



March 27, 2019

Ms. Leslie Haase, Finance Director
City of Joplin Policemen's and Firemen's Pension Plan
602 S. Main Street
Joplin, Missouri 64801

Re: Pension Plan Review

Dear Ms. Haase:

Enclosed are the results of the Pension Plan Review to measure the financial effects of closing the City of Joplin Policemen's and Firemen's Pension Plan to new members and to determine the approximate cost to fully fund the Plan in its current form. One of the scenarios requested involves a transfer of Tier 2 employees to LAGERS.

GRS provides consulting services to both LAGERS and the City of Joplin Policemen's and Firemen's Pension Plan although the signing actuaries are different individuals. It is my opinion that my ability to act fairly in this assignment has not been impaired.

Respectfully submitted,

A handwritten signature in black ink that reads "Brad Lee Armstrong". The signature is fluid and cursive, with a long horizontal stroke at the end.

Brad Lee Armstrong, ASA, EA, FCA, MAAA

BLA:sc
Enclosure

City of Joplin Pension Plan Review as of October 31, 2018

Requested By: Ms. Leslie Haase, Finance Director
City of Joplin Policemen's and Firemen's Pension Plan

Date: March 27, 2019

Submitted By: Brad Lee Armstrong, ASA, EA, FCA, MAAA
Abra D. Hill, ASA, MAAA
Derek Henning, ASA, MAAA
Gabriel, Roeder, Smith & Company

This report contains the results of a supplemental actuarial valuation to review the fiscal impact of proposed plan changes to the City of Joplin Policemen's and Firemen's Pension Plan. The first Proposal (Proposal 1) would continue benefit eligibility for current Tier 1 and Tier 2 members and close the Plan to new hires. The second Proposal (Proposal 2) would only allow for Tier 1 members to remain in the Plan while current Tier 2 members, along with their allocated contributions to date, would be transferred to the Missouri Local Government Employees Retirement System (LAGERS).

Supplemental valuations do not predict the results of future actuarial valuations. (Future activities can affect future valuation results in an unpredictable manner.) Rather, supplemental valuations give an indication of the probable effect of the **change only** on future valuations without comment on the complete end result of the future valuations.

Brad Lee Armstrong, Abra D. Hill and Derek Henning are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

The valuations were based upon data furnished by the City for the October 31, 2018 actuarial valuation. Unless otherwise noted, actuarial methods and assumptions were the same as those used in the valuation. In particular:

- The assumed rate of interest under the current plan is 6.75%.
- The assumed rate of interest under Proposal 1 is 6.25%.
- The assumed rate of interest under Proposal 2 is 5.75%.
- The assumed rate of wage inflation is 2.50% for all scenarios.

A brief summary of the member data used in this valuation is shown below:

Actives Members

Benefit Tier	Number	Payroll	Averages		
			Payroll	Age	Service
Tier 1	69	\$3,939,938	\$57,101	43.5 years	14.8 years
Tier 2	116	\$4,818,927	\$41,542	32.1 years	4.5 years
Total	185	\$8,758,865	\$47,345	36.4 years	8.3 years

Retired Members

Number	Benefits	Averages		
		Benefits	Age	Age Retired
161	\$3,373,811	\$20,955	65.5 years	49.4 years

Item One

To satisfy Item One of the City’s request, we performed impact statements and cash flow projections of the current plan and the following proposals:

- **Current Plan** – The City of Joplin Policemen’s and Firemen’s Pension Plan is open to new hires.
- **Proposal 1** – Close the Pension Plan to new hires while current Tier 1 and Tier 2 members remain in the Plan.
- **Proposal 2** – Close the Pension Plan to new hires while current Tier 1 members remain in the Pension Plan and current Tier 2 members, along with their allocated contributions to date, transfer to the Missouri Local Government Employees Retirement System (LAGERS).
- **The Unfunded Accrued Liability (UAL) and Employer Present Value of Future Normal Cost (PVFNC) are amortized as a level dollar amount over a closed 10-year period for all three scenarios.**
 - **Amortizing both the UAL and Employer PVFNC over 10 years produces a higher contribution dollar amount than the current funding policy.**
 - **The current funding policy amortizes the UAL as a level dollar amount over a closed 18-year period. The Employer PVFNC is financed over a member’s service life.**

The projected fiscal impact of each proposal is shown on pages 3 through 5.

