Response to Written Questions for the Actuarial Audit

What were the fees for the 2018 actuarial audit?

$68,279.00

Please provide a copy of the 2018 actuarial audit report.

See Appendix

Please provide the most recent contract for these services.

See Appendix

Please confirm that a full replication audit valuation (parallel valuation) is within the scope of determining the reasonableness and/or accuracy of valuation results, actuarial assumptions, and actuarial methods in connection with the July 1, 2022 actuarial valuation.

Yes.

Does the scope of services include audit of the GASB 67/68 Report as of June 30, 2022?

No.

Will the contractor receive the processed data used by Cherion for its actuarial valuation?

Yes.

Would it be permissible to provide an electric copy of the RFP response on April 14, and then follow with three printed copies in the following week?

The requirements in the RFP are stated clearly, and no exceptions will be permitted.

SFERS

San Francisco Employees' Retirement System

BARTEL ASSOCIATES, LLC

San Francisco Employees' Retirement System

Actuarial Audit of July 1, 2017 Actuarial Valuation

September 5, 2018

September 5, 2018

Retirement Board
City and County of San Francisco Employees' Retirement System
1145 Market Street, 5th Floor
San Francisco, CA 94103

Members of the Board:

We are pleased to present the results of our actuarial audit of the City and County of San Francisco Employees' Retirement System (SFERS) July 1, 2017 actuarial valuation. The purpose of our review was to verify the reasonableness of the calculations and recommendations made in that report. Our report also comments on those calculations, the assumptions and methodologies used.

We would like to acknowledge the assistance of both SFERS and Cheiron staff. Cheiron's actuaries provided helpful responses to our questions and provided the supporting information we requested.

This review was conducted by the undersigned. We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion in this report.

We would be pleased to discuss our review and this report with the System.

Sincerely,

Mary Elizabeth Redding	Tak Frazita
FSA, MAAA, EA, FCA	FSA, MAAA, EA
Vice President	Associate Actuary

c: Marilyn Oliver, Cathy Wandro, Bartel Associates, LLC

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SECTION 1
EXECUTIVE SUMMARY

This report has been prepared by Bartel Associates, LLC to present the results of our actuarial audit of the July 1, 2017 actuarial valuation, and our review of the July 1, 2009 through June 30, 2014 Demographic Experience Study and the 2017 Review of Economic Assumptions, all prepared by Cheiron. Our review was based on actuarial reports, census data, and additional information provided by SFERS and Cheiron, and on email discussions with Cheiron staff.

The purpose of the review is to express opinions on:

- Valuation results including contribution rates and accrued liabilities
- Assumptions used
- Application of the funding method
- Whether the valuation was performed by qualified actuaries
- Whether the valuation was performed in accordance with principles and practices prescribed by the Actuarial Standards Board

Overall, we believe Cheiron's actuarial work produced for SFERS is reasonable, appropriate, and accurate, as well as following generally accepted actuarial principles and practices, with the exception noted below.

- In accordance with Actuarial Standards of Practice, we believe the value of future Supplemental COLAs, if significant, should be included in the actuarial costs, liabilities, and recommended contribution rates presented in the valuation report.

We do have comments and recommendations for Cheiron and SFERS based upon our review. Those are detailed in the following sections.

We would like to again express our thanks to SFERS and Cheiron staff for their assistance in this project.

Mary Elizabeth Redding

Mary Elizabeth Redding, FSA, MAAA, EA, FCA
Vice President

Tak Frazita

Tak Frazita, FSA, MAAA, EA
Associate Actuary

Catherine A. Wandro

Cathy Wandro, ASA, MAAA, FCA
Assistant Vice President

Marilyn M. Oliver

Marilyn M. Oliver, FSA, MAAA, EA, FCA
Vice President

Part 1: Review of Actuarial Valuation Purpose, Scope and Methodology

Purpose of the Actuarial Review

Bartel Associates, LLC has performed an actuarial review of SFERS' July 1, 2017 actuarial valuation to provide assurance to the System that the actuarial calculations, methods, assumptions, and conclusions are reasonable and conform to Actuarial Standards of Practice.

Scope of the Actuarial Review

The scope of our review includes the following:

- *Data Review* – A high-level review of census data used in the valuation for reasonableness and consistency.
- *Actuarial Assumptions* – Review of the most recent demographic experience study and economic assumption review. Test that the correct assumptions were applied in the valuation.
- *Software Testing*– Obtain key sample test cases from Cheiron to review in detail.
- *Parallel Actuarial Valuation* –To be sure all members in all categories and classifications have been properly included in the valuation, using the appropriate methodology and assumptions confirmed in the test cases.
- *Actuarial Methodology* – Examine funding methods and the actuarial valuation methodology used to determine the recommended contribution.

Methodology

Our actuarial review process consisted of the following steps:

1) Compare the demographics of the 2017 data provided by SFERS with the valuation data used by Cheiron for the July 1, 2017 actuarial valuation. Review Cheiron's data editing procedures. Process the data in accordance with Bartel Associates' procedures, and compare the results to the demographics of Cheiron's valuation data.
2) Develop an actuarial valuation model based upon SFERS' Charter provisions, policies, benefit calculations, and Cheiron's benefit summary. Use the actuarial assumptions in Cheiron's report, comparing those to the assumptions recommended in the experience study.
3) Select "sample lives" who are individuals from each benefit tier and member status with a range of pay, service, and gender. Use the valuation model to determine actuarial liabilities for each. Obtain a summary of Cheiron's results for these same individuals. Adjust the valuation model as required and appropriate.

4) Run the valuation model with Cheiron's valuation data, compile results by categories and compare to Cheiron's results.
5) Review the assets included in the valuation and the calculation of the actuarial valuation of assets. Determine whether the methodology is appropriate.
6) Review and replicate the calculation of the unfunded actuarial accrued liability and its amortization. Determine whether the methodology is appropriate.
7) Review and replicate the calculation of employer contribution rates. Determine whether the methodology is appropriate.
8) Review the complete actuarial valuation report for compliance with actuarial standards, clarity, and completeness. Present recommendations for improvement.

The remainder of Part 1 of our report presents the results of each of these steps.

PART 1: REVIEW OF ACTUARIAL VALUATION RESULTS: CENSUS DATA

The exhibit below provides a comparison by membership group and status of key data indicators in Cheiron's valuation data as summarized in the report and the SFERS raw data as processed by Bartel Associates. In general, the data files match very closely, with differences, we believe, most likely attributable mainly to employees and retirees with multiple benefits and records.

The data files provided to us by Cheiron did not include all of the data fields necessary to properly value all of the plan benefits. Based on email conversations, we understand Cheiron used additional information from the client data files. Some of the information we were not provided by Cheiron was:

- Joint and survivor continuation percentage, or Retirement Option plus Marital Status needed to determine it.
- Actual birthdate or annuity payment period for child survivors
- Increase to Section 415 benefit limit for after-tax contributions, or data to calculate that amount
- Date original pension began
- Industrial/Ordinary indicator for disability retirees

Overall, we believe the census data is reasonable and, as it appears to have been used in the valuation, complies with Actuarial Standards of Practice regarding data quality. In our opinion, data is adequate to support the valuation's conclusions.

Observations and Recommendations

We reviewed the data assumptions employed by Cheiron and found them for the most part to be reasonable. We do have the following comments on the data process.

1) New entrants to the valuation have their valuation pay based on the larger of actual pay in the prior year and their hourly pay rate multiplied by 2088 hours. There were about 620 new part-time or irregularly-paid members in the 2017 valuation. For part time employees, this "annualization" to a full-time pay rate can lead to a potentially large overstatement of their pay in the first year they are included in the valuation and with it their accrued liability, again for the first year's valuation only. In subsequent years' valuations, use of actual earnings corrects any initial overstatement. We believe the cost impact is very small but recommend employing an additional rule based on annualized first year pay for new entrants.

2) There are about 2,640 retirees, disability and QDRO retirees on the valuation file listed with a joint and survivor form of benefit, but where no survivor birth date and typically no survivor gender is listed. We understand these benefits are being valued using the family composition assumptions regarding spouse age and gender, but we assume the percentage married assumption is 100%.

   We believe many of these benefits are coded as joint and survivor as the participant elected an unmodified benefit and has a marital status of Married, Domestic Partner, or Separated. Based on our discussions with the System, we understand that the "marital status" data element is considered reliable. However, this resulted in the selected QDRO sample life being valued as receiving a joint and survivor benefit when it is actually being paid as a life annuity only.

   We expect that in many cases the spouse information is not reported because it is not available. We recommend continuing to collect this data if possible. Where sufficient data exists, we recommend a periodic process to determine whether designated beneficiaries are deceased, allowing release of the liability for the survivor benefit.

3) We note that pre-SFERS reciprocal service is not reflected in the valuation. This mainly impacts eligibility for benefits. Actuarial liabilities could be understated if participants are not identified as being eligible for retirement benefits. It is also possible that the impact of pre-SFERS reciprocal service is captured in the demographic experience study and is properly reflected in the plans liabilities.

PART 1: REVIEW OF ACTUARIAL VALUATION RESULTS: CENSUS DATA

Summary of Active Member data by group:

		Cheiron Report	Bartel Associates from SFERS Data	Ratio BA/Cheiron
Total	Count	33,447	33,447	100.0%
	Avg. Age	46.7	46.7	100.1%
	Avg. Service	10.8	10.8	100.1%
	Total Earnings	3,102,672,358	3,100,630,284	99.9%
	Avg. Earnings	92,764	92,703	99.9%
Police	Count	2,293	2,289	99.8%
	Avg. Age	41	41.0	100.0%
	Avg. Service	12.4	12.4	100.2%
	Total Earnings	276,596,552	275,936,299	99.8%
	Avg. Earnings	120,626	120,549	99.9%
Fire	Count	1,609	1,609	100.0%
	Avg. Age	44.3	44.3	100.0%
	Avg. Service	13.8	13.8	100.0%
	Total Earnings	204,443,368	204,443,369	100.0%
	Avg. Earnings	127,062	127,062	100.0%
Miscellaneous	Count	29,545	29,549	100.0%
	Avg. Age	47.3	47.3	100.0%
	Avg. Service	10.5	10.5	100.2%
	Total Earnings	2,621,632,438	2,620,250,616	99.9%
	Avg. Earnings	88,734	88,675	99.9%

Summary of Inactive member data by group:

		Cheiron Report	Bartel Associates from SFERS Data	Ratio BA/Cheiron
Retired	Count	22,587	22,280	98.6%
	Avg. Age	70.4	70.29	99.8%
	Total Ben	1,045,974,914	1,021,832,965	97.7%
	Avg. Ben	46,309	45,863	99.0%
Disabled	Count	2,572	2,608	101.4%
	Avg. Age	68.8	68.65	99.8%
	Total Ben	157,954,899	156,130,796	98.8%
	Avg. Ben	61,413	59,866	97.5%
Beneficiaries	Count	3,968	3,975	100.2%
	Avg. Age	77.3	77.37	100.1%
	Total Ben	128,500,450	126,437,897	98.4%
	Avg. Ben	32,384	31,808	98.2%
Total Payees	Count	29,127	28,863	99.1%
	Avg. Age	71.2	71.12	99.9%
	Total Ben	1,332,430,263	1,304,401,659	97.9%
	Avg. Ben	45,746	45,193	98.8%
Inactives	Count	8,420	8,450	100.4%
	Avg. Age	47.3	47.32	100.0%
	Total Bal	228,851,427	234,357,413	102.4%
	Avg. Bal	27,180	27,735	102.0%

More detailed comparisons of the census data are provided in Appendix A.

Part 1: Review of Actuarial Valuation Results: Actuarial Liabilities

Shown below is a comparison of key valuation actuarial liabilities calculated by Bartel Associates compared to those in Cheiron's valuation report. All of the amounts exclude future Supplemental COLAs. Appendix C provides a more detailed listing of results by Tier and Status. Appendix B provides a comparison of Bartel Associates' and Cheiron's test life results.

