

# Memorandum



CITY OF DALLAS

DATE May 31, 2019

TO Honorable Mayor and Members of the City Council

SUBJECT **Results of Pension Actuarial Reviews: DFPF System and ERF**

Per Texas Government Code 802, public retirement systems with total assets over \$100 million must be audited by an independent actuary every five years. The City contracted with Deloitte to perform actuarial audits of the Employee Retirement Fund (ERF) and the Dallas Police and Fire Pension (DPFP).

On June 5, 2019, Jeannie Chen, the Deloitte actuary who led the audit, will brief City Council on the results of the actuarial services for the City's pension plans. The presentation materials are attached for your review.

Please let me know if you need additional information.

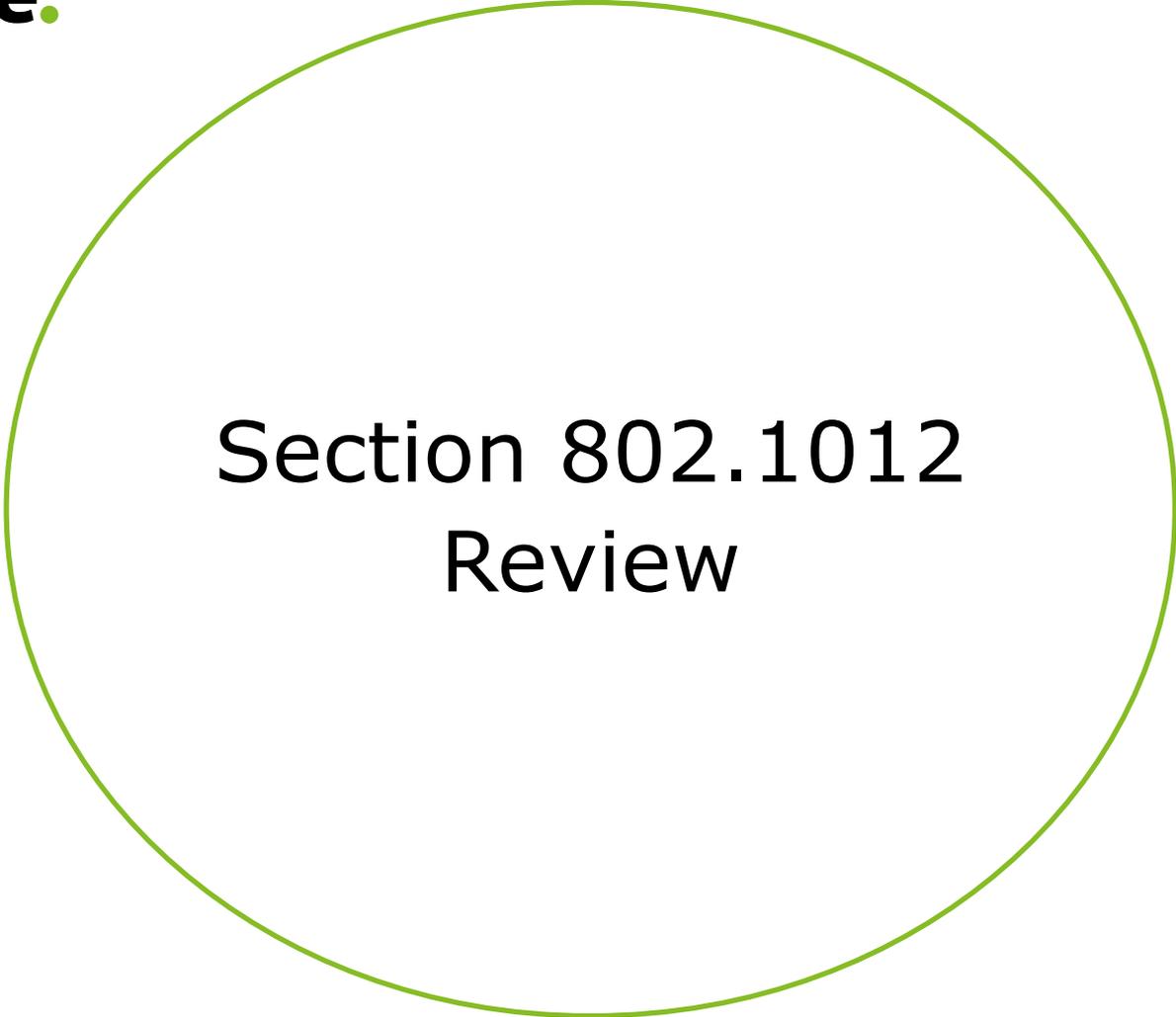
A handwritten signature in blue ink that reads "M. Elizabeth Reich".

M. Elizabeth Reich  
Chief Financial Officer

## Attachments

c: T. C. Broadnax, City Manager  
Chris Caso, City Attorney (Interim)  
Mark Swann, City Auditor  
Billierae Johnson, City Secretary  
Preston Robinson, Administrative Judge  
Kimberly Bizer Tolbert, Chief of Staff to the City Manager  
Majed A. Al-Ghafry, Assistant City Manager

Jon Fortune, Assistant City Manager  
Joey Zapata, Assistant City Manager  
Nadia Chandler Hardy, Assistant City Manager and Chief Resilience Officer  
Michael Mendoza, Chief of Economic Development and Neighborhood Services  
Laila Alequresh, Chief Innovation Officer  
Directors and Assistant Directors



**Section 802.1012  
Review**

**Presentation of Results to City Council**

Dallas Police and Fire Pension System (DPFP)  
Employees' Retirement Fund of the City of Dallas (ERF)

June 5, 2019

# Requirements of Texas Government Code Section 802.1012

- Applies only to a public retirement system with total assets the book value of which, as of the last day of the preceding fiscal year, is at least \$100 million.
- Every five years, the actuarial valuations, studies, and reports of a public retirement system most recently prepared for the retirement system... must be audited by an independent actuary

## Prior to Commencing Audit

- Agree in writing with the City to maintain the confidentiality of any non-public information provided by the pension funds for the audits
- **Meet with manager of the pension funds to discuss appropriate assumptions to use in conducting audits**

## No later than 30th Day After Completion

- **Submit draft report to pension funds for discussion and clarification**
- **Discuss draft report with pension funds' Boards**
- **Request in writing that the pension funds submit any response to accompany the final report within 30 days of receiving draft report**

## 31st to 60th Day After Submitting Draft Report

- Submit final audit report to the City
- At first regularly scheduled open meeting after receiving final report, City Council will:
  - Include presentation of audit report on the agenda
  - Present final audit report and any response from the pension funds
  - Provide printed copies of final audit report and response from pension funds to individuals attending meeting

## City's responsibility – No later than 30<sup>th</sup> day After Receiving Final Report

- Submit a copy of the final report to the pension funds and the State Pension Review Board
- Maintain a copy of the final report at main office for public inspection

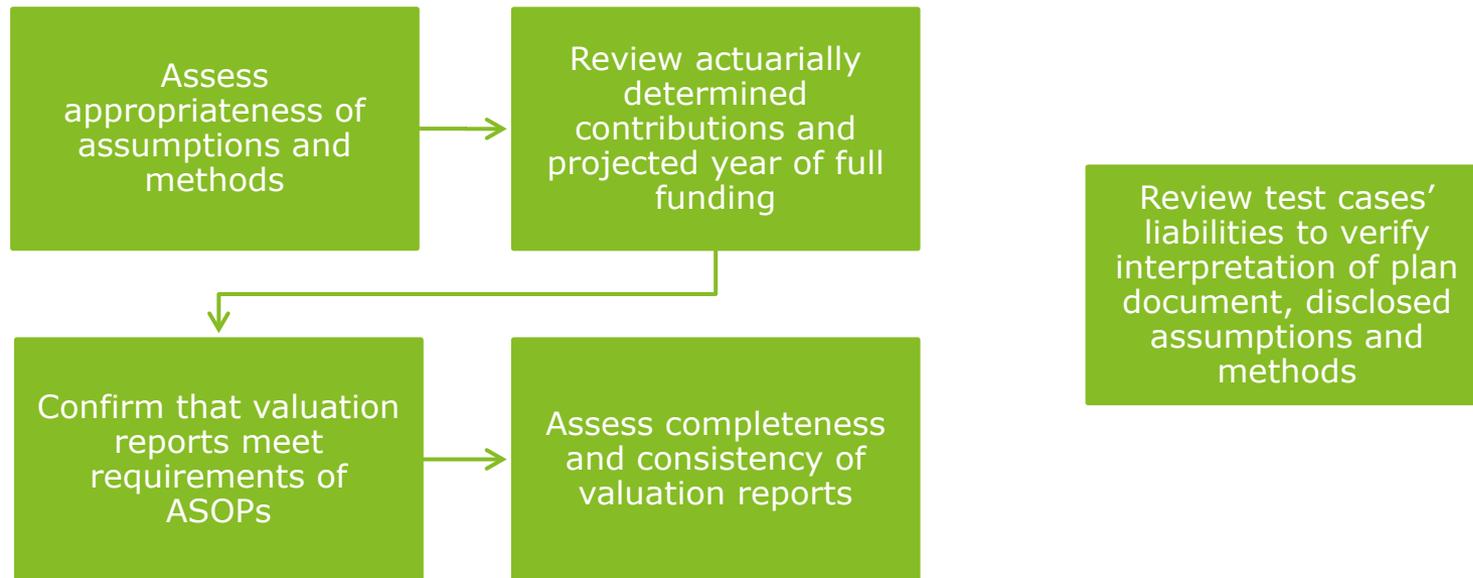
Source: Texas Pension Review Board, GOVERNMENT CODE Title 8, Subtitle A

<http://www.prb.state.tx.us/txpen/wp-content/uploads/2017/09/2017-Government-Code-Title-8-Subtitle-A.pdf>

# Plan Highlights from 2018 Valuation Reports

(in millions)	DPFP	ERF
Actuarial Accrued Liability	\$4,505	\$4,378
Actuarial Value of Asset	\$2,151	\$3,602
Unfunded Liability	\$2,354	\$776
Benefit Payments	\$296	\$262
Active Participants	4,952	7,838
Inactive Participants	4,974	8,290
Most recent valuation date	January 1, 2018	December 31, 2017
Most recent experience study	December 31, 2014	December 31, 2014

# Deloitte's Process



## Items received from the Funds for Deloitte's Process

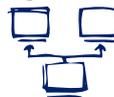
System data from  
DPFP/ERF



Sample life output  
from the valuation



Final valuation data  
from retained actuary  
Segal/GRS



Most recent  
Valuation report



Plan document



Most recent  
Experience study



# Findings and Recommendations



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## Findings

- It is our opinion that the most recent actuarial valuation report and experience study for DFPF and ERF were performed in compliance with the applicable Actuarial Standards of Practice issued by the Actuarial Standards Board.
- For the DFPF, the assumptions used in the January 1, 2018 actuarial valuation were updated as recommended in the experience study, and subsequent changes to certain economic and demographic assumptions recommended at September 1, 2017.
- For the ERF, the assumptions used in the December 31, 2017 actuarial valuation were updated as recommended in the experience study, and subsequent changes to certain economic assumptions recommended at December 31, 2016.
- Plan provisions, methods and assumptions disclosed in the actuarial valuation reports were appropriately valued based on our review of the sample life outputs.



## Recommendations

- For each plan, we have noted recommendations that could provide additional detail and improve the understanding of the actuarial work performed. In addition to clarifications for certain assumptions and plan provisions being valued, we recommend providing sensitivity analysis associated with certain assumptions.
- The next few slides are recommendations that we would like to highlight (the full list of recommendations are included in the Appendix)

# Recommendations

## Funding Method



### Recommendation

Determine the Actuarially Determined Contribution (ADC) based on funding policy best practices

### Purpose

Provide additional detail between best practice funding policy and statutory contributions



## Retained Actuaries' Responses

- **DPFP (Segal):** *"To date, our primary focus in our work with the System has been to incorporate changes necessary to ensure long-term solvency. However, initial discussions have begun with the Board on the topic of the ADC (Actuarially Determined Contribution) in the funding policy, including a shorter and/or closed amortization period. Further discussions will be held with the Trustees as to the most appropriate manner in which to determine and present the ADC."*
- **ERF (GRS):** *"Following discussion with the Board, it was decided to postpone for at least a year the inclusion of an additional ADC. If ASOP No. 4 is finalized before the next valuation then an additional ADC compliant with the revised ASOP No. 4 will be included."*

# Recommendations

## Funding Method



### Recommendation

Disclose the history of fully funded year

### Purpose

Provide additional detail on plan funding history



## Retained Actuaries' Responses

- **DPFP (Segal):** *"This information has been included in each of Segal's three valuation reports for DPFP. We will consider inclusion of a table that shows the historical projected year of full funding."*
- **ERF (GRS):** *"We have never seen an historical table showing the projected full funding date in a valuation report. However, just because we have never seen one doesn't mean that the idea should be dismissed. We will consider this issue in the next actuarial valuation report."*

# Recommendations

## Report Content



Recommendation	Purpose
Disclose 10-20 years of undiscounted cash flows	Enhance understanding of the plan's financial obligation



## Retained Actuaries' Responses

- **DPFP (Segal):** *"We will discuss this possibility with System staff and with the Trustees, and will consider providing the Board with projections of expected benefit payments and contribution income in future presentations."*
- **ERF (GRS):** *"GRS will add this to the next actuarial valuation report."*

# Recommendations

## Experience Study



Plan	Recommendation	Purpose
DPFP	Consider adding a separate withdrawal assumption for members hired after March 1, 2011	Align assumption selection with expected behavior based on plan provisions
ERF	Add a separate withdrawal assumption for Tier B employees	



## Retained Actuaries' Responses

- **DPFP (Segal):** *"Our intent is to review the experience for these participants in the next experience study. This group did not have enough history to warrant inclusion of a separate assumption based on their experience in the experience study for the five-year period ended December 31, 2014."*
- **ERF (GRS):** *"Turnover behavior early in a career is tied less to plan provisions than to the employee's employment decisions. While plan provisions can impact turnover later in the career, there is no experience for Tier B on which to base separate rates. At the next experience study we will consider separate termination rates for Tier B for longer periods of service due to the plan provisions differences."*

# Appendix A – DPFP

## *Full Summary of Recommendations*

# Section 802 Review

## DPFP – Valuation Report

We recommend the following changes be considered.

Area	Recommendations	Purpose
<b>Plan Provisions</b>	Confirm that the pre-retirement death benefit after leaving active service with fewer than five years should be a lump sum equal to the return of member contributions without interest	Provide additional detail on plan design
<b>Plan Provisions</b>	Expand the description of post-retirement death to include situations where the Member had elected a 100% joint and survivor annuity or a life annuity	Provide additional detail on plan design
<b>Plan Provisions</b>	Include a description that both the Member and City contributions are reduced if the DPFP has no unfunded actuarial liability, as described in Section 4.025 of the plan document	Provide additional detail on plan design
<b>Plan Provisions</b>	Confirm that the description of optional forms available aligns with the plan document	Provide additional detail on plan design
<b>Funding Method</b>	Determine the ADC based on funding policy best practices	Provide additional detail between best practice funding policy and statutory contributions
<b>Funding Method</b>	Disclose the history of fully funded year	Provide additional detail on plan funding history
<b>COLA Assumption</b>	Include documentation for the rationale for the selection of the 2.00% assumption after 2053 for the payment of Ad Hoc COLAs	Enhance support for assumption selection
<b>Retirement Assumption</b>	Clarify the language for DROP actives to disclose that a retirement rate of 100% is assumed after achieving 8 years of DROP service in any future year	Enhance support for assumption selection

# Section 802 Review

## DPFP – Valuation Report

We recommend the following changes be considered.

Area	Recommendations	Purpose
<b>Retirement Assumption</b>	Provide detail on the basis of the selection of the non-DROP retirement assumption	Enhance support for assumption selection
<b>Form of payment Assumption</b>	Disclose the actuarial equivalence assumption	Enhance support for assumption selection
<b>Report Content</b>	Demonstrate the sensitivity of the discount rate assumption by providing key metrics using a discount rate 1% higher and 1% lower than the prescribed rate	Increase understanding of impact of experience deviating from expected
<b>Report Content</b>	Disclose 10-20 years of undiscounted cash flows	Enhance understanding of the plan's financial obligation
<b>Report Content</b>	Categorize the target and actual asset allocations across consistent classes	Enhance understanding of the plan's investment policy

# Section 802 Review

## DPFP – Experience Study

The following are our recommendations and purpose for the recommendations to be considered in the next experience study.

Area	Recommendations	Purpose
<b>Investment Return</b>	Include additional detail in support of the investment return assumption, including: <ul style="list-style-type: none"> <li>• the reasonable range for the real return component</li> <li>• the target asset allocation used in the analysis</li> <li>• expected returns by asset class used in the forecast</li> <li>• Description of whether the arithmetic or geometric return was considered when developing the reasonable range of investment returns</li> </ul>	Support assumption selection
<b>Salary Increase</b>	Study the salary increase assumption for the DPFP Supp, as its definition of compensation differs from the DPFP	Improve appropriateness of assumption selection
<b>Mortality</b>	Discuss the basis for the selection of the Blue-Collar adjustment and the set back/forward period including a credibility analysis	Support assumption selection
<b>Mortality</b>	Review the appropriateness of updating the base mortality table to the Pub-2010 mortality tables	Align assumption to recently released industry accepted standard
<b>Retirement</b>	Consider studying the retirement behavior of deferred vested participants	Align assumption selection with expected behavior based on plan provisions
<b>Withdrawal</b>	Consider adding a separate withdrawal assumption for members hired after March 1, 2011	Align assumption selection with expected behavior based on plan provisions
<b>Disability</b>	Supplement historical data with industry-standard data for disability incidence for similar job types to increase credibility	Improve appropriateness of assumption selection

# Section 802 Review

## DPFP – Experience Study

The following are our recommendations and purpose for the recommendations to be considered in the next experience study.

