Tucson Supplemental Retirement System

ACTUARIAL VALUATION REPORT AS OF

June 30, 2020

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October 14, 2020

The Board of Trustees
Tucson Supplemental Retirement System
Tucson, Arizona

Re: Actuarial Valuation of the Tucson Supplemental Retirement System as of June 30, 2020

Dear Board Members:

We are pleased to present the report on the actuarial valuation of the Tucson Supplemental Retirement System as of June 30, 2020.

This report presents the results of the June 30, 2020 actuarial valuation of the Tucson Supplemental Retirement System. The report describes the current actuarial condition of the Tucson Supplemental Retirement System, determines recommended annual employer and employee contribution rates, and analyzes changes in these required rates. This report should not be relied on for any purpose other than the purpose described in the primary communication. Information needed to comply with Statements No. 67 and 68 is provided in a separate accounting report.

We certify that the information included herein and contained in the June 30, 2020 Actuarial Valuation Report is accurate and fairly presents the actuarial position of the Tucson Supplemental Retirement System as of the valuation date.

Contribution Rates

There are no recommended changes to the contribution rates for FY 2021 for the employer rate or the employee rate for those hired prior to July 1, 2006. Based on the TSRS funding policy, the recommended employer rate will remain at 27.5%, and the recommended employee rates will remain at 5.00% for the members hired prior to July 1, 2006.

Currently, members hired prior to July 1, 2006 contribute a flat rate, while members hired after June 30, 2006 are subject to variable rates that are 50% of their tiers' normal cost, subject to a floor of 5.0%. These rates are further subject to a 5.00% floor and a roundup policy rounding to the next 0.25% percent. The Tier I and II variable rates based on this policy were 7.00% and 5.50%, respectively, as of the prior valuation; however due to circumstances related to the COVID-19 pandemic, the City decided to temporarily delay the increase to employee contributions and keep them at 6.75% and 5.25%, respectively, for fiscal year 2021. Based on the Board funding policy, we recommend an increase to the employee rates from 6.75% to 7.00% for the Tier I variable class and from 5.25% to 5.50% for the tier II variable class for fiscal year 2022. Full details of these calculations are in the report.

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Financing Objectives

The employer contributions, when combined with the contributions made by members, are intended to cover the Actuarially Determined Contribution (ADC), which is the sum of the Normal Cost plus a 20-year open level percent-of-pay amortization payment of the Unfunded Actuarial Accrued Liability (UAAL). If the contributions made are equal to the ADC, and if all actuarial assumptions are met, there will still be an unfunded accrued liability at the end of the 20-year period. This is due to "open" amortization – an amortization method that resets the payment period to 20 years with each valuation. However, the Board has adopted a funding policy which rounds up the employee and City contribution rates, and in addition, sets a 27.50% minimum on the City contribution rate until full funding is reached. Based on this funding policy, the System is projected to reach full funding in 2037.

Progress Toward Realization of Financing Objectives

The UAAL/(surplus) 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, 2020, the Plan has an unfunded liability of $306.5 million and a funded ratio of 73.3%.

The slight increase in the funded ratio, from 72.8% to 73.3%, is primarily due to say anticipated improvement based on the current funding policy. 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.

The Total Actuarially Determined Contribution as a percentage of pay based on the actuarial valuation as of July 1, 2020 is 29.45% compared to the total contribution rate in the prior year of 30.05%. This total rate, net of the employee contributions, is used in setting City rates for the fiscal year beginning July 1, 2021 (FY 2022).

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 an assessment of the risks of future experience not meeting the actuarial assumptions. Additional 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 System's financial condition.

Benefit Provisions

All of the benefit provisions reflected in this valuation are those which were in effect on June 30, 2020. There were no changes to the benefit provisions since the prior valuation. The benefit provisions are summarized in Section D of this Report.

Assumptions and Methods

There were no changes in actuarial methods and assumptions since the prior valuation. The Board has sole authority to determine the actuarial assumptions used for the Plan. The assumptions that are based upon the actuary's recommendations are internally consistent and are reasonably based on the actual past experience of the Plan.

The current assumptions were adopted by the Board in 2019 for first use in the June 30, 2019 valuation following a regularly scheduled experience study. The rationale for all of the current assumptions is included in that report, dated January 8, 2019.

This report was prepared using our proprietary valuation model and related software 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.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. The actuarial calculations presented in this Report are intended to provide information for rational decision making.

Data

The valuation was based upon information as of June 30, 2020, furnished by Tucson Supplemental 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 audit the data. We are not responsible for the accuracy or completeness of the information provided by Tucson Supplemental 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 the plan sponsor. Dana Woolfrey is an Enrolled Actuary and both Dana Woolfrey and Paul Wood are Members of the American Academy of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries.

Respectfully submitted,

GABRIEL, ROEDER, SMITH & COMPANY

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SECTION A

EXECUTIVE SUMMARY

Actuarial Valuation

Valuations are prepared annually, as of July 1 of each year, the first day of the fiscal year. The primary purposes of the valuation report are to measure the plan's liabilities, to determine the required contribution rates and to analyze changes in the Tucson Supplemental Retirement System's actuarial position.

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

Experience During the Year

As shown on page B-5, the expected accrued liability as of June 30, 2020 was $1,142.7 million. The actual accrued liability was $1,148.9 million, and the plan experienced a liability loss of $6.2 million during fiscal year 2020, primarily due to salary increases being more than expected. The plan experienced an asset loss of $0.4 million during fiscal year 2020. Please see page B-5 for further information.

Financial Position

The funded ratio increased from June 30, 2019 to June 30, 2020, primarily due to anticipated improvement based on the current funding policy. On a market value basis, the funded ratio decreased from June 30, 2019 to June 30, 2020 due to market value investment returns less than the assumed 7.00% during the year.

Funded Status Summary ($ in millions)

Valuation Date	June 30, 2020	June 30, 2019
Accrued Liability	$1,148.9	$1,129.5
Actuarial Value of Assets (smoothed)	842.4	822.8
Unfunded Accrued Liability	$306.5	$306.7
Funded Ratio (AVA basis)	73.32%	72.85%
Market Value of Assets	$833.2	$836.6
Unfunded Accrued Liability	$315.8	$292.9
Funded Ratio (MVA basis)	72.52%	74.07%

Financing Objectives and Funding Policy

The financing objective of the Retirement System is to establish and receive contributions, expressed as percent of active member payroll, which will remain approximately level from year to year and thereby minimize inter-generational cost transfers.

The Tucson Supplemental Retirement System is supported by member contributions, employer contributions, and investment return from retirement system assets. Currently, members hired prior to July 1, 2006 contribute a flat rate, while members hired after June 30, 2006 are subject to variable rates that are 50% of their tiers' normal cost, subject to a floor of 5.0%. The rates are outlined in the table below. These rates are further subject to a 5.00% floor and a roundup policy rounding to the next 0.25% percent - in this case, making the rates for fiscal years 2021 and 2022, 5.00%, 7.00%, and 5.50%, respectively.

Employee Group	Actuarial (Non Rounded) Rates FY 2022*	FY 2021*
Employees hired prior to July 1, 2006	5.00%	5.00%
Tier I Variable - employees hired after June 30, 2006, before July 1, 2011	6.91%	6.95%
Tier II Variable - employees hired after June 30, 2011	5.33%	5.33%

**Before application of 5.0% floor or roundup policy.*

Total contributions which satisfy the funding objective are determined by the annual actuarial valuation and are sufficient to:

(1) cover the normal cost (the actuarial present value of benefits allocated to the current year by the actuarial cost method described in Section C); and

(2) finance over a period of future years the annual payment of the unfunded actuarial accrued liability (the actuarial present value of benefits not covered by valuation assets and anticipated future normal costs); and

(3) cover administrative expenses of the System.