(Amounts in $000's)

	Cheiron Report			
	Police	**Fire**	**Misc**	**Total**
Present Value of Future Benefits	5,556,329	4,413,489	20,575,683	30,545,501
Actuarial Liability				
Active	1,438,148	1,243,598	7,177,825	9,859,571
Terminated Vested	22,278	18,541	423,677	464,496
Service Retired	2,167,339	1,305,336	8,711,332	12,184,007
Disability Retired	632,845	977,435	430,759	2,041,039
Beneficiary	338,404	266,766	551,808	1,156,978
Total	4,599,014	3,811,676	17,295,401	25,706,091
Normal Cost	89,405	68,079	403,719	561,203

	Bartel Associates			
	Police	**Fire**	**Misc**	**Total**
Present Value of Future Benefits	5,537,326	4,385,425	20,493,712	30,416,463
Actuarial Liability				
Active	1,431,752	1,241,194	7,072,212	9,745,158
Terminated Vested	22,544	18,410	434,699	475,653
Service Retired	2,170,507	1,307,261	8,715,610	12,193,378
Disability Retired	621,369	961,209	430,994	2,013,571
Beneficiary	338,797	266,730	557,309	1,162,837
Total	4,584,969	3,794,804	17,210,824	25,590,597
Normal Cost	89,109	67,177	406,101	562,388

	Ratio: Bartel Associates/Cheiron			
	Police	**Fire**	**Misc**	**Total**
Present Value of Future Benefits	99.7%	99.4%	99.6%	99.6%
Actuarial Liability				
Active	99.6%	99.8%	98.5%	98.8%
Terminated Vested	101.2%	99.3%	102.6%	102.4%
Service Retired	100.1%	100.1%	100.0%	100.1%
Disability Retired	98.2%	98.3%	100.1%	98.7%
Beneficiary	100.1%	100.0%	101.0%	100.5%
Total	99.7%	99.6%	99.5%	99.6%
Normal Cost	99.7%	98.7%	100.6%	100.2%

PART 1: REVIEW OF ACTUARIAL VALUATION RESULTS: ACTUARIAL LIABILITIES

Present Value of Future Benefits (PVFB) is the value today of all projected benefits for each member, taking into account the time value of money (discounting for interest until the time the benefits are projected to be paid) as well as the projected level of benefits, probability of remaining employed, and the expected lifetime of the member and beneficiary. The average ratio is 99.6%. This indicates that overall, there is a very good match with Cheiron for both the benefits being projected for active employees and the actuarial assumptions.

Actuarial Accrued Liability (AAL) is the portion of the present value of future benefits deemed earned to date under the selected actuarial cost method, and the total Normal Cost is the portion of the PVFB allocated to the coming year. Under the Entry Age method used in SFERS' valuation, this allocation is in proportion to the present value of future pay beginning from each member's entry age. For inactive members, PVFB is the same as the AAL. The average AAL ratio is 98.8 % for active members and the average total normal cost ratio is 100.2%. This indicates that overall, there is a good match with Cheiron for present value of future pay, entry age, and valuation methodology.

Observations and Recommendations

1) The group with the largest difference in actuarial accrued liability is Miscellaneous Proposition D and C members where our actuarial accrued liability is about 95% of Cheiron's. While the Prop C group's liability is currently small, it will grow over time.

   Based on detailed review of calculations for sample employees we believe this difference is related to Prop C employees all having short service. We typically see larger variations, as percentages, in the small liabilities of new hires than in longer-service employees, and rounding of age and service can have a large impact.

2) For retired members whose benefits are impacted by the Internal Revenue Code Section 415 (b) limit, Cheiron has assumed the IRS limits will increase at the same rate as the COLA increase applicable to each member. For active employees, the limits are assumed to increase with price inflation, as are the IRC Section 401(a)(17) pay limits. While it has only a minimal impact on valuation results, we recommend reviewing this assumption in the future.

Supplemental COLA

The San Francisco Charter provides Supplemental COLA benefits to a closed group in years where the asset earnings exceed the expected amount. For other retirees, this Supplemental COLA will be paid only in years when the asset earnings exceed the expected amount and the plan is fully funded.

We believe Actuarial Standard of Practice No. 4, (ASOP 4) "Measuring Pension Obligations and Determining Pension Plan Costs or Contributions", requires the value of the future Supplemental COLAs, when significant, to be included in the actuarial valuation for purposes of determining contributions. ASOP 4, Paragraph 3.5, says "when measuring pension obligations and determining periodic costs or actuarially determined contributions, the actuary should reflect all significant plan provisions known to the actuary as appropriate for the purpose of the measurement." The Standard also requires the inclusion of "difficult to measure" liabilities such as "gain sharing provisions that trigger benefit increases when investment returns are favorable but do not trigger benefit decreases when investment returns are unfavorable."

Should the actuary believe it is not appropriate to include the future Supplemental COLAs in the valuation, we believe that reasoning should be disclosed in the report, as required by paragraphs 3.5 and 4.1(d) of ASOP 4.. Alternatively, if it has not been included because of a prescribed assumption – where an outside agency such as the SFERS Board has determined that the Supplemental COLAs should be assumed to be 0% - then ASOP 4 requires the actuary to disclose that the assumption is prescribed and to disclose whether or not the prescribed assumption is reasonable, unless the actuary cannot make that determination.

We understand the short amortization periods for Supplemental COLAs is expected to produce a stable contribution pattern, and that contribution projections including the expected impact of future Supplemental COLAs have been presented to the Board. We also acknowledge that including the Supplemental COLA's value in the Plan's liabilities would increase the plan assets required for full funding and so lengthen the time until a Supplemental COLA could be payable to certain retiree groups.

We believe the Supplemental COLA liability should be included in the actuarial valuation, including calculations of SFERS funded status and contribution rates. This is a benefit which the System must pay: its value should be included in the same manner as any other benefit or cost of living increase.

Actuarial Cost Method

The actuarial valuation used the Entry Age cost method. This method is the most common in use among public pension plans. It allocates the present value of an employee's benefit over the period from plan entry until separation from employment as a constant percentage of payroll. This is the only method permitted under GASB Statements 67 and 68. The Entry Age cost method as applied in the SFERS valuation meets the GASB's requirements.

The Entry Age cost method is also specified as a "model practice" in the California Actuarial Advisory Panel's (CAAP's) publication "Actuarial Funding Policies and Practices for Public Pension and OPEB Plans and Level Cost Allocation Model".

We believe this is the most appropriate cost method for SFERS, and that the cost method has been properly applied in the valuation.

Conclusion

We believe our total results are within an acceptable range of Cheiron's indicating that the significant liabilities (except for Supplemental COLA) are reasonably valued. However, we believe Actuarial Standards of Practice require the value of future Supplemental COLAs, if significant, be included in the actuarial valuation for purposes of evaluating the plan's funded status and determining required contributions.

Actuarial Value of Assets

Bartel Associates verified the market value (MVA) of assets and the change in market value for the year against the fiduciary net position and changes in fiduciary net position reported in SFERS' 2017 CAFR. We have also replicated Cheiron's calculation of the actuarial value of assets.

The actuarial value of assets (AVA) methodology used in the valuation recognizes investment returns above and below the assumed rate of return over five year periods. This method is intended to smooth asset volatility in order to lower the volatility in employer contribution rates.

The asset smoothing method is based on delayed recognition of investment returns different than the expected rate of return applied to the previous year's actuarial value of assets. As applied, the methodology does not result in the actuarial value of assets equaling market value after a period of 5 years of returns exactly at the assumed rate. The method's actuarial value of assets would approach market value over time. While we believe the actuarial value of assets not equaling market value in the long term is not desirable (if future asset returns equal the expected rate), it does not preclude the method from being reasonable. However, note that the method's effective smoothing period is longer than 5 years.

We find the actuarial asset value methodology to be reasonable. The 5-year asset smoothing period is the most common method used by public plans.

The methodology, in our opinion, meets Actuarial Standard of Practice No. 44 since:

1) Differences between the AVA and MVA are recognized over a reasonable period of time.
2) While the AVA is not limited to a corridor around the MVA, we believe the smoothing policy is "sufficiently short" to make the absence of a corridor acceptable.
3) The method is not biased – it is not expected to produce AVA values consistently over or under the MVA.
4) Realized and unrealized gains and losses are treated identically.

The methodology used also meets the "Acceptable Practice" definition in the CAAP's publication "Actuarial Funding Policies and Practices for Public Pension and OPEB Plans and Level Cost Allocation Model". One of the "acceptable practices" is a 5-year (or shorter) smoothing period with no corridor.

Amortization Method for Unfunded Actuarial Accrued Liability (UAAL)

SFERS' policy regarding amortization of the unfunded actuarial accrued liability (UAAL) is to amortize changes in the UAAL as a level percentage of payroll over a closed period of 20 years from the date the UAAL layer arose. Benefit changes are amortized over 15 years and changes to retiree benefits including each Supplemental COLA, are amortized over 5 years. The impact of the 2015 assumption changes is being phased in over 5 years.

The CAAP's publication "Actuarial Funding Policies and Practices for Public Pension and OPEB Plans and Level Cost Allocation Model" provides a detailed discussion of amortization policies and expresses a preference for:

1) Level percentage of pay amortization
    a. Meets the general policy goal of being a reasonable allocation of the cost of benefits to years of service
    b. Mirrors the percentage of pay cost allocation inherent in the Entry Age cost method.
2) Multiple fixed amortization layers
    a. Track UAAL components by source, increasing transparency
    b. Avoids the "reset" needed by a single fixed period amortization policy when the single amortization period becomes too short to provide contribution stability.
3) Amortization periods of 15-20 years for actuarial gains and losses, to avoid negative amortization.

Observations and Recommendations

Under SFERS' current actuarial assumptions (7.5% discount rate and 3.5% payroll growth) an amortization period of 20 years does not produce "negative amortization" meaning that the amortization payment is slightly larger than interest on the UAAL. In each year, more and more of the UAAL principal will be paid and the balance will decline.

Actuarial Method for Normal Cost

In determining the Normal Cost portion of the contribution rate, Cheiron spreads the required normal cost for the year (in dollars) for current employees over the total expected payroll in the year. If the demographic and payroll assumptions are met, this will lead to normal cost being paid in the exact amount required to fund benefits for all employees included in the actuarial valuation. However, no normal cost will have been paid for employees hired during the year. This results in a small actuarial loss each year, as new members have an actuarial accrued liability but no assets (from normal cost payments) have been accumulated for them.

Observations and Recommendations

We believe this is an acceptable funding method as long as the System is aware of its implications.

Dollar amounts of normal cost are presented in the valuation report by Group and Tier. We recommend the accompanying normal cost rates as a percentage of payroll be shown as well. This can be useful for plan management and communications.

UAL allocation

The Plan's assets are not allocated between groups or employers for purposes of calculating different UAL contribution rates by group. Instead, the non-proposition unfunded actuarial accrued liability payment is the same for each group, with the result that all non-proposition UAL is treated as equally funded. If in the future a non-proposition change should be made that impacts the liability of only one group, this method would result in the cost of that change being spread among all groups. We recommend that the Board consider any change to the contribution allocation method that might be made in advance of such a change occurring.

Determination of Contribution Rates

Overall, we have verified that Cheiron's calculations of the total UAAL and the total employer and member Normal Cost contribution rates as a percentage of payroll are reasonable and calculated accurately, reflecting the results of the actuarial valuation. We also verified that the 5-year phase-in of the effect of change in actuarial assumptions was correctly computed.

It is not clear whether the employer contribution rates determined in the actuarial valuation are intended to apply only to pensionable earnings, in particular, to the earnings of Prop C employees only up to the pensionable earnings limits. We recommend this be specifically stated in the report.

The following chart compares the employer contribution rates we calculated for each group, including the difference in the actuarial accrued liability (but not including future Supplemental COLAs), as compared to Cheiron's results.

	Cheiron Report			
	Police	Fire	Misc	Total
Normal cost rate (composite)	30.86%	31.85%	14.70%	17.28%
Member contribution rate	8.00%	8.02%	7.50%	7.58%
Net employer normal cost	22.86%	23.83%	7.20%	9.70%
Unfunded liability rate:				
Proposition UAL	9.96%	11.74%	4.03%	5.07%
Non-proposition UAL	7.97%	7.97%	7.97%	7.97%
Total UAL payment	17.92%	19.71%	12.00%	13.03%
Administrative expenses	0.60%	0.60%	0.60%	0.60%
Total employer rate	41.39%	44.15%	19.80%	23.33%

	Bartel Associates			
	Police	Fire	Misc	Total
Normal cost rate (composite)	30.76%	31.50%	14.81%	17.34%
Member contribution rate	8.00%	8.02%	7.50%	7.58%
Net employer normal cost	22.76%	23.48%	7.31%	9.76%
Unfunded liability rate:				
Proposition UAL	9.96%	11.78%	4.03%	5.07%
Non-proposition UAL	7.71%	7.71%	7.71%	7.71%
Total UAL payment	17.67%	19.49%	11.75%	12.79%
Administrative expenses	0.60%	0.60%	0.60%	0.60%
Total employer rate	41.03%	43.58%	19.66%	23.15%

	Difference: Bartel Associates Minus Cheiron Rates			
	Police	Fire	Misc	Total
Normal cost rate (composite)	-0.11%	-0.35%	0.11%	0.06%
Member contribution rate	0.00%	0.00%	0.00%	0.00%
Net employer normal cost	-0.11%	-0.35%	0.11%	0.06%
Unfunded liability rate:				
Proposition UAL	0.00%	0.04%	0.01%	0.01%
Non-proposition UAL	-0.26%	-0.26%	-0.26%	-0.26%
Total UAL payment	-0.26%	-0.22%	-0.25%	-0.25%
Administrative expenses	0.00%	0.00%	0.00%	0.00%
Total employer rate	-0.36%	-0.57%	-0.14%	-0.18%

Conclusion

In our opinion, the resulting employer contribution rates are sufficiently close to Cheiron's for us to conclude that, except for the Supplemental COLA, the employer contribution rates developed in the actuarial valuation report are reasonable.

PART 1: REVIEW OF ACTUARIAL VALUATION RESULTS: REVIEW OF THE ACTUARIES' QUALIFICATIONS

We reviewed the actuarial qualifications of the actuaries signing the report.