Area	Recommendations	Purpose
<b>Disability</b>	Study the incidence of service versus non-service related disabilities	Improve appropriateness of assumption selection
<b>Age of Survivor</b>	Disclose the observed data on the age difference between male and female spouses for the DPFP's retirees to support the assumption	Support assumption selection
<b>Form of Payment</b>	Study the refund versus deferred annuity behavior for terminated vested participants	Align assumption selection with expected behavior based on plan provisions
<b>Form of Payment</b>	Develop an optional form election assumption based on the forms offered by the DPFP and value the impact of the actuarial equivalence factors directly in the valuation software	Improve accuracy of valuation method based on plan provisions

# Appendix B – ERF

## *Full Summary of Recommendations*

# Section 802 Review

## ERF – Valuation Report

We recommend the following changes be considered.

Area	Recommendations	Purpose
<b>Plan Provisions</b>	Disclose the Tier A early retirement adjustment table found in Section 40(A)-16 of Chapter 40A and the Tier B actuarial equivalence factors mentioned in 40(A)-16(d)	Provide additional detail on plan design
<b>Plan Provisions</b>	Disclose the eligibility requirements for Tier A and Tier B benefits	Provide additional detail on plan design
<b>Plan Provisions</b>	Enhance the summary of death benefit provisions to include the service eligibility tiers and optional forms available in each tier, according to Section 40A-21(d)-(f)	Provide additional detail on plan design
<b>Plan Provisions</b>	Update Tier B's maximum percentage of annual average change disclosed in item (d) from 5% to 3%	Provide additional detail on plan design
<b>Data</b>	Confirm the consistency between the ERF-provided data and valuation data for the beneficiary date of birth	Enhance accuracy of data
<b>Data</b>	Disclose judgmental data adjustments or assumptions made in the data or note that none exist, to address Section 3.4c of ASOP 23	Provide additional detail on data process for compliance with ASOP 23
<b>Funding Method</b>	Determine the ADC based on funding policy best practices	Provide additional detail between best practice funding policy and statutory contributions
<b>Funding Method</b>	Disclose the history of fully funded year	Provide additional detail on plan funding history
<b>Assumptions</b>	Include a statement that the retirement assumptions, and others as appropriate, are not "best estimates" and include a degree of conservatism	Provide greater understanding of the possibility that different estimates may be considered reasonable

# Section 802 Review

## ERF – Valuation Report

We recommend the following changes be considered.

Area	Recommendations	Purpose
<b>Retirement Assumption</b>	Provide detail on the basis for the selection of the Tier B retirement assumption	Enhance support for assumption selection
<b>Retirement Assumption</b>	Disclose the assumption for retirements from deferred vested status and consider studying the retirement behavior of deferred vested participants	Enhance support for assumption selection
<b>Mortality Assumption</b>	Revise the mortality description for disabled lives and other benefit recipients, as the actuarial report incorrectly states that the “annuitant” tables are used instead of the “combined employee and annuitant” tables	Enhance support for assumption selection
<b>Form of Payment Assumption</b>	Disclose the actuarial equivalence assumption	Enhance support for assumption selection
<b>Report Content</b>	Demonstrate the sensitivity of the discount rate assumption by providing key metrics using a discount rate 1% higher and 1% lower than the prescribed rate	Increase understanding of impact of experience deviating from expected
<b>Report Content</b>	Disclose 10-20 years of undiscounted cash flows	Enhance understanding of the plan’s financial obligation
<b>Report Content</b>	Include a description of how closely current actual and target asset allocations align with the target asset allocation used to select the investment return assumption during the experience study	Improve ability to validate appropriateness of asset management policies and investment return assumption

# Section 802 Review

## ERF – Experience Study

The following are our recommendations and purpose for the recommendations to be considered in the next experience study.

Area	Recommendations	Purpose
<b>Mortality</b>	Validate the overall Actual/Expected (A/E) ratio for healthy female retirees	Support assumption selection
<b>Mortality</b>	Use a mortality improvement scale for each type of mortality decrement	Align assumption with industry accepted standard
<b>Mortality</b>	Review the appropriateness of updating the base mortality table to the Pub-2010 mortality tables	Align assumption to recently released industry accepted standard
<b>Mortality</b>	Consider a more recently-published mortality improvement scale	Align assumption with industry accepted standard
<b>Mortality</b>	Discuss the basis for the selection of the Blue-Collar adjustment, the set back/forward period, and the multiplier adjustment, including a credibility analysis	Support assumption selection
<b>Mortality</b>	Update the healthy retiree mortality table to be a best estimate, targeting an A/E ratio of 100%	Align assumption selection with anticipated experience
<b>Retirement</b>	Provide additional detail on the actual versus expected retirement assumption by age for completeness	Support assumption selection
<b>Retirement</b>	Consider separate assumption for the first year in which someone becomes eligible for Tier B, since the data supported such a separation for Tier A	Align assumption selection with expected behavior based on plan provisions
<b>Withdrawal</b>	Add a separate withdrawal assumption for Tier B employees	Align assumption selection with expected behavior based on plan provisions
<b>Disability</b>	Supplement historical data with industry-standard data for disability incidence for similar job types	Support assumption selection



## **Dallas Police and Fire Pension System**

Review under Texas Government Code Section  
802.1012

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# Actuarial Opinion

This report presents the results of the actuarial review of the most recently prepared actuarial valuation and experience study for the Dallas Police and Fire Pension System (“DPFP”, or “System”, or “plan”), a plan sponsored by the City of Dallas (“City”), to satisfy the requirements of Texas Government Code Section 802.1012 (“Section 802”).

Our review was based on participant data and financial information provided by the DPFP and their retained actuary, Segal Consulting (“Segal” or “actuary”), and our interpretation of the applicable Actuarial Standards of Practice issued by the Actuarial Standards Board.

In our opinion, the January 1, 2018 actuarial valuation and the December 31, 2014 experience study for the DPFP were performed in compliance with the applicable Actuarial Standards of Practice issued by the Actuarial Standards Board.

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

The undersigned with actuarial credentials collectively meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

This report was prepared solely for the benefit and internal use of the City. This report is not intended for the benefit of any other party and may not be relied upon by any third party for any purpose, and Deloitte Consulting accepts no responsibility or liability with respect to any party other than the City.

To the best of our knowledge, no employee of the Deloitte U.S. Firms is an officer or director of the employer. In addition, we are not aware of any relationship between the Deloitte U.S. Firms and the employer that may impair or appear to impair the objectivity of the work included in this analysis.

DELOITTE CONSULTING LLP




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Michael de Leon, ASA, FCA, EA, MAAA  
Managing Director




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Jeannie Chen, ASA, FCA, EA, MAAA  
Specialist Leader

# Executive Summary

## Intent

The intent of this report is to review the January 1, 2018 actuarial valuation and the December 31, 2014 experience study reports prepared by Segal for compliance with the applicable Actuarial Standards of Practice issued by the Actuarial Standards Board, to satisfy the requirements of Texas Government Code Section 802.1012.

Additionally, while a review of the Dallas Police and Fire Pension System Supplemental Plan (“DPFP Supp”) is not required by Section 802.1012 (assets are under \$100 million), commentary provided in this report may apply to the DPFP Supp where appropriate. The plan provisions for the DPFP Supp are identical to the DPFP except that the DPFP Supp uses a different definition of pay and it excludes certain minimum benefits.

## Process

To achieve the above-stated goals, we have reviewed both the DPFP-provided and actuary-provided census data, sample life output from the actuary’s valuation software, the January 1, 2018 actuarial valuation report, and the December 31, 2014 experience study report. The DPFP-provided data was used by retained actuary used to develop the census data used as the basis for the actuarial valuation.

## Results and Recommendations

As stated in the previous section, it is our opinion that the January 1, 2018 actuarial valuation and the December 31, 2014 experience study for the DPFP were performed in compliance with the applicable Actuarial Standards of Practice issued by the Actuarial Standards Board.

The assumptions used in the January 1, 2018 actuarial valuation were updated as recommended in the experience study, and subsequent changes to certain economic and demographic assumptions recommended at September 1, 2017.

Plan provisions, methods and assumptions disclosed in the January 1, 2018 actuarial valuation report were appropriately valued based on our review of the sample life outputs.

We have also noted recommendations that could provide additional detail and improve the understanding of the actuarial work performed. In addition to clarifications for certain assumptions and plan provisions being valued, we recommend providing sensitivity analysis associated with certain assumptions.

These comments are discussed further in the Summary of Key Findings section as well as the detailed sections that follow.

# Summary of Key Findings and Recommendations

## Valuation Report

We recommend the following changes be considered.

Area	Recommendations	Purpose
Plan Provisions	Confirm that the pre-retirement death benefit after leaving active service with fewer than five years should be a lump sum equal to the return of member contributions without interest	Provide additional detail on plan design
Plan Provisions	Expand the description of post-retirement death to include situations where the Member had elected a 100% joint and survivor annuity or a life annuity	Provide additional detail on plan design
Plan Provisions	Include a description that both the Member and City contributions are reduced if the DFPF has no unfunded actuarial liability, as described in Section 4.025 of the plan document	Provide additional detail on plan design
Plan Provisions	Confirm that the description of optional forms available aligns with the plan document	Provide additional detail on plan design
Funding Method	Determine the ADC based on funding policy best practices	Provide additional detail between best practice funding policy and statutory contributions
Funding Method	Disclose the history of fully funded year	Provide additional detail on plan funding history
COLA Assumption	Include documentation for the rationale for the selection of the 2.00% assumption after 2053 for the payment of Ad Hoc COLAs	Enhance support for assumption selection
Retirement Assumption	Clarify the language for DROP actives to disclose that a retirement rate of 100% is assumed after achieving 8 years of DROP service in any future year	Enhance support for assumption selection
Retirement Assumption	Provide detail on the basis of the selection of the non-DROP retirement assumption	Enhance support for assumption selection
Form of Payment Assumption	Disclose the actuarial equivalence assumption	Enhance support for assumption selection

Area	Recommendations	Purpose
Report Content	Demonstrate the sensitivity of the discount rate assumption by providing key metrics using a discount rate 1% higher and 1% lower than the prescribed rate	Increase understanding of impact of experience deviating from expected
Report Content	Disclose 10-20 years of undiscounted cash flows	Enhance understanding of the plan's financial obligation
Report Content	Categorize the target and actual asset allocations across consistent classes	Enhance understanding of the plan's investment policy

The details supporting these findings and recommendations are included in the sections that follow.

## Experience Study

The following are our recommendations and purpose for the recommendations to be considered in the next experience study.

Area	Recommendation	Purpose
Investment Return	Include additional detail in support of the investment return assumption, including: <ul style="list-style-type: none"> <li>the reasonable range for the real return component</li> <li>the target asset allocation used in the analysis</li> <li>expected returns by asset class used in the forecast</li> <li>Description of whether the arithmetic or geometric return was considered when developing the reasonable range of investment returns</li> </ul>	Support assumption selection
Salary Increase	Study the salary increase assumption for the DFPF Supp, as its definition of compensation differs from the DFPF	Improve appropriateness of assumption selection
Mortality	Discuss the basis for the selection of the Blue-Collar adjustment and the set back/forward period including a credibility analysis	Support assumption selection
Mortality	Review the appropriateness of updating the base mortality table to the Pub-2010 mortality tables	Align assumption to recently released industry accepted standard
Retirement	Consider studying the retirement behavior of deferred vested participants	Align assumption selection with expected behavior based on plan provisions
Withdrawal	Consider adding a separate withdrawal assumption for members hired after March 1, 2011	Align assumption selection with expected behavior based on plan provisions
Disability	Supplement historical data with industry-standard data for disability incidence for similar job types to increase credibility	Improve appropriateness of assumption selection
Disability	Study the incidence of service versus non-service related disabilities	Improve appropriateness of assumption selection
Age of Survivor	Disclose the observed data on the age difference between male and female spouses for the DFPF's retirees to support the assumption	Support assumption selection
Form of Payment	Study the refund versus deferred annuity behavior for terminated vested participants	Align assumption selection with expected behavior based on plan provisions

Area	Recommendation	Purpose
Form of Payment	Develop an optional form election assumption based on the forms offered by the DFPF and value the impact of the actuarial equivalence factors directly in the valuation software	Improve accuracy of valuation method based on plan provisions

The details supporting these findings and recommendations are included in the sections that follow.

# Review of Plan Provisions

The plan provisions and some actuarial assumptions and methods are prescribed in Article 6243a-1 of the Texas Statutes (as amended as of May 31, 2017 by HB3158) ("plan document"). Our review identifies the prescriptions from the plan document, and compares their requirements against the provisions, assumptions, and methods valued and disclosed in the report by the retained actuary.

## Comments and Recommendations

For the DFPF, we reviewed the summary of Benefit Provisions on pages 51-58 of the valuation report and assessed the completeness of the summary provided in comparison to the plan document.

We have the following recommendations to provide additional detail and improve the understanding of the valuation report's summary of benefit provisions:

Provisions	Recommendations
Pre-Retirement Death Benefits	Confirm that the pre-retirement death benefit after leaving active service with fewer than five years should be a lump sum equal to the return of member contributions without interest. The summary of benefit provisions incorrectly states that the refund includes interest.
Post-Retirement Death Benefits	Expand the description of post-retirement death to include situations where the Member had elected a 100% joint and survivor annuity or a life annuity
Member and City Contributions	Include a description that both the Member and City contributions are reduced if the DFPF has no unfunded actuarial liability, as described in Section 4.025 of the plan document
Optional Form of Benefits	Confirm that the description of optional forms available aligns with the plan document. From the plan document, it appears that the only optional form available is a 100% joint and survivor annuity

Other than the recommendations above, the summary provisions do not conflict with the provisions described in the plan document, nor do they omit any plan provisions described in the plan document that could have a significant impact on plan benefits.

# Review of Census Data

There are typical and anticipated adjustments made to census data in preparing an actuarial valuation. This section assesses the reasonableness of the retained actuary's reconciliation and data adjustment procedures, including their documentation in the valuation report. To perform this analysis, we received data files from the DFPF, valuation data files from the retained actuary and sample life output from the actuary's valuation software. The DFPF-provided data was used by the retained actuary to develop the census data used as the basis for the actuarial valuation.

## Applicable ASOPs

**Actuarial Standard of Practice No. 23, Data Quality**, provides general guidance for determining if data is appropriate for its intended purpose and whether it is sufficiently reasonable, consistent, and comprehensive. Section 3.1 of the ASOP effective for the December 31, 2017 actuarial valuation report states:

*Appropriate data that are accurate and complete may not be available. The actuary should use available data that, in the actuary's professional judgment, allow the actuary to perform the desired analysis. However, if significant data limitations are known to the actuary, the actuary should disclose those limitations and their implications.*

Section 3.5 of this Standard also addresses the actuary's responsibilities in reviewing data upon which they rely and states that in such cases:

*... the actuary should perform a review, unless, in the actuary's professional judgment, such review is not necessary or not practical. In exercising such professional judgment, the actuary should take into account the purpose and nature of the assignment, any relevant constraints, and the extent of any known checking, verification, or audit of the data that has already been performed.*

And Section 3.4c. of this Standard states:

*...judgmental adjustments or assumptions can be applied to the data that allow the actuary to perform the analysis. Any judgmental adjustments to data or assumptions should be disclosed...*

## Comments and Recommendations

### **Documentation of data review procedures performed by the actuary**

Page 9 of the DFPF valuation report (and page 8 of the DFPF Supp valuation report) mentions:

*An actuarial valuation for a plan is based on data provided to the actuary by the System. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.*

This statement appropriately addresses Section 3.5 of ASOP 23.

**Data reconciliation and adjustment process performed by the actuary**

We have reviewed adjustments and assumptions that the actuary deemed necessary to create a valuation database. The actuary developed several sets of data questions regarding inconsistencies in participant data between multiple files or unreasonable values or movements for a particular field. We confirmed that the data answers from the City were appropriately reflected in the final valuation data.

The actuary's final valuation file is generally consistent with the data files provided by the DFPF. Additions or removals of records between the raw census file and the final valuation file appear appropriate based on our high-level review of data answers received and information in other key fields (for example, active records with military leave were absent from the raw data but were added to the final valuation data).

Page 50 of the DFPF valuation report mentions that for unknown data for participants:

*Same age and service as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.*

This statement appropriately addresses Section 3.4c of ASOP 23.

**Verification of Sample Life Data**

For each sample life, the data used in the sample life calculation is consistent with the valuation data and the data provided by the DFPF. Additional details of the sample life review can be found in the *Review of Sample Lives* section below.