It is assumed that the investment return assumption of 7.00% is net of investment expenses. The additional explicit administrative expense charge to the contribution rate is applied to the recommended employer contribution.

The Total Actuarially Determined Contribution which is used to set rates for fiscal year 2022 decreased from 30.05% as of the prior valuation to 29.45% as of the current valuation. The expected decrease to the Actuarially Determined Contribution, from paying down the Unfunded Actuarially Accrued Liability, was partially offset by salaries increasing more than expected as well as investment returns less than expected.

Contribution Requirement Summary
All Numbers Reported Middle of Year, Percent of Pay

Fiscal Year Beginning	July 1, 2020	July 1, 2019
Total Actuarial Determined Contribution	29.45%	30.05%
Estimated Member Contribution	5.35%	5.34%
Net Annual Required Contribution	24.10%	24.71%

Normal Cost by Tier

Aggregate Total Normal Cost	11.75%
Tier I Normal Cost (Hired before July 1, 2006)	12.47%
Tier I Normal Cost (Hired between July 1, 2006 and June 30, 2011)	13.82%
Tier II Normal Cost (Hired after June 30, 2011)	10.66%

Member and City Rates by Tier for Fiscal Year Beginning July 1, 2021

Tier	Member Contribution*	City Contribution*	Total Contribution
Hired Prior to July 1, 2006	5.00%	24.45%	29.45%
Hired between July 1, 2006 and June 30, 2011	6.91%	22.54%	29.45%
Hired after June 30, 2011	5.33%	24.12%	29.45%
Blended Across Tiers	5.35%	24.10%	29.45%

*Prior to application of roundup policy and funding policy minimums. It is anticipated that the three member groups will contribute 5.00%, 7.00%, and 5.50%, respectively. It is anticipated that the City will contribute 27.50% of pay, in accordance with the funding policy minimum.

The recommended rates, with the application of the administrative expenses and the round up policy, are illustrated below:

FY 22 Recommended Rates
Based on TSRS Funding Policy
(full description of the TSRS funding policy may be found in Section I)

Employee Rates	Actuarial Rate (50% of Normal Cost)	Round up to nearest .25%	FY 22 Board Recommended Rates	FY 21 Adopted Rates***
Tier				
Hired prior to 7/1/2006	5.00%*	n/a	5.00%	5.00%
Hired 7/1/2006 to 6/30/2011	6.91%	7.00%	7.00%	6.75%
Hired after 6/30/2011	5.33%**	5.50%	5.50%	5.25%

**Rate set in ordinance at 5.00%*
*** Minimum 5% rate*
**** Temporary deviation from Board recommended rates due to pandemic*

Employer Rates		Round up to nearest .50%	FY 22 Board Recommended Rates	FY 21 Adopted Rates
Tier				
Hired prior to 7/1/2006	24.45%	n/a		
Hired 7/1/2006 to 6/30/2011	22.54%	n/a		
Hired after 6/30/2011	24.12%	n/a		
Blended Rate	24.10%	n/a	27.50%*	27.50%

**Minimum 27.5% recommended rate*

Exhibit A.1 Tucson Supplemental Retirement System Executive Summary		
	June 30, 2020	**June 30, 2019**
1. **Actuarially Determined Contribution**		
a. Total	29.45%	30.05%
b. Blended Member %	5.35%	5.34%
c. Blended Net Employer %	24.10%	24.71%
2. **Funded Status**		
a. Actuarial Accrued Liability	$ 1,148,930,428	$ 1,129,491,900
b. Actuarial Value of Assets (AVA)	842,424,756	822,834,629
c. Unfunded Liability (AVA-basis)	306,505,672	306,657,271
d. Funded Ratio (AVA-basis)	73.32%	72.85%
e. Market Value of Assets (MVA)	$ 833,171,532	$ 836,583,028
f. Unfunded Liability (MVA-basis)	315,758,896	292,908,872
g. Funded Ratio (MVA-basis)	72.52%	74.07%
3. **Summary of Census Data**		
a. Actives		
i. Counts	2,482	2,508
ii. Total Annual Covered Payroll	$ 127,378,110	$123,822,602
iii. Average Covered Payroll	51,321	49,371
iv. Average Age	47.9	47.7
v. Average Service	11.5	11.5
b. Members with Refunds Due Counts	192	151
c. Deferred Vested Member Counts	324	328
d. Retired Member Counts	2,570	2,539
e. Beneficiary Counts	369	357
f. Disabled Retiree Counts	142	148
g. Alternate Payees	64	57
h. Total Members Included in Valuation	6,143	6,088

SECTION B

VALUATION RESULTS

Exhibit B.1

Tucson Supplemental Retirement System

Actuarial Valuation Results

Actuarial Accrued Liability

	June 30, 2020	June 30, 2019
1. **Active Members**		
a. Retirement Benefits	$ 324,944,853	$ 315,844,675
b. Withdrawal Benefits	7,059,503	6,961,496
c. Disability Benefits	2,043,841	1,942,498
d. Death Benefits	4,363,309	4,292,889
e. Total	$ 338,411,506	$ 329,041,558
2. **Members with Deferred Benefits**	$ 25,264,711	$ 25,932,128
3. **Members Receiving Benefits**	$ 784,845,229	$ 774,206,327
4. **Non-Vested Terminated Members Due Refund**	$ 408,982	$ 311,887
5. **Total**	$ 1,148,930,428	$ 1,129,491,900
6. **Actuarial Value of Assets**	$ 842,424,756	$ 822,834,629
7. **Unfunded Actuarial Accrued Liability**	$ 306,505,672	$ 306,657,271

Exhibit B.2

Tucson Supplemental Retirement System

Actuarial Valuation Results

Normal Cost

	July 1, 2020	July 1, 2019
1. **Normal Cost Rate**		
a. Retirement Benefits	9.06 %	9.14 %
b. Withdrawal Benefits	2.23	2.23
c. Disability Benefits	0.28	0.28
d. Death Benefits	0.18	0.18
e. Total	11.75 %	11.83 %

Exhibit B.3

Tucson Supplemental Retirement System

Actuarial Valuation Results

Present Value of Projected Benefits

	June 30, 2020	June 30, 2019
1. **Active Members**		
a. Retirement Benefits	$ 398,978,726	$ 388,573,329
b. Withdrawal Benefits	27,181,485	26,417,799
c. Disability Benefits	4,781,691	4,575,901
d. Death Benefits	5,871,748	5,759,522
e. Total	$ 436,813,650	$ 425,326,551
2. **Members with Deferred Benefits**	$ 25,264,711	$ 25,932,128
3. **Members Receiving Benefits**	$ 784,845,229	$ 774,206,327
4. **Non-Vested Terminated Members Due Refund**	$ 408,982	$ 311,887
5. **Total**	$ 1,247,332,572	$ 1,225,776,893

Exhibit B.4
Tucson Supplemental Retirement System
Development of the Actuarially Determined Contribution

Fiscal Year Beginning[1]	July 1, 2020	July 1, 2019
1. Total Normal Cost	11.75%	11.83%
2. Total Contribution to the Unfunded Actuarial Accrued Liability[2]	17.19%	17.69%
3. Administrative Expenses	0.51%	0.53%
4. Total Computed Contribution	29.45%	30.05%
5. Member Financed Portion[3]	5.35%	5.34%
6. City Financed Portion[4]	24.10%	24.71%

[1] *One-year lag in contribution timing. Contribution rates developed for the fiscal year beginning July 1, 2020 are used to set the actual contribution rates for fiscal year beginning July 1, 2021.*