Additional questions and the actuary’s response are on page 6.

The cash flow projections of each proposal are shown on page 7.

Actuarial Statement - Overview

Current Plan

- **To fully fund both the Unfunded Actuarial Accrued Liability (UAAL) and the Employer Present Value of Future Normal Costs (PVFNC) as of the valuation date:**
 - Would require a lump sum contribution of \$29,959,303
 - \$25,493,195 for the UAAL
 - \$4,466,108 for the Employer PVFNC
 - The Normal Costs for New Members would be funded as they arise in future years.
- **To finance both the Unfunded Actuarial Accrued Liability (UAAL) and the Employer Present Value of Future Normal Costs (PVFNC) over 10 years (beginning with the Fiscal Year 2020 contribution)**
 - Would require a level dollar amount of \$3,973,415
 - \$3,419,691 for the UAAL
 - \$553,724 for the Employer PVFNC
 - The Normal Costs for New Members would be funded as they arise in future years.

Proposed Plan 1 (Closing the Plan to New Hires)

- **To fully fund both the Unfunded Actuarial Accrued Liability (UAAL) and the Employer Present Value of Future Normal Costs (PVFNC) as of the valuation date:**
 - Would require a lump sum contribution of \$35,206,858
 - \$29,239,601 for the UAAL
 - \$5,967,257 for the Employer PVFNC
- **To finance both the Unfunded Actuarial Accrued Liability (UAAL) and the Employer Present Value of Future Normal Costs (PVFNC) over 10 years (beginning with the Fiscal Year 2020 contribution)**
 - Would require a level dollar amount of \$4,627,698
 - \$3,889,822 for the UAAL
 - \$737,876 for the Employer PVFNC

Proposed Plan 2 (Closing the Plan to New Hires + Transfer of Tier 2 Members to LAGERS)

- **To fully fund both the Unfunded Actuarial Accrued Liability (UAAL) and the Employer Present Value of Future Normal Costs (PVFNC) as of the valuation date:**
 - Would require a lump sum contribution of \$33,580,087
 - \$30,742,026 for the UAAL
 - \$2,838,061 for the Employer PVFNC
- **To finance both the Unfunded Actuarial Accrued Liability (UAAL) and the Employer Present Value of Future Normal Costs (PVFNC) over 10 years (beginning with the Fiscal Year 2020 contribution)**
 - Would require a level dollar amount of \$4,505,436
 - \$4,183,688 for the UAAL
 - \$321,748 for the Employer PVFNC

Actuarial Statement – Proposal 1

Valuation Date	October 31, 2018
Contributions for Fiscal Year Ending	October 31, 2020

	Current Plan	Proposal 1	Impact
Unfunded Actuarial Accrued Liability			
Actuarial Accrued Liability (AAL)	\$66,406,387	\$70,152,793	\$3,746,406
Market Value of Assets (MVA)	40,913,192	40,913,192	0
Unfunded Actuarial Accrued Liability	\$25,493,195	\$29,239,601	\$3,746,406
Funded Ratio (MVA/AAL)	61.6%	58.3%	(3.3)%

Present Value of Future Normal Cost (PVFNC)			
Present Value of Future Benefits	\$79,358,754	\$84,848,028	\$5,489,274
Actuarial Accrued Liability (AAL)	\$66,406,387	\$70,152,793	\$3,746,406
Present Value of Future Normal Cost	\$12,952,367	\$14,695,235	\$1,742,868
PV of Future Member Contribs.	\$8,486,259	\$8,727,978	\$241,719
Employer PV Future Normal Cost	\$4,466,108	\$5,967,257	\$1,501,149