- William R. Hallmark is listed by the Society of Actuaries' actuarial directories as having the ASA, EA, FCA, and MAAA designations and has complied with the continuing education requirements.
- Anne D. Harper is listed by the Society of Actuaries' actuarial directories as having the FSA, EA, and MAAA designations and has complied with the continuing education requirements.

Both actuaries certified in the valuation report that they meet the Qualification Standards to issue the actuarial report.

We are familiar with Cheiron as a firm and are aware that they work with many public pension plans and have for many years.

Conclusion

In our opinion, the valuation was performed by qualified actuaries.

PART 2: REVIEW OF ACTUARIAL EXPERIENCE STUDY
PURPOSE, SCOPE & METHODOLOGY

Purpose of the Actuarial Review

Bartel Associates has reviewed the July 1, 2009 through June 30, 2014 Demographic Experience Study and the 2017 Review of Economic Assumptions, to provide assurance to the System that the actuarial assumptions are reasonable and conform to Actuarial Standards of Practice.

Methodology

Bartel Associates performed the following steps in connection with our review of the actuarial experience study.

1) We reviewed Cheiron's reports and used professional judgment to evaluate the methodologies, evaluation of data, and conclusions drawn.
2) We performed stochastic modeling to evaluate the discount rate we would recommend based on Bartel Associates' usual capital market assumptions.

Part 2: Review of Actuarial Experience Study Results: Economic Assumptions

The economic assumptions included in Cheiron's 2017 review of economic assumptions for the July 1, 2017 actuarial valuation were:

1) Price inflation
2) Wage Inflation
3) Discount rate

COLA increase assumptions in the July 1, 2017 actuarial valuation were updated to incorporate the new price inflation assumption.

Price Inflation:

In addition to providing a basis for valuing the System's COLA increases, this assumption is a building block used in the construction of the Wage Inflation and Discount Rate assumptions.

The Price Inflation assumption adopted by the Board was 3.00%. We agree that this is a reasonable long-term assumption.

Wage Inflation

This assumption is generally based on the assumed inflation rate plus a component for pay increases in excess of inflation (i.e. increases in real wages). The assumption is used as a building block in determining future active member pay increases and salary-related COLA increases. It is also used to project future payrolls for amortization of the Unfunded Actuarial Accrued Liability. The assumption recommended in the Cheiron report was the price inflation rate increased by 0.50%. We agree that this is a reasonable long-term assumption.

Discount Rate

This assumption is dependent on the assumed rate of inflation and the "real" rate of return on the various asset investment classes in the SFERS fund. The assumption most recently adopted by the Board and recommended by Cheiron is 7.5% (which may be separated into a 3.00% inflation rate and a real rate of return, net of investment expenses, for the portfolio of 4.50%).

Results of our stochastic simulations of returns are shown below. See Appendix D for a summary of our capital market assumptions.

	50% Confidence	55% Confidence	60% Confidence
Real Rate of Return	5.14%	4.72%	4.35%
Investment Expenses[1]	-0.10%	-0.10%	-0.10%
Net Real Rate of Return	5.04%	4.62%	4.25%
Inflation Assumption	3.00%	3.00%	3.00%
Discount Rate	8.04%	7.62%	7.25%
Discount Rate rounded	**8.00%**	**7.50%**	**7.25%**

Based on these results we consider the 7.50% discount rate reasonable.

We relied on NEPC capital market assumptions for categories not included in our current capital market assumptions (liquid credit, absolute return, private real assets, and private debt) and used our current capital market assumptions for all other investment categories. To look at the sensitivity of the results to the NEPC return assumptions we reduced the NEPC returns by 1%. On that basis, the discount rates prior to rounding would have been reduced by 0.4%.

Basic COLA

For Miscellaneous members and new Police and Fire, SFERS Basic post-retirement COLA increases are capped at 2% and Cheiron assumes 2% increases.

COLA increases for Old Plan Police and Fire retirees are based on pay increases after retirement for the retirees' ranks/positions. Cheiron's methodology takes into account the various types of increases that apply under various applicable charter sections (% vs dollar increase in pay). Overall, the assumptions appear reasonable, however both the actuarial valuation report and experience study report do not give details of the derivation of the 1.67 and 1.25 factors used in the dollar increase calculation. Though the factors do not seem unreasonable, their derivation should be disclosed in the experience study report.

[1] Capital market returns assumed to be net of investment management fees.

Supplemental COLA

A Supplemental COLA is payable when the market value return amount exceeds the assumed return amount of the actuarial value of assets. The Supplemental COLA may not exceed 3.50% minus the Basic COLA. For those who retired before November 6, 1996 or were hired on or after January 7, 2012 there is a restriction that the retirement system must be fully funded before a Supplemental COLA is granted.

Supplemental COLA benefits are not prefunded. When granted, increases in liabilities due to Supplemental COLAs are included in contribution rates and amortized over 5 years.

Because, though they can fluctuate from year to year, the Supplemental COLAs are a consistent source of loss, we recommend that the Supplemental COLA be prefunded in the contribution rate.

Also, we believe ASOP 4 requires inclusion of the value of future Supplemental COLAs in the actuarial liabilities and contribution rates. Please see page 10 of this report for further discussion.

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Part 2: Review of Actuarial Experience Study Results: Demographic Assumptions

Actuarial Standard of Practice #35, "Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations" defines a reasonable assumption as one that:

1) Is appropriate for the purpose of the measurement;
2) Reflects the actuary's professional judgment;
3) Takes into account historical and current demographic data that is relevant as of the measurement date;
4) Reflects the actuary's estimate of future experience; and
5) Has no significant bias (i.e., it is not significantly optimistic or pessimistic).

The Standard also notes that, due to the inherent uncertainties in trying to predict the future, there is a range of possible reasonable assumptions and different actuaries may select different reasonable assumptions.

Our analysis focused on whether we believe the selected assumptions are reasonable and adequately supported by the data information contained in the experience report. However, we have several recommendations for improvements in subsequent studies.

Conclusion

Overall, we believe Cheiron's recommended actuarial assumptions are appropriate and reasonable.

General Comments

Cheiron has followed standard industry methodology by finding "A/E" ratios for each contingency. The number of occurrences actually ("A") found in the data is divided by the number expected ("E") or predicted by the assumptions. Ratios near 100% indicate the assumptions may be working well. However, this calculation considers only the total number of occurrences and not how they are distributed by age or service. That timing is very important to the liabilities produced by the valuation. Cheiron has added a second measure to their analysis: r-squared. This factor measures how similar two curves are. An r-squared of 1.0 means the curves are identical. We believe this adds an important element to the assumption selection.

Following are our comments on some of the specific calculations and assumptions selected.

Salary Merit Increases

The merit salary increase rates and their derivation appear reasonable. Merit increases are based on service and are calculated separately for the 5 job classifications. Cheiron's report states that rates of merit salary increase were calculated by subtracting the increase in the aggregate average wages for Plan members with 25 or more years of service from the actual increase. It would be helpful if the average aggregate pay increases were documented in the report, as well as the actual pay increases observed.

Disability

It was assumed that 38% of disability retirements due to disablements during the experience period had yet to be granted. The 38% is based on the pattern of disablements since FY 2005, however supporting data is only shown for FY's 2010-2015. Based on additional data supplied by Cheiron, this is a reasonable assumption. Since this assumption has a significant effect on the derivation of the disability retirement assumptions, its derivation should be fully documented in the experience study.

Post-retirement Mortality

We concur with Cheiron's methodology, weighting the calculations by benefit amount and also adjusting the calculated rates for credibility. We also concur with their choice of standard base tables (generally CalPERS mortality tables) and application of a modified form of the MP-2014 mortality projection scale on a generational basis. Cheiron adjusted the MP-2014 scale to lower future mortality improvement rates. These adjustments are not unreasonable.

Service Retirement

We agree with Cheiron's use of separate age-based rates for:

* Miscellaneous, Muni Drivers, Craft, Police and Fire
* Service categories (24 or less, 25-29, and 30+ for Safety and 19 or less, 20-29, and 30+ for all other categories), and
* Prop C versus non-Prop C.

In addition the rates themselves appear reasonable.

Police experienced significantly more retirements than anticipated during the experience period. This was undoubtedly influenced by the number of police electing the DROP program (and therefore counted as retirements). The program had 56 participants at the beginning of the experience study period (6/30/2009) and 266 participants as of 6/30/2011 when the program closed. Cheiron took into account that this was an aberration and did not fully take into account all the retirements during the period.

Additional Salary Increases in Year Before Retirement

For retirements during the experience study period Cheiron compared the actual covered compensation in the year prior to retirement with the salary that would have been expected using "actual wage inflation and the regular ultimate salary merit increase". Based on these calculations, increase assumptions were derived for Miscellaneous, Craft, Muni Drivers and Safety. For Miscellaneous and Safety the increase %'s that were calculated were 5.33% and 4.72% respectively but the assumptions are set at 2.5% and 3.5%. However, for Craft and Municipal Drivers the calculated rates were 4.50% and 4.49% respectively and the factors used were both 4.50%. We note that for the Miscellaneous and Safety groups the recommended assumptions are lower than the observed data. The rationale for this adjustment should be presented in the report.

Summary of Active Member Data by Plan

	Cheiron		Bartel Associates from SFERS Data		Ratio BA/Cheiron	
	Counts	Annual Earnings	Counts	Annual Earnings	Counts	Annual Earnings
Total						
Old	29	2,962,894	29	2,962,895	100.0%	100.0%
New	19,822	1,979,270,418	19,824	1,977,541,712	100.0%	99.9%
D	1,709	149,030,909	1,708	148,867,836	99.9%	99.9%
C	11,887	971,408,137	11,886	971,257,841	100.0%	100.0%
Total	33,447	3,102,672,358	33,447	3,100,630,284	100.0%	99.9%
Police						
Old	0	0	0	0		
New	1,488	199,019,020	1,484	198,417,510	99.7%	99.7%
D	23	2,837,350	23	2,837,350	100.0%	100.0%
C	782	74,740,182	782	74,681,439	100.0%	99.9%
Total	2,293	276,596,552	2,289	275,936,299	99.8%	99.8%
Fire						
Old	2	333,372	2	333,372	100.0%	100.0%
New	1,067	154,234,765	1,067	154,234,765	100.0%	100.0%
D	53	6,430,669	53	6,430,669	100.0%	100.0%
C	487	43,444,562	487	43,444,562	100.0%	100.0%
Total	1,609	204,443,368	1,609	204,443,369	100.0%	100.0%
Miscellaneous						
Old	27	2,629,522	27	2,629,522	100.0%	100.0%
New	17,267	1,626,016,633	17,273	1,624,889,436	100.0%	99.9%
D	1,633	139,762,890	1,632	139,599,817	99.9%	99.9%
C	10,618	853,223,393	10,617	853,131,840	100.0%	100.0%
Total	29,545	2,621,632,438	29,549	2,620,250,616	100.0%	99.9%

APPENDIX A
MEMBERSHIP DETAIL

Age & Service Distribution of Active Members showing count as of July 1, 2017 (Based on nearest age)

Cheiron

Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 and up	Total
Under 25	211	136	0	0	0	0	0	0	0	0	347
25 to 29	547	1,307	94	0	0	0	0	0	0	0	1,948
30 to 34	617	2,060	781	129	0	0	0	0	0	0	3,587
35 to 39	447	1,723	1,075	685	115	1	0	0	0	0	4,046
40 to 44	308	1,189	969	818	599	82	0	0	0	0	3,965
45 to 49	306	1,011	860	909	1,139	536	100	2	0	0	4,863
50 to 54	240	814	754	801	1,162	747	494	89	5	0	5,106
55 to 59	172	656	588	691	1,066	632	631	458	85	0	4,979
60 to 64	87	340	396	473	748	408	371	359	74	10	3,266
65 to 69	16	95	141	173	242	125	120	99	23	20	1,054
70 and up	12	23	26	47	64	46	28	17	10	13	286
Total Count	2,963	9,354	5,684	4,726	5,135	2,577	1,744	1,024	197	43	33,447

Bartel Associates from SFERS Data

Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 and up	Total
Under 25	211	136	0	0	0	0	0	0	0	0	347
25 to 29	547	1,309	94	0	0	0	0	0	0	0	1,950
30 to 34	617	2,059	781	129	0	0	0	0	0	0	3,586
35 to 39	447	1,722	1,076	687	115	1	0	0	0	0	4,048
40 to 44	309	1,190	968	816	599	82	0	0	0	0	3,964
45 to 49	305	1,010	860	909	1,139	537	100	2	0	0	4,862
50 to 54	240	814	756	802	1,163	747	494	89	5	0	5,110
55 to 59	172	656	588	690	1,065	631	631	459	85	0	4,977
60 to 64	87	340	394	474	748	409	371	358	74	10	3,265
65 to 69	16	95	141	172	243	124	120	99	23	20	1,053
70 and up	12	23	26	47	63	46	28	17	10	13	285
Total Count	2,963	9,354	5,684	4,726	5,135	2,577	1,744	1,024	197	43	33,447