# Review of Actuarial Methods

This section determines if the actuarial cost method, funding method, and actuarial asset valuation method used by the DFPF are reasonable and consistent with generally accepted actuarial practice and relevant ASOPs. It also determines if the funding method of the DFPF conforms to the Pension Review Board (“PRB”) Funding Guidelines effective June 30, 2017.

## Cost Method

### Applicable ASOPs

**Actuarial Standard of Practice No. 4, *Measuring Pension Obligations***, provides guidance regarding the actuarial cost method for pension valuations. According to Section 3.13 of this ASOP, an “acceptable actuarial cost method” meets the following criteria:

- costs are allocated over the period of time that benefits are earned; and
- costs are allocated on a basis that has a logical relationship to the plan’s benefit formula (compensation, service, benefit level, etc.).

### Comments and Recommendations

The actuarial cost method used is Entry Age Normal (EAN) as a level percentage of pay.

Under this method, the present value of future benefits (PVFB) is determined for each employee and is then spread evenly as a level percentage of pay over each employee's career. This method therefore produces employer contributions that are level as a percentage of payroll. This method also produces an actuarial accrued liability that is generally more conservative than other cost methods.

This meets the “acceptable actuarial cost method” criteria above.

## Funding Method

### Applicable ASOPs

**Actuarial Standard of Practice No. 4, *Measuring Pension Obligations***, provides guidance regarding the amortization/funding method for pension valuations. According to Section 3.14 of this ASOP:

*A cost allocation procedure or contribution allocation procedure typically combines an actuarial cost method, an asset valuation method, and an amortization method to determine the plan cost or contribution for the period.*

Generally, an “acceptable contribution allocation procedure” meets the following criteria:

- In the actuary's professional judgment, the procedure is consistent with the plan accumulating adequate assets to make benefit payments when due;

- The procedure should consider relevant input received from the principal, such as a desire for stable or predictable costs or contributions, or a desire to achieve a target funding level within a specified time frame.

Additionally, the **PRB Pension Funding Guidelines** provides guidance for the determination of a plan's funding policy:

*Public retirement systems should develop a funding policy, the primary objective of which is to fund the obligations over a time frame that ensures benefit security while balancing the additional, and sometimes competing, goals of intergenerational equity and a stable contribution rate.*

1. *The funding of a pension plan should reflect all plan obligations and assets.*
2. *The allocation of the normal cost portion of the contributions should be level or declining as a percentage of payroll over all generations of taxpayers, and should be calculated under applicable actuarial standards.*
3. *Funding of the unfunded actuarial accrued liability should be level or declining as a percentage of payroll over the amortization period.*
4. *Actual contributions made to the plan should be sufficient to cover the normal cost and to amortize the unfunded actuarial accrued liability over as brief a period as possible, but not to exceed 30 years, with 10 - 25 years being a more the preferable target range. For plans that use multiple amortization layers, the weighted average of all amortization periods should not exceed 30 years.\* Benefit increases should not be adopted if all plan changes being considered cause a material increase in the amortization period and if the resulting amortization period exceeds 25 years.*

*\*Plans with amortization periods that exceed 30 years as of 06/30/2017 should seek to reduce their amortization period to 30 years or less as soon as practicable, but not later than 06/30/2025.*

### **Comments and Recommendations**

Page 25 of the DFPF report summarizes the calculation of the Actuarially Determined Contribution (ADC). The ADC, or the recommended employer contribution, is determined to be the sum of the employer normal cost, assumed administrative expenses, and an open 30-year amortization of the Unfunded Actuarial Accrued Liability (UAAL), all adjusted with a half-year of interest.

While the ADC uses a 30-year amortization, HB 3158 prescribes the actual employer contribution, which is outlined on page 25 of the valuation report and below:

The city will contribute 34.5% of computation payroll each year. However, for the pay periods beginning after September 1, 2017 to the pay period ending after December 31, 2024, additional minimum requirements are in force.

The percentage of payroll contributions (along with the minimums in place through 2024) are lower than the recommended contribution, and as a result the implied amortization period is greater than 30 years. Page 25 of the actuarial valuation report states:

*The effective amortization, based on the City's payroll projections, is 45 years.*

As such, the statutory contributions to DPFP do not meet the 4<sup>th</sup> requirement of the PRB Funding Guidelines that suggest the amortization of the UAAL should be over a period not to exceed 30 years, preferably 10-25 years.

We recommend that the ADC be determined based on funding policy best practices, such as a shorter open amortization period, a closed amortization period, and/or layered amortization bases over periods that may vary by source of (gain)/loss. This will provide additional detail between the best practice funding policy and the statutory contributions.

We also recommend disclosing the history of fully funded year.

## Actuarial Value of Asset Method

### Applicable ASOPs

**Actuarial Standard of Practice No. 44**, *Selection and Use of Asset Valuation Methods for Pension Valuations*, governs the asset valuation method for pension valuations, which is used to develop the actuarial value of assets (AVA). In short, the Standard does not take issue with using Market Value of Assets (MVA) as a Plan's Actuarial Value of Assets (AVA).

When a plan opts to use a smoothing method, the ASOP provides that the actuary should select an asset valuation method that is designed to produce actuarial values of assets that bear a reasonable relationship to the corresponding market values. In making that determination, the Standard indicates that such a method would be likely to produce:

- AVAs that are sometimes greater than and sometimes less than the corresponding market values
- AVAs that fall within a reasonable range of market values
- Recognition of differences between a plan's AVA and MVA within a reasonable period of time

All three requirements above are considered to be met if in the actuary's professional judgment the asset valuation method:

- Produces AVAs within a sufficiently narrow range of market values; and/or
- Recognizes differences between AVA and MVA in a sufficiently short period

### Comments and Recommendations

Page 16 of the actuarial valuation report describes the asset method:

*Under this valuation method, the full value of market fluctuations is not recognized in a single year and, as a result, the asset value and the plan costs are more stable. The amount of the adjustment to recognize market value is treated as income, which may be positive or negative. Realized and unrealized gains and losses are treated equally and, therefore, the sale of assets has no immediate effect on the actuarial value. The actuarial value of assets was reset to market value*

*as of December 31, 2015, with future gains and losses after that date amortized on a straight-line basis over five years.*

The current actuarial value of asset method is consistent with the requirements of ASOP 44.

# Review of Economic Assumptions

Actuarial calculations inherently make predictions about future events to estimate financial costs on a present value basis and to quantify and/or qualify the risks and volatility associated with the financial costs. To do so, actuaries must make best-estimate assumptions about these possible future events and establish methods for performing the calculations. Actuarial assumptions are needed to determine the value of plan obligations to its participants, and actuarial methods create a schedule for allocating costs over a participant's career. The assumptions and methods are established by adhering to best practices for determination, studying historical experience, utilizing relevant external data, and considering internal and reputable external opinions on expected future experience. Comprehensive reporting of the assumptions and methods is required under ASOPs 27, 35, and 41.

Actuarial assumptions used in the valuation of retirement benefits are generally broken into two categories: economic and demographic. This section considers only those assumptions we have categorized as economic, which include assumption dependent on economic factors, such as the inflation rate, payroll growth rate, investment return, and salary increase rate.

This section determines if the economic assumptions are reasonable and consistent with generally accepted actuarial practice and relevant ASOPs. As a component of our review we have also reviewed the results and recommendations of the December 31, 2014 experience study, as well as subsequent changes to certain economic assumptions as a result of HB3158 and the new Meet and Confer Agreement.

## Applicable ASOPs

**Actuarial Standards of Practice No. 27**, *Selection of Economic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries in selecting and recommending economic assumptions. ASOP No. 27 has been restated effective for any actuarial work product with a measurement date on or after September 30, 2014.

The following process is set forth by ASOP 27 in selecting an identified economic assumption:

- a. Identify any components of the assumption
- b. Evaluate relevant data
- c. Consider factors specific to the measurement
- d. Consider other general factors
- e. Select a reasonable assumption

The standard also requires the actuary to review the entire assumption set upon selection of each individual assumption to ensure internal consistency, and make adjustments as necessary.

The standard defines a reasonable assumption as follows:

*3.6 — Selecting a Reasonable Assumption—Each economic assumption selected by the actuary should be reasonable. For this purpose, an assumption is reasonable if it has the following characteristics:*

- a. *It is appropriate for the purpose of the measurement;*
- b. *It reflects the actuary's professional judgment;*
- c. *It takes into account historical and current economic data that is relevant as of the measurement date;*
- d. *It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and*
- e. *It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included and disclosed under section 3.5.1, or when alternative assumptions are used for the assessment of risk.*

*3.6.1 — Reasonable Assumption Based on Future Experience or Market Data—The actuary should develop a reasonable economic assumption based on the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof.*

*3.6.2 —Range of Reasonable Assumptions—The actuary should recognize the uncertain nature of the items for which assumptions are selected and, as a result, may consider several different assumptions reasonable for a given measurement. The actuary should also recognize that different actuaries will apply different professional judgment and may choose different reasonable assumptions. As a result, a range of reasonable assumptions may develop both for an individual actuary and across actuarial practice.*

ASOP 27 provides assumption specific guidance for each of the assumptions below. The remainder of this section of our report presents our review of selected economic assumptions to ensure the retained actuaries have followed the ASOP's general guidance and the assumption-specific guidance provided by the ASOP.

## **Inflation**

The inflation assumption is not directly used to measure the liabilities of the plan; rather it is a component of all economic assumptions, including payroll growth, investment return, and salary increase.

### **Applicable ASOPs**

The Actuarial Standards of Practice has brief guidance regarding inflationary data to consider, as noted below:

**ASOP No. 27, Section 3.7.1 – Data** –*The actuary should review appropriate inflation data. These data may include consumer price indices, the implicit price deflator, forecasts of inflation, yields on government securities of various maturities, and yields on nominal and inflation-indexed debt.*

### **Retained Actuary's Assumption**

The DFPF uses an inflation assumption of 2.75%.

### **Experience Study Considerations**

The retained actuary considered historical Consumer Price Index (CPI) data from the last 40 years, noting that inflation continues at relatively low levels from a historical perspective:

Average Annual Change in CPI-U, Through 2015	
Last 5 years	1.62%
Last 10 years	1.92%
Last 20 years	2.22%
Last 30 years	2.66%
Last 40 years	3.77%

The retained actuary also noted that, based on a recent survey of public plans from the National Association of State Retirement Administrators (NASRA), the average inflation assumption was 3.00%. Considering this trend, as well as the bond market’s current low future expectation, the retained actuary determined the reasonable range to be between 2.50% and 3.00%. Ultimately, 2.75% was chosen given the DFPF’s salary history and because it was within the reasonable range.

**Comments and Recommendations**

The experience study considered both historical and survey data. To supplement the experience study analysis, which is now several years old, we considered more recent benchmarking information to validate the current inflation assumption of 2.75%. The forward-looking 30-year inflation forecasts from the Office of the Chief Actuary of the Social Security Administration provided in the 2018 OASDI Trustees Report is as follows:

Scenario	CPI
Low Cost	2.0%
Intermediate Cost	2.6%
High Cost	3.2%

Based on the information above, an inflation assumption of 2.75% is reasonable.

**Payroll Growth and Wage Inflation**

The assumed aggregate payroll growth is used in the amortization of the unfunded actuarial accrued liability. Payroll growth is chosen using a building block approach in which the inflation assumption is added to the assumed real wage growth. Real wage growth includes wage growth due to productivity, but excludes individual compensation increases above wage growth, also called “merit” increases.

**Applicable ASOPs**

The section of ASOP No. 27 addressing payroll growth provides the actuary with general guidance but is far from prescriptive:

**ASOP No. 27, Section 3.11.3 — Rate of Payroll Growth—***As a result of terminations and new participants, total payroll generally grows at a different rate than does a participant’s salary or the average of all current participants combined. As such, when a payroll growth assumption is needed, the actuary should use an assumption that is consistent with but typically not identical to the compensation increase*

*assumption. One approach to setting the payroll growth assumption may be to reduce the compensation increase assumption by the effect of any assumed merit increases. The actuary should apply professional judgment in determining whether, given the purpose of the measurement, the payroll growth assumption should be based on a closed or open group and, if the latter, whether the size of that group should be expected to increase, decrease, or remain constant.*

### **Retained Actuary's Assumption**

The DFPF uses a payroll growth assumption of 2.75%. While the wage inflation assumption is not explicitly disclosed, the ultimate salary increase rate for employees with over 16 years of service is 3.00%, implying that the wage inflation assumption is 3.00%. Therefore, the DFPF's payroll growth assumption is the same as the inflation assumption while the real wage growth assumption is 0.25%, net of the DFPF's inflation assumption.

### **Experience Study Considerations**

The prior assumption was 4.00%. However, because the average payroll increase over the study period was 0.87%, the retained actuary lowered the assumption to be equal to the inflation assumption of 2.75%.

### **Comments and Recommendations**

National real wages can be studied by reviewing increases in the historical Average Wage Index, or AWI, published by the Social Security Administration. The AWI from 1977 to 2017, is shown below. Real Payroll Growth is the AWI less the CPI-U.

Period	Years	AWI	CPI-U (US)	Real Payroll Growth
2012-2017	5	2.31%	1.02%	1.29%
2007-2017	10	1.99%	1.30%	0.68%
1997-2017	20	2.82%	2.06%	0.76%
1987-2017	30	3.24%	2.46%	0.78%
1977-2017	40	3.98%	3.37%	0.62%

Also, the Office of the Chief Actuary of the Social Security Administration provided real payroll growth forecasts for a 30-year period in the 2018 OASDI Trustees Report:

Scenario	Payroll Differential
Low Cost	1.82%
Intermediate Cost	1.20%
High Cost	0.58%

Based on the information above, as well as the retained actuary's commentary on historical payroll growth, the 0.25% real wage growth assumption and payroll growth assumption that is the same as the inflation assumption are reasonable.

## Investment Return

The investment return assumption reflects anticipated returns on the plan's current and future assets. It is also used to calculate the present value of all plan liabilities and generally has the greatest impact of all assumptions reviewed in this report. The investment return assumption is chosen using a building block approach in which the inflation assumption is added to the assumed real rate of return.

### **Applicable ASOPs**

In selecting or recommending an investment return assumption, ASOP No. 27, Section 3.8 provides actuaries with guidance. The standard recommends the actuary review the investment data as follows.

**ASOP No. 27, Section 3.8.1 — Data**—*The actuary should review appropriate investment data. These data may include the following:*

- a. *current yields to maturity of fixed income securities such as government securities and corporate bonds;*
- b. *forecasts of inflation, GDP growth, and total returns for each asset class;*
- c. *historical and current investment data including, but not limited to, real and nominal returns, the inflation and inflation risk components implicit in the yield of inflation-protected securities, dividend yields, earnings yields, and real estate capitalization rates; and*
- d. *historical plan performance.*

*The actuary may also consider historical and current statistical data showing standard deviations, correlations, and other statistical measures related to historical or future expected returns of each asset class and to inflation. Stochastic simulation models or other analyses may be used to develop expected investment returns from this statistical data.*

The standards also state the actuary may adjust or customize the data above to reflect asset allocation, investment volatility and investment manager performance among other factors, and that combining estimated components of the investment return assumption and using multiple return rates in lieu of a single rate is also acceptable.

### **Retained Actuary's Assumption**

The DFPF use an annual rate of investment return assumption of 7.25%, which was chosen by the DFPF's Board of Trustees, with input from the actuaries.

Market value of asset returns are assumed to be 4.75% in 2018, 5.00% in 2019, 5.25% in 2020, 6.25% in 2021, and 7.25% annually thereafter, as the DFPF works to rebalance its investment portfolio.

### **Experience Study Considerations**

The investment rate of return assumption is developed using the "building block" approach as outlined in ASOP 27. Under this approach, the investment rate of return assumption is made up of two components; the inflation component and the real investment rate of return component. The

reasonable range of the inflation component determined above is combined with the reasonable range of the real rate of return component. This reasonable range is then evaluated and refined. The final recommendation is a specific point in this best-estimate range.

First, the retained actuary considered the DFPF's market returns for the last ten years as reported in the January 1, 2015 actuarial valuation report:

Year Ended December 31	Market Value Investment Return
2005	10.81%
2006	14.64%
2007	8.85%
2008	-24.80%
2009	13.78%
2010	10.72%
2011	-1.78%
2012	9.92%
2013	7.70%
2014	-5.25%

	5 Years	10 Years
Arithmetic Return	4.26%	4.46%
Geometric Return	4.05%	3.74%

In addition to looking at the DFPF's market returns, the retained actuary considered the historical returns of the DFPF's major asset classes (as revised) as well as assumptions used by other large governmental retirement systems. NASRA published a study in February of 2016 indicating that the average rate of return assumption for over 100 of the nation's largest governmental retirement systems was 7.62%.

Finally, the retained actuary reviewed the newly adopted investment policy, which included a three-to-five year phase-in of the revised target asset allocation. Based on the target asset allocation and the inflation assumption of 2.75%, the retained actuary believes that 7.25% is reasonable over the next 20 to 30 years. While short-term returns in the three-to-five year phase-in period may fall short of the assumption, the investment return assumption is meant to value long-term liabilities.

### **Comments and Recommendations**

We recommend that the next experience study include additional detail in support of the investment return assumption, including:

- the reasonable range for the real return component
- the target asset allocation used in the analysis.