Present Value of Future Benefits (PVFB)			
Employer PV Future Benefits (AAL + ER PVFNC)	\$70,872,495	\$76,120,050	\$5,247,555
Funded Ratio (MVA/ER PVFB)	57.7%	53.7%	(4.0)%

Contributions			
UAAL \$ (Financed over 10 years)	\$3,419,691	\$3,889,822	\$470,131
Future Normal Cost (Financed over 10 years)	\$553,724	\$737,876	\$184,152

Illustrative only. Estimated employer contribution amounts shown are based on the Employer Total Contribution rate shown and the valuation payroll projected two years to the applicable fiscal year using the valuation assumption of 2.5% per year. Contributions shown above exclude the administrative expense load.

Please note that the employer contributions would fluctuate from deviations from assumptions (gains or losses). This risk is explored in **Item 2** of this report.

Actuarial Statement – Proposal 2

Contributions for Fiscal Year Ending

October 31, 2020

Unfunded Actuarial Accrued Liability	Current Plan	Proposal 2	Impact
Actuarial Accrued Liability (AAL)	\$66,406,387	\$68,841,311	\$2,434,924
Market Value of Assets (MVA)	40,913,192	38,099,285	(2,813,907)
Unfunded Actuarial Accrued Liability	\$25,493,195	\$30,742,026	\$5,248,831
Funded Ratio (MVA/AAL)	61.6%	55.3%	(6.3)%
Present Value of Future Normal Cost (PVFNC)			
Present Value of Future Benefits	\$79,358,754	\$75,342,714	\$(4,016,040)
Actuarial Accrued Liability (AAL)	\$66,406,387	\$68,841,311	\$2,434,924
Present Value of Future Normal Cost	\$12,952,367	\$6,501,403	\$(6,450,964)
PV of Future Member Contribs.	\$8,486,259	\$3,663,342	(4,822,916)
Employer PV Future Normal Cost	\$4,466,108	\$2,838,061	\$(1,628,048)
Present Value of Future Benefits (PVFB)			
Employer PV Future Benefits (AAL + ER PVFNC)	\$70,872,495	\$71,679,372	\$806,876
Funded Ratio (MVA/ER PVFB)	57.7%	53.2%	(4.6)%
Contributions			
UAAL \$ (Financed over 10 years)	\$3,419,691	\$4,183,688	\$763,998
Future Normal Cost (Financed over 10 years)	\$553,724	\$321,748	\$(231,976)

Illustrative only. Estimated employer contribution amounts shown are based on the Employer Total Contribution rate shown and the valuation payroll projected two years to the applicable fiscal year using the valuation assumption of 2.5% per year. Under Proposal 2, the payroll is projected two years assuming cessation of employment, and a declining payroll, based on current valuation assumptions. Contributions shown above exclude the administrative expense load.

For purposes of this study, the transfer of Tier 2 members (and their contributions) to LAGERS was assumed to take place on the valuation date. The Market Value of Assets was reduced by \$2,813,907 to model the transfer of Tier 2 contributions, and was determined as follows:

(a)	AAL - Tier 2	\$4,417,436
(b)	Funded Ratio (Current Plan)	63.7%
(a) x (b)	Computed Transfer	\$2,813,907

Please note that the employer contributions would fluctuate from deviations from assumptions (gains or losses). This risk is explored in **Item 2** of this report.

Additional questions regarding Item One, and the actuary's response, are below:

Questions:

- **Does the City need to estimate the timing of the cash payments over time to the closed pension plan?**

Not initially in our opinion since existing assets are invested in primarily, if not entirely, in liquid securities.

- **Is it appropriate to use the current plan assumptions and methods?**

No, we recommend lowering the interest rate as the average demographic profile of the group matures. Eventually the asset valuation method needs to be set equal to the market value.