[2] *Financed as a level percent of active member payroll over a period of 20 years from June 30, 2020.*

[3] *This percentage reflects the fact that members hired prior to July 1, 2006 contributed 5.00% of pay per year and members hired between July 1, 2006 and June 30, 2011 (Tier I variable class) and for those hired after July 1, 2011 (Tier II variable class), employee contributions are 50% of the respective Normal Cost for each class with a floor of 5.0%. The employee contribution rates, before application of the floor or roundup policy, for fiscal year 2022 are 6.91% and 5.33%, respectively.*

[4] *Prior to round up policy and application of 27.5% minimum.*

Exhibit B.5
Tucson Supplemental Retirement System
Plan Experience for Fiscal Year 2020

	Liabilities	
1.	Actuarial Accrued Liability at June 30, 2019	$ 1,129,491,900
2.	Normal Cost during Fiscal Year 2020	14,648,214
3.	Benefit Payments during Fiscal Year 2020	(78,298,677)
4.	Change in Actuarial Accrued Liability Due to Assumption Changes	0
5.	Change in Actuarial Accrued Liability Due to Provision Changes	0
6.	Interest on Items 1-5 to End of Year	76,836,667
7.	Expected Actuarial Accrued Liability at June 30, 2020	1,142,678,104
8.	Actual Actuarial Accrued Liability at June 30, 2020	1,148,930,428
9.	Liability Gain/(Loss)	(6,252,324)
	Assets	
10.	Actuarial Value of Assets at June 30, 2019	$ 822,834,629
11.	Benefit Payments and Administrative Expenses during Fiscal Year 2020	(78,943,085)
12.	Contributions during Fiscal Year 2020	42,622,174
13.	Interest on Items 10-12 to End of Year	56,327,192
14.	Expected Actuarial Value of Assets at June 30, 2020	842,840,910
15.	Actual Actuarial Value of Assets at June 30, 2020	842,424,756
16.	Asset Gain/(Loss)	(416,154)
	Total	
17.	Total Gain/(Loss)	**$ (6,668,478)**

SECTION C

PLAN ASSETS

Exhibit C.1
Tucson Supplemental Retirement System
Statement of Plan Net Assets

	June 30, 2020	June 30, 2019
Assets		
Short-term investments	$ 35,414,442	$ 28,647,513
Receivables		
Accounts Receivable - Sale of Investments	$ 3,951,150	$ 10,386,466
Accrued Interest and Other Dividends	1,825,227	2,007,094
Contributions	0	0
Total Receivables	$ 5,776,377	$ 12,393,560
Investments		
Fixed income securities	230,736,172	214,261,755
Domestic equity	286,646,569	275,104,869
International equity	208,272,250	208,519,269
Real estate investments	76,641,488	77,625,268
Other	1,158,180	39,059,474
Total Investments	$ 803,454,659	$ 814,570,635
Total assets	$ 844,645,478	$ 855,611,708
Liabilities and net assets held in trust for benefits		
Accounts payable	$ 11,473,946	19,028,680
Total payables	$ 11,473,946	19,028,680
Net assets held in trust for pension benefits	$ 833,171,532	$ 836,583,028

Exhibit C.2
Tucson Supplemental Retirement System
Statement of Changes in Plan Net Assets

		Year Ended June 30, 2020		Year Ended June 30, 2019
Additions to Net Assets Attributed to:				
Contributions				
Employer contributions		34,830,264		32,589,204
Plan members contributions		7,791,910		7,779,477
Total	$	42,622,174	$	40,368,681
Net Investment Income				
Net appreciation in fair value of investments		29,271,832		40,058,019
Interest and dividends		9,707,903		14,516,767
Other		236,491		123,500
	$	39,216,226	$	54,698,286
Total additions	$	81,838,400	$	95,066,967
Deductions to Net Assets Attributed to:				
Benefit payments		76,930,436		74,928,771
Refunds		1,368,241		1,657,445
Investment expenses		6,306,811		4,879,176
Administrative expenses		644,408		652,065
Other		0		0
Total deductions	$	85,249,896	$	82,117,457
Change in net assets	$	(3,411,496)	$	12,949,510
Net assets held in trust for benefits:				
Beginning of year		836,583,028		823,633,518
End of year	$	833,171,532	$	836,583,028

Exhibit C.3
Tucson Supplemental Retirement System
Development of the Actuarial Value of Assets

	Item				Year Ending June 30, 2020
1.	Market value of assets, at beginning of year				836,583,028
2.	Net new investments				
	a. Contributions received for prior plan year			$	42,622,174
	b. Benefits paid and administrative expenses				(78,943,085)
	c. Net			$	(36,320,911)
3.	Market value of assets, at end of year			$	833,171,532
4.	Net MVA earnings [(3) - (1) - (2c)]			$	32,909,415
5.	Assumed investment return rate				7.00%
6.	Expected return [(5)*(1)+(5)*(2c)/2]			$	57,289,580
7.	Excess return [(4) - (6)]			$	(24,380,165)
8.	Deferred amounts for fiscal year ending June 30,				
	Year	Gain/(Loss)	Percent Deferred		Amount Deferred
	a. 2020	(24,380,165)	80%		(19,504,132)
	b. 2019	(6,544,800)	60%		(3,926,880)
	c. 2018	12,254,236	40%		4,901,694
	d. 2017	46,380,470	20%		9,276,094
	e. 2016	(34,602,453)	0%		0
	f. Total	(6,892,712)			(9,253,224)
9.	Actuarial value of assets (Item 3 - Item 8f)			$	842,424,756

Exhibit C.4
Average Annual Rates of Investment Return

Fiscal Year Ended June 30,	Actuarial Value	Market Value*
2013	4.1 %	14.3 %
2014	13.8	19.1
2015	12.1	4.3
2016	8.0	2.5
2017	10.0	13.8
2018	9.4	8.8
2019	7.2	6.2
2020	6.9	4.0

**Market value numbers are based on actuarial estimate using beginning of year market value, end of year market value, and the assumption that all cash flows occur at middle of year. Other calculations of this number, such as those provided by the investment consultant, may be different.*

Section D

Summary of Benefit Provisions

SUMMARY OF BENEFIT PROVISIONS

JUNE 30, 2020

NORMAL RETIREMENT (NO REDUCTION FACTOR)

Eligibility :

Tier 1 – Members hired before July 1, 2011. Age 62, or a combination of age and creditable service equal to 80 (for those hired on or after July 1, 2009, eligibility at age 62 requires a minimum of 5 years of accrued service).

Tier 2 – Members hired on or after July 1, 2011. Age 65 with 5 years of service or a combination of age and creditable service equal to 85 and the attainment of age 60.

Amount - Creditable service times 2.25% of average final compensation for Tier 1 and 2.00% of average final compensation for Tier 2.

Average Final Compensation - The average monthly creditable compensation for the period of 36 consecutive months during which the member's creditable compensation was the highest during the 120 months immediately preceding the date of retirement for Tier 1 and 60 consecutive months during which the member's creditable compensation was the highest during the 120 months immediately preceding the date of retirement for Tier 2. Effective July 1, 2000, accrued unused sick leave at the final salary shall be substituted for an equal number of hours at the beginning of the 36 month period for Tier 1.

EARLY RETIREMENT (REDUCTION FACTOR)

Eligibility - Age 55 with 20 or more years of creditable service for Tier 1 and age 60 with 20 or more years of creditable service tor Tier 2.

Amount - An amount computed as for normal retirement but reduced by 1/2 of 1% per month for each month (6% per year) retirement precedes normal retirement.