- expected returns by asset class used in the forecast
- Description of whether the arithmetic or geometric return was considered when developing the reasonable range of investment returns

We have assessed the validity of the 2.75% inflation assumption above. In this section, we assessed the validity of the 4.50% real return assumption based on data provided in the January 1, 2018 valuation report, which discloses the target asset allocation and the anticipated risk premiums of each of the portfolio's asset classes. The retained actuary's projected real rates of return are based on the Segal Marco Advisors. A survey released by Horizon Actuarial Services, LLC provides alternate expected returns by asset classes. The survey provides capital market assumptions specific to projections over 10 years and 20 years. The investment return assumption, as noted by the SOA's Report of the Blue Ribbon Panel on Public Pension Plan Funding, should be using rates of return that can be achieved over the next 20 to 30-year period. Therefore, we selected the 20-year time horizon for our analysis.

Using the survey's expected returns by asset class for the 20-year horizon, the asset allocation modeled by the retained actuary, and adjusting for inflation differences and expenses, we have the following results:

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return (Segal Marco Advisors)	Long-Term Expected Real Rate of Return (Horizon) <sup>1</sup>
Global Equity	20.00%	6.54%	6.98%
Emerging Markets Equity	5.00%	9.41%	9.46%
Private Equity	5.00%	10.28%	9.69%
Short-Term Core Bonds	2.00%	1.25%	2.15%
Global Bonds	3.00%	1.63%	1.08%
High Yield	5.00%	4.13%	3.96%
Bank Loans <sup>2</sup>	6.00%	3.46%	3.46%
Structured Credit and Absolute Return <sup>2</sup>	6.00%	5.38%	5.38%
Emerging Market Debt	6.00%	4.42%	4.37%
Private Debt <sup>2</sup>	5.00%	7.30%	7.30%
Natural Resources	5.00%	7.62%	3.99%
Infrastructure	5.00%	6.25%	5.76%
Real Estate	12.00%	4.90%	5.19%
Liquid Real Estate	3.00%	4.71%	5.19%
Asset Allocation <sup>2</sup>	10.00%	4.90%	4.90%
Cash	2.00%	1.06%	0.62%
<b>Weighted Average Real Return</b>		<b>5.67%</b>	<b>5.55%</b>
<b>Weighted Average Nominal Return</b>		<b>8.42%</b>	<b>8.30%</b>

<sup>1</sup>Expected return for the 20-year time horizon for those consultants that responded to the survey, adjusted by Horizon's inflation expectation of 2.48%, as noted in Exhibit 15 of the Horizon Actuarial 2018 Survey of Capital Market Assumptions.

<sup>2</sup>The Horizon Survey does not include these asset classes, so the Segal Marco Advisors rate of return was used for purposes of the weighted average calculation.

The expected real rate of return based on the target asset allocation is 5.55% for Horizon, compared to 5.67% for Segal Marco Advisors. These are comparable and are both well above the 4.25% assumption used by the plan.

The return assumption was ultimately selected with consideration of the following data points:

- Historical returns of the plan's investments (4.46% Arithmetic and 3.74% Geometric)
- February 2016 NASRA Survey (7.62%)
- Expected return based on target asset allocation and Segal Marco Advisors returns by asset class (8.42%)

Based on the information above, we believe a long-term investment return of 7.25% is reasonable.

As shown above, the short-term investment returns are 4.75% in 2018, 5.00% in 2019, 5.25% in 2020, 6.25% in 2021, and 7.25% annually thereafter, as the DFPF works to rebalance its investment portfolio. We assessed the actual asset allocation against the long-term target asset allocation. Page 39 of the DFPF report (and Page 37 of the DFPF Supp report) discloses the actual asset allocation as of December 31, 2017 and December 31, 2016:

Asset Class	Target Allocation	Actual December 31, 2017 Allocation	Actual December 31, 2016 Allocation
Real Assets <sup>1</sup>	25%	40%	58%
Equity Securities <sup>2</sup>	25%	24%	8%
Private Equity <sup>3</sup>	5%	11%	13%
Alternative Investments <sup>4</sup>	10%	7%	7%
Fixed Income Securities <sup>5</sup>	33%	17%	14%
Other <sup>6</sup>	2%	1%	0%

<sup>1</sup> Natural Resources, Infrastructure, Real Estate, Liquid Real Estate

<sup>2</sup> Global Equity and Emerging Markets Equity

<sup>3</sup> Private Equity

<sup>4</sup> Asset Allocation

<sup>5</sup> Short-Term Core Bonds, Global Bonds, High Yield, Bank Loans, Structured Credit and Absolute Return, Emerging Market Debt, Private Debt

<sup>6</sup> Cash

The actual asset allocation as of December 31, 2017 shows a much higher allocation to Real Assets than the target allocation. As mentioned in the experience study report, it will take three to five years to fully implement the target allocation. Progress was made between December 31, 2016 and December 31, 2017 to trend towards the target allocation.

Based on the information above, the real rate of return assumption of 4.50% as well as the investment rate of return of 7.25% is reasonable.

## Salary Increase

The salary increase assumption is used to project an employee's salary from the valuation date to the assumed termination date(s). It is comprised of inflation, real wage growth and a merit scale. Inflation and real wage growth were already discussed above. This section focuses on the determination of the merit scale.

### **Applicable ASOPs**

In selecting or recommending a total wage scale, ASOP No. 27, Section 3.10 provides actuaries with guidance. The standard recommends the actuary review the compensation data as follows.

**ASOP No. 27, Section 3.10.1— Data**—The actuary should review available compensation data. These data may include the following:

- a. the plan sponsor's current compensation practice and any anticipated changes in this practice;
- b. current compensation distributions by age or service;
- c. historical compensation increases and practices of the plan sponsor and other plan sponsors in the same industry or geographic area; and
- d. historical national wage increases and productivity growth.

The actuary should consider available plan-sponsor-specific compensation data, but the actuary should carefully weigh the credibility of these data when selecting the compensation increase assumption.

**Retained Actuary's Assumption**

For 2018 and 2019, the Plans use the following assumption, which is based on the Meet and Confer Agreement:

Year	Less than 10 Years of Service	10-11 Years of Service	More than 11 Years of Service
2018	5.00%	2.00%	2.00%
2019	10.00%	7.00%	2.00%

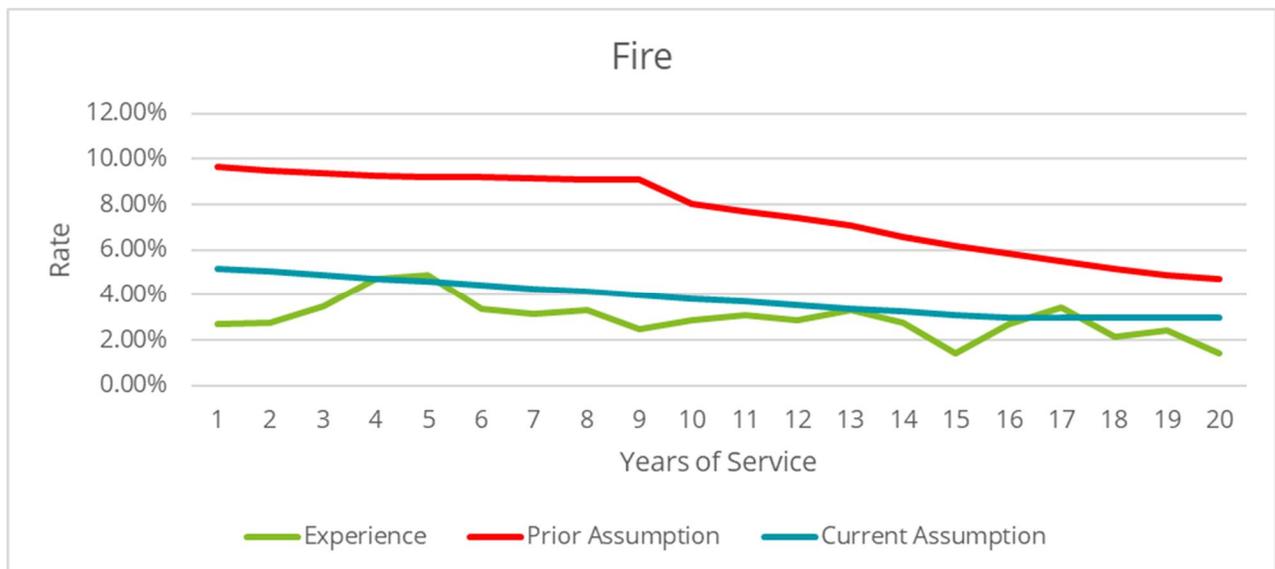
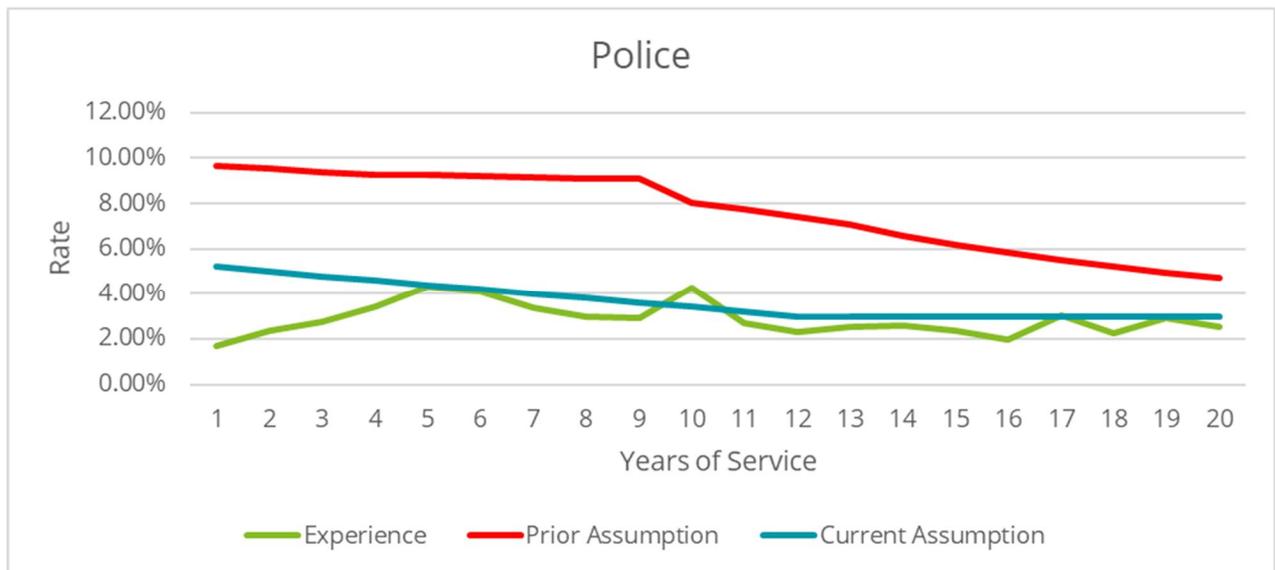
For 2020 and after, the Plans use a service-based assumption with separate rates for Police and Fire:

Years of Service	Rate (Police)	Rate (Fire)
1	5.20%	5.20%
2	5.00%	5.05%
3	4.80%	4.90%
4	4.60%	4.75%
5	4.40%	4.60%
6	4.20%	4.45%
7	4.00%	4.30%
8	3.80%	4.15%
9	3.60%	4.00%
10	3.40%	3.85%
11	3.20%	3.70%
12	3.00%	3.55%
13	3.00%	3.40%
14	3.00%	3.25%
15	3.00%	3.10%
16	3.00%	3.00%

**Experience Study Considerations**

The actual salary experience was examined, for the Police and Fire groups separately, and was discussed with the City's HR Director. It was determined that the two groups have similar salary

experience but Fire has a longer period before leveling out to the ultimate rate. The retained actuary reviewed the most recent Meet and Confer agreement at the time of the experience study and this confirmed what was observed in the data. Based on the salary increases during the five-year period, and taking into the Meet and Confer agreement, the retained actuary proposed modifying the salary assumption to conform to recent experience and future expectations.



**Comments and Recommendations**

The assumption recommended in the experience study is used for 2020 and beyond. For 2018 and 2019, the revised assumption, based on the Meet and Confer Agreement, is reasonable, as it is a best estimate of future increases based on the most currently available data.

The retained actuary is appropriately using the building blocks approach, with the salary assumption equal to 2.75% inflation plus 0.25% real wage growth plus a merit/promotion/longevity scale for employees with 0-16 years of service.

The assumption at each service level appears reasonable based on experience during the study period.

Based on the information above, the salary increase assumption is reasonable.

The DFPF Supp uses the same salary increase assumption as the DFPF. We recommend the retained actuary study the salary increase assumption for the DFPF Supp, as its definition of compensation differs from the DFPF.

## **Cost-of-Living Adjustment**

The cost-of-living-adjustment (COLA) assumption is used to estimate the plan's future COLA adjustments for retirees, which are often based on an inflation index.

### **Applicable ASOPs**

The section of ASOP No. 27 addressing COLA's provides the actuary with general guidance but is far from prescriptive:

**ASOP No. 27, Section 3.11.2 — Cost-of-Living Adjustments — Plan benefits or limits affecting plan benefits (including the Internal Revenue Code (IRC) section 401(a)(17) compensation limit and section 415(b) maximum annuity) may be automatically adjusted for inflation or assumed to be adjusted for inflation in some manner (for example, through regular plan amendments). However, for some purposes (such as qualified pension plan funding valuations), the actuary may be precluded by applicable laws or regulations from anticipating future plan amendments or future cost-of-living adjustments in certain IRC limits.**

### **COLA Plan Provision**

As described in Section 6.12 of the plan document, the Board may grant an ad hoc COLA based on the actual market return over the prior five years less 5%, not to exceed 4% of the base benefit, if, after granting a COLA, the funded ratio on a market value of assets basis is no less than 70%.

### **Retained Actuary's Assumption**

Prior to October 1, 2053, the assumed COLA is 0.00%.

Beginning October 1, 2053, the assumed COLA is 2.00% on the original benefit.

The assumption for the year the COLA begins will be updated on an annual basis and set equal to the year the System is projected to be 70% funded on a market value basis after the COLA is reflected.

### **Experience Study Considerations**

The experience study does not include analysis of the COLA assumption.

### **Comments and Recommendations**

The DPFP's COLA assumption ties to actual market returns less 5%, with the added complexity of a 4% maximum. Section 3.5.1 of ASOP 27 provides guidance on assumptions for plan provisions that are difficult to measure, such as a COLA with a maximum:

*Depending on the purpose of the measurement, the actuary may determine that it is appropriate to adjust the economic assumptions to provide for considerations such as adverse deviation or plan provisions that are difficult to measure, as discussed in ASOP No. 4. Any such adjustment made should be disclosed in accordance with section 4.1.1.*

The assumed investment return is 7.25%. The investment return less 5% would be 2.25%. Presumably, 2.00% was selected to reflect the impact of the 4% maximum, a difficult-to-measure plan provision as per Section 3.5.1 of ASOP 27. While this process appears reasonable, the valuation report and experience study lack appropriate documentation for the selection of the assumption. We recommend that the valuation report include documentation for the rationale for the selection of the 2.00% COLA assumption after 2053.

The valuation report states that the DPFP is projected to be 70% funded in 2053 based on projections of the unfunded actuarial accrued liability. The valuation report states that the assumed year of 70% funding will be updated each year. This is reasonable.

# Review of Demographic Assumptions

Actuarial assumptions used in the valuation of retirement benefits are generally broken into two categories: economic and demographic. This section of the report considers only those assumptions we have categorized as demographic, which include any non-economic assumption and generally include assumptions regarding how the workforce will behave.

## Applicable ASOPs

**Actuarial Standard of Practice No. 35**, *Selection of Demographic and other Noneconomic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries in selecting demographic and other assumptions not covered by ASOP No. 27. ASOP No. 35 has been restated effective for any actuarial work product with a measurement date on or after June 30, 2015. Because the assumptions resulting from this experience study will be used in actuarial valuations with measurement dates no sooner than July 1, 2015, we consider this standard applicable.

As set forth by ASOP 35, the actuary should follow the process below for selecting demographic assumptions, as applicable:

- a. Identify the types of assumptions
- b. Consider the relevant assumption universe
- c. Consider assumption formats
- d. Select the specific assumptions
- e. Select a reasonable assumption

The standard defines a *reasonable* assumption as follows:

*3.3.5 — Selecting a Reasonable Assumption—Each demographic assumption selected by the actuary should be reasonable. For this purpose, an assumption is reasonable if it has the following characteristics:*

- a. It is appropriate for the purpose of the measurement;*
- b. It reflects the actuary's professional judgment;*
- c. It takes into account historical and current demographic data that is relevant as of the measurement date;*
- d. It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data (if any), or a combination thereof; and*
- e. It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included (as discussed in section 3.10.1), and disclosed under section 4.1.1 or when alternative assumptions are used for the assessment of risk.*

*3.4 — Range of Reasonable Assumptions—The actuary should recognize the uncertain nature of the items for which assumptions are selected and, as a result, may consider several different assumptions equally*

*reasonable for a given measurement. The actuary should also recognize that different actuaries will apply different professional judgment and may choose different reasonable assumptions. As a result, a range of reasonable assumptions may develop both for an individual actuary and across actuarial practice.*

The standard also discusses consistency among selection of demographic assumptions and requires the actuary to review the combined effect of all non-prescribed assumptions selected by the actuary (both demographic assumptions selected in accordance with this standard and economic assumptions selected in accordance with ASOP No. 27).