Ratio: BA/Cheiron

Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 and up	Total
Under 25	100%	100%									100%
25 to 29	100%	100%	100%								100%
30 to 34	100%	100%	100%	100%							100%
35 to 39	100%	100%	100%	100%	100%	100%					100%
40 to 44	100%	100%	100%	100%	100%	100%					100%
45 to 49	100%	100%	100%	100%	100%	100%	100%	100%			100%
50 to 54	100%	100%	100%	100%	100%	100%	100%	100%	100%		100%
55 to 59	100%	100%	100%	100%	100%	100%	100%	100%	100%		100%
60 to 64	100%	100%	99%	100%	100%	100%	100%	100%	100%	100%	100%
65 to 69	100%	100%	100%	99%	100%	99%	100%	100%	100%	100%	100%
70 and up	100%	100%	100%	100%	98%	100%	100%	100%	100%	100%	100%
Total Count	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Age & Service Distribution of Active Members showing average pay as of July 1, 2017 (Based on nearest age)

Cheiron

Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 and up	Total
Under 25	62,058	62,637	0	0	0	0	0	0	0	0	62,285
25 to 29	71,020	73,226	86,036	0	0	0	0	0	0	0	73,225
30 to 34	78,873	80,268	94,421	106,965	0	0	0	0	0	0	84,070
35 to 39	79,152	83,239	95,802	105,285	108,626	83,554	0	0	0	0	90,579
40 to 44	81,060	82,280	96,615	106,661	110,078	112,138	0	0	0	0	95,535
45 to 49	77,731	81,982	89,101	103,860	109,641	122,707	128,795	133,055	0	0	99,013
50 to 54	85,602	82,760	86,439	96,592	102,868	113,952	123,391	116,735	102,651	0	99,289
55 to 59	80,262	80,302	89,511	93,865	93,781	100,701	113,376	104,968	102,420	0	95,584
60 to 64	79,331	80,956	87,475	87,935	88,999	100,115	107,234	105,099	98,812	90,892	93,023
65 to 69	65,144	74,433	85,176	87,821	94,357	94,301	105,013	98,708	114,039	109,977	92,158
70 and up	58,089	84,302	82,696	88,501	97,480	95,902	96,878	97,134	99,852	99,151	91,773
Total Count	76,858	80,211	91,779	99,609	100,965	108,988	114,950	105,356	102,297	102,265	92,764

Bartel Associates from SFERS Data

Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 and up	Total
Under 25	62,559	62,216	0	0	0	0	0	0	0	0	62,425
25 to 29	71,286	72,913	86,018	0	0	0	0	0	0	0	73,088
30 to 34	79,774	80,018	94,363	106,965	0	0	0	0	0	0	84,070
35 to 39	80,839	82,804	95,651	105,193	108,626	83,554	0	0	0	0	90,535
40 to 44	82,091	82,040	96,320	106,533	110,078	112,138	0	0	0	0	95,432
45 to 49	78,101	81,706	88,803	103,788	109,480	122,690	128,795	133,055	0	0	98,887
50 to 54	86,502	82,618	86,432	96,339	102,782	113,888	123,391	116,735	102,651	0	99,234
55 to 59	80,753	80,167	89,364	93,641	93,739	100,703	113,376	105,114	102,420	0	95,541
60 to 64	83,031	80,434	87,193	87,819	88,999	99,874	107,234	104,911	98,812	90,892	92,966
65 to 69	65,144	74,433	85,176	87,930	94,264	94,527	105,013	98,708	114,039	109,977	92,185
70 and up	60,786	84,302	82,696	88,501	97,885	95,902	96,878	97,134	99,852	99,151	91,957
Total Count	77,753	79,923	91,611	99,477	100,903	108,949	114,950	105,356	102,297	102,265	92,703

Ratio: BA/Cheiron

Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 and up	Total
Under 25	101%	99%									100%
25 to 29	100%	100%	100%								100%
30 to 34	101%	100%	100%	100%							100%
35 to 39	102%	99%	100%	100%	100%	100%					100%
40 to 44	101%	100%	100%	100%	100%	100%					100%
45 to 49	100%	100%	100%	100%	100%	100%	100%	100%			100%
50 to 54	101%	100%	100%	100%	100%	100%	100%	100%	100%		100%
55 to 59	101%	100%	100%	100%	100%	100%	100%	100%	100%		100%
60 to 64	105%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
65 to 69	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
70 and up	105%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Total Count	101%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

APPENDIX A
MEMBERSHIP DETAIL

Active Police Members as of July 1, 2017
(Based on nearest age)
Ratio of Counts and Average Pay Calculated by Bartel Associates from SFERS Data to Cheiron's Report

COUNTS - POLICE

Ratio: BA/Cheiron

Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 and up	Total
Under 25		100%									100%
25 to 29	100%	100%	100%								100%
30 to 34	100%	100%	100%	100%							100%
35 to 39	100%	100%	100%	100%	100%						100%
40 to 44		100%	100%	100%	100%	100%					100%
45 to 49	100%	100%	100%	100%	99%	100%	100%				100%
50 to 54	100%	100%	100%	100%	100%	98%	100%	100%			99%
55 to 59	100%	100%	100%	100%	100%	100%	100%	100%	100%		100%
60 to 64		100%	100%	100%	75%	100%	100%	100%			96%
65 to 69				100%		100%	100%				100%
70 and up											
Total Count	100%	100%	100%	100%	99%	99%	100%	100%	100%		100%

AVERAGE PAY - POLICE

Ratio: BA/Cheiron

Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 and up	Total
Under 25		100%									100%
25 to 29	100%	100%	100%								100%
30 to 34	100%	100%	100%	100%							100%
35 to 39	100%	100%	100%	100%	100%						100%
40 to 44		100%	100%	100%	100%	100%					100%
45 to 49	100%	100%	100%	100%	100%	100%	100%				100%
50 to 54	100%	100%	100%	100%	100%	100%	100%	100%			100%
55 to 59	100%	100%	100%	100%	100%	100%	100%	100%	100%		100%
60 to 64		100%	100%	100%	101%	100%	100%	100%			100%
65 to 69				100%		100%	100%				100%
70 and up											
Tot Avg Pay	100%	100%	100%	100%	100%	100%	100%	100%	100%		100%

Active Fire Members as of July 1, 2017
(Based on nearest age)
Ratio of Counts and Average Pay Calculated by Bartel Associates from SFERS Data to Cheiron's Report

COUNTS - FIRE

Ratio: BA/Cheiron

Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 and up	Total
Under 25	100%	100%									100%
25 to 29	100%	100%	100%								100%
30 to 34	100%	100%	100%	100%							100%
35 to 39	100%	100%	100%	102%	100%						100%
40 to 44	100%	100%	100%	98%	100%	100%					100%
45 to 49	100%	100%	100%	100%	100%	101%	100%	100%			100%
50 to 54		100%	100%	100%	100%	99%	100%	100%			100%
55 to 59		100%	100%	100%	100%	100%	100%	100%			100%
60 to 64			100%	100%	100%	100%	100%	100%	100%		100%
65 to 69		100%				100%	100%		100%	100%	100%
70 and up											
Total Count	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

AVERAGE PAY - FIRE

Ratio: BA/Cheiron

Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 and up	Total
Under 25	100%	100%									100%
25 to 29	100%	100%	100%								100%
30 to 34	100%	100%	100%	100%							100%
35 to 39	100%	100%	100%	100%	100%						100%
40 to 44	100%	100%	100%	100%	100%	100%					100%
45 to 49	100%	100%	100%	100%	100%	100%	100%	100%			100%
50 to 54		100%	100%	100%	100%	100%	100%	100%			100%
55 to 59		100%	100%	100%	100%	100%	100%	100%			100%
60 to 64			100%	100%	100%	100%	100%	100%	100%		100%
65 to 69		100%				100%	100%		100%	100%	100%
70 and up											
Tot Avg Pay	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Age Distribution of Inactive Members by Count as of July 1, 2017 (Based on nearest age)

Cheiron

Age	Police	Fire	Misc	TOTAL
Under 50	41	25	122	188
50 to 54	88	58	582	728
55 to 59	320	159	1,622	2,101
60 to 64	534	269	3,732	4,535
65 to 69	476	439	5,526	6,441
70 to 74	383	400	4,428	5,211
75 to 79	282	279	3,278	3,839
80 to 84	203	139	2,328	2,670
85 to 89	182	162	1,576	1,920
90 and up	139	145	1,210	1,494
Total Count	2,648	2,075	24,404	29,127

Bartel Associates from SFERS Data

Age	Police	Fire	Misc	TOTAL
Under 50	40	28	119	187
50 to 54	89	59	581	729
55 to 59	320	158	1,609	2,087
60 to 64	535	270	3,715	4,520
65 to 69	474	438	5,479	6,391
70 to 74	382	401	4,394	5,177
75 to 79	282	279	3,242	3,803
80 to 84	203	139	2,295	2,637
85 to 89	182	163	1,525	1,870
90 and up	139	145	1,167	1,451
Total Count	2,646	2,080	24,126	28,852

Ratio: BA/Cheiron

Age	Police	Fire	Misc	TOTAL
Under 50	98%	112%	98%	99%
50 to 54	101%	102%	100%	100%
55 to 59	100%	99%	99%	99%
60 to 64	100%	100%	100%	100%
65 to 69	100%	100%	99%	99%
70 to 74	100%	100%	99%	99%
75 to 79	100%	100%	99%	99%
80 to 84	100%	100%	99%	99%
85 to 89	100%	101%	97%	97%
90 and up	100%	100%	96%	97%
Total Count	100%	100%	99%	99%

Age Distribution of Inactive Members showing total annual benefits as of July 1, 2017 (Based on nearest age). Note that benefits in SFERS data do not include Supplemental COLA effective July 1, 2017.

Cheiron

Age	Police	Fire	Misc	TOTAL
Under 50	2,535,064	1,519,740	2,494,911	6,549,716
50 to 54	6,048,165	3,568,718	10,532,310	20,149,193
55 to 59	35,718,349	13,455,611	34,731,551	83,905,512
60 to 64	59,375,755	31,622,109	130,768,070	221,765,934
65 to 69	48,758,285	49,823,998	230,982,551	329,564,834
70 to 74	33,365,203	41,401,994	189,176,274	263,943,472
75 to 79	21,878,531	25,639,203	127,858,631	175,376,365
80 to 84	15,390,126	11,851,065	81,391,106	108,632,296
85 to 89	12,332,159	14,158,028	46,897,739	73,387,926
90 and up	8,733,561	11,068,777	29,352,675	49,155,014
Total Benefit	244,135,199	204,109,245	884,185,818	1,332,430,262

Bartel Associates from SFERS Data

Age	Police	Fire	Misc	TOTAL
Under 50	2,316,560	1,495,610	2,415,932	6,228,102
50 to 54	5,889,259	3,522,108	10,417,341	19,828,708
55 to 59	35,586,555	13,145,374	34,058,409	82,790,337
60 to 64	59,009,360	31,647,015	128,559,405	219,215,781
65 to 69	47,663,728	48,972,584	225,792,607	322,428,919
70 to 74	32,444,190	40,358,536	184,897,485	257,700,211
75 to 79	21,384,675	25,036,652	125,016,471	171,437,798
80 to 84	15,166,649	11,656,526	79,368,112	106,191,287
85 to 89	12,068,138	13,930,637	45,054,184	71,052,960
90 and up	8,583,290	10,786,703	28,157,564	47,527,557
Total Benefit	240,112,405	200,551,745	863,737,510	1,304,401,659

Ratio: BA/Cheiron

Age	Police	Fire	Misc	TOTAL
Under 50	91%	98%	97%	95%
50 to 54	97%	99%	99%	98%
55 to 59	100%	98%	98%	99%
60 to 64	99%	100%	98%	99%
65 to 69	98%	98%	98%	98%
70 to 74	97%	97%	98%	98%
75 to 79	98%	98%	98%	98%
80 to 84	99%	98%	98%	98%
85 to 89	98%	98%	96%	97%
90 and up	98%	97%	96%	97%
Total Benefit	98%	98%	98%	98%

APPENDIX B
DETAIL OF SAMPLE LIVES

							Cheiron			Bartel Associates			Ratio: Bartel/Cheiron		
Sample	Status	Group/Tier	Age	Svc	Gender	Form	Present Value of Future Benefits	Actuarial Liability	Valuation Pay	Present Value of Future Benefits	Actuarial Liability	Valuation Pay	Present Value of Future Benefits	Actuarial Liability	Valuation Pay
1	Active	Police New	48	27	M		2,641,407	2,316,648	315,096	2,702,077	2,369,724	315,172	102%	102%	100%
2	Active	Misc New	47	21	M		511,169	406,900	89,230	500,563	401,136	89,230	98%	99%	100%
3	Active	Misc New	65	37	M		1,434,660	1,388,909	167,126	1,500,057	1,460,157	167,126	105%	105%	100%
4	Active	Police Prop D	38	6	M		866,448	243,740	122,418	844,800	235,155	121,906	98%	96%	100%
5	Active	Fire Prop C	24	2	F		505,637	40,160	86,330	485,483	37,833	84,095	96%	94%	97%
6	Active	Police Prop C	54	2	F		710,611	149,029	193,640	710,792	151,341	188,917	100%	102%	98%
7	Active	Police Prop C	31	2	M		594,416	53,383	90,606	587,434	52,204	90,691	99%	98%	100%
8	Active	Misc Prop C	64	0	F		176,110	143	204,914	153,194	(0)	204,914	87%	0%	100%
9	Retired	Police Old	65		M	Option 1 J&S	2,033,689			2,035,255			100%		
10	Retired	Police New	60		M	Joint & Survivor	3,321,976			3,263,853			98%		
11	Retired	Misc New	60		M	Joint & Survivor	27,420			34,390			125%		
12	Retired	Misc New	73		M	Option 1 LA	534,096			536,490			100%		
13	Beneficiary	Misc Old	69		F	Life Annuity	331,740			333,869			101%		
14	Beneficiary	Fire New	15		F	Temp for Child	372,175			305,395			82%		
15	Disabled	Misc New	62		M	Joint & Survivor	387,024			387,024			100%		
16	QDRO	Misc New	65		M	Joint & Survivor	5,016			5,016			100%		
17	QDRO	Police New	65		M	Joint & Survivor	298,529			298,531			100%		
18	Inactive - Refund Du	Misc New	44		M	Contribution LS	8,972			8,972			100%		
19	Reciprocal	Misc Prop D	34		F	Deferred to 55	62,709			61,558			98%		
20	Terminated Vested	Misc Prop D	39		F	Deferred to 55	96,257			96,257			100%		

Notes:

Sample life #14: Based on Cheiron-reported birth date

Sample live #10 and #11 are the same person. Cheiron data does not contain full Section 415 limited benefit.