DEFERRED RETIREMENT (VESTED TERMINATION)

Eligibility - 5 or more years of accrued service. Deferred retirement benefits for terminated vested employee becomes automatic at age 62 (age 65 for Tier 2) or when a combination of age and creditable service equals 80 (85 with the attainment of age 60 for Tier 2), unless the member elects to withdraw the employee contribution account in lieu of a deferred retirement benefit. In addition to the eligibility listed above, the term-vested member may choose an Early Retirement (minimum age of 55 for Tier 1 and 60 for Tier 2 and minimum service of 20 yrs) subject to the same reduction – reduced by ½ of 1% per month for each month (6% per year) retirement precedes normal retirement eligibility.

Amount - An amount computed as for normal retirement.

Disability Retirement

Eligibility - Eligibility requires 10 or more years of credited service and a disability that is total and permanent.

Amount - An amount computed as for normal retirement. Disability Retirement Benefits are offset, if the combination of all employer-provided benefits exceeds 100% of the members adjusted income base, then members pension benefit from TSRS is reduced so income does not exceed the 100% maximum allowed.

Pre-Retirement Survivor Benefits

Eligibility - 5 or more years of accrued service and not eligible to retire.

Amount - Lump sum payment equal to twice the member's contributions, with interest.

Eligibility - After attaining eligibility for retirement, in the event the member dies prior to submitting an application for retirement benefits:

Amount - If the member is married, a default provision allows the member's spouse to elect to receive either a lump sum payment of twice the member's contributions account, or receive a lifetime annuity benefit determined as if the member had elected a joint & last survivor benefit of 100% survivor annuity prior to death. If the member is not married and has named a single non-spousal beneficiary, the beneficiary may elect to receive either a lump sum payment of twice the member's contributions account, or receive a 15 year annuity benefit determined as if the member elected payment of a 15 year term certain annuity. If the member has named multiple designated beneficiaries, a lump sum refund of the member's account balance will be paid to the named beneficiaries.

Other Termination Benefits

Eligibility - Termination of employment without eligibility for any other benefit.

Amount - Accumulated contributions and interest in members account at time of termination.

Employee Contributions

As of July 1, 2017, interest is credited to member accumulated contributions accounts as compound interest two times per year at an annual interest rate of 3.0%. For those hired prior to July 1, 2006, employee contributions are 5.00% of salary. For those hired between July 1, 2006 and June 30, 2011

(Tier I variable class) and for those hired after July 1, 2011 (Tier II variable class), employee contributions are 50% of the respective Normal Cost for each class, with a floor of 5.0%. The employee contributions for the Tier I and Tier II variable classes for FY 2022 are 6.91% and 5.33%, respectively, before application of the floor or roundup policy.

CITY CONTRIBUTIONS

City Contributions are actuarially determined; which together with employee contributions and investment earnings will fund the obligations of the System in accordance with generally accepted actuarial principles. (please refer to the Funding Policy in Section I of this report).

POST-RETIREMENT ADJUSTMENTS

The TSRS Board has established formal policies to determine whether the system shall fund an annual supplemental post-retirement benefit payment to retired members and beneficiaries.

SECTION E

SUMMARY OF PARTICIPANT DATA

Exhibit E.1

Tucson Supplemental Retirement System

Summary of Census Data

	July 1, 2020	July 1, 2019
1. **Active Members**		
a. Counts	2,482	2,508
b. Annual Covered Payroll	$ 127,378,110	$ 123,822,602
c. Average Annual Compensation	$ 51,321	$ 49,371
d. Average Age	47.9	47.7
e. Average Service	11.5	11.5
f. Accumulated Member Contributions with Interest	$ 112,619,589	$ 115,885,693
2. **NonVested Members with Refunds Due**		
a. Counts	192	151
b. Amount of Refunds Due	$ 408,982	$ 311,887
3. **Deferred Vested Members**		
a. Counts	324	328
b. Annual Deferred Benefits	$ 3,935,405	$ 3,884,542
c. Average Benefit	$ 12,146	$ 11,843
4. **Retired Members**		
a. Counts	2,570	2,539
b. Annual Benefits	$ 69,725,301	$ 68,423,050
c. Average Benefit	$ 27,130	$ 26,949
5. **Beneficiaries**		
a. Counts	369	357
b. Annual Benefits	$ 4,778,699	$ 4,512,634
c. Average Benefit	$ 12,950	$ 12,640
6. **Disabled Retirees**		
a. Counts	142	148
b. Annual Benefits	$ 1,912,900	$ 1,965,862
c. Average Benefit	$ 13,471	$ 13,283
7. **Alternate Payees**	64	57
8. Total Members Included in Valuation	6,143	6,088

Exhibit E.2
Summary of Changes in Participant Status
During Fiscal Year 2020

	Active Participants	Terminated Vested	Terminated Non-vested	Retirees	Disabled Retirees	Beneficiaries	Alternate Payees	Total
A. Number as of June 30, 2019	2,508	328	151	2,539	148	357	57	6,088
1. Age Retirements	(85)	(12)		97				0
2. Disability Retirements	(1)				1			0
3. Deceased	(5)			(66)	(7)	(13)		(91)
5. Terminated - Deferred	(21)	21						0
6. Terminated - Due Refund	(72)		72					0
7. Cashouts	(113)	(10)	(30)					(153)
8. Rehired as Active	5	(3)	(2)					0
9. New Hires	266					29	7	302
10. Expired Benefits						(4)		(4)
11. Data Adjustments			1					1
B. Number as of June 30, 2020	2,482	324	192	2,570	142	369	64	6,143

Exhibit E.3
Active Member Counts by Age and Service
as of July 1, 2020

Age	Service							
	0-4	5-9	10-14	15-19	20-24	25-29	Over 30	Total
Under 20	4	0	0	0	0	0	0	4
20-24	62	0	0	0	0	0	0	62
25-29	138	13	0	0	0	0	0	151
30-34	126	66	7	1	0	0	0	200
35-39	124	74	38	15	0	0	0	251
40-44	96	61	50	58	17	1	0	283
45-49	82	66	63	71	63	22	0	367
50-54	74	57	41	73	85	30	7	367
55-59	81	59	48	75	69	43	21	396
60-64	36	45	31	60	52	31	33	288
65-69	19	12	16	14	9	8	14	92
Over 70	4	1	4	2	3	1	6	21
Total	846	454	298	369	298	136	81	2,482

Exhibit E.4
Active Member Average Salary by Age and Service
as of July 1, 2020

Age	Service							
	0-4	5-9	10-14	15-19	20-24	25-29	Over 30	Total
Under 20	*	*	*	*	*	*	*	*
20-24	$33,430	*	*	*	*	*	*	$33,430
25-29	37,607	43,757	*	*	*	*	*	38,136
30-34	42,105	47,382	47,662	*	*	*	*	44,023
35-39	45,145	51,156	48,471	46,647	*	*	*	47,510
40-44	46,165	49,843	53,783	53,760	56,487	*	*	50,522
45-49	47,633	48,915	55,825	56,360	55,927	54,481	*	52,792
50-54	51,438	50,082	55,282	52,961	57,474	67,800	57,726	54,815
55-59	50,151	52,446	49,070	53,626	57,655	67,803	58,909	54,709
60-64	45,415	50,469	49,619	56,897	57,505	68,671	71,436	56,717
65-69	55,448	53,966	56,245	55,442	50,456	71,867	73,109	59,019
Over 70	*	*	*	*	*	*	83,656	70,050
Total	$44,178	50,052	52,803	54,426	56,752	66,362	68,197	$51,321

**Data excluded when cell contains less than five active members.*

SECTION F

HISTORICAL SCHEDULES

Exhibit F.1
Tucson Supplemental Retirement System
Schedule of Funding Progress
$ in thousands