*3.7 — Consistency among Demographic Assumptions Selected by the Actuary for a Particular Measurement—With respect to any particular measurement, each demographic assumption selected by the actuary should be consistent with the other assumptions selected by the actuary unless the assumption, considered individually, is not material (see section 3.10.2). For example, if an employer’s business is in decline and the effect of that decline is reflected in the turnover assumption, it should also be reflected in the retirement assumption.*

ASOP 35 provides assumption specific guidance for each of the assumptions below. The remainder of this section of our report presents our review of selected demographic assumptions to ensure the retained actuaries have followed the ASOP’s general guidance and the assumption-specific guidance provided by the ASOP.

## **Mortality**

The mortality assumption is used to determine when an active employee or retired employee will become deceased.

### **Applicable ASOPs**

**ASOP No. 35, Section 3.5.3 — Mortality and Mortality Improvement—***The actuary should take into account factors such as the following in the selection of mortality and mortality improvement assumptions:*

- a. the possible use of different assumptions before and after retirement (for example, in some small plan cases a reasonable model for mortality may be to assume no mortality before retirement);*
- b. the use of a different assumption for disabled lives, which in turn may depend on the plan’s definition of disability and how it is administered; and*
- c. the use of different assumptions for different participant subgroups and beneficiaries.*

*The actuary should reflect the effect of mortality improvement both before and after the measurement date. With regard to mortality improvement, the actuary should do the following:*

- i. adjust mortality rates to reflect mortality improvement before the measurement date. For example, if the actuary starts with a published mortality table, the mortality rates may need to be adjusted to reflect mortality improvement from the effective date of the table to the measurement date. Such an adjustment is not necessary if, in the actuary’s professional judgment, the published mortality table reflects expected mortality rates as of the measurement date.*

- ii. *include an assumption as to expected mortality improvement after the measurement date. This assumption should be disclosed in accordance with section 4.1.1, even if the actuary concludes that an assumption of zero future improvement is reasonable as described in section 3.3.5. Note that the existence of uncertainty about the occurrence or magnitude of future mortality improvement does not by itself mean that an assumption of zero future improvement is a reasonable assumption.*

## **Background on Recent National Mortality Studies**

### *Base Mortality Tables*

In October 2014, the Society of Actuaries (“SOA”) published several reports of the Retirement Plans Experience Committee (“RPEC”). The RP-2014 Mortality Tables Report<sup>1</sup> reflects observed data for single-employer defined benefit pension plans covering the years 2004 – 2008 (central year, 2006). The RPEC observed that this data was relatively consistent with the data underlying the RP 2000 mortality tables (that is, from 1990 – 1994, central year 1992) adjusted for longevity improvements using MP-2014<sup>2</sup>. The rates in the RP-2014 tables were developed on a liability weighted basis (i.e. exposures and deaths were weighted by compensation for actives and by benefit amount for retirees).

As a supplement to the RP-2014 Mortality Tables Report, the Society of Actuaries also published the Supplement to the RP-2014 Mortality Tables Report, RPH-2014 Headcount-Weighted Tables<sup>3</sup>. The rates in these tables, denoted RPH-2014 (for Retirement Plans by Headcount), were calculated using the same underlying datasets and methods as those used in the development of the corresponding RP-2014 tables, but with exposures and deaths weighted by headcount rather than by amount.

As a result of comments received on the prior RP-2014 study, which included only data from private pension plans, the SOA and the RPEC initiated a mortality study of public pension plans in January 2015. The primary focus of this study was a comprehensive review of recent mortality experience of public retirement plans in the United States. The objectives of this study were the following:

1. Develop mortality tables based exclusively on public-sector pension plan experience.
2. Provide new insights into the composition of gender-specific pension mortality by factors such as job category (e.g., Teachers, Public Safety, General), salary/benefit amount, health status (i.e., healthy or disabled), geographic region and duration since event.

In October, 2018 the Pub-2010 Public Retirement Plans Mortality Tables Report<sup>4</sup> was published, with job category-specific mortality base tables for Teachers, Public Safety, and General populations. Additional factors were considered and subset mortality tables were released based on income

<sup>1</sup> RP-2014 Mortality Tables Report (<https://www.soa.org/Files/Research/Exp-Study/research-2014-rp-report.pdf>)

<sup>2</sup> Mortality Improvement Scale MP-2014 Report (<http://www.soa.org/Research/Experience-Study/pension/research-2014-mp.aspx>)

<sup>3</sup> Supplement to the RP-2014 Mortality Tables Report (<https://www.soa.org/Files/Research/Exp-Study/research-2014-rp-supplement.pdf>)

<sup>4</sup> Pub-2010 Public Retirement Plans Mortality Tables Report (<https://www.soa.org/Files/resources/research-report/2019/pub-2010-mort-report.pdf>)

level, with which they determined mortality had a strong correlation. Separate tables were also developed for contingent survivors, as their experience was determined to differ from that of other annuitants. We believe that this study is the most credible basis on which to base public sector mortality at this time.

### *Mortality Improvement Scale*

The RPEC's Mortality Improvement Scale MP-2014 Report<sup>5</sup> reflects data from the Social Security Administration through 2009. As discussed in the report, the historical data was graduated and then projected from the resulting smoothed 2007 values to reach an ultimate rate of 1%<sup>6</sup> after 20 years (from 2007<sup>7</sup>). As discussed in the RPEC's Mortality Improvement Scale MP-2014 Report<sup>8</sup>, we believe this is a reasonable ultimate rate and convergence period.

The Society of Actuaries published the MP-2015 scale of longevity improvements in October 2015, the MP-2016 scale of longevity improvements in October 2016, the MP-2017 scale of longevity improvements in October 2017, and the MP-2018 scale of longevity improvements in October 2018. The MP-2015 scale reflected two additional years of Social Security data, the MP-2016 scale reflected an additional three<sup>9</sup> years (beyond those reflected in MP-2015) of Social Security data, the MP-2017 scale reflected one additional year (beyond those reflected in MP-2016) of Social Security data and the MP-2018 scale reflected one additional year (beyond those reflected in MP-2017) of Social Security data.

### **Retained Actuary's Assumption**

The following table shows the current mortality assumptions for each group of participants:

Participant Group	Assumption
Disabled Lives	RP-2014 Disabled Retiree Mortality Table, set back three years for males and females, projected generationally using Scale MP-2015
Healthy Retirees	RP-2014 Blue Collar Healthy Annuitant Mortality Table, set forward two years for females, projected generationally using Scale MP-2015
Active Members	RP-2014 Employee Mortality Table, set back two years for males, projected generationally using Scale MP-2015

### **Experience Study Considerations**

The actual mortality experience was examined for disabled lives, healthy retirees, and active members, separately for males and females. The following table contains the results of the plan's

<sup>5</sup> [www.soa.org/Research/Experience-Study/pension/research-2014-mp.aspx](http://www.soa.org/Research/Experience-Study/pension/research-2014-mp.aspx)

<sup>6</sup> The ultimate rate is actually 1% at ages up to 85, then grading down to 0.85% at 95 and 0% at 110.

<sup>7</sup> To avoid so-called edge effect distortions, the last two years of actual data (2008 and 2009) were replaced with the first two years of smoothed data.

<sup>8</sup> [www.soa.org/Research/Experience-Study/pension/research-2014-mp.aspx](http://www.soa.org/Research/Experience-Study/pension/research-2014-mp.aspx)

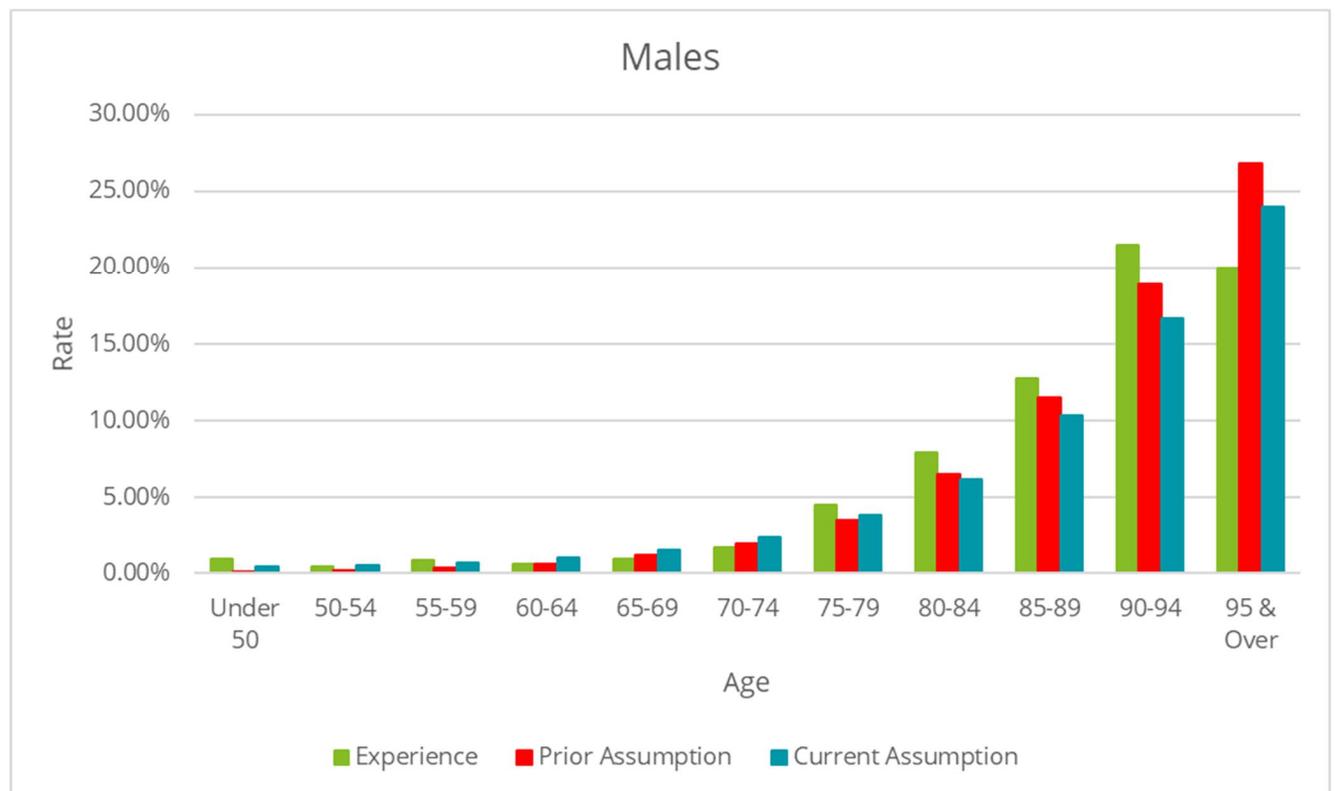
<sup>9</sup> SSA published data was used for 2012 and 2013, while preliminary data was used for 2014.

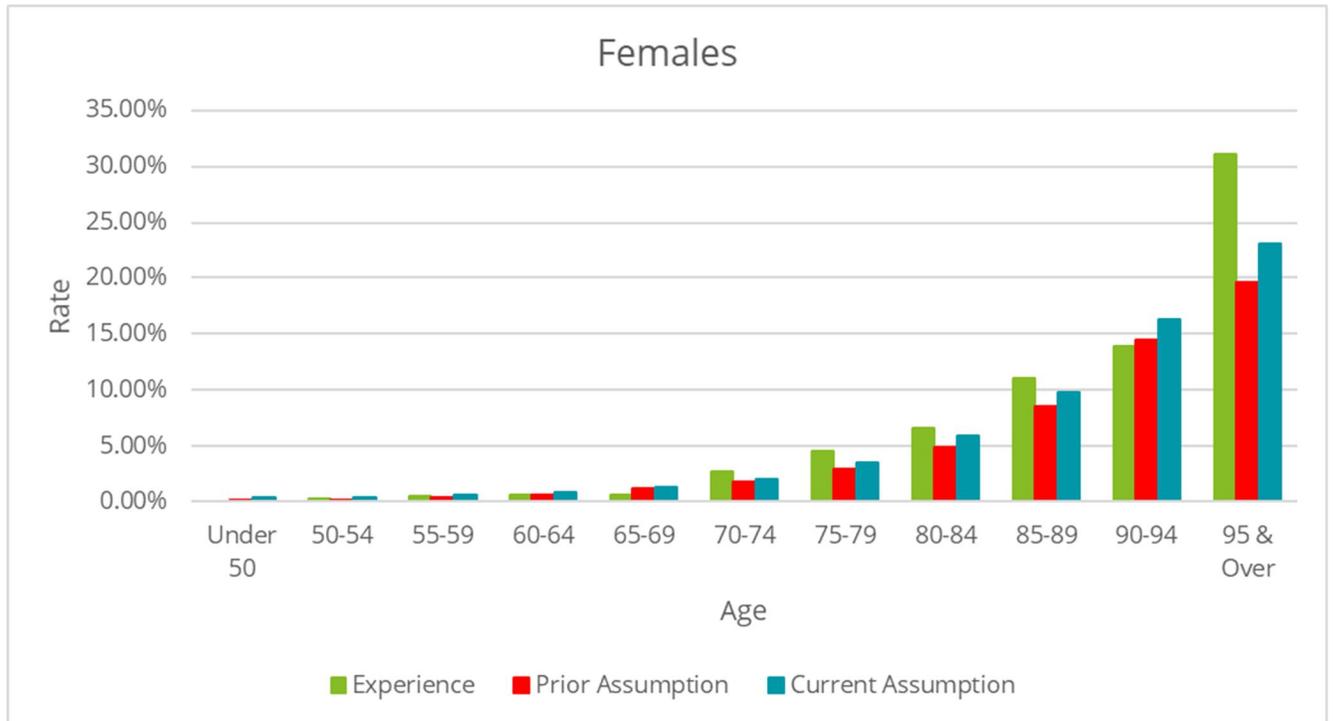
experience over the study period including the ratio of actual deaths to expected deaths (based on the prior assumption).

Participant Group	Exposure	Actual Deaths	Expected Deaths (Prior Assumption)	Ratio of Actual Deaths to Expected Deaths
Disabled Lives – Male	751	32	30.6	105%
Disabled Lives – Female	113	0	0.6	0%
Healthy Retirees – Male	12,115	296	264.0	112%
Healthy Retirees – Female	5,013	198	156.3	127%
Active Members – Male	24,044	22	31.2	71%
Active Members – Female	3,749	3	2.9	103%

The retained actuary recommended updating the tables to reflect the recently published RP-2014 tables and the MP-2015 improvement scale (the most recently available table at the time of the study).

The retained actuary provided additional analysis regarding the healthy retiree mortality, as this assumption is the most material (active mortality rates are so low that they don't impact liability much, and disability is a rare occurrence for this population):





Participant Group	Ratio of Actual Deaths to Expected Deaths (Prior Assumption)	Ratio of Actual Deaths to Expected Deaths (Current Assumption)
Healthy Retirees - Male	112%	102%
Healthy Retirees - Female	127%	107%
Total	118%	104%

**Comments and Recommendations**

In accordance with ASOP 35 Section 3.5.3, the retained actuary considered the mortality for participants in post-retirement status, disabled retirement status, and pre-retirement (active) status. Within each of these participant groups, male and female experience was considered separately.

We have several recommendations regarding the mortality assumption:

- We recommend that the next experience study discuss the basis for the selection of the Blue-Collar adjustment and the set back/forward period including a credibility analysis. If there is no credible experience, we recommend using a standard published mortality table. The experience study does not provide sufficient discussion for the selection of these adjustments or if credible experience exists by cohort.
- We recommend that the next experience study review the appropriateness of updating the base mortality table to the Pub-2010 mortality tables. The mortality base table assumption

should be based on more recent tables and reflect the employee base covered under the DPFP to the extent that such plan experience is credible. At the time of the experience study, the RP-2014 mortality tables were the most current basis available and were the recommended base table for DPFP. The subsequent release of the Pub-2010 tables should be considered and we recommend that the appropriateness of these tables be considered for this population.

## Retirement

The retirement assumption is used to determine when an employee is expected to commence benefits.

### Actuarial Standards

**ASOP No. 35, Section 3.5.1 — Retirement**—*The actuary should take into account factors such as the following:*

- a. *employer-specific or job-related factors such as occupation, employment policies, work environment, unionization, hazardous conditions, and location of employment;*
- b. *the plan design, where specific incentives may influence when participants retire;*
- c. *the design of, and date of anticipated payment from, social insurance programs (for example, Social Security or Medicare); and*
- d. *the availability of other employer-sponsored postretirement benefit programs (for example, postretirement health coverage or savings plan).*

### Retained Actuary's Assumption

The DPFP uses a separate retirement assumption for DROP Active members and non-DROP active members.

For DROP Active members, the DPFP uses an age-based assumption with separate rates for police and fire. Additionally, there are separate rates for 2018 reflecting higher retirement behavior after the September 1, 2017 plan changes.