Sample lives #16 and #17 are the same person.

APPENDIX C
DETAIL OF LIABILITY MATCHING
(Amounts in $000's)

POLICE	Cheiron Report				
	Old	New	Prop D	Prop C	Total
Present Value of Future Benefits					5,556,329
Actuarial Liability					
Active	0	1,356,757	6,015	75,376	1,438,148
Terminated Vested					22,278
Service Retired					2,167,339
Disability Retired					632,845
Beneficiary					338,404
Total					4,599,014
Normal Cost	0	64,211	1,027	24,167	89,405

	Bartel Associates				
	Old	New	Prop D	Prop C	Total
Present Value of Future Benefits	1,270,522	3,774,764	19,476	472,564	5,537,326
Actuarial Liability					
Active		1,352,060	5,888	73,805	1,431,752
Terminated Vested		20,818	220	1,506	22,544
Service Retired		1,447,119	0	630	2,170,507
Disability Retired		354,274	0	23	621,369
Beneficiary		58,104	0	0	338,797
Total		3,232,376	6,108	75,964	4,584,969
Normal Cost		64,158	1,016	23,935	89,109

	Ratio: Bartel Associates/Cheiron				
	Old	New	Prop D	Prop C	Total
Present Value of Future Benefits					**99.7%**
Actuarial Liability					
Active		99.7%	97.9%	97.9%	99.6%
Terminated Vested					101.2%
Service Retired					100.1%
Disability Retired					98.2%
Beneficiary					100.1%
Total					99.7%
Normal Cost		99.9%	99.0%	99.0%	99.7%

APPENDIX C
DETAIL OF LIABILITY MATCHING

(Amounts in $000's)

FIRE	Cheiron Report				
	Old	New	Prop D	Prop C	Total
Present Value of Future Benefits					4,413,489
Actuarial Liability					
Active	4,369	1,184,177	16,173	38,879	1,243,598
Terminated Vested					18,541
Service Retired					1,305,336
Disability Retired					977,435
Beneficiary					266,766
Total					3,811,676
Normal Cost		50,372	2,433	15,274	68,079

	Bartel Associates				
	Old	New	Prop D	Prop C	Total
Present Value of Future Benefits	1,349,692	2,722,542	44,398	268,793	4,385,425
Actuarial Liability					
Active	4,188	1,183,288	16,035	37,683	1,241,194
Terminated Vested	2	18,259	0	148	18,410
Service Retired	568,263	738,998	0	0	1,307,261
Disability Retired	546,940	413,065	1,205	0	961,209
Beneficiary	230,299	36,431	0	0	266,730
Total	1,349,692	2,390,041	17,240	37,831	3,794,804
Normal Cost	0	49,944	2,407	14,826	67,177

	Ratio: Bartel Associates/Cheiron				
	Old	New	Prop D	Prop C	Total
Present Value of Future Benefits					**99.4%**
Actuarial Liability					
Active	95.9%	99.9%	99.1%	96.9%	99.8%
Terminated Vested					99.3%
Service Retired					100.1%
Disability Retired					98.3%
Beneficiary					100.0%
Total					99.6%
Normal Cost		99.1%	99.0%	97.1%	98.7%

APPENDIX C

DETAIL OF LIABILITY MATCHING

(Amounts in $000's)

MISC	Cheiron Report				
	Old	New	Prop D	Prop C	Total
Present Value of Future Benefits					20,575,683
Actuarial Liability					
Active	20,708	6,647,135	165,404	344,578	7,177,825
Terminated Vested					423,677
Service Retired					8,711,332
Disability Retired					430,759
Beneficiary					551,808
Total					17,295,401
Normal Cost	150	251,643	23,378	128,548	403,719

	Bartel Associates				
	Old	New	Prop D	Prop C	Total
Present Value of Future Benefits	2,776,165	15,677,526	396,596	1,643,425	20,493,712
Actuarial Liability					
Active	20,943	6,570,093	155,648	325,528	7,072,212
Terminated Vested	3,741	409,026	9,064	12,867	434,699
Service Retired	2,325,383	6,384,058	3,675	2,494	8,715,610
Disability Retired	87,848	343,146	0	0	430,994
Beneficiary	337,988	219,322	0	0	557,309
Total	2,775,902	13,925,645	168,387	340,890	17,210,824
Normal Cost	135	252,461	23,779	129,726	406,101

	Ratio: Bartel Associates/Cheiron				
	Old	New	Prop D	Prop C	Total
Present Value of Future Benefits					99.6%
Actuarial Liability					
Active	101.1%	98.8%	94.1%	94.5%	98.5%
Terminated Vested					102.6%
Service Retired					100.0%
Disability Retired					100.1%
Beneficiary					101.0%
Total					99.5%
Normal Cost	90.1%	100.3%	101.7%	100.9%	100.6%

Appendix C
Detail of Liability Matching

(Amounts in $000's)

	Normal Cost Rate by Group (Normal Cost / Total Projected Pay) Before Adjustment for Population Shift Between Tiers			
		Cheiron	Bartel Associates	Ratio: BA/Cheiron
Police	Old	0.00%	0.00%	
	New	31.14%	31.11%	99.9%
	Prop D	34.37%	34.15%	99.4%
	Prop C	30.13%	29.85%	99.1%
	Total	30.89%	30.79%	99.7%
Fire	Old	0.00%	0.00%	
	New	31.56%	31.28%	99.1%
	Prop D	36.29%	36.00%	99.2%
	Prop C	31.98%	31.54%	98.6%
	Total	31.75%	31.44%	99.0%
Miscellaneous	Old	5.54%	4.99%	90.1%
	New	14.97%	15.03%	100.4%
	Prop D	16.04%	16.34%	101.9%
	Prop C	14.14%	14.32%	101.3%
	Total	14.74%	14.85%	100.7%
Total	Total	17.31%	17.37%	100.4%

Appendix D
Detail of Capital Market Assumptions

Following are the details of the Capital Market Assumptions used in our stochastic simulations to review the valuation discount rate:

Category	Asset Class	Target Asset Allocation	30-Year Geometric Real Returns	Standard Deviation
Equity	Large Cap Equities	12.30%	4.36%	15.95%
	Small/Medium Cap Equities	3.70%	5.02%	18.65%
	Int'l Equities (Unhedged)	12.20%	4.60%	17.91%
	Emerging Market Int'l Equities	2.80%	5.58%	24.91%
Fixed Inc	Treasuries (Intermediate)	6.00%	0.65%	4.58%
	Liquid Credit *	3.00%	3.56%	11.21%
	Private Debt*	10.00%	5.11%	14.00%
Real Estate	Core Real Estate	8.50%	3.04%	11.22%
Misc	Private Equity	18.00%	5.96%	25.14%
	Private Real Assets *	8.50%	4.21%	21.00%
	Absolute Return *	15.00%	3.87%	8.58%

* NEPC 30-year assumptions

Agreement between

THE SAN FRANCISCO CITY AND COUNTY EMPLOYEES' RETIREMENT SYSTEM
and
BARTEL ASSOCIATES, LLC

THIS Agreement is made this **4th day of June, 2018** in the City and County of San Francisco, State of California, by and between: **Bartel Associates, LLC, 411 Borel Avenue, Suite 101, San Mateo, CA 94402** ("Actuary") and the San Francisco Retirement Board ("Retirement Board"), by and through the San Francisco City and County Employees' Retirement System ("System").

RECITALS

WHEREAS, The System is a duly established and existing public retirement system created under the Charter of the City and County of San Francisco, and

WHEREAS, The Retirement Board has plenary authority and fiduciary responsibility for investment of System monies and administration of the System; and

WHEREAS, The Retirement Board, through the System, wishes to retain a professional actuarial consulting firm to conduct an actuarial audit of the reasonableness and accuracy of valuation results, actuarial assumptions, and actuarial methods in connection with the July 1, 2017 actuarial valuation of the System performed by Cheiron, the System's retained actuary; and

WHEREAS, The System issued a request for proposal ("RFP") for an actuarial audit. As a result of that RFP process, the System recommended and the Retirement Board approved selection of Actuary to conduct the actuarial audit; and

WHEREAS, Actuary represents and warrants that it is qualified to perform the services required by System under this Agreement;

Now, THEREFORE, in consideration of the promises and mutual covenants herein contained, Actuary and System do hereby agree as follows:

1. **Term of the Agreement.** Subject to Section 7 of this Agreement, the term of this Agreement is from June 4, 2018 to October 31, 2018.

2. **Engagement.** System hereby engages Actuary to conduct an actuarial audit regarding the reasonableness and accuracy of valuation results, actuarial assumptions, and actuarial methods in connection with Cheiron's July 1, 2017 actuarial valuation of the System. Actuary hereby accepts that engagement.

3. **Services.** Actuary agrees to perform the services described in Exhibit A, Scope of Services, attached hereto and incorporated by reference as if fully set forth herein. Actuary's services shall meet the requirements and standards set forth in this Agreement. Actuary will promptly correct any errors or omissions in the provision of such services, at no cost or expense to System and in a timely manner after a request by System.

4. Compensation.

a. For the full performance and completion of the services described in Exhibit A, Actuary shall be compensated as set forth in Exhibit B, Fee Schedule, attached hereto and incorporated by reference as if fully set forth herein. The fee set in Exhibit B includes the compensation for professional services as well as travel, printing, delivery, secretarial and clerical support services and any other costs incurred as may be necessary to perform the services under this Agreement in a professional manner. The Actuary shall furnish invoices as specified in Exhibit B. No charges shall be incurred under this Agreement nor shall any payments become due to Actuary until reports, services, or both, required under this Agreement are received from Actuary and approved by the System as being in accordance with this Agreement. System may withhold payment to Actuary in any instance in which Actuary has failed or refused to satisfy any material obligation provided for under this Agreement. In no event shall System be liable for interest or late charges for any late payments.

b. In no event shall the compensation under this Agreement exceed Seventy Thousand Dollars ($70,000).

c. Payment Does Not Imply Acceptance of Work. The granting of any payment by System, or the receipt thereof by Actuary, shall in no way lessen the liability of Actuary to replace unsatisfactory work, equipment, or materials, although the unsatisfactory character of the work, equipment or materials may not have been apparent or detected at the time the payment was made. Materials, equipment, components, or workmanship that do not conform to the requirements of this Agreement may be rejected by System and in that case must be replaced by Actuary without delay.

5. Actuary's Responsibility.

a. Actuary represents and warrants that it meets the standards of a qualified actuary under the provisions of the Employee Retirement Income Security Act of 1974, and that it has specific experience providing actuarial services to public retirement systems. Actuary further agrees that it shall perform its obligations under this Agreement in the highest professional manner, and with the competence, care, skill, prudence and diligence prevailing in the actuarial industry and that a prudent person acting in a like capacity to that of Actuary and familiar with actuarial services would use in the conduct of those services. In performing services under this Agreement, Actuary shall adhere to professional and ethical standards required of actuaries under the Code of Professional Conduct. Actuary shall be responsible for and cause any and all of its employees, agents and representatives providing services under this Agreement to exercise the same standard of care and comply with the Code of Professional Conduct.

b. Actuary shall comply at all times with all federal, State of California, and local laws applicable to Actuary and the System, and shall obtain from the appropriate authorities any permits and licenses required for the conduct of Actuary's business and the provision of services under this Agreement.

c. The Actuary acknowledges that it must maintain independence from all interests other than the interests of the System and its members and beneficiaries, as those interests are expressed by the Retirement Board. Actuary further acknowledges that the System staff act as the agent for the Retirement Board in its relationship with the Actuary, but is subordinate to the Retirement Board and cannot direct the Actuary to consider interests contrary to those expressed by the Retirement Board.

d. The services and deliverables Actuary provides under this Agreement shall not infringe on any intellectual property rights of any other third party.