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)
6/30/1991	$ 164,268	$ 175,537	$ 11,269	93.6%	$86,830	13.0%
6/30/1992	179,570	187,812	8,242	95.6%	86,205	9.6%
6/30/1993	197,282	208,024	10,742	94.8%	92,867	11.6%
6/30/1994	213,541	230,026	16,485	92.8%	94,180	17.5%
6/30/1995	237,713	249,049	11,336	95.4%	99,847	11.4%
6/30/1996	266,740	269,186	2,446	99.1%	105,230	2.3%
6/30/1997	304,684	297,490	(7,194)	102.4%	110,189	-6.5%
6/30/1998	353,057	348,966	(4,090)	101.2%	113,729	-3.6%
6/30/1999	402,875	400,224	(2,651)	100.7%	126,817	-2.1%
6/30/2000	453,954	437,750	(16,204)	103.7%	134,088	-12.1%
6/30/2001[1]	470,672	486,702	16,030	96.7%	145,059	11.1%
6/30/2001[2]	470,672	495,359	24,687	95.0%	145,059	17.0%
6/30/2002	463,102	553,947	90,845	83.6%	153,580	59.2%
6/30/2003	458,857	601,173	142,316	76.3%	143,164	99.4%
6/30/2004	494,987	645,351	150,364	76.7%	149,782	100.4%
6/30/2005	538,789	693,871	155,082	77.6%	162,149	95.6%
6/30/2006[1]	588,228	734,377	146,149	80.1%	155,855	93.8%
6/30/2006[2]	588,228	735,793	147,565	79.9%	155,855	94.7%
6/30/2007[1]	634,763	758,427	123,663	83.7%	159,250	77.7%
6/30/2007[2,3]	634,763	763,539	128,776	83.1%	159,250	80.9%
6/30/2008	650,227	822,205	171,978	79.1%	153,982	111.7%
6/30/2009	665,298	859,485	194,187	77.4%	149,925	129.5%
6/30/2010	641,819	904,480	262,662	71.0%	141,459	185.7%
6/30/2011	624,665	928,609	303,944	67.3%	121,631	249.9%
6/30/2012	597,107	940,939	343,832	63.5%	125,003	275.1%
6/30/2013	600,330	948,562	348,232	63.3%	125,858	276.7%
` 6/30/2014	655,998	1,012,393	356,396	64.8%	126,639	281.4%
6/30/2015	706,774	1,021,378	314,604	69.2%	123,415	254.9%
6/30/2016	732,927	1,030,695	297,768	71.1%	115,183	258.5%
6/30/2017	767,988	1,036,687	268,699	74.1%	117,006	229.6%
6/30/2018	803,439	1,053,987	250,548	76.2%	118,152	212.1%
6/30/2019	822,835	1,129,492	306,657	72.8%	123,823	247.7%
6/30/2020	842,425	1,148,930	306,506	73.3%	127,378	240.6%

[1] *Before benefit changes.*
[2] *After benefit changes.*
[3] *Reflects an ad hoc pension increase.*

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

Exhibit F.2
Tucson Supplemental Retirement System
Schedule of Employer Contributions

Fiscal Year Ended June 30,	Annual Determined Contribution	Actual City Contribution	Percentage Contributed
1996	8.55 %	8.18 %	95.67 %
1997	8.05	8.38	104.10
1998	8.05	8.38	104.10
1999	7.41	7.91	106.75
2000	6.07	7.35	121.09
2001	6.77	7.35	108.57
2002	6.30	7.35	116.67
2003	8.41	8.41	100.00
2004	11.17	11.17	100.00
2005	14.06	14.06	100.00
2006	14.83	14.83	100.00
2007	15.04	15.04	100.00
2008	15.21	15.21	100.00
2009	14.37	14.37	100.00
2010	16.84	16.84	100.00
2011	18.02	18.02	100.00
2012	23.38	23.38	100.00
2013	28.77	28.77	100.00
2014	27.09	27.09	100.00
2015	26.95	27.50	102.04
2016	27.03	27.50	101.74
2017	25.52	27.50	107.76
2018	25.78	27.50	106.67
2019	23.48	27.50	117.12
2020	21.99	27.50	125.06
2021	24.71	N/A	N/A
2022	24.10	N/A	N/A

Exhibit F.3
Tucson Supplemental Retirement System
Schedule of Retirees and Beneficiaries Added to and Removed from Rolls

	Added to Rolls		Removed from Rolls		Rolls End of Year			
Fiscal Year	Number	Annual Allowances	Number	Annual Allowances	Number	Annual Allowance	Average Annual Allowance	Percentage Increase in Allowance
6/30/2005	68	$3,498,948	42	$485,633	1,791	$ 31,990,842	17,796	
6/30/2006	101	$2,335,032	53	$656,383	1,878	$ 35,092,308	18,686	4.61%
6/30/2007	213	$6,055,096	36	$403,347	2,018	$ 39,883,032	19,764	5.77%
6/30/2008	313	$10,001,857	24	$395,246	2,307	$ 49,489,643	21,452	8.54%
6/30/2009	112	$2,005,399	54	$684,115	2,365	$ 50,810,927	21,485	0.15%
6/30/2010	141	$3,089,275	56	$784,935	2,450	$ 53,115,267	21,680	0.91%
6/30/2011	332	$9,880,306	73	$1,284,997	2,709	$ 61,710,576	22,780	5.07%
6/30/2012	64	$1,084,848	69	$1,057,560	2,704	$ 61,737,864	22,832	0.23%
6/30/2013	96	$2,027,292	81	$1,216,923	2,719	$ 62,548,233	23,004	0.75%
6/30/2014	114	$2,635,101	69	$907,497	2,764	$ 64,275,837	23,255	1.09%
6/30/2015	127	$3,157,078	82	$1,299,698	2,809	$ 66,133,217	23,543	1.24%
6/30/2016	214	$5,463,524	78	$1,339,953	2,945	$ 70,256,788	23,856	1.33%
6/30/2017	124	$2,912,641	95	$1,644,499	2,974	$ 71,524,930	24,050	0.81%
6/30/2018	136	$3,062,324	79	$1,261,813	3,031	$ 73,325,441	24,192	0.59%
6/30/2019	149	$3,665,023	79	$1,449,493	3,101	$ 75,540,971	24,360	0.70%
6/30/2020	134	$3,267,094	90	$1,683,879	3,145	$ 77,124,186	24,523	0.67%

Exhibit F.4
Tucson Supplemental Retirement System
Comparative Schedule of Annual Pension Benefits Paid