Police			Fire		
Age	2018*	2019+	Age	2018*	2019+
Under 50	50.00%	1.00%	Under 50	50.00%	0.75%
50-52	50.00%	3.00%	50-54	50.00%	2.50%
53-54	50.00%	7.00%	55-58	50.00%	12.00%
55	50.00%	15.00%	59-64	50.00%	25.00%
56-57	50.00%	20.00%	65-66	50.00%	30.00%
58-64	50.00%	25.00%	67	50.00%	100.00%
65-66	50.00%	50.00%			
67	50.00%	100.00%			

If at least eight years in DROP as of January 1, 2017, 100% retirement rate in 2018

If less than eight years in DROP as of January 1, 2017, 50% retirement rate in 2018

For non-DROP Active members, the DPFP uses an age-based assumption, with separate rates for the following groups:

- Members hired prior to March 1, 2011 with less than 20 years of service as of September 1, 2017
- Members hired prior to March 1, 2011 with at least 20 years of service as of September 1, 2017
- Members hired on or after March 1, 2011

Additionally, a 100% retirement rate is assumed once the sum of age plus service equals 90.

In addition to the assumptions for retirement from active status, the assumptions related to retirement from deferred status is age 50 for current terminated vested participants, and age 58 for future terminated vested participants.

### **Experience Study Considerations**

The experience study, dated May 2016, was conducted before the plan changes as of September 1, 2017. These plan changes included changes to early retirement eligibility and reductions, freezing/eliminating the supplemental benefit, and removing the Active DROP interest credit (which resulted in a change in the DROP utilization assumption from 100% to 0%). These plan changes will influence retirement behavior, with the change to the DROP having the most significant impact.

The plan revised its retirement assumption to reflect the updated plan provisions and therefore the current non-DROP actives assumption is not detailed in the experience study.

For DROP actives, the assumption was revised for 2018, with retirement rates either 100% or 50% depending if the active has more or less than eight years in the DROP. For DROP actives after 2018, the assumption is the same as recommended by the experience study. We will detail the experience study here, with consideration that the assumption recommended from the experience study only applies to a small group of actives (DROP actives with less than eight years of service).

The retained actuary examined the retirement experience during the study period and revised the rates to be consistent with observed experience.



**Comments and Recommendations**

For DROP actives, the updated plan provisions as of September 1, 2017 limit participation in DROP to 10 years. Additionally, DROP account balances accrued after September 1, 2017 receive no interest. Therefore, the retained actuary's revisions to the retirement assumption are reasonable, as DROP actives will likely retire at a much higher rate given the plan changes.

For non-DROP actives, the retirement assumption was also changed as a result of the September 1, 2017 plan changes. The retirement assumption is separated into three tiers based on an employee's

benefit formula and early retirement options available. For employees hired after March 1, 2011, there will not be significant retirement exposures to study until these employees begin to retire. Therefore, it is unclear how this assumption was developed.

We have several recommendations regarding the retirement assumption:

- We recommend clarifying the language for DROP actives to disclose that a retirement rate of 100% is assumed after achieving 8 years of DROP service in any future year.
- We recommend that the valuation report provide detail on the basis of the selection of the non-DROP retirement assumption. The assumption recommended from the December 31, 2014 experience study was age-based and separated by Police and Fire. The revised assumption to reflect the September 1, 2017 plan changes is age-based, separated by hire date and service as of September 1, 2017. Additionally, 100% retirement is assumed once age plus service equals 90. While it is reasonable that the retirement assumption changed as a result of the plan changes, it is unclear why the assumption no longer separates rates by Police and Fire, and the basis for the 100% retirement rate once age plus service equals 90 is unclear. The retained actuary should provide more support for the basis for this assumption.
- We recommend that the retained actuary consider studying the retirement behavior of deferred vested participants.

## Withdrawal

The withdrawal assumption is used to determine when an employee who is not eligible for retirement will terminate employment.

### **Actuarial Standards**

**ASOP No. 35, Section 3.5.2 — Termination of Employment—***The actuary should take into account factors such as the following:*

- employer-specific or job-related factors such as occupation, employment policies, work environment, unionization, hazardous conditions, and location of employment; and*
- plan provisions, such as early retirement benefits, vesting schedule, or payout options.*

### **Retained Actuary's Assumption**

The DFPF uses service-based retirement rates, with separate rates for police and fire:

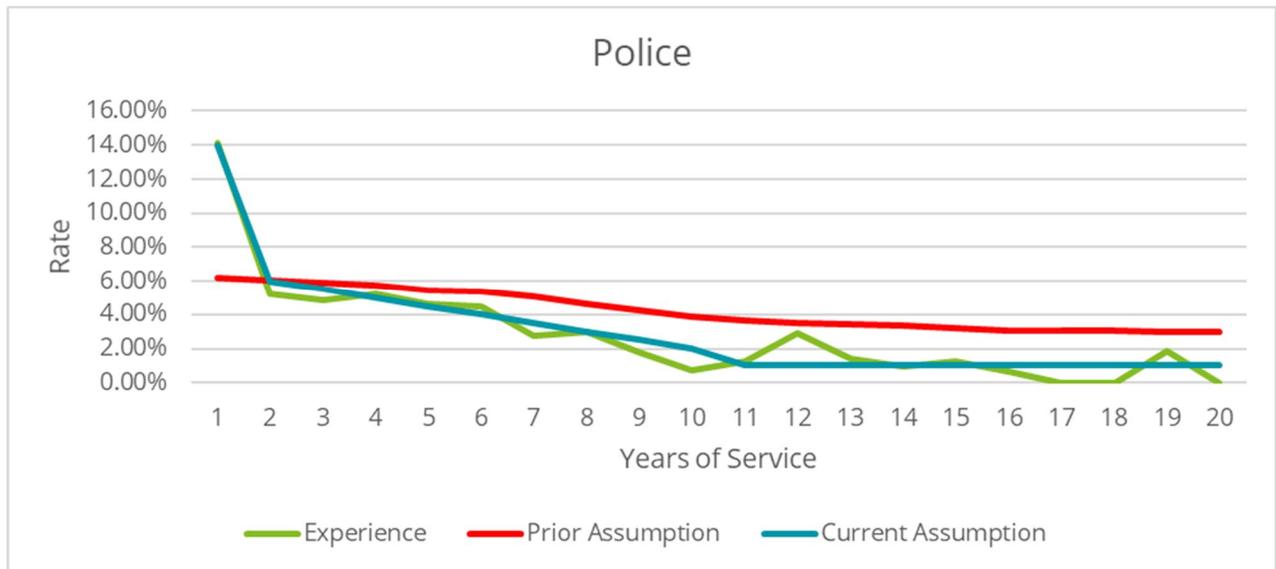
Years of Service	Rate (Police)	Rate (Fire)
0	14.00%	5.50%
1	6.00%	4.50%
2	5.50%	4.00%
3	5.00%	3.50%
4	4.50%	3.00%
5	4.00%	1.50%

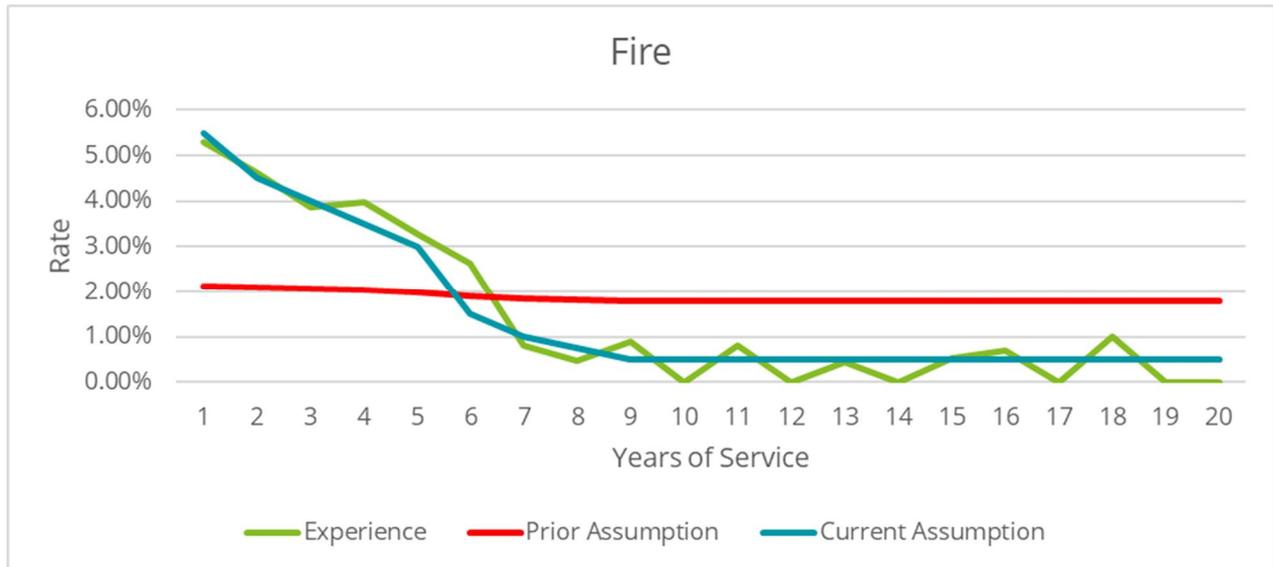
6	3.50%	1.00%
7	3.00%	0.75%
8	2.50%	0.50%
9	2.00%	0.50%
10-37	1.00%	0.50%
38 and over	0.00%	0.00%

There is 0% assumption of termination for members eligible for retirement.

**Experience Study Considerations**

The actual turnover experience was examined separately for the Police and Fire groups. The retained actuary found that the patterns of termination more closely correlate to service than age. Police and Fire continue to exhibit different withdrawal behavior (with police more likely to withdraw prior to retirement). Overall, the rates are quite low for both groups, which is consistent with national trends for public safety. The retained actuary proposed modifying the withdrawal assumption to conform to recent experience for each group.





### **Comments and Recommendations**

The withdrawal assumption is based on years of service separated by Police and Fire. This is a robust basis for the assumption because it reflects the general tendency of shorter-tenured employees to incur higher rates of turnover. The assumed rates reflect higher expected turnover within the first several years of service, which is not uncommon. Based on the information provided, the withdrawal assumption appears reasonable.

We recommend adding a separate withdrawal assumption for members hired after March 1, 2011. As benefits for employees hired after March 1, 2011 are less valuable, withdrawal rates may increase as participants are less likely to remain with the City to preserve their pension benefits. Unlike the retirement assumption, which will take 20-30 years to develop meaningful experience, termination rates, especially for early years of service, can be immediately studied.

### **Disability**

The disability assumption is used to determine when an employee becomes disabled and qualifies for disability benefits.

### **Actuarial Standards**

**ASOP No. 35, Section 3.5.4 — Disability and Disability Recovery—***The actuary should take into account factors such as the following:*

- a. *the plan's definition of disability (for example, whether the disabled person is eligible for Social Security benefits); and*
- b. *the potential for recovery. For example, if the plan requires continued disability monitoring and if the plan's definition of disability is very liberal, an assumption for rates of recovery may be appropriate. Alternatively, the probability of recovery may be reflected by assuming a lower incidence of disability than the actuary might otherwise assume.*

**Retained Actuary's Assumption**

The plans use a disability incidence table with sample rates as follows:

Age	Rate
20	0.010%
25	0.015%
30	0.020%
35	0.025%
40	0.030%
45	0.035%
50	0.040%

100% of disabilities are assumed to be service related.

**Experience Study Considerations**

Participants are eligible for disability benefits immediately upon membership. The disability rates are quite low. There were three Police disabilities in the study period, vs. 7.9 expected. There was one disability from the Fire group, vs. 7.4 expected. The retained actuary recommended lowering the rates for both the Firefighters and Police Officers from the previous assumption, and further recommended a single table for both groups.

**Comments and Recommendations**

The current disability rates appear reasonable and consistent with the experience reviewed. Using a single table for Police and Fire groups is an appropriate simplification due to the small sample size and inability to infer significant information about each group separately.

Due to the very small sample size, we recommend supplementing historical data with industry-standard data for disability incidence for similar job types to increase credibility.

Additionally, we recommend that the next experience study include an analysis on the incidence of service versus non-service related disabilities, as service-related disabilities are calculated with a 20-year minimum on benefit service. While there is a high likelihood of disabilities being service-related for Police and Fire, the assumption that 100% of disabilities are service-related should be addressed in the next experience study.

**Marital Status**

It is common for actuaries to make an assumption regarding the marital status of plan participants for use in assuming future benefit eligibility and election. Like the inflation assumption, the marital status assumption is often a component of several other assumptions.

**Actuarial Standards**

**ASOP No. 35, Section 3.6.3 — Marriage, Divorce, and Remarriage—** *The actuary should consider whether marriage, divorce, or remarriage affects the payment of benefits, the amount or type of benefits, or the*

*continuation of benefit payments. If such an assumption is selected, it may also be necessary to make an assumption regarding beneficiary ages.*

### **Retained Actuary's Assumption**

75% of participants are assumed to be married.

### **Experience Study Considerations**

During the study period, 76% of those retiring were married. The retained actuary recommended changing the assumption from 80% to 75%.

### **Comments and Recommendations**

The observed data supported a change in the assumption to 75%. Based on the information provided, the method and assumption are reasonable.

## **Age of Survivor**

Future Joint & Survivor annuity payment amounts are based in part on the age of the survivor. Because valuation mortality and interest rates are not equal to those used to calculate optional forms of payment, the age of survivors impacts liability amounts.

### **Actuarial Standards**

**ASOP No. 35, Section 3.6.7 — Missing or Incomplete Data—** *At times, the actuary may find that the data provided are incomplete due to missing elements such as birth dates or hire dates. Provided that the actuary has determined, in accordance with ASOP No. 23, Data Quality, that the overall data are of sufficient quality to complete the assignment, the actuary may need to make reasonable assumptions for the missing data elements. In making such assumptions, the actuary should consider the relevant data actually supplied. For example, it may be appropriate to assume a missing birth date is equal to the average birth date for other participants who have complete data and who have the same service credits as the participant whose date of birth is missing.*

### **Retained Actuary's Assumption**

The female spouse is assumed to be 3 years younger than the male spouse.

### **Experience Study Considerations**

The assumption is unchanged from the prior assumption. According to the experience study, the assumption is based on actual data on the DFPF's retirees.

### **Comments and Recommendations**

The actuary's discussion supported no change to the assumption. Based on the information provided, the method and assumption is reasonable.

However, we recommend that the next experience study disclose the observed data on the age difference between male and female spouses for the DFP's retirees to support the assumption.

## Form of Payment

In cases where participants receive no subsidy among payment forms and valuation actuarial equivalence matches that of optional payment forms, this assumption is not necessary. However, because valuation mortality and interest rates are not equal to those used to calculate optional forms of payment, this assumption impacts liabilities.

### **Actuarial Standards**

**ASOP No. 35, Section 3.5.5 — Optional Form of Benefit Assumption—***The actuary should consider factors such as the following:*

- a. *the benefit forms and benefit commencement dates available under the plan being valued;*
- b. *the historical or expected experience of elections under the plan being valued and similar plans; and*
- c. *the degree to which particular benefit forms may be subsidized.*
- d. *cost projections, including those made in conjunction with establishing or modifying the plan's design; and*
- e. *determinations of actuarial present values.*

### **Retained Actuary's Assumption**

Married participants are assumed to elect the Joint and Survivor annuity form of payment and non-married participants are assumed to elect a Life Only annuity.

Additionally, with respect to refunds of contributions, it is assumed that vested members will defer their annuity (current terminated vested employees retire at age 50, future terminated vested employees retire at age 58).

### **Experience Study Considerations**

This assumption was not considered in the experience study.

### **Comments and Recommendations**

We have several recommendations regarding the form of payment assumption:

- We recommend that the retained actuary study the refund versus deferred annuity behavior for terminated vested participants. The plan provisions allow active participants who terminate prior to retirement eligibility to elect either a lump sum refund of accumulated employee contributions made (without interest), or a deferred annuity at retirement age based on the benefit provisions. There may be a significant difference in the future plan liability between a refund of employee contributions and the deferred annuity, and therefore this election behavior should be studied.

- We recommend that the valuation report disclose the actuarial equivalence assumption. The actuarial equivalence factors are used to calculate the amount of the actuarially reduced Joint and 100% survivor annuity. A form of payment assumption is needed because the actuarial equivalence assumptions to calculate the benefits differ from the valuation assumptions, which will create gain or loss when an active transitions to a retiree.
- We recommend that the retained actuary develop an optional form election assumption based on the forms offered by the DFPF and value the impact of the actuarial equivalence factors directly in the valuation software. Adding an optional form election assumption will result in enhanced support of the assumptions by aligning them to the plan provisions.

# Validation of Actuarial Valuation Results

This section will validate the retained actuary's calculation of several key items in the valuation report, including Actuarial Accrued Liability (AAL), Normal Cost, ADC, and AVA.

## Actuarial Accrued Liability and Normal Cost

Representative sample lives have been selected and reviewed as summarized in the *Review of Sample Lives* section below. By confirming decrement rates, benefit amounts, and select Present Value of Benefit calculations, we determined the reasonableness of liabilities and normal cost for sample participants.

## Actuarially Determined Contribution

The DFPF's contribution policies are discussed in detail in the *Review of Actuarial Methods* section above. The purpose of this section will be to verify the retained actuary's calculation of the ADC. Note that the DFPF's actual employer contribution is a fixed percentage of payroll and is not dependent on the ADC.

Based on the information provided, including the UAAL, Normal Cost, and Administrative Expenses, we were able to verify the ADC as shown below (in \$000's).