Cash Flow Projections

Financing the Unfunded Actuarial Accrued Liability Over a 10-Year Period

Valuation Date	Current Plan					Proposal 1				Proposal 2			
	Estimated Employer Contribution ⁽¹⁾					Estimated Employer Contribution ⁽¹⁾				Estimated Employer Contribution ⁽¹⁾			
	To Fund Current Members		To Fund New Members		Employer PVFB	To Fund Current Members		Employer PVFB	To Fund Current Members		Employer PVFB		
	UAAL	Employer Normal Cost	Employer Normal Cost	Total Dollars		Funded Percent	UAAL		Employer Normal Cost	Total Dollars		Funded Percent	UAAL
2018	\$ 3,419,691	\$ 553,724	\$ 45,350	\$ 4,018,764	57.7%	\$ 3,889,822	\$ 737,876	\$ 4,627,698	53.7%	\$ 4,183,688	\$ 321,748	\$ 4,505,436	53.2%
2019	3,419,691	553,724	76,926	4,050,340	59.7%	3,889,822	737,876	4,627,698	55.4%	4,183,688	321,748	4,505,436	52.3%
2020	3,419,691	553,724	111,094	4,084,509	63.5%	3,889,822	737,876	4,627,698	59.5%	4,183,688	321,748	4,505,436	56.2%
2021	3,419,691	553,724	142,320	4,115,735	66.8%	3,889,822	737,876	4,627,698	63.3%	4,183,688	321,748	4,505,436	59.8%
2022	3,419,691	553,724	169,902	4,143,317	70.3%	3,889,822	737,876	4,627,698	67.2%	4,183,688	321,748	4,505,436	63.5%
2023	3,419,691	553,724	195,917	4,169,331	74.0%	3,889,822	737,876	4,627,698	71.3%	4,183,688	321,748	4,505,436	67.7%
2024	3,419,691	553,724	223,595	4,197,010	77.9%	3,889,822	737,876	4,627,698	75.6%	4,183,688	321,748	4,505,436	72.1%
2025	3,419,691	553,724	254,293	4,227,708	81.9%	3,889,822	737,876	4,627,698	80.0%	4,183,688	321,748	4,505,436	76.8%
2026	3,419,691	553,724	289,947	4,263,362	86.1%	3,889,822	737,876	4,627,698	84.7%	4,183,688	321,748	4,505,436	81.9%
2027	3,419,691	553,724	325,752	4,299,167	90.4%	3,889,822	737,876	4,627,698	89.4%	4,183,688	321,748	4,505,436	87.2%
2028	-	-	356,289	356,289	95.0%	-	-	-	94.5%	-	-	-	93.2%
2029	-	-	383,409	383,409	100.0%	-	-	-	100.0%	-	-	-	100.0%

⁽¹⁾ The Estimated Employer Contribution is projected to the fiscal year in which it will be contributed, which is the second year after the valuation date. The employer normal costs shown exclude the administrative expense load.

City of Joplin Pension Plan Review as of October 31, 2018

Item Two

Item Two addresses the cost to fully fund the Plan to 100% on a Market Value Basis using the current plan assumptions:

- **To fully fund Unfunded Actuarial Accrued Liability (as of the valuation date):**
 - Would require a lump sum contribution of \$25,493,195
 - Plus the Normal Costs arising from future benefit accruals

The City also requested analysis of the likelihood that the Pension Plan will remain 100% funded. To satisfy this request, we performed stochastic projections to illustrate the potential future outcomes of two funding policies.

- **Funding Policy 1**
 - Fully fund the Pension Plan with a lump sum contribution.
 - The City contributes a minimum of the Employer Normal Cost, even in years with a funding surplus.
 - The active members continue to contribute to the Plan.
 - Funding deficits are amortized over a closed period of 20 years when they arise, and remain open once reaching 10 years.
 - The amortization period resets when there is a funding surplus.
- **Funding Policy 2**
 - Fully fund the Pension Plan with a lump sum contribution.
 - The City contributes the no more and no less than Employer Normal Cost, whether there is a funding surplus or deficit (similar to a fixed rate contribution).
 - The active members continue to contribute to the Plan.

Additional questions and the actuary's response are on page 9.