Year Ending June 30	Retired Members	Annual Pensions	% Increase	No. of Active Per Retired	Pensions as % of Active Payroll	Average Pensions	Actuarial Present Value of Pensions	Expected Removals	
								No.	Pensions
1989 [1]	780	$ 5,344,719	17.6 %	4.2 [2]	6.6 %	$ 6,852	$ 46,556,352	26.6	$ 133,860
1990	832	6,488,714	21.4	3.9	7.5	7,799	57,430,128	28.5	150,864
1991 [1]	918	8,111,103	25.0	3.5	9.3	8,836	72,419,436	29.8	172,608
1992	965	9,010,345	11.1	3.3	10.5	9,337	80,342,604	32.3	208,068
1993 [1]	989	9,704,929	7.7	3.3	10.5	9,813	85,832,484	34.3	235,068
1994	1,035	10,612,612	9.4	3.2	11.3	10,254	95,449,308	35.8	263,340
1995 [1]	1,065	11,429,402	7.7	3.1	11.4	10,732	102,511,728	35.8	270,600
1996	1,105	12,236,298	7.1	3.1	11.6	11,074	109,572,672	37.7	302,952
1997 [1]	1,156	13,391,185	9.4	3.0	12.2	11,594	119,508,312	39.4	325,440
1998	1,208	14,479,476	8.1	2.9	12.7	11,986	129,345,816	42.4	370,344
1999 [1]	1,260	15,721,865	8.6	2.8	12.4	12,478	139,805,832	44.2	402,504
2000 [1]	1,301	16,966,042	7.9	2.8	12.7	13,041	150,527,136	46.2	445,464
2001 [1]	1,355	18,505,247	9.1	2.7	12.8	13,657	161,740,968	47.1	484,776
2002 [1]	1,442	21,273,162	15.0	2.5	13.9	14,753	187,508,568	53.3	622,236
2003 [1]	1,742	29,767,500	39.9	1.9	20.8	17,088	275,193,384	58.2	742,908
2004 [1]	1,753	30,491,864	2.4	2.0	20.4	17,394	286,698,084	55.7	717,888
2005 [1]	1,793	32,027,305	5.0	2.0	19.8	17,862	298,395,396	58.3	781,152
2006 [1]	1,878	35,091,468	9.6	1.7	22.5	18,686	326,828,088	61.1	857,760
2007 [1]	2,018	39,883,032	13.7	1.6	25.0	19,764	371,497,680	66.3	977,328
2008	2,307	49,489,643	24.1	1.4	32.1	21,452	473,240,976	74.4	1,134,019
2009	2,365	50,810,927	2.7	1.3	33.9	21,485	494,923,021	63.8	994,553
2010	2,450	53,115,267	4.5	1.2	37.5	21,680	525,200,232	58.9	948,815
2011	2,709	61,710,576	16.2	1.0	50.7	22,780	614,497,202	63.5	1,059,171
2012	2,704	61,737,864	0.0	1.0	49.4	22,832	607,450,331	66.1	1,125,302
2013	2,719	62,548,233	1.3	1.0	49.7	23,004	609,558,963	69.0	1,200,744
2014	2,764	64,275,837	2.8	1.0	50.8	23,255	647,811,688	70.4	1,219,112
2015	2,809	66,133,217	2.9	0.9	53.6	23,543	661,292,061	73.7	1,301,409
2016	2,945	70,256,788	6.2	0.8	61.0	23,856	699,577,704	75.9	1,392,573
2017	2,974	71,524,930	1.8	0.8	61.1	24,050	706,495,829	77.4	1,457,270
2018	3,031	73,325,441	2.5	0.8	62.1	24,192	716,751,118	80.8	1,555,043
2019	3,101	75,540,971	3.0	0.8	61.0	24,360	774,206,327	78.3	1,550,696
2020	3,145	77,124,186	2.1	0.8	60.5	24,523	784,845,229	81.5	1,393,502

[1] *Includes ad-hoc cost-of-living increases.*
[2] *Reflects increase in the number of active members as a result of an amendment which eliminated the one year service requirement for participation in the Retirement System.*

Exhibit F.5
Tucson Supplemental Retirement System
Solvency Test

	Aggregate Accrued Liabilities For						
	(1)	(2)	(3)				
	Active	Retirants	Active Member		Portion of Accrued Liabilities Covered by Reported Assets		
Valuation	Member	and	(Employer	Valuation			
Date	Contributions	Beneficiaries	Financed Portion)	Assets	(1)	(2)	(3)
6/30/1991	$ 44,496,039	$ 72,419,436	$ 86,372,322	$164,268,134	100.0 %	100.0 %	54.8 %
6/30/1992	49,238,019	80,342,604	86,902,648	179,569,858	100.0	100.0	57.5
6/30/1993	55,146,786	85,832,484	98,492,344	197,281,861	100.0	100.0	57.2
6/30/1994	60,424,161	95,449,308	105,838,311	213,540,661	100.0	100.0	54.5
6/30/1995	66,316,408	102,511,728	113,211,848	237,712,863	100.0	100.0	60.8
6/30/1996	72,294,235	109,572,672	118,739,900	266,740,007	100.0	100.0	71.5
6/30/1997	78,991,358	119,508,312	128,878,531	304,684,444	100.0	100.0	82.4
6/30/1998	85,106,175	129,345,816	134,514,294	353,056,577	100.0	100.0	103.0
6/30/1999	92,367,491	139,805,832	168,050,794	402,875,158	100.0	100.0	101.6
6/30/2000	100,413,022	150,527,136	186,809,583	453,953,722	100.0	100.0	108.7
6/30/2001	108,696,394	161,740,968	224,921,223	470,671,667	100.0	100.0	89.0
6/30/2002	118,913,979	187,508,568	247,524,186	463,101,526	100.0	100.0	63.3
6/30/2003	110,195,709	275,193,384	215,784,329	458,856,831	100.0	100.0	34.0
6/30/2004	123,643,527	286,698,084	235,009,321	494,986,798	100.0	100.0	36.0
6/30/2005	135,346,297	298,395,396	260,129,138	538,788,828	100.0	100.0	40.4
6/30/2006	140,387,532	326,828,088	268,577,863	588,227,845	100.0	100.0	45.1
6/30/2007	136,028,896	371,497,680	256,012,354	634,763,193	100.0	100.0	49.7
6/30/2008	125,331,432	473,240,976	223,632,380	650,227,215	100.0	100.0	23.1
6/30/2009	133,633,947	494,923,021	230,928,190	665,298,494	100.0	100.0	15.9
6/30/2010	140,224,998	525,200,232	239,055,106	641,818,551	100.0	95.5	0.0
6/30/2011	119,049,097	614,497,202	195,062,492	624,664,880	100.0	82.3	0.0
6/30/2012	122,240,396	607,450,331	211,247,995	597,106,511	100.0	78.2	0.0
6/30/2013	138,342,388	609,558,963	200,661,102	600,330,066	100.0	75.8	0.0
6/30/2014	142,418,791	647,811,688	222,162,858	655,997,802	100.0	79.3	0.0
6/30/2015	143,648,835	661,292,061	216,436,668	706,773,630	100.0	85.2	0.0
6/30/2016	133,200,540	699,577,704	197,916,702	732,926,710	100.0	85.7	0.0
6/30/2017	133,917,363	706,495,829	196,274,125	767,988,402	100.0	89.7	0.0
6/30/2018	138,420,705	716,751,118	198,815,201	803,439,269	100.0	92.8	0.0
6/30/2019	135,645,102	774,206,327	219,640,471	822,834,629	100.0	88.8	0.0
6/30/2020	132,227,165	784,845,229	231,858,034	842,424,756	100.0	90.5	0.0

SECTION G

ACTUARIAL ASSUMPTIONS AND METHODS

SUMMARY OF ACTUARIAL METHODS AND ASSUMPTIONS

I. Valuation Date

The valuation date is July 1st 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 (7.00%). 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 funding approach, and consist of a normal cost contribution and an accrued liability contribution.

3. The normal contribution is determined using the Entry Age Normal method. Under this method, a calculation is made to determine the average uniform and constant percentage rate of employer contribution which, if applied to the compensation of each new participant during the entire period of his anticipated covered service, would be required in addition to the contributions of the participant to meet the cost of all benefits payable on their behalf. Effective July 1, 2013 the TSRS funding policy requires the computation of normal cost separately for those members in Tier 1 and Tier 2 (the variable rate tiers).

4. The unfunded accrued liability contributions are determined by subtracting the actuarial value of assets from the actuarial accrued liability and amortizing the result over 20 years from the valuation date as a level percentage of pay. It is assumed that payments are made throughout the year.

5. Administrative expenses for the recent year will be added to the employer normal cost in the current valuation and will be reflected in the recommended employer rate for the upcoming fiscal year.

