	30.00	27.50
55	0.00	0.00	30.00	27.50
56	0.00	37.50	25.00	27.50
57	0.00	37.50	22.50	22.50
58	0.00	25.00	22.50	22.50
59	0.00	22.50	20.00	22.50
60	10.00	22.50	20.00	22.50
61	10.00	20.00	20.00	22.50
62	13.00	20.00	25.00	32.50
63	13.00	20.00	25.00	37.50
64	10.00	17.50	15.00	25.00
65	20.00	27.50	25.00	35.00
66	25.00	32.50	40.00	37.50
67	25.00	35.00	40.00	37.50
68	25.00	35.00	40.00	37.50
69	25.00	35.00	40.00	47.50
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 explicity valued. An additional load of 1.5% is also included as a margin for adverse deviation.

4. Member Contribution Crediting Rate: Member contributions are credited with interest at 3.75% per annum.

5. Decrement Timing : Middle of the Year.

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:

	June 30, 2022	June 30, 2021
Ratio of the market value of assets to total payroll	5.3	5.8
Ratio of actuarial accrued liability to payroll	7.7	7.6
Ratio of actives to retirees and beneficiaries	1.0	1.1
Ratio of net cash flows to market value of assets	-1%	4%
Duration of the actuarial accrued liability	12.2	12.2

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