6. Personnel.

a. Work under this Agreement shall be performed only by personnel under the supervision of and in the employment of Actuary, who in Actuary's judgment have the necessary education, training and experience to perform the tasks Actuary assigns to them under this Agreement. Actuary will comply with System's reasonable requests regarding assignment of personnel, but all personnel, including those assigned at System's request, must be supervised and directed by Actuary. Actuary shall commit adequate resources to complete the services within the schedule specified in this Agreement.

b. The System may designate in writing, from time to time, that certain personnel of the Actuary are "key personnel." Actuary shall immediately notify the System in writing of any changes in key personnel within its organization. Key personnel under this Agreement are: Mary Elizabeth Redding and Marilyn Oliver.

7. Budget Authorization. This Agreement is subject to the budget and fiscal provisions of the Charter of the City and County of San Francisco. Charges will accrue only after prior written authorization certified by the City Controller, and any amount of the System's obligation hereunder shall not at any time exceed the amount certified for the purpose and period stated in such advance authorization. This Agreement will terminate without penalty, liability or expense of any kind to the System at the end of any fiscal year if funds are not appropriated for the next succeeding fiscal year. If funds are appropriated for a portion of the fiscal year, this Agreement will terminate, without penalty, liability or expense of any kind at the end of the term for which funds are appropriated. The System has no obligation to make appropriations for this Agreement in lieu of appropriations for new or other agreements. City budget decisions are subject to the discretion of the Mayor and the Board of Supervisors. Actuary's assumption of risk of possible non-appropriation is part of the consideration for this Agreement.

This section controls against any and all other provisions of this Agreement.

8. Invoices. Actuary shall submit invoices for services under this Agreement in a form acceptable to the System.

9. False Claims. Actuary acknowledges that Actuary is subject to San Francisco Administrative Code Section 21.35, which provides that any contractor, subcontractor or consultant who submits a false claim shall be liable to the City for the statutory penalties set forth in that section. The San Francisco Administrative Code is available on the web at:

http://www.amlegal.com/nxt/gateway.dll?f=templates&fn=default.htm&vid=amlegal:sanfrancisco_ca. A contractor, subcontractor or consultant will be deemed to have submitted a false claim to the City if the contractor, subcontractor or consultant: (a) knowingly presents or causes to be presented to an officer or employee of the System a false claim or request for payment or approval; (b) knowingly makes, uses, or causes to be made or used a false record or statement to get a false claim paid or approved by the System; (c) conspires to defraud the System by getting a false claim allowed or paid by the System; (d) knowingly makes, uses, or causes to be made or used a false record or statement to conceal, avoid, or decrease an obligation to pay or transmit money or property to the System; or (e) is a beneficiary of an inadvertent submission of a false claim to the System, subsequently discovers the falsity of the claim, and fails to disclose the false claim to the System within a reasonable time after discovery of the false claim.

10. **Taxes.** Actuary has the sole obligation to pay any taxes, including, without limitation, California sales and use taxes, and payroll taxes for Actuary personnel, levied on this Agreement, the transaction, or the services delivered.

11. **Independent Contractor.**

a. In performing services under this Agreement, Actuary is acting at all times as an independent contractor, and is wholly responsible for the manner in which it performs the services and work under this Agreement. Any terms in this Agreement referring to direction from System shall be construed as providing for direction as to policy and the result of Actuary's work only, and not as to the means by which a result is obtained. System does not retain the right to control the means or the method by which Actuary performs work under this Agreement. This Agreement is not intended, and may not be construed, to create the relationship of agent, servant, employee, partnership, joint venture, or association between Actuary and System. Neither Actuary nor any agents or employees of Actuary shall have employee status with System, nor be entitled to participate in any plans, arrangements, or distributions by System pertaining to or in connection with any retirement, health or other benefits that System may offer its employees. Actuary is liable for the acts and omissions of itself, its employees and its agents. Actuary shall be responsible for all obligations and payments, whether imposed by federal, state or local law, including, but not limited to, FICA, income tax withholdings, unemployment compensation, insurance, and other similar responsibilities related to Actuary's performing services and work, or any agent or employee of Actuary providing same. Nothing in this Agreement shall be construed as creating an employment or agency relationship between System and Actuary or any of Actuary's agents or employees.

b. If any governmental authority should, nevertheless, determine that Actuary is an employee, then the System's payment obligations hereunder shall be reduced so that the aggregate amount of payments directly to the Actuary and to the applicable governmental authority does not exceed the maximum amount specified in Section 4(b). Actuary shall refund any amounts necessary to effect such reduction.

12. Insurance.

a. Without in any way limiting Actuary's liability pursuant to the "Indemnification" section of this Agreement, Actuary must maintain in force, during the full term of the Agreement, insurance in the following amounts and coverages:

   1) Workers' Compensation, in statutory amounts, with Employers' Liability Limits not less than $1,000,000 each accident, injury, or illness; and

   2) Commercial General Liability Insurance with limits not less than $1,000,000 each occurrence Combined Single Limit for Bodily Injury and Property Damage, including Contractual Liability, Personal Injury, Products and Completed Operations; and

   3) Commercial Automobile Liability Insurance with limits not less than $1,000,000 each occurrence Combined Single Limit for Bodily Injury and Property Damage, including Owned, Non-Owned and Hired auto coverage, as applicable; and

   4) Professional errors and omissions liability insurance with annual limits not less than $5,000,000 each claim and in the aggregate with respect to negligent acts, errors or omissions in connection with professional services to be provided under this Agreement.

b. Commercial General Liability and Commercial Automobile Liability Insurance policies must be endorsed to provide:

   1) Name as Additional Insured the Retirement System and Retirement Board, and their Officers, Agents, and Employees.

   2) That such policies are primary insurance to any other insurance available to the Additional Insureds, with respect to any claims arising out of this Agreement, and that insurance applies separately to each insured against whom claim is made or suit is brought.

c. Regarding Workers' Compensation, Actuary hereby agrees to waive subrogation which any insurer of Actuary may acquire from Actuary by virtue of the payment of any loss. Actuary agrees to obtain any endorsement that may be necessary to effect this waiver of subrogation. The Workers' Compensation policy shall be endorsed with a waiver of subrogation in favor of the System for all work performed by the Actuary, its employees, agents and subcontractors.

d. All policies shall provide thirty days' advance written notice to the System of reduction or nonrenewal of coverages or cancellation of coverages for any reason. Notices shall be sent to the System address in the "Notices" section.

e. Should any of the required insurance be provided under a claims-made form, Actuary shall maintain such coverage continuously throughout the term of this Agreement and, without lapse, for a period of three years beyond the expiration of this Agreement, to the effect that, should occurrences during the contract term give rise to claims made after expiration of the Agreement, such claims shall be covered by such claims-made policies.

f. Should any of the required insurance be provided under a form of coverage that includes a general annual aggregate limit or provides that claims investigation or legal defense costs be included in such general annual aggregate limit, such general annual aggregate limit shall be double the occurrence or claims limits specified above.

g. Should any required insurance lapse during the term of this Agreement, requests for payments originating after such lapse shall not be processed until the System receives satisfactory evidence of reinstated coverage as required by this Agreement, effective as of the lapse date. If insurance is not reinstated, the System may, at its sole option, terminate this Agreement effective on the date of such lapse of insurance.

h. Before commencing any operations under this Agreement, Actuary shall furnish to System certificates of insurance and additional insured policy endorsements with insurers with ratings comparable to A-, VIII or higher, that are authorized to do business in the State of California, and that are satisfactory to System, in form evidencing all coverages set forth above. Failure to maintain insurance shall constitute a material breach of this Agreement.

i. Approval of the insurance by System shall not relieve or decrease the liability of Actuary hereunder.

13. **Indemnification.** Actuary shall indemnify and save harmless the System, and its officers, agents and employees from, and, if requested, shall defend them against any and all loss, cost, damage, injury, liability, and claims thereof for injury to or death of a person, including employees of Actuary or loss of or damage to property, arising directly or indirectly from Actuary's performance of this Agreement, including, but not limited to, Actuary's use of facilities or equipment provided by System or others, regardless of the negligence of, and regardless of whether liability without fault is imposed or sought to be imposed on System, except to the extent that such indemnity is void or otherwise unenforceable under applicable law in effect on or validly retroactive to the date of this Agreement, and except where such loss, damage, injury, liability or claim is the result of the active negligence or willful misconduct of System and is not contributed to by any act of, or by any omission to perform some duty imposed by law or agreement on Actuary, its subcontractors or either's agent or employee. The foregoing indemnity shall include, without limitation, reasonable fees of attorneys, consultants and experts and related costs and System's costs of investigating any claims against the System. In addition to Actuary's obligation to indemnify the System, Actuary specifically acknowledges and agrees that it has an immediate and independent obligation to defend System from any claim that actually or potentially falls within this indemnification provision, even if the allegations are or may be groundless, false or fraudulent, which obligation arises at the time such claim is tendered to Actuary by System and continues at all times thereafter. Actuary shall indemnify and hold System harmless from all loss and liability, including attorneys' fees, court costs and all other litigation expenses for any infringement of the patent rights, copyright, trade secret or any other proprietary right or trademark, and all other intellectual property claims of any person or persons in consequence of the use by System, or any of their officers or agents, of articles or services to be supplied in the performance of this Agreement.

14. **Limitation on Liability of the System.** The System's payment obligations hereunder shall be limited to the payments under Section 4 of this Agreement. Notwithstanding any other provision of this Agreement, in no event shall the System be liable, regardless of whether the claim is based on contract or tort, for any special, consequential, indirect or incidental damages, including but not limited to, lost profits, arising out of or in connection with this Agreement or the services performed in connection with this Agreement.

15. Termination for Convenience. The System shall have the option, in its sole discretion, to terminate this Agreement, at any time during the term hereof, for convenience and without cause. The System shall exercise this option by giving Actuary written notice of termination. The notice shall specify the date on which termination shall become effective.

Upon termination of this Agreement, Actuary shall commence and perform, with diligence, all actions necessary on the part of Actuary to effect the termination of this Agreement on the date specified by the System and to minimize the liability of Actuary and the System to third parties as a result of termination. All such actions shall be subject to the prior approval of the System.

16. Default; Remedies

a. Each of the following shall constitute an event of default ("Event of Default") under this Agreement:

1) Actuary fails or refuses to perform or observe any term, covenant or condition contained in any of the following Sections of this Agreement:

9. False Claims
10. Taxes
12. Insurance
19. Proprietary or Confidential Information of System
24. No Assignment or Subcontracting
30. Drug-Free Workplace
45. Compliance with Laws
48. Protection of Private Information
49. Graffiti Removal

2) Actuary fails or refuses to perform or observe any other term, covenant or condition contained in this Agreement, and such default continues for a period of ten (10) days after written notice thereof from System to Actuary.

3) Actuary (a) is generally not paying its debts as they become due, (b) files, or consents by answer or otherwise to the filing against it of a petition for relief or reorganization or arrangement or any other petition in bankruptcy or for liquidation or to take advantage of any bankruptcy, insolvency or other debtors' relief law of any jurisdiction, (c) makes an assignment for the benefit of its creditors, (d) consents to the appointment of a custodian, receiver, trustee or other officer with similar powers of Actuary or of any substantial part of Actuary's property or (e) takes action for the purpose of any of the foregoing.

4) A court or government authority enters an order (a) appointing a custodian, receiver, trustee or other officer with similar powers with respect to Actuary or with respect to

any substantial part of Actuary's property, (b) constituting an order for relief or approving a petition for relief or reorganization or arrangement or any other petition in bankruptcy or for liquidation or to take advantage of any bankruptcy, insolvency or other debtors' relief law of any jurisdiction or (c) ordering the dissolution, winding-up or liquidation of Actuary.

b. On and after any Event of Default, System shall have the right to exercise its legal and equitable remedies, including, without limitation, the right to terminate this Agreement or to seek specific performance of all or any part of this Agreement. In addition, System shall have the right (but no obligation) to cure (or cause to be cured) on behalf of Actuary any Event of Default; Actuary shall pay to System on demand all costs and expenses incurred by System in effecting such cure, with interest thereon from the date of incurrence at the maximum rate then permitted by law. System shall have the right to offset from any amounts due to Actuary under this Agreement or any other agreement between System and Actuary all damages, losses, costs or expenses incurred by System as a result of such Event of Default and any liquidated damages due from Actuary pursuant to the terms of this Agreement or any other agreement.

c. All remedies provided for in this Agreement may be exercised individually or in combination with any other remedy available hereunder or under applicable laws, rules and regulations. The exercise of any remedy shall not preclude or in any way be deemed to waive any other remedy.