The stochastic projections of each funding policy are shown on pages 10 through 12.

Additional questions regarding Item Two, and the actuary's response, are below:

Questions:

- **What would the normal cost percentage of payroll be if the pension plan is 100% funded?**

The total normal cost is projected to be 20.79% for the fiscal year 2020 and is anticipated to trend down to an ultimate rate of 16.3% in future years.

The current plan provisions require both City and Member contributions.

- **How long will it take for the normal cost to include only Tier 2 employees?**

Under current assumptions, the Tier 2 employees will replace the remaining Tier 1 employees within 10 to 15 years.

- **Is it appropriate to use current plan assumptions and methods?**

Yes, however, lowering the assumed investment rate of return is encouraged to help reduce contribution rate volatility, especially for Funding Policy 2 with a fixed rate.

- **What is the likelihood that the pension plan will remain at the normal cost (fully funded) into the future after it is fully funded?**

Under Funding Policy 1, the likelihood that the pension plan contributions will remain at normal cost is approximately 40%.

Under Funding Policy 2, the likelihood that the plan will remain 100% funded with fixed normal cost contributions trends from approximately 50% to 35% from the beginning to the end of the projection period.

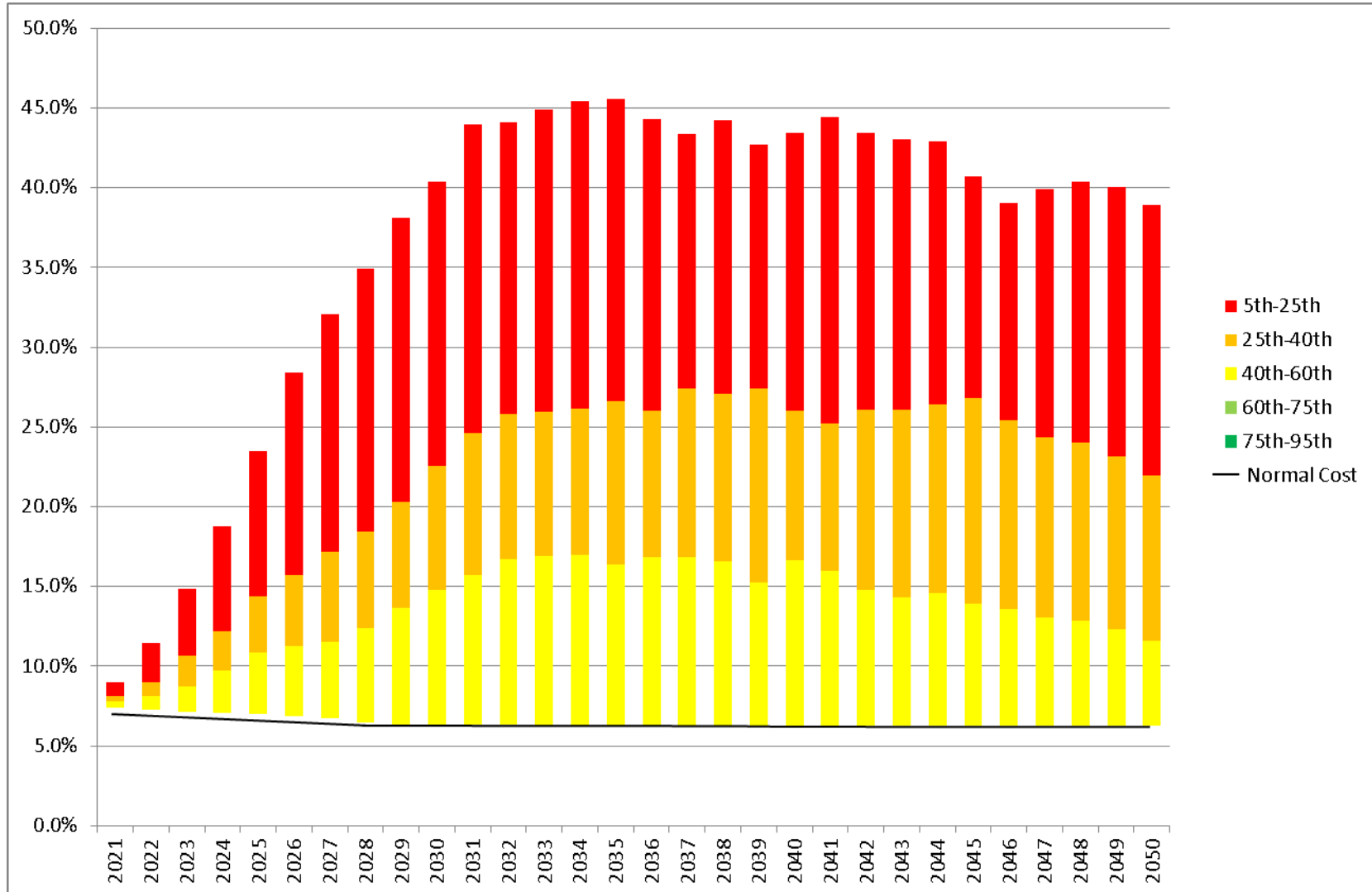
- **What components affect this likelihood?**