DFPF Plan (In thousands of \$'s)		Retained Actuary	Deloitte
		<b>01/01/2018</b>	<b>01/01/2018</b>
<b>1</b>	<b>UAAL</b>	2,354,397,842	
<b>2</b>	<b>Payment to Amortize UAAL over 30 Years</b>	136,519,813	136,519,813
<b>3</b>	<b>Employer Normal Cost<sup>1</sup></b>	15,177,500	
<b>4</b>	<b>Adjustment for Timing<sup>2</sup></b>	<u>5,402,815</u>	<u>5,402,815</u>
<b>5</b>	<b>ADC</b>	157,100,128	157,100,128

<sup>1</sup> Includes Administrative Expenses

<sup>2</sup> Actuarially determined contributions are assumed to be paid at the middle of every year.

The results confirm that the actuary's calculation of the ADC is consistent with the method described in the valuation report.

## Actuarial Value of Assets

The components of the DFPF's AVA are the Market Value of Assets (MVA) as of the Valuation Date, as well as the excess (shortfall) between expected investment return and actual investment income for each of the five previous years. The DFPF reset its AVA method as of December 31, 2015, so only the

excess (shortfall) between expected investment return and actual investment income for the two previous years are used in the calculation.

We were able to replicate the retained actuary's calculation of the AVA as summarized below:

(In \$'s)		Retained Actuary		Deloitte	
		<b>12/31/2017</b>		<b>12/31/2017</b>	
<b>1</b>	<b>MVA</b>	2,103,345,471		2,103,345,471	
<b>2</b>	<b>Avg. Bal. Calc.</b>				
a	Total assets, BOY	2,149,836,260		2,149,836,260	
b	Total assets, EOY	2,103,345,471		2,103,345,471	
c	Net Investment Income	98,457,176		98,457,176	
d	Avg. Balance (a+b-c)/2	2,077,362,278		2,077,362,278	
<b>3</b>	<b>Expected Return (7.25% * 2.d.)</b>	150,608,765		150,608,765	
<b>4</b>	<b>Actual Return</b>	98,457,176		98,457,176	
<b>5</b>	<b>Current Year G/(L) (4-3)</b>	-52,151,589		-52,151,589	
<b>6</b>	<b>Unrecognized asset returns</b>	Unrecognized AMT		Unrecognized AMT	
a	FYE 2017	80%	-41,721,271	80%	-41,721,271
b	FYE 2016	60%	-5,972,601	60%	-5,972,601
c	FYE 2015	40%	-	40%	-
d	FYE 2014	20%	-	20%	-
e	FYE 2013	0%	-	0%	-
			-47,693,872		-47,693,873
<b>7</b>	<b>AVA at EOY</b>	2,151,039,343		2,151,039,344	
<b>8</b>	<b>AVA / MVA =</b>	1.023		1.023	

The results confirm that the actuary's calculation of the AVA is consistent with the method described in the valuation report.

# Report Content

In this section, we review the content of the actuarial report for required disclosures.

## Applicable ASOPs

**Actuarial Standard of Practice No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions***, provides guidance regarding nearly all aspects of the actuarial valuation method, including several cross-references to other ASOPs cited in this review.

**Actuarial Standard of Practice No. 41, *Actuarial Communications***, provides guidance for any written, electronic, or oral communication issued by an actuary with respect to actuarial services. The standard specifically identifies disclosures that must be made within Actuarial Reports like the annual valuation provided by the DPFP.

Generally, an actuarial report should:

- Accurately and fairly represent the financial condition of the Plan
- Be written so that it can be reasonably understood by the intended audience
- Make disclosures necessary to allow a qualified actuary to approximate the results, if required data were provided.

The standards above identify what must be reported within the reviewed valuations. We have recommended additional disclosure where we judged its value to be worth the effort of production.

## Comments and Recommendations

The actuarial report meets applicable actuarial standards of practice and appear to accurately represent the funded status of the plans. However, we do recommend making the following additions to the reports:

- Demonstrate the sensitivity of the discount rate assumption by providing the following key metrics using a discount rate 1% higher and 1% lower than the prescribed rate:
  - Actuarial Accrued Liability
  - Unfunded Actuarial Accrued Liability
  - Funded Ratio
- Disclose the undiscounted cash flows, a beneficial tool for understanding the plan's financial obligation. This could be for a 10 to 20 year period, showing current and future retirees separately.

- Categorize the target and actual asset allocations across consistent classes to allow for easier observation for how closely actual allocations align with the target.

# Review of Sample Lives

## Summary of Reviewed Sample Lives

Sample life output is used by actuaries to confirm the actuarial assumptions, plan provisions, and actuarial methods used in actuarial valuations.

The retained actuary provided sample life data for active and inactive participants for each plan. For inactive sample lives, the present value of benefits was provided. For active sample lives, the present value of benefits, accrued liability, and normal cost were provided. The tables below summarize the sample lives that Deloitte reviewed.

Status	Number of Sample Lives Reviewed
Active	5
Terminated Vested	4
Retiree	4
Disabled	1
Beneficiary	1

Our review of representative sample lives consists of the following:

- Review the data provided for the sample participants to confirm its consistency with the valuation data. All data was consistent with the valuation data.
- Review sample life results for compliance with the plan provisions, assumptions and methods disclosed in the actuarial valuation report using our actuarial valuation software. Results were within a reasonable threshold.

# Responses Received

Attached are the responses received from the board and the retained actuaries after reviewing the preliminary draft audit report. Comments have been incorporated into the final report, as appropriate.



2727 Paces Ferry Road SE Building One, Suite 1400 Atlanta, GA 30339-4053  
T 678.306.3100 www.segalco.com

April 29, 2019

Board of Trustees  
Dallas Police and Fire Pension System  
4100 Harry Hines Blvd., Suite 100  
Dallas, TX 75219-3207

**Re: Segal's Response to Deloitte's April 2019 Actuarial Audit**

Dear Board Members:

We have had the opportunity to assess the independent actuarial audit completed by Deloitte Consulting LLP for the Dallas Police and Fire Pension System (DPFP). We are pleased to note on page 3 of Deloitte's report that, in their opinion, "*the January 1, 2018 actuarial valuation and the December 31, 2014 experience study for the DPFP were performed in compliance with the applicable Actuarial Standards of Practice issued by the Actuarial Standards Board*".

The responses that follow address the items listed as "Recommendations" in the audit.

**Valuation Report**

**Plan Provisions**

Deloitte recommended the following changes be made for inclusion in the plan provisions section of the valuation report:

- Confirm that the pre-retirement death benefit after leaving active service with fewer than five years should be a lump sum equal to the return of member contributions without interest.

*We have confirmed that the appropriate benefit is being valued and will adjust the text in the 2019 valuation.*

- Expand the description of post-retirement death to include situations where the Member had elected a 100% joint and survivor annuity or a life annuity.

*Additional descriptive language will be added.*

- Include a description that both the Member and City contributions are reduced if the DPFP has no unfunded actuarial accrued liability, as described in Section 4.025 of the plan document.

*We do not believe this to be a necessary inclusion in the valuation report; the plan provisions listed in the report are a summary of provisions that directly impact valuation results and are not an all-inclusive listing of plan provisions.*

- Confirm that the description of optional forms available aligns with the plan document.  
*We will review available optional forms prior to publication of the 2019 valuation report and adjust as agreed upon with Staff and Board.*

### **Funding Method**

Deloitte had the following recommendations related to the funding method:

- Determine the ADC based on best funding practices. This will increase the transparency between the best practice funding policy and the statutory contributions.  
*To date, our primary focus in our work with the System has been to incorporate changes necessary to ensure long-term solvency. However, initial discussions have begun with the Board on the topic of the ADC (Actuarially Determined Contribution) in the funding policy, including a shorter and/or closed amortization period. Further discussions will be held with the Trustees as to the most appropriate manner in which to determine and present the ADC.*
- Disclose the history of fully funded year.  
*This information has been included in each of Segal's three valuation reports for DPF. We will consider inclusion of a table that shows the historical projected year of full funding.*

### **Assumptions**

The following recommendations are related to the description of actuarial assumptions in the valuation report:

- Include documentation for the rationale for the selection of the 2.00% COLA assumption after 2053 for the payment of Ad Hoc COLAs.  
*Discussion of the year 2053 is included in the 2018 valuation report. The year is updated annually based on when DPF is projected to become 70% funded on a market value basis. The 2.00% assumption was previously addressed with the Board and will be further evaluated as necessary in the next experience study.*
- Clarify the language for DROP actives to disclose that a retirement rate of 100% is assumed after achieving 8 years of DROP service in any future year.  
*This language will be clarified in future valuations.*
- Provide detail on the basis of the selection of the non-DROP retirement assumption.  
*The current DROP utilization assumption is that there will be no future DROP entrants. Regarding current DROP actives, we will clarify the language as necessary.*
- Disclose the actuarial equivalence assumption.  
*This assumption will be listed in future valuation reports.*

### **Report Content**

Deloitte had three additional recommendations related to the report content:

- Demonstrate the sensitivity of the discount rate assumption by providing key metrics using a discount rate 1% higher and 1% lower than the prescribed rate.

*This is a requirement when determining the System's Net Pension Liability under GASB Statements 67 and 68, and Segal provides this information. We have also provided the Board with estimates of projected contribution requirements should the discount rate assumption be lowered from 7.25%. (It is not anticipated that the assumed rate will increase, so we have not provided similar information for rates above 7.25%.)*

- Disclose 10-20 years of undiscounted cash flows.

*We will discuss this possibility with System staff and with the Trustees, and will consider providing the Board with projections of expected benefit payments and contribution income in future presentations.*

- Categorize the target and actual asset allocations across consistent classes.

*Segal relies on financial statements provided by the System to summarize the investments for the valuation report, and the categories on the balance sheet do not precisely align with the target allocation in the System's investment policy. Should the Board agree that alignment of these classes is appropriate, we will work with System staff, their auditor and the new investment advisor to make them more consistent.*

### **Experience Study**

Deloitte also reviewed the experience study completed by Segal in 2016, and recommended the following changes be made the next time a multi-year study is completed:

- Include additional detail in support of the investment return assumption, including:

- the reasonable range for the real return component
- the target asset allocation used in the analysis
- expected returns by asset class used in the forecast, and
- description of whether the arithmetic or geometric return was considered when developing the reasonable range of investment returns.

*DPFP's next experience study is due to be completed in 2020. Segal will take these recommendations under consideration and determine any changes that should be made in the experience study at that time.*

- Study the salary increase assumption for the DPFP Supp, as its definition of compensation differs from the DPFP.

*Segal will review the salary increase assumption for the DPFP Supplemental Plan in the next experience study.*

- Discuss the basis for selection of the Blue-Collar adjustment and the set back/forward period including a credibility analysis.

*The experience study did include a basis for selection of the mortality tables that are now in place, and the System has not had significant gains or losses resulting from mortality experience in the years since the new assumption was implemented. However, there is value in disclosing the credibility of the data, and we will include a discussion of credibility in the next study.*

- We recommend that the next experience study review the appropriateness of updating the base mortality table to the PUB-2010 mortality tables.

*We anticipate using the PUB-2010 Public Safety mortality tables as the basis for mortality in the next experience study. The specific tables chosen will depend on the observed experience of Dallas Police and Fire participants.*

- Consider studying the retirement behavior of deferred vested participants.

*The retirement assumption and experience will be analyzed in the next experience study. It should be noted that there were only 226 deferred vested participants in the January 1, 2018 actuarial valuation report, and the liability for those participants is less than 1% of the System's actuarial accrued liability. Thus, it is not a significant assumption.*

- Consider adding a separate withdrawal assumption for members hired after March 1, 2011.

*Our intent is to review the experience for these participants in the next experience study. This group did not have enough history to warrant inclusion of a separate assumption based on their experience in the experience study for the five-year period ended December 31, 2014.*

- Supplement historical data with industry-standard data for disability incidence for similar job types to increase credibility.

*Segal agrees that using industry-standard information for disability could be helpful. The number of disabilities from the System has been quite low, historically, and the expected associated liability is low as well.*

- Study the incidence of service versus non-service related disabilities.

*The disability assumption and experience will be analyzed in the next experience study. However, with so few actual disabilities, we do not believe that the current assumption that 100% of disabilities will be service-related is unreasonable.*

- Disclose the observed data on the age difference between male and female spouses for the DPFPP's retirees to support the assumption.

*We will include this documentation in the next experience study.*

- Study the refund versus deferred annuity behavior for terminated vested participants.

*The withdrawal assumption and experience will be analyzed in the next experience study.*

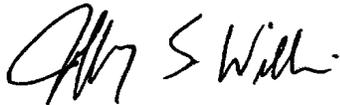
- Develop an optional form election assumption based on the forms offered by the DPF and value the impact of the actuarial equivalence factors directly in the valuation software.

*As stated on page 50 of the January 1, 2018 actuarial valuation report, "Married participants are assumed to elect the Joint and Survivor annuity form of payment and non-married participants are assumed to elect a Life Only Annuity." We will review the options chosen by retirees in the five-year period covered in the next experience study, and consider whether a further breakdown is appropriate.*

Deloitte also listed items for Segal to consider, in both the valuation reports and the next experience study, but which did not rise to the level of "recommendations." Segal will review these considerations and make updates we believe to be applicable and appropriate, pending approval of the Trustees.

We look forward to discussing this with you further as we strive to continue to improve our processes and the services we provide the Board and staff of the Dallas Police and Fire Pension System, as well as the plan participants you represent.

Sincerely,



Jeffrey S. Williams, FCA, ASA, MAAA, EA  
Vice President and Consulting Actuary



Leon F. (Rocky) Joyner, Jr., FCA, ASA, MAAA, EA  
Vice President and National Retirement Practice Leader



Deborah K. Brigham, FCA, ASA, MAAA, EA  
Senior Vice President and Consulting Actuary

cc: Kelly Gottschalk



## **Retirement Plan for the Employees' Retirement Fund of the City of Dallas**

Review under Texas Government Code Section  
802.1012

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# Actuarial Opinion

This report presents the results of the actuarial review of the most recently prepared actuarial valuation and experience study for the Retirement Plan for the Employees' Retirement Fund of the City of Dallas ("ERF" or "Fund" or "plan"), a plan sponsored by the City of Dallas ("City"), to satisfy the requirements of Texas Government Code Section 802.1012 ("Section 802").

Our review was based on participant data and financial information provided by the ERF and their retained actuary, Gabriel Roeder Smith & Company ("GRS" or "actuary"), and our interpretation of the applicable Actuarial Standards of Practice issued by the Actuarial Standards Board.

In our opinion, the December 31, 2017 actuarial valuation and the December 31, 2014 experience study for the ERF were performed in compliance with the applicable Actuarial Standards of Practice issued by the Actuarial Standards Board.

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

The undersigned with actuarial credentials collectively meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

This report was prepared solely for the benefit and internal use of the City. This report is not intended for the benefit of any other party and may not be relied upon by any third party for any purpose, and Deloitte Consulting accepts no responsibility or liability with respect to any party other than the City.

To the best of our knowledge, no employee of the Deloitte U.S. Firms is an officer or director of the employer. In addition, we are not aware of any relationship between the Deloitte U.S. Firms and the employer that may impair or appear to impair the objectivity of the work included in this analysis.

DELOITTE CONSULTING LLP




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Michael de Leon, ASA, FCA, EA, MAAA  
Managing Director




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Jeannie Chen, ASA, FCA, EA, MAAA  
Specialist Leader

# Executive Summary

## Intent

The intent of this report is to review the December 31, 2017 actuarial valuation and the December 31, 2014 experience study reports prepared by GRS for compliance with the applicable Actuarial Standards of Practice issued by the Actuarial Standards Board, to satisfy the requirements of Texas Government Code Section 802.1012.

## Process

To achieve the above-stated goals, we have reviewed both the ERF-provided and actuary-provided census data, sample life output from the actuary's valuation software, the December 31, 2017 actuarial valuation report, and the December 31, 2014 experience study report. The ERF-provided data was used by the retained actuary to develop the census data used as the basis for the actuarial valuation.

## Results and Recommendations

As stated in the previous section, it is our opinion that the December 31, 2017 actuarial valuation and the December 31, 2014 experience study for the ERF were performed in compliance with the applicable Actuarial Standards of Practice issued by the Actuarial Standards Board.

The assumptions used in the December 31, 2017 actuarial valuation were updated as recommended in the experience study, and subsequent changes to certain economic assumptions recommended at December 31, 2016.

Plan provisions, methods and assumptions disclosed in the December 31, 2017 actuarial valuation report were appropriately valued based on our review of the sample life outputs.

We have noted recommendations that could provide additional detail and improve the understanding of the actuarial work performed. In addition to clarifications for certain assumptions and plan provisions being valued, we recommend providing sensitivity analysis associated with certain assumptions.

These comments are discussed further in the Summary of Key Findings section as well as the detailed sections that follow.

# Summary of Key Findings and Recommendations

## Valuation Report

We recommend the following changes be considered.