17. Rights and Duties upon Termination or Expiration. This Section and the following Sections of this Agreement shall survive termination or expiration of this Agreement:

4(c). Payment Does Not Imply Acceptance of Work
9. False Claims
10. Taxes
11. Independent Contractor
12. Insurance
13. Indemnification
14. Limitation on Liability of the System
19. Proprietary or Confidential Information of System
20. Ownership of Results
21. Works for Hire
23. Audit and Inspection of Records
40. Modifications
41. Administrative Remedy
42. California Law; Venue.
43. Construction
44. Entire Agreement
46. Severability
48. Protection of Private Information
50. Cooperative Drafting

Upon termination of this Agreement prior to expiration of the term specified in Section 1, this Agreement shall terminate and be of no further force or effect. Actuary shall transfer title to System, and deliver in the manner, at the times, and to the extent, if any, directed by System, any completed reports, supplies and equipment produced as a part of, or acquired in connection with the performance of this Agreement, and any completed or partially completed work which, if this Agreement had been completed, would have been required to be furnished to System.

18. **Conflict of Interest.** Through its execution of this Agreement, Actuary acknowledges that it is familiar with the provision of Section 15.103 of the San Francisco Charter, Article III, Chapter 2 of the San Francisco Campaign and Governmental Conduct Code, and Section 87100 et seq. and Section 1090 et seq. of the Government Code of the State of California, and certifies that it does not know of any facts that constitute a violation of those provisions and agrees that it will immediately notify the System if it becomes aware of any such fact during the term of this Agreement.

19. **Proprietary or Confidential Information of System.** Actuary understands and agrees that, in the performance of the work or services under this Agreement or in contemplation thereof, Actuary may have access to private or confidential information that may be owned or controlled by System and that such information may contain proprietary or confidential details, including but not limited to financial and other information of System members and beneficiaries, the disclosure of which to third parties may be damaging to System and its members and beneficiaries. Actuary agrees that all information disclosed by System to Actuary shall be held in confidence and used only in performance of the Agreement. Actuary shall exercise the same standard of care to protect such information as a reasonably prudent actuary would use to protect its own proprietary data.

20. **Ownership of Results.** Any interest of Actuary or its subcontractors, in drawings, plans, specifications, blueprints, studies, reports and memoranda, prepared by Actuary or its subcontractors in connection with services to be performed under this Agreement, shall become the property of and will be transmitted to System. However, Actuary may retain and use copies for reference and as documentation of its experience and capabilities. The Retirement Board and System shall have the unrestricted authority to publish, disclose, distribute or otherwise use in whole or in part any drawings, plans, specifications, blueprints, studies, reports and memoranda prepared under this Agreement, crediting Actuary as the source. System is responsible for any misunderstanding, errors, or other losses that arise from publication or distribution of only part of a report or document without all of the accompanying details on actuarial assumptions, methodology and limitations.

21. **Works for Hire.** If, in connection with services performed under this Agreement, Actuary or its subcontractors create artwork, copy, posters, billboards, photographs, videotapes, audiotapes, reports, diagrams, surveys and blueprints, such works of authorship shall be works for hire as defined under Title 17 of the United States Code, and all copyrights in such works are the property of the System. If it is ever determined that any works created by Actuary or its subcontractors under this Agreement are not works for hire under U.S. law, Actuary hereby assigns all copyrights to such works to the System, and agrees to provide any material and execute any documents necessary to effectuate such assignment. With the

approval of the System, Actuary may retain and use copies of such works for reference and as documentation of its experience and capabilities.

22. **Notices.** Unless otherwise indicated elsewhere in this Agreement, all written communications sent by the parties may be by U.S. mail, e-mail (return receipt requested) or by fax with confirmation, and shall be addressed as follows:

To the System: Jay Huish, Executive Director
San Francisco City and County Employees' Retirement System
1145 Market Street, 5th Floor
San Francisco, CA 94103
E-mail address: jay.huish@sfgov.org

To the Actuary: Mary Beth Redding, Vice President
Bartel Associates, LLC
411 Borel Avenue, Suite 101
San Mateo, CA 94402

From time to time, either party may designate a new recipient or address for notice for purposes of this Section 22 by written notice to the other party.

23. **Audit and Inspection of Records.** Actuary agrees to maintain and make available to the System, during regular business hours, accurate books and accounting records relating to its work under this Agreement. Actuary will permit System to audit, examine and make excerpts and transcripts from such books and records, and to make audits of all invoices, materials, payrolls, records or personnel and other data related to all other matters covered by this Agreement, whether funded in whole or in part under this Agreement. Actuary shall maintain such data and records in an accessible location and condition for a period of not less than five years after final payment under this Agreement or until after final audit has been resolved, whichever is later. The State of California or any federal agency having an interest in the subject matter of this Agreement shall have the same rights conferred upon System by this Section 23.

24. **No Assignment or Subcontracting.** The services under this Agreement are personal in nature and Actuary shall perform the work contemplated with resources available within its own organization. Neither this Agreement nor any duties or obligations hereunder may be assigned, subcontracted or delegated by Actuary without prior written consent of the System.

25. **Earned Income Credit Forms.** Administrative Code Section 12O requires that employers provide their Eligible Employees with IRS Form W-5 (The Earned Income Credit Advance Payment Certificate) and the IRS EIC Schedule, as set forth below. Employers can locate these forms at the IRS Office, on the Internet, or anywhere that Federal Tax Forms can be found. Actuary shall provide EIC Forms to each Eligible Employee at each of the following times: (i) within thirty days following the date on which this Agreement becomes effective (unless Actuary has already provided such EIC Forms at least once during the calendar year in which such effective date falls); (ii) promptly after any Eligible Employee is hired by Actuary; and (iii) annually between January 1 and January 31 of each calendar year during the

term of this Agreement. Failure to comply with any requirement contained in this Section 25 shall constitute a material breach by Actuary of the terms of this Agreement. If, within thirty days after Actuary receives written notice of such a breach, Actuary fails to cure such breach or, if such breach cannot reasonably be cured within such period of thirty days, Actuary fails to commence efforts to cure within such period or thereafter fails to diligently pursue such cure to completion, the System may pursue any rights or remedies available under this Agreement or under applicable law. Any Subcontract entered into by Actuary shall require the subcontractor to comply, as to the subcontractor's Eligible Employees, with each of the terms of this section. Capitalized terms used in this Section 25 and not defined in this Agreement shall have the meanings assigned to such terms in Section 12O of the San Francisco Administrative Code.

26. **Local Business Enterprise Utilization.** Actuary understands and agrees to comply fully with all the requirements of the Local Business Enterprise Ordinance set forth in Chapter 14B of the San Francisco Administrative Code as it now exists or as it may be amended in the future (collectively the "LBE Ordinance"), provided such amendments do not materially increase the Actuary's obligations or liabilities, or materially diminish Actuary's rights, under this Agreement. Such provisions of the LBE Ordinance are incorporated by reference and made part of this Agreement as though fully set forth in this section. Actuary's willful failure to comply with any applicable provision of the LBE Ordinance is a material breach of Actuary's obligations under this Agreement and shall entitle the System, subject to any applicable notice and cure provisions set forth in this Agreement, to exercise any of the remedies provided for under this Agreement, under the LBE Ordinance or otherwise available at law or in equity, which remedies shall be cumulative unless this Agreement expressly provides that any remedy is exclusive. In addition, Actuary shall comply fully with all other applicable local, state and federal laws prohibiting discrimination and requiring equal opportunity in contracting.

Actuary agrees to maintain records necessary for monitoring its compliance with Chapter 14B for a period of three years following termination of this Agreement.

27. **Nondiscrimination; Penalties.**

a. Actuary Shall Not Discriminate. In the performance of this Agreement, Actuary agrees not to discriminate against any employee, City and County of San Francisco or System employee working with Actuary, applicant for employment with Actuary, or against any person seeking accommodations, advantages, facilities, privileges, services, or membership in all business, social, or other establishments or organizations, on the basis of the fact or perception of a person's race, color, creed, religion, national origin, ancestry, age, height, weight, sex, sexual orientation, gender identity, domestic partner status, marital status, disability or Acquired Immune Deficiency Syndrome or HIV status (AIDS/HIV status), or association with members of such protected classes, or in retaliation for opposition to discrimination against such classes.

b. Subcontracts. Actuary shall incorporate by reference in all subcontracts under this Agreement the provisions of §§12B.2(a), 12B.2(c)-(k), and 12C.3 of the San Francisco Administrative Code (copies of which are available from Purchasing) and shall require all subcontractors to comply with such provisions. Actuary's failure to comply with the obligations in this subsection shall constitute a material breach of this Agreement.

c. Nondiscrimination in Benefits. Actuary does not as of the date of this Agreement and will not during the term of this Agreement, in any of its operations in San Francisco, on real property owned by San Francisco, or where work is being performed for the System elsewhere in the United States, discriminate in the provision of bereavement leave, family medical leave, health benefits, membership or membership discounts, moving expenses, pension and retirement benefits or travel benefits, as well as any benefits other than the benefits specified above, between employees with domestic partners and employees with spouses, and/or between the domestic partners and spouses of such employees, where the domestic partnership has been registered with a governmental entity pursuant to state or local law authorizing such registration, subject to the conditions set forth in §12B.2(b) of the San Francisco Administrative Code.

d. Condition to Contract. As a condition to this Agreement, Actuary shall execute the "Chapter 12B Declaration: Nondiscrimination in Contracts and Benefits" form (form HRC-12B-101) with supporting documentation and secure the approval of the form by the San Francisco Human Rights Commission.

e. Incorporation of Administrative Code Provisions by Reference. The provisions of Chapters 12B and 12C of the San Francisco Administrative Code are incorporated in this Section by reference and made a part of this Agreement as though fully set forth herein. Actuary shall comply fully with and be bound by all of the provisions that apply to this Agreement under such Chapters, including but not limited to the remedies provided in such Chapters. Without limiting the foregoing, Actuary understands that pursuant to §§12B.2(h) and 12C.3(g) of the San Francisco Administrative Code, a penalty of $50 for each person for each calendar day during which such person was discriminated against in violation of the provisions of this Agreement may be assessed against Actuary and/or deducted from any payments due Actuary.

28. **MacBride Principles – Northern Ireland.** Pursuant to San Francisco Administrative Code §12F.5, the City and County of San Francisco urges companies doing business in Northern Ireland to move towards resolving employment inequities, and encourages such companies to abide by the MacBride Principles. The City and County of San Francisco urges San Francisco companies to do business with corporations that abide by the MacBride Principles. By signing below, the person executing this Agreement on behalf of Actuary acknowledges and agrees that he or she has read and understood this section.

29. **Tropical Hardwood and Virgin Redwood Ban.** Pursuant to §804(b) of the San Francisco Environment Code, the City and County of San Francisco urges contractors not to import, purchase, obtain, or use for any purpose, any tropical hardwood, tropical hardwood wood product, virgin redwood or virgin redwood wood product.

30. **Drug-Free Workplace.** Actuary acknowledges that pursuant to the Federal Drug-Free Workplace Act of 1989, the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited on System's premises. Actuary agrees that any

violation of this prohibition by Actuary, its employees, agents or assigns will be deemed a material breach of this Agreement.

31. **Resource Conservation.** Actuary shall comply in good faith with Chapter 5 of the San Francisco Environment Code (Resource Conservation), which is hereby made a part of this Agreement as though fully set forth herein.

32. **Sunshine Ordinance.** Actuary understands that under San Francisco Administrative Code Section 67.24(e), contracts, contractors' bids, responses to requests for proposals and all other records of communications between the System and persons or firms seeking contracts, must be open to public inspection immediately after a contract has been awarded. All information provided by Actuary which is covered by that ordinance (as it may be amended) will be made available to the public upon appropriate request.

33. **Limitations on Contributions.** Through execution of this Agreement, Actuary acknowledges that it is familiar with Section 1.126 of the San Francisco Campaign and Governmental Conduct Code, which prohibits any person who contracts with the System for the rendition of personal services, for the furnishing of any material, supplies or equipment, for the sale or lease of any land or building, or for a grant, loan or loan guarantee, from making any campaign contribution to (1) an individual holding a City elective office if the contract must be approved by the individual, a board on which that individual serves, or the board of a state agency on which an appointee of that individual serves, (2) a candidate for the office held by such individual, or (3) a committee controlled by such individual, at any time from the commencement of negotiations for the contract until the later of either the termination of negotiations for such contract or six months after the date the contract is approved. Actuary acknowledges that the foregoing restriction applies only if the contract or a combination or series of contracts approved by the same individual or board in a fiscal year have a total anticipated or actual value of $50,000 or more. Actuary further acknowledges that the prohibition on contributions applies to each prospective party to the contract; each member of Actuary's board of directors; Actuary's chairperson, chief executive officer, chief financial officer and chief operating officer; any person with an ownership interest of more than 20 percent in Actuary; any subcontractor listed in the bid or contract; and any committee that is sponsored or controlled by Actuary. Additionally, Actuary acknowledges that Actuary must inform each of the persons described in the preceding sentence of the prohibitions contained in Section 1.126. Actuary further agrees to provide to System the names of each person, entity or committee described above.