The volatility associated with investment markets and the volatility associated with demographic behavior affect this likelihood. If actual experience deviates from actuarial assumptions, gains and losses will occur. Lowering the assumed investment rate of return and conducting regular experience studies (at least every 5 years) would increase this likelihood of employer contributions remaining at the normal cost.

Stochastic Projections

Funding Policy 1

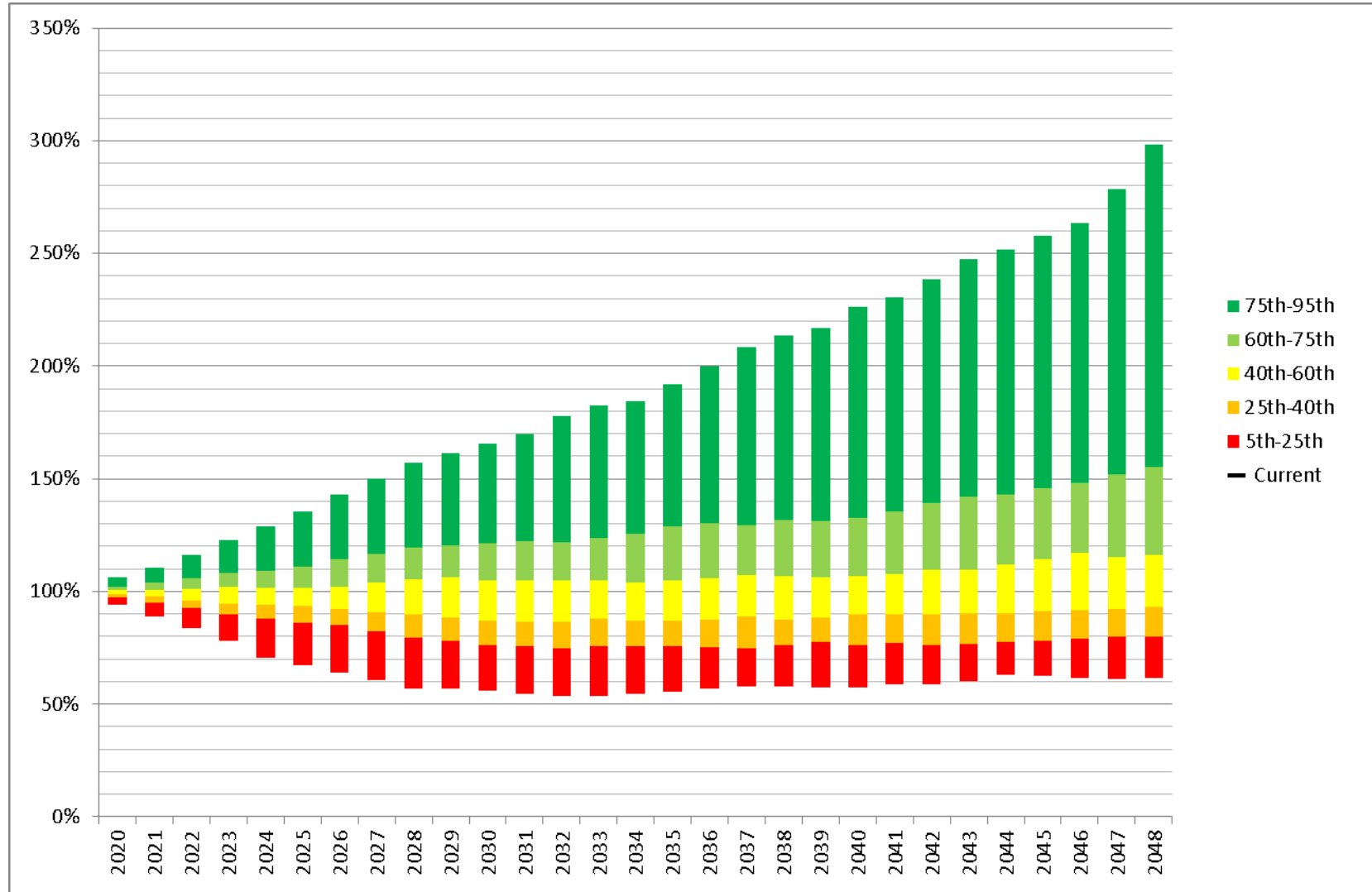
Employer Contribution Rate



Stochastic Projections

Funding Policy 1

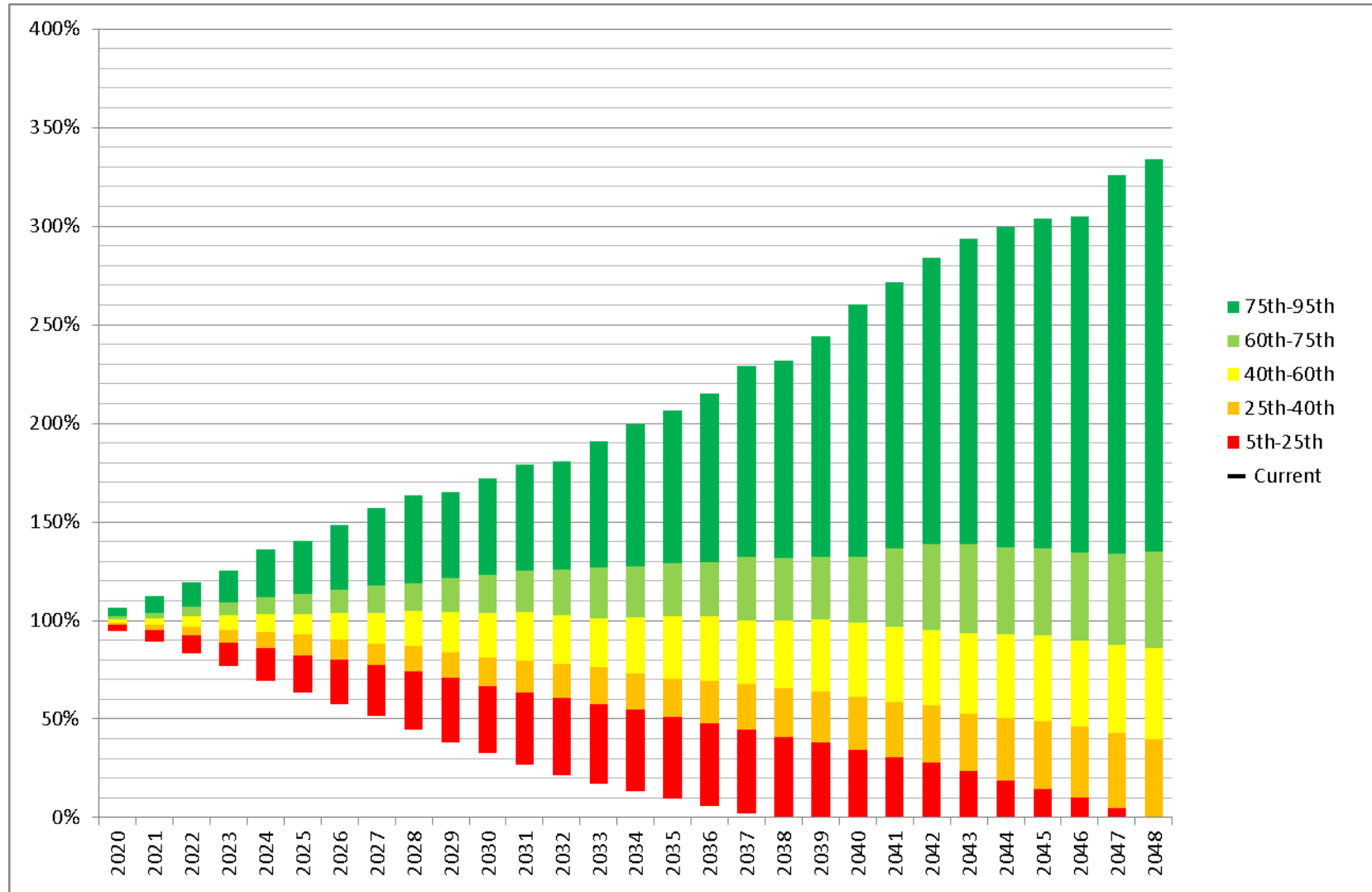
Funded Ratio



Stochastic Projections

Funding Policy 2 – Fixed Normal Cost Contributions

Funded Ratio



City of Joplin

Pension Plan Review

as of October 31, 2018

Comments on Actuarial Statement

Comment 1 — The stochastic models use the lognormal distribution to simulate interest rate scenarios. The assumptions for the model include a mean of 6.30% and a standard deviation of 10.50%, which comes from our Capital Market Modeling tool using the asset allocation for the Pension Plan. The Pension Plan's current investment return assumption is 6.75%. An additional 2% is added to the standard deviation in our model to approximate deviations of the actuarial accrued liability. The model randomly generates 500 series of investment returns over the next 30 years.