III. Actuarial Value of Assets

The actuarial value of assets is based on recognizing gains and losses over a five-year period where gains and losses are determined by comparing the projected market value return (based on the prior year's market value of assets, cash flows during the year and expected investment returns on those amounts) to the actual market investment return.

IV. Actuarial Assumptions

A. Economic Assumptions

1. Investment return: 7.00% per annum, compounded annually, composed of an assumed 2.50% inflation rate and a 4.50% real rate of return. This rate represents the assumed return, net of all investment expenses.

2. Salary increase rate:

Sample Attained Service	Percentage Increase in Salary with Less than Five Years of Service		
	Merit/ Productivity	Inflation	Total
0	3.50 %	2.50 %	6.00 %
1	3.50	2.50	6.00
2	3.00	2.50	5.50
3	2.75	2.50	5.25
4	2.50	2.50	5.00

Sample Attained Age	Percentage Increase in Salary with Five or More Years of Service		
	Merit/ Productivity	Inflation	Total
25	3.00 %	2.50 %	5.50 %
30	2.75	2.50	5.25
35	2.40	2.50	4.90
40	1.70	2.50	4.20
45	1.10	2.50	3.60
50	0.75	2.50	3.25
55	0.50	2.50	3.00
60	0.50	2.50	3.00
65	0.50	2.50	3.00

3. Payroll growth rate: In the amortization of the unfunded actuarial accrued liability, payroll is assumed to increase 3.00% per year. This increase rate is primarily due to the effect of inflation on salaries, with no allowance for future membership growth.

B. Demographic Assumptions

1. Mortality rates – Healthy Pre-Retirement Mortality RP-2014 Employee Mortality Tables projected with the ultimate rates of the MP-2018 projection scale. Healthy Post-Retirement Mortality RP-2014 Healthy Annnuitant Mortality Tables projected with the ultimate rates of the MP-2018 projection scale. Disabled Mortality RP-2014 Disabled Mortality Tables projected with the ultimate rates of the MP-2018 projection scale. Mortality rates were adjusted to include margin for future mortality improvement as described in the table name above. Sample 2020 rates shown below:

Sample Attained Ages	Probability of Death Pre-Retirement	
	Men	Women
20	0.04 %	0.02 %
25	0.05	0.02
30	0.04	0.02
35	0.05	0.03
40	0.06	0.04
45	0.09	0.06
50	0.16	0.10
55	0.26	0.16
60	0.44	0.23
65	0.78	0.35
70	1.30	0.59
75	2.18	1.01
80	3.65	1.73
85	7.11	4.45
90	13.00	9.76

Sample Attained Ages	Probability of Death Post-Retirement	
	Men	Women
20	0.04 %	0.02 %
25	0.06	0.03
30	0.08	0.06
35	0.11	0.10
40	0.17	0.14
45	0.26	0.20
50	0.38	0.26
55	0.54	0.34
60	0.73	0.49
65	1.04	0.76
70	1.58	1.21
75	2.53	1.97
80	4.21	3.28
85	7.30	5.70
90	12.85	10.13

Sample Attained Ages	Probability of Death Post-Disability	
	Men	Women
20	0.05 %	0.02 %
25	0.19	0.08
30	0.46	0.22
35	0.81	0.40
40	1.20	0.62
45	1.58	0.87
50	1.92	1.12
55	2.20	1.36
60	2.50	1.60
65	2.98	1.96
70	3.80	2.66
75	5.11	3.86
80	7.21	5.75
85	10.67	8.51
90	16.36	12.54

3. Disability rates. Sample rates shown below:

Sample Attained Ages	Probability of Disablement Next Year	
	Men	Women
25	0.01 %	0.01 %
30	0.07	0.07
35	0.09	0.09
40	0.14	0.14
45	0.17	0.17
50	0.25	0.25
55	0.36	0.36
60	0.48	0.48

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

Sample Attained Age	Years of Credible Service	Probability of Termination
Any	0	19.00 %
	1	14.00
	2	11.00
	3	9.00
	4	9.00
20	5 & over	7.40
25		7.40
30		6.98
35		4.88
40		3.83
45		3.10
50		2.68
55		2.57

5. Forfeiture rates: The percentages below represent the probability that a vested terminated member will take a refund of contributions rather than receive a deferred annuity benefit.

Sample Ages	**% of Vested Terminating Members Choosing Refund at Termination**
Under 30	50 %
30	45
35	40
40	35
45	30
50	25
55	20
60 and Over	0

6. Retirement rates for Tier 1. For those ages 62+, the Rule of 80 retirement rates only applies if the Rule of 80 is attained by age 62.

Attained Age	Tier 1 Members Percentage of Those Eligible Retiring During the Year		
	Rule of 80	Age Based	Early
50-54	24.0 %		
55-59	24.0		6.0 %
60	24.0		
61	24.0		
62	24.0	33.0 %	
63-65	24.0	18.0	
66	24.0	40.0	
67-69	24.0	30.0	
70 & Over	100.0	100.0	

Retirement rates for Tier 2. For those ages 65+, the Rule of 85 retirement rates only applies if the Rule of 85 is attained by age 65.

Attained Age	Tier 2 Members Percentage of Those Eligible Retiring During the Year		
	Rule of 85	Age Based	Early
60	24.0 %		6.0 %
61	24.0		6.0
62	24.0		6.0
63	24.0		6.0
64	24.0		6.0
65	24.0	18.0 %	
66	24.0	40.0	
67-69	24.0	30.0	
70 & Over	100.0	100.0	

Deferred vested members are assumed to retire at age first eligibility for unreduced benefits.

C. Other Assumptions

1. Percent married: 80% 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. Cost of living adjustment: None.
4. Optional forms: Members are assumed to elect the normal form of benefit.
5. Current and future deferred vested participants are assumed to retire at the earlier of age 62 and eligibility for rule of 80 for tier 1 and the earlier of age 65 and eligibility for the rules of 85 (but at least 60) for Tier 2.
6. Administrative expenses: Administrative expenses are added to the employer normal cost , before application of the round up policy.
7. Pay increase timing: End of year.
8. Decrement timing: Decrements of all types are assumed to occur mid-year.

9. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.

10. Decrement relativity: Decrement rates are used directly, without adjustment for multiple decrement table effects.

11. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.

12. Benefit and Eligibility Service due to Accrued Sick and Vacation Leave at Retirement and Termination: Tier 1 Members are assumed to have an additional 0.019 years per year of benefit and eligibility service at early or normal retirement and termination due to accrued sick and vacation leave. This assumption was developed using sick and vacation leave and service amounts for active members included in the actuarial valuation as of June 30, 2013.

13. Adjustment to Final Average Pay due to accrued sick leave at retirement and terminationg: For each year of additional service attributable to the prior service assumption, final average pay is assumed to increase 2.6%.