34. **Prohibition on Political Activity with System Funds.** In accordance with San Francisco Administrative Code Chapter 12.G, Actuary may not participate in, support, or attempt to influence any political campaign for a candidate or for a ballot measure (collectively, "Political Activity") in the performance of the services provided under this Agreement. Actuary agrees to comply with San Francisco Administrative Code Chapter 12.G and any implementing rules and regulations promulgated by the City and County of San Francisco Controller. The terms and provisions of Chapter 12.G are incorporated herein by this reference. In the event Actuary violates the provisions of this section, the System may, in addition to any other rights or remedies available hereunder, (i) terminate this Agreement, and (ii) prohibit Actuary from bidding on or receiving any new System contract for a period

of two (2) years. The Controller will not consider Actuary's use of profit as a violation of this section.

35. **Compliance with Americans with Disabilities Act.** Actuary acknowledges that, pursuant to the Americans with Disabilities Act (ADA), programs, services and other activities provided by a public entity to the public, whether directly or through a contractor, must be accessible to the disabled public. Actuary shall provide the services specified in this Agreement in a manner that complies with the ADA and any and all other applicable federal, state and local disability rights legislation. Actuary agrees not to discriminate against disabled persons in the provision of services, benefits or activities provided under this Agreement and further agrees that any violation of this prohibition on the part of Actuary, its employees, agents or assigns will constitute a material breach of this Agreement.

36. **Requiring Minimum Compensation for Employees.** Actuary agrees to comply fully with and be bound by all of the provisions of the Minimum Compensation Ordinance ("MCO"), as set forth in San Francisco Administrative Code Chapter 12P (Chapter 12P), including the remedies provided, and implementing guidelines and rules. The provisions of Chapter 12P are incorporated herein by reference and made a part of this Agreement as though fully set forth. The text of the MCO is available on the web: http://www.amlegal.com/nxt/gateway.dll/California/administrative/chapter12pminimumcompensation?f=templates$fn=default.htm$3.0$vid=amlegal:sanfrancisco_ca.

37. **Requiring Health Benefits for Covered Employees.** Unless exempt, Actuary agrees to comply fully with and be bound by all of the provisions of the Health Care Accountability Ordinance ("HCAO"), as set forth in San Francisco Administrative Code Chapter 12Q, including the remedies provided, and implementing regulations, as the same be amended from time to time. The provisions of Chapter 12Q are incorporated herein by reference and made a part of this Agreement as though fully set forth. The text of the HCAO is available on the web: http://www.amlegal.com/nxt/gateway.dll/California/administrative/chapter12qhealthcareaccountability?f=templates$fn=default.htm$3.0$vid=amlegal:sanfrancisco_ca.

38. **No Waiver.** The omission by either party at any time to enforce any default or right reserved to it, or to require performance of any of the terms, covenants, or provisions hereof by the other party at the time designated, shall not be a waiver of any such default or right to which the party is entitled, nor shall it in any way affect the right of the party to enforce such provisions thereafter.

39. **Documents and Reports.** The Actuary will furnish to the System and its authorized representatives, on reasonable notice (which in no event need ever be more than five (5) business days) and during ordinary business hours, full access (including useable electronic data format) to the records maintained by Actuary with regard to this Agreement. Any interest of Actuary in reports, memoranda, or other documents prepared by the Actuary in connection with services to be performed under this Agreement shall become the property of and will be transmitted to the System in a useable format (including electronic date format) upon demand.

40. **Modifications.** This Agreement may not be modified, nor may compliance with any of its terms be waived, except by written instrument executed and approved in the same manner as this Agreement.

41. **Administrative Remedy.** All disputes, controversies or claims arising under or relating to this Agreement shall be presented to the Executive Director of the System for disposition. The Executive Director's decision shall be deemed an exhaustion of all administrative remedies. However, the Executive Director's decision shall not preclude resorting to judicial remedy.

42. **California Law; Venue.** The formation, interpretation and performance of this Agreement shall be governed by the laws of the State of California. Venue for all litigation relative to the formation, interpretation and performance of this Agreement shall be in San Francisco.

43. **Construction.** Section headings are for reference only and shall not be used to interpret this Agreement. Terms such as "hereunder" or "herein" refer to this Agreement as a whole. Terms such as "include" or "including" shall be deemed followed by the words "without limitation." References to consents, approvals, determinations or other decisions of the System shall refer to the sole judgment of the System.

44. **Entire Agreement.** This Agreement contains the entire agreement between the parties, and supersedes all other oral or written provisions. The attached Exhibits A and B are a part of this Agreement.

45. **Compliance with Laws.** Actuary shall keep itself fully informed of the provisions of San Francisco Charter and Municipal codes and ordinances, the rules and regulations of the System, and State of California and federal laws that in any manner affect the performance of this Agreement, and must at all times comply with such federal, California and local codes, ordinances, and regulations and all applicable laws as they may be amended from time to time.

46. **Severability.** Should the application of any provision of this Agreement to any particular facts or circumstances be found by a court of competent jurisdiction to be invalid or unenforceable, then (a) the validity of other provisions of this Agreement shall not be affected or impaired thereby, and (b) such provision shall be enforced to the maximum extent possible so as to effect the intent of the parties and shall be reformed without further action by the parties to the extent necessary to make such provision valid and enforceable.

47. **Services Provided by Attorneys.** Any services to be provided by a law firm or attorney must be reviewed and approved in writing in advance by the San Francisco City Attorney. No invoices for services provided by law firms or attorneys, including without limitation, as subcontractors of Actuary, will be paid unless the provider received advance written approval from the City Attorney.

48. **Protection of Private Information.** Actuary has read and agrees to the terms set forth in San Francisco Administrative Code Sections 12M.2, "Nondisclosure of Private Information," and 12M.3, "Enforcement" of Administrative Code Chapter 12M, "Protection of Private Information," which are incorporated herein as if fully set forth.

Actuary agrees that any failure of Actuary to comply with the requirements of Section 12M.2 of this Chapter shall be a material breach of the Agreement. In such an event, in addition to any other remedies available to it under equity or law, the System may terminate the Agreement, bring a false claim action against Actuary pursuant to Chapter 6 or Chapter 21 of the Administrative Code, or debar Actuary.

49. **Graffiti Removal.** Graffiti is detrimental to the health, safety and welfare of the community in that it promotes a perception in the community that the laws protecting public and private property can be disregarded with impunity. This perception fosters a sense of disrespect of the law that results in an increase in crime; degrades the community and leads to urban blight; is detrimental to property values, business opportunities and the enjoyment of life; is inconsistent with the City and County of San Francisco's property maintenance goals and aesthetic standards; and results in additional graffiti and in other properties becoming the target of graffiti unless it is quickly removed from public and private property. Graffiti results in visual pollution and is a public nuisance. Graffiti must be abated as quickly as possible to avoid detrimental impacts on the City and County and its residents, and to prevent the further spread of graffiti.

Actuary shall remove all graffiti from any real property owned or leased by Actuary in the City and County of San Francisco within forty eight (48) hours of the earlier of Actuary's (a) discovery or notification of the graffiti or (b) receipt of notification of the graffiti from the Department of Public Works. This section is not intended to require the Actuary to breach any lease or other agreement that it may have concerning its use of the real property. The term "graffiti" means any inscription, word, figure, marking or design that is affixed, marked, etched, scratched, drawn or painted on any building, structure, fixture or other improvement, whether permanent or temporary, including by way of example only and without limitation, signs, banners, billboards and fencing surrounding construction sites, whether public or private, without the consent of the owner of the property or the owner's authorized agent, and which is visible from the public right-of-way. "Graffiti" shall not include: (1) any sign or banner that is authorized by, and in compliance with, the applicable requirements of the San Francisco Public Works Code, the San Francisco Planning Code or the San Francisco Building Code; or (2) any mural or other painting or marking on the property that is protected as a work of fine art under the California Art Preservation Act (California Civil Code Sections 987 et seq.) or as a work of visual art under the Federal Visual Artists Rights Act of 1990 (17 U.S.C. §§ 101 et seq.).

50. **Cooperative Drafting.** This Agreement has been drafted through a cooperative effort of both parties, and both parties have had an opportunity to have the Agreement reviewed and revised by legal counsel. No party shall be considered the drafter of this Agreement, and no presumption or rule that an ambiguity shall be construed against the party drafting the clause shall apply to the interpretation or enforcement of this Agreement.

51. **Execution in Counterparts.** This Agreement may be executed in two or more counterparts, each of which will be deemed an original, but all of which constitute one and the same agreement.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date first referenced above.

SAN FRANCISCO CITY AND COUNTY EMPLOYEES' RETIREMENT SYSTEM

By: ______________________ Date: June 5, 2018
Jay Huish
Executive Director

BARTEL ASSOCIATES, LLC

By: ______________________ Date: **June 4, 2018**
Mary Elizabeth Redding
Vice President

EXHIBIT A
SCOPE OF SERVICES

Actuary agrees to provide the following services:

Consulting and Advisory Services. Actuary shall review the work of Cheiron in connection with the July 1, 2017 actuarial valuation to the degree necessary for Actuary to express opinions regarding the accuracy and/or reasonableness of the following:

- Results of the valuations including analysis of contribution rates and accrued liabilities,
- Assumptions in use,
- Proper application of the funding method.

In addition, Actuary shall express an opinion regarding whether or not the July 1, 2017 valuation was performed by qualified actuaries and was performed in accordance with principles and practices prescribed by the Actuarial Standards Board.

Actuary shall perform an in-depth analysis of Cheiron's July 1, 2017 actuarial valuation, as described in Actuary's April 18, 2018 Proposal for Actuarial Audit Services to the System ("Proposal"), which is incorporated by reference as if fully set forth herein.

All of Actuary's work under this Agreement shall be conducted by or under the supervision of Mary Beth Redding. Work under Actuary's peer review process shall be conducted by Marilyn Oliver. Actuary's personnel identified in the Proposal shall perform the services under this Agreement, except Actuary may substitute personnel if necessary with advance written authorization from the System.

Deadlines and Deliverables. Actuary shall perform services under this Agreement in accordance with the deliverable dates set below in this Exhibit A. Although the schedule and dates are approximate, Actuary shall make every reasonable effort to adhere to the deliverable dates.

Proposed Timeline (Work Schedule)

Project Steps	*Estimated Dates*
1. Contract approval	***May 23, 2018***
2. Kick-off meeting/call	***May 24, 2018***
3. Data requests to Cheiron and System	***May 24, 2018***
4. Actuary reviews experience study and actuarial methods and assumptions (discussions with Cheiron as necessary)	***June 5, 2018 – July 23, 2018***
5. Receipt of valuation data from Cheiron	***June 5, 2018***
6. Actuary requests test cases (June 15, 2018 and as necessary thereafter), calculates test cases, conducts parallel valuation, compiles results, and formulates opinions of accuracy/reasonableness (discussion of any questions with Cheiron)	***June 5, 2018 – August 7, 2018***
7. Discussion and resolution of any questions with SFERS	***June 5, 2018 – August 7, 2018***
8. Discussion of preliminary audit results with SFERS	***August 13, 2018***
9. Draft of Board materials submitted to Actuarial Services Coordinator	***August 27, 2018***
10. Draft of Board materials approved	***August 31, 2018***
11. Delivery of 40 paper copies of approved Board materials	***September 4, 2018***
12. Presentation of final audit report at Retirement Board meeting	***September 12, 2018***

Actuary shall send Mary Beth Redding to appear in person and present Actuary's final report to the Retirement Board at the Board's regularly scheduled public meeting on September 12, 2018. This meeting shall be the only "in person" meeting under this agreement; all other work under this agreement shall be conducted by alternate means, such as phone or e-mail.

Point of Contact. Actuary's point of contact with the System for day to day work under this Agreement is:

Janet Brazelton
Actuarial Services Coordinator
San Francisco City and County Employees' Retirement System
1145 Market Street, 5th Floor
San Francisco, CA 94103
Phone: (415) 487-7024
E-mail: janet.brazelton@sfgov.org

System's point of contact with Actuary for day to day work under this Agreement is:

Mary Beth Redding, Vice President
Bartel Associates, LLC
411 Borel Avenue, Suite 101
San Mateo, CA 94402
Phone: (650) 377-1617
E-mail: mbredding@bartel-associates.com

EXHIBIT B
FEE SCHEDULE

Estimated fees

Actuary's fees are a function of the hours worked by each professional on a project and their hourly billing rates, shown below:

Member	Hourly Rate
Mary Beth Redding – Supervising Actuary	***$280***
Marilyn Oliver – Support and Peer Review Actuary	***$280***
Cathy Wandro – Support Actuaries	***$250***
Tak Frazita – Associate Actuary	***$200***
Actuarial Analyst (as needed)	***$150***

Not to Exceed

Actuary agrees not to bill more than $70,000 unless the scope changes or significant issues arise. If that occurs Actuary will notify you before proceeding with additional work.

There will be no additional charges for expenses (such as travel, telephone, copying, computer, etc.). The hourly rates and fees listed above include Actuary's costs for these items.

Actuary's fee proposal assumes they will:

- Review member data, but Actuary will not replicate the creation of the member data from the raw data.
- Invoice SFERS monthly based on time incurred, subject to the above maximum fee.