Comment 2 — No statement in this report is intended to be interpreted as a recommendation in favor of the changes, or in opposition to them.

Comment 3 — This report is intended to describe the financial effect of the proposed plan changes on the Retirement System. Except as otherwise noted, potential effects on other benefit plans were not considered.

Comment 4 — If you have reason to believe that the information provided in this report is inaccurate, or is in any way incomplete, or if you need further information in order to make an informed decision on the subject matter of this report, please contact the authors of the report prior to making such decision.

Comment 5 — Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of the actuary's assignment, the actuary did not perform an analysis of the potential range of such future measurements.

Comment 6 — This calculation is based upon present and proposed plan provisions that are outlined in the report. If you have reason to believe that the assumptions that were used are unreasonable, that the plan provisions are incorrectly described, that important plan provisions relevant to this proposal are not described, or that conditions have changed since the calculations were made, you should contact the authors of this report prior to relying on information in the report. Also, in the event that more than one plan change is being considered, it is very important to remember that the results of separate actuarial valuations cannot generally be added together to produce a correct estimate of the combined effect of all of the changes. The total can be considerably greater than the sum of the parts due to the interaction of various plan provisions with each other, and with the assumptions that must be used.

Risk Commentary

The determination of the accrued liability and the actuarially determined contribution (i.e., total employer contribution rate) 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 Risk** – 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, contributions and contribution rates 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; and
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 rates shown on pages 4 thru 12 may be considered as a minimum contribution rate for the selected benefit provisions 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.

Risk Commentary (Concluded)

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 are described below.

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 2.0 times the payroll, a return on assets 5% different than assumed would equal 10% 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 2.5 times the payroll, a change in liability 2% other than assumed would equal 5% 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 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.