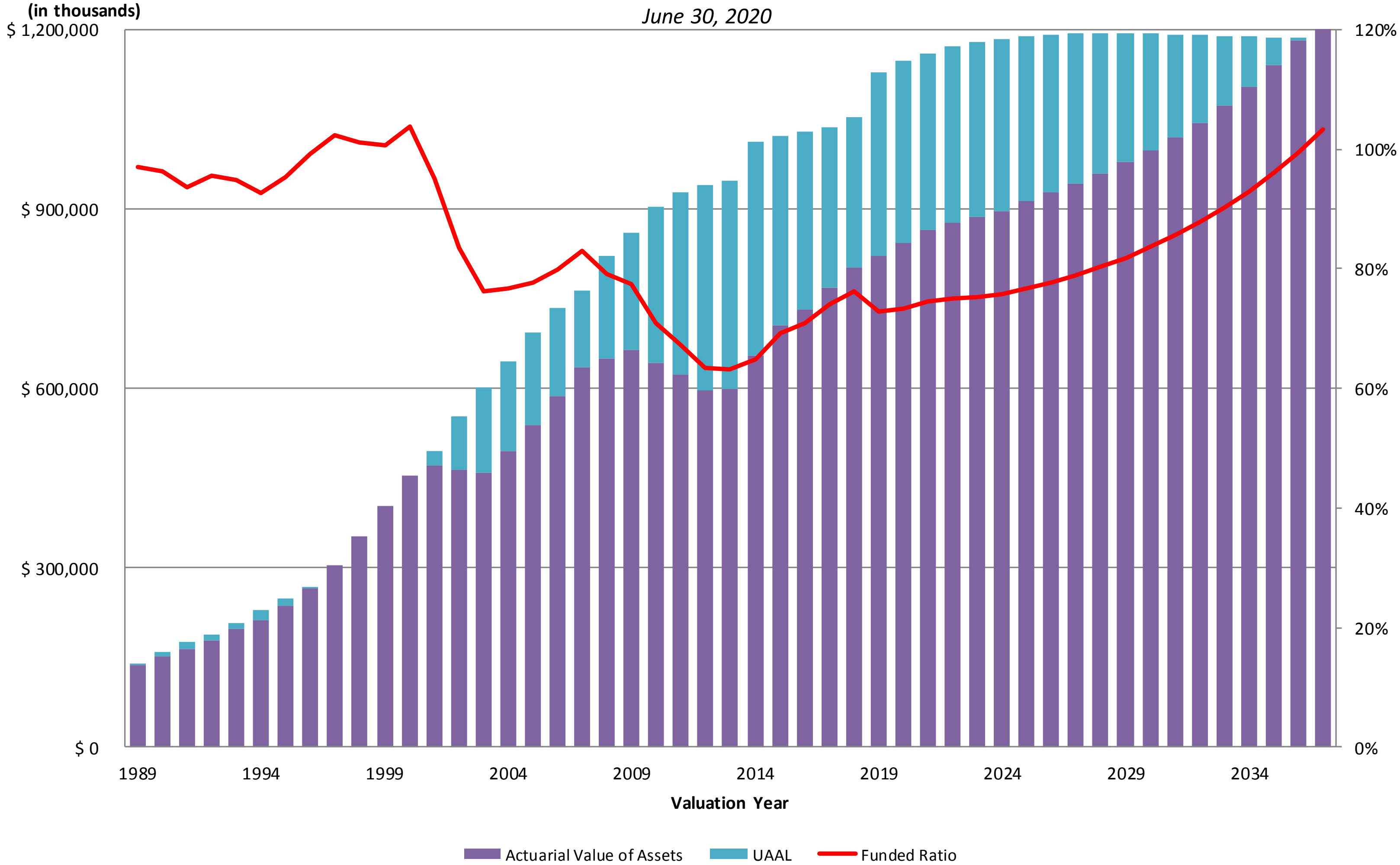
SECTION H

30-YEAR DETERMINISTIC PROJECTIONS

Tucson Supplemental Retirement System
Historical and Projected Funding Results

(shows trend and projection of future funded ratios)

June 30, 2020



Funding policy reflects 27.50% of pay minimum City contribution until full funding is reached.

SECTION I

FUNDING POLICY OF THE TSRS BOARD

Basis for variable employee contribution rates

Effective July 1, 2013 the contribution requirement for members hired after July 1, 2006 was changed from 40% of the Actuarial Required Contribution (or "ARC," as defined below) to a range of 50% to 100% of the normal cost of their given tier. In no event shall the variable contribution tier members contribute less than 5% of pay as set forth in TCC §22-34(a) and (b). Members hired prior to 7/1/2006 contribute 5% of pay.

Amortization Policy

The Board has adopted a 20 year open, level percent of pay amortization policy. A single unfunded amount is determined with each actuarial valuation, and that amount is then amortized over a 20 year period, assuming that the contribution amounts will remain level as a percent of the total payroll (so the dollar amount of the contribution is assumed to grow each year). The Board's amortization policy was most recently revised effective July 1, 2013, and later updated effective June 30, 2016.

Administrative Expenses

The annual administrative expenses incurred by the System, based on the administrative operating budget approved by the Board in advance of the fiscal year and determined as of the end of the fiscal year, shall be included in the calculation of the Actuarially Determined Contribution in accordance with sound actuarial principles. Administrative expenses paid by the System and included in the calculation of the ADC shall be reasonable and appropriate, and shall include staff salaries and related overhead expenses, actuarial, legal and other professional consulting fees, accounting charges, compliance expenses, and other fees and expenses necessary for the efficient administration of the System. Investment fees and expenses shall not be included in the calculation of the ADC.

Contribution Rounding Policy

I. Member Contribution Rates: Member Contributions for Legacy Members, Tier I Members and Tier II Members shall be determined by the TSRS actuary pursuant to TCC Section 22-34: members hired prior to July 1, 2006 (the "Legacy Members"), members hired between July 1, 2006 and June 30, 2011 ("Tier I Members") and members hired on or after July 1, 2011 ("Tier II Members"). The actuarially determined Member Contribution rate for each group shall be referred to as the "Calculated Rate" for the applicable group.

   The Board will then review the Calculated Rate for each member group and set the "Charged Rate" for the upcoming fiscal year. The Charged Rate will equal the Calculated Rate, rounded up to the nearest 0.25. The Charged Rate for a member group shall never be less than the Calculated Rate for that member group (for that same fiscal year). The Charged Rate for the legacy members is set at 5.00%.

II. City Contribution Rates: The City Contribution rate for a particular fiscal year equals the difference between the Actuarially Determined Contribution and the Member Contribution rate(s). TCC §22-30(t). Because there are three different Member Contribution rates, the TSRS actuary shall calculate a City Contribution rate for each member group and a blended City Contribution rate for the entire member population. In no event shall the blended City Contribution rate for the entire member population be less than the City Contribution rate for any member group. The City Contribution rates calculated by the TSRS actuary are referred to as the "Calculated Rates."

The Board will then review the Calculated Rates and set the "Charged Rate" for the City Contribution for the upcoming fiscal year. The Charged Rate will equal the blended Calculated City Contribution rate, rounded up to the nearest 0.50. The Charged Rate shall be rounded up to the nearest 0.50 instead of the nearest 0.25 because the Charged Rate is a blended rate. The Charged Rate shall never be less than the Calculated Rate for any member group for that same fiscal year.

III. Funded Status of TSRS: It is the goal of the Board to increase the funded status of TSRS. The Board anticipates that Calculated Rates for both Member Contributions and City Contributions may decrease from time to time, based on various actuarial factors. The Board will not recommend a decrease in the Charged Rate for Member and/or City Contributions until such point as TSRS is fully funded because the unfunded accrued liability has been extinguished, and the Calculated Rates for Member and City Contributions represent the payment of the normal cost of benefits only. Moreover, the Board shall recommend a decrease in the Charged Rates for Member Contributions only to the extent that the Charged Rates for Tier I Member Contributions and Tier II Member Contributions decrease simultaneously, in the same percentage of pay.

SECTION J

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.4 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, 2020	June 30, 2019	June 30, 2018
Ratio of the market value of assets to total payroll	6.5	6.8	7.0
Ratio of actuarial accrued laibility to payroll	9.0	9.1	8.9
Ratio of actives to retirees and beneficiaries	0.8	0.8	0.8
Ratio of net cash flows to market value of assets	-5%	-5%	-5%
Duration of the actuarial accrued liability	10.6	10.6	10.0

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