Area	Recommendations	Purpose
Plan Provisions	Disclose the Tier A early retirement adjustment table found in Section 40(A)-16 of Chapter 40A and the Tier B actuarial equivalence factors mentioned in 40(A)-16(d)	Provide additional detail on plan design
Plan Provisions	Disclose the eligibility requirements for Tier A and Tier B benefits	Provide additional detail on plan design
Plan Provisions	Enhance the summary of death benefit provisions to include the service eligibility tiers and optional forms available in each tier, according to Section 40A-21(d)-(f)	Provide additional detail on plan design
Plan Provisions	Update Tier B's maximum percentage of annual average change disclosed in item (d) from 5% to 3%	Provide additional detail on plan design
Data	Confirm the consistency between the ERF-provided data and valuation data for the beneficiary date of birth	Enhance accuracy of data
Data	Disclose judgmental data adjustments or assumptions made in the data or note that none exist, to address Section 3.4c of ASOP 23	Provide additional detail on data process for compliance with ASOP 23
Funding Method	Determine the ADC based on funding policy best practices	Provide additional detail between best practice funding policy and statutory contributions
Funding Method	Disclose the history of fully funded year	Provide additional detail on plan funding history
Assumptions	Include a statement that the retirement assumptions, and others as appropriate, are not "best estimates" and include a degree of conservatism	Provide greater understanding of the possibility that different estimates may be considered reasonable
Retirement Assumption	Provide detail on the basis for the selection of the Tier B retirement assumption	Enhance support for assumption selection

Area	Recommendations	Purpose
Retirement Assumption	Disclose the assumption for retirements from deferred vested status and consider studying the retirement behavior of deferred vested participants	Enhance support for assumption selection
Mortality Assumption	Revise the mortality description for disabled lives and other benefit recipients, as the actuarial report incorrectly states that the “annuitant” tables are used instead of the “combined employee and annuitant” tables	Enhance support for assumption selection
Form of Payment Assumption	Disclose the actuarial equivalence assumption	Enhance support for assumption selection
Report Content	Demonstrate the sensitivity of the discount rate assumption by providing key metrics using a discount rate 1% higher and 1% lower than the prescribed rate	Increase understanding of impact of experience deviating from expected
Report Content	Disclose 10-20 years of undiscounted cash flows	Enhance understanding of the plan’s financial obligation
Report Content	Include a description of how closely current actual and target asset allocations align with the target asset allocation used to select the investment return assumption during the experience study	Improve ability to validate appropriateness of asset management policies and investment return assumption

The details supporting these findings and recommendations are included in the sections that follow.

## Experience Study

The following are our recommendations and purpose for the recommendations to be considered in the next experience study.

Assumption	Recommendations	Purpose
Mortality	Validate the overall Actual/Expected (A/E) ratio for healthy female retirees	Support assumption selection
Mortality	Use a mortality improvement scale for each type of mortality decrement	Align assumption with industry accepted standard
Mortality	Review the appropriateness of updating the base mortality table to the Pub-2010 mortality tables	Align assumption to recently released industry accepted standard
Mortality	Consider a more recently-published mortality improvement scale	Align assumption with industry accepted standard
Mortality	Discuss the basis for the selection of the Blue-Collar adjustment, the set back/forward period, and the multiplier adjustment, including a credibility analysis	Support assumption selection
Mortality	Update the healthy retiree mortality table to be a best estimate, targeting an A/E ratio of 100%	Align assumption selection with anticipated experience
Retirement	Provide additional detail on the actual versus expected retirement assumption by age for completeness	Support assumption selection
Retirement	Consider separate assumption for the first year in which someone becomes eligible for Tier B, since the data supported such a separation for Tier A	Align assumption selection with expected behavior based on plan provisions
Withdrawal	Add a separate withdrawal assumption for Tier B employees	Align assumption selection with expected behavior based on plan provisions
Disability	Supplement historical data with industry-standard data for disability incidence for similar job types	Support assumption selection

The details supporting these findings and recommendations are included in the sections that follow.

# Review of Plan Provisions

The plan provisions and some actuarial assumptions and methods are prescribed by the Dallas City Code Chapter 40A ("Chapter 40A"). Our review identifies the prescriptions from Chapter 40A, and compares their requirements against the provisions, assumptions, and methods valued and disclosed in the report by the retained actuary.

## Comments and Recommendations

We reviewed the summary of Benefit Provisions on pages 50-52 of the valuation report and assessed the completeness of the summary provided in comparison to Chapter 40A. No benefits specified by Chapter 40A were identified as having been omitted from the valuation.

This December 31, 2017 valuation is the first valuation to include City of Dallas employees hired after December 31, 2016, who are eligible for the new tier of benefits ("Tier B"). The plan changes for "Tier B" members include, but are not limited to:

- Eligibility for unreduced retirement was pushed back to age 65 and 5 years of service or 40 years of service (previously was age 60, or age 50 with age + service greater than 78)
- Eligibility for reduced retirement was changed from age 50 with 30 years of service to any age if age + service exceeds 80
- The benefit multiplier was reduced from 2.75% to 2.50%
- The cap on the cost-of-living adjustments was changed from 5% to 3%
- The normal form of benefit was changed from a Joint and 50% Survivor Annuity with ten years guaranteed to a ten-year certain and life annuity.

We have the following recommendations to provide additional detail and improve the understanding of the valuation report's summary of benefit provisions:

Provisions	Recommendations
Early Retirement Factors	Disclose the Tier A early retirement adjustment table found in Section 40(A)-16 of Chapter 40A and the Tier B actuarial equivalence factors mentioned in 40(A)-16(d)
Eligibility	Disclose the eligibility requirements for Tier A and Tier B benefits
Death Benefits	Enhance the summary of death benefit provisions to include the service eligibility tiers and optional forms available in each tier, according to Section 40A-21(d)-(f)
Cost-of-Living Adjustments	Update Tier B's maximum percentage of annual average change disclosed in item (d) from 5% to 3%

Other than the recommendations above, the summary provisions do not conflict with the provisions described in the plan document, nor do they omit any plan provisions described in the plan document that could have a significant impact on plan benefits.

# Review of Census Data

There are typical and anticipated adjustments made to census data in preparing an actuarial valuation. This section assesses the reasonableness of the retained actuary's reconciliation and data adjustment procedures, including their documentation in the valuation report. To perform this analysis, we received data files from the ERF, valuation data files from the retained actuary and sample life output from the actuary's valuation software. The ERF-provided data was used by the retained actuary to develop the census data used as the basis for the actuarial valuation.

## Applicable ASOPs

**Actuarial Standard of Practice No. 23, Data Quality**, provides general guidance for determining if data is appropriate for its intended purpose and whether it is sufficiently reasonable, consistent, and comprehensive. Section 3.1 of the ASOP effective for the December 31, 2017 actuarial valuation report states:

*Appropriate data that are accurate and complete may not be available. The actuary should use available data that, in the actuary's professional judgment, allow the actuary to perform the desired analysis. However, if significant data limitations are known to the actuary, the actuary should disclose those limitations and their implications.*

Section 3.5 of this Standard also addresses the actuary's responsibilities in reviewing data upon which they rely and states that in such cases:

*... the actuary should perform a review, unless, in the actuary's professional judgment, such review is not necessary or not practical. In exercising such professional judgment, the actuary should take into account the purpose and nature of the assignment, any relevant constraints, and the extent of any known checking, verification, or audit of the data that has already been performed.*

And Section 3.4c. of this Standard states:

*...judgmental adjustments or assumptions can be applied to the data that allow the actuary to perform the analysis. Any judgmental adjustments to data or assumptions should be disclosed...*

## Comments and Recommendations

### Documentation of data review procedures performed by the actuary

Page 2 of the letter prefacing the valuation report mentions:

*Data on the ERF membership and information on the asset values of the Fund as of December 31, 2017. The member, annuitant and asset data used in the valuation were all prepared and furnished by ERF staff. While certain checks for reasonableness were performed, the data used was not audited.*

This statement appropriately addresses Section 3.5 of ASOP 23.

### **Data reconciliation and adjustment process performed by the actuary**

We have reviewed adjustments and assumptions that the actuary deemed necessary to create a valuation database. The actuary developed a set of data questions regarding inconsistencies in participant data between multiple files or unreasonable values or movements for a particular field. We confirmed that the data answers from the City were appropriately reflected in the final valuation data.

The actuary's final valuation file is generally consistent with the data files provided by the ERF, with one exception below:

- We recommend that the actuary confirm the consistency between the ERF-provided data and valuation data for the beneficiary date of birth field for retiree records with forms of payment that continue to the survivor. There are approximately 1,500 retiree records in this category with missing beneficiary date of birth in the valuation data who have a beneficiary date of birth listed in the ERF-provided data. For valuation purposes, the assumption is applied (female spouses are three years younger than males), which will generally produce reasonable results. However, since this information is available in the ERF-provided data, the actuary should consider utilizing it in the valuation.

Additions or removals of records between the raw census file and the final valuation file appear appropriate based on our high-level review of data answers received and information in other key fields (for example, active records with a termination date were removed from the active tab).

The valuation report does not address Section 3.4c of ASOP 23, as it does not mention any judgmental adjustments or assumptions to the data (or provides a statement that no adjustments or assumptions needed to be made).

We recommend the valuation report disclose judgmental data adjustments or assumptions made in the data or note that none exist, to address Section 3.4c of ASOP 23.

### **Verification of Sample Life Data**

For each sample life, the data used in the sample life calculation is consistent with the valuation data and the data provided by the ERF. Additional details of the sample life review can be found in the *Review of Sample Lives* section below.

# Review of Actuarial Methods

This section determines if the actuarial cost method, funding method, and actuarial asset valuation method used by the ERF are reasonable and consistent with generally accepted actuarial practice and relevant ASOPs. It also determines if the funding method of the ERF conforms to the Pension Review Board (“PRB”) Funding Guidelines effective June 30, 2017.

## Cost Method

### Applicable ASOPs

**Actuarial Standard of Practice No. 4, *Measuring Pension Obligations***, provides guidance regarding the actuarial cost method for pension valuations. According to Section 3.13 of this ASOP, an “acceptable actuarial cost method” meets the following criteria:

- costs are allocated over the period of time that benefits are earned; and
- costs are allocated on a basis that has a logical relationship to the plan’s benefit formula (compensation, service, benefit level, etc.).

### Comments and Recommendations

The actuarial cost method used is Entry Age Normal (EAN) as a level percentage of pay.

Under this method, the present value of future benefits (PVFB) is determined for each employee and is then spread evenly as a level percentage of pay over each employee's career. This method therefore produces employer contributions that are level as a percentage of payroll. This method also produces an actuarial accrued liability that is generally more conservative than other cost methods.

This meets the “acceptable actuarial cost method” criteria above.

## Funding Method

### Applicable ASOPs

**Actuarial Standard of Practice No. 4, *Measuring Pension Obligations***, provides guidance regarding the amortization/funding method for pension valuations. According to Section 3.14 of this ASOP:

*A cost allocation procedure or contribution allocation procedure typically combines an actuarial cost method, an asset valuation method, and an amortization method to determine the plan cost or contribution for the period.*

Generally, an “acceptable contribution allocation procedure” meets the following criteria:

- In the actuary's professional judgment, the procedure is consistent with the plan accumulating adequate assets to make benefit payments when due;

- The procedure should consider relevant input received from the principal, such as a desire for stable or predictable costs or contributions, or a desire to achieve a target funding level within a specified time frame.

Additionally, the **PRB Pension Funding Guidelines** provides guidance for the determination of a plan’s funding policy:

*Public retirement systems should develop a funding policy, the primary objective of which is to fund the obligations over a time frame that ensures benefit security while balancing the additional, and sometimes competing, goals of intergenerational equity and a stable contribution rate.*

1. *The funding of a pension plan should reflect all plan obligations and assets.*
2. *The allocation of the normal cost portion of the contributions should be level or declining as a percentage of payroll over all generations of taxpayers, and should be calculated under applicable actuarial standards.*
3. *Funding of the unfunded actuarial accrued liability should be level or declining as a percentage of payroll over the amortization period.*
4. *Actual contributions made to the plan should be sufficient to cover the normal cost and to amortize the unfunded actuarial accrued liability over as brief a period as possible, but not to exceed 30 years, with 10 - 25 years being a more the preferable target range. For plans that use multiple amortization layers, the weighted average of all amortization periods should not exceed 30 years.\* Benefit increases should not be adopted if all plan changes being considered cause a material increase in the amortization period and if the resulting amortization period exceeds 25 years.*

*\*Plans with amortization periods that exceed 30 years as of 06/30/2017 should seek to reduce their amortization period to 30 years or less as soon as practicable, but not later than 06/30/2025.*

**Comments and Recommendations**

The funding method for the ERF is outlined on pages 17-20 of the valuation report. To summarize the method:

- The Actuarially Determined Contribution (ADC) is determined as an open 30-year amortization of Unfunded Actuarial Accrued Liability (UAAL) as a level percentage of projected payroll.
- The Actuarially Required Rate is the ADC divided by the annual payroll.
- The Current Total Obligation Rate (CTOR) is the sum of the Actuarially Required Rate and the Pension Obligation Bond Credit Rate (debt payments on pension obligation bonds divided by projected payroll).
- Depending on how the CTOR compares to the Prior Adjusted Total Obligation Rate (PATOR), the final Current Adjusted Total Obligation Rate (CATOR) is determined:

Condition	CATOR
If the absolute value of PATOR less CTOR is less than or equal to 3.00%	CATOR equals PATOR

If PATOR less CTOR is greater than 3.00%	CATOR equals the greater of: <ul style="list-style-type: none"> <li>• The average of CTOR and PATOR</li> <li>• 90% of PATOR</li> </ul>
If PATOR less CTOR is less than or equal to -3.00%	CATOR equals the lesser of: <ul style="list-style-type: none"> <li>• The average of CTOR and PATOR</li> <li>• 110% of PATOR</li> </ul>

- Finally, CATOR is capped at 36.00%.

While the ADC uses a 30-year amortization, the presence of the cap on the CATOR and the Pension Obligation Bond debt repayment lowers the contribution percentage towards the ERF and raises the implied amortization period. Page 13 of the valuation report states:

*Based upon our projections, reflecting the new tier of benefits and assuming the actuarial assumptions are exactly met, the ERF is expected to be fully funded in approximately 47 years.*

As such, the ERF's statutory contributions do not meet the 4<sup>th</sup> requirement of the PRB Funding Guidelines that suggests that the amortization of the UAAL should be over a period not to exceed 30 years, preferably 10-25 years.

We recommend that the ADC be determined based on funding policy best practices, such as a shorter open amortization period, a closed amortization period, and/or layered amortization bases over periods that may vary by source of (gain)/loss. This will provide additional detail between the best practice funding policy and the statutory contributions.

We also recommend disclosing the history of fully funded year.

## Actuarial Value of Asset Method

### Applicable ASOPs

**Actuarial Standard of Practice No. 44**, *Selection and Use of Asset Valuation Methods for Pension Valuations*, governs the asset valuation method for pension valuations, which is used to develop the actuarial value of assets (AVA). In short, the Standard does not take issue with using Market Value of Assets (MVA) as a Plan's Actuarial Value of Assets (AVA).

When a plan opts to use a smoothing method, the ASOP provides that the actuary should select an asset valuation method that is designed to produce actuarial values of assets that bear a reasonable relationship to the corresponding market values. In making that determination, the Standard indicates that such a method would be likely to produce:

- AVAs that are sometimes greater than and sometimes less than the corresponding market values
- AVAs that fall within a reasonable range of market values

- Recognition of differences between a plan's AVA and MVA within a reasonable period of time

All three requirements above are considered to be met if in the actuary's professional judgment the asset valuation method:

- Produces AVAs within a sufficiently narrow range of market values; and/or
- Recognizes differences between AVA and MVA in a sufficiently short period

### **Comments and Recommendations**

The actuarial value of assets method was changed as of December 31, 2017. The current method disclosed in the valuation report is included below:

*The actuarial value of assets was reset to equal the market value of assets as of December 31, 2017. The method for determining the actuarial value of assets in future years is equal to the market value of assets less a five-year phase in of the excess (shortfall) between expected investment return and actual income. The actual calculation is based on the difference between actual market value and the expected actuarial value of assets each year, and recognizes the cumulative excess return (or shortfall) at a minimum rate of 20% per year. Each year a base is set up to reflect this difference. If the current year's base is of opposite sign to the deferred bases then it is offset dollar for dollar against the deferred bases. Any remaining bases are then recognized over the remaining period for the base (5 less the number of years between the base year and the valuation year). This is intended to facilitate the smoothed value of assets will converge towards the market value in a reasonable amount of time.*

The current actuarial value of asset method is consistent with the requirements of ASOP 44.

# Review of Economic Assumptions

Actuarial calculations inherently make predictions about future events to estimate financial costs on a present value basis and to quantify and/or qualify the risks and volatility associated with the financial costs. To do so, actuaries must make best-estimate assumptions about these possible future events and establish methods for performing the calculations. Actuarial assumptions are needed to determine the value of plan obligations to its participants, and actuarial methods create a schedule for allocating costs over a participant's career. The assumptions and methods are established by adhering to best practices for determination, studying historical experience, utilizing relevant external data, and considering internal and reputable external opinions on expected future experience. Comprehensive reporting of the assumptions and methods is required under ASOPs 27, 35, and 41.

Actuarial assumptions used in the valuation of retirement benefits are generally broken into two categories: economic and demographic. This section considers only those assumptions we have categorized as economic, which include assumptions dependent on economic factors, such as the inflation rate, payroll growth rate, investment return, and salary increase rate.

This section determines if the economic assumptions are reasonable and consistent with generally accepted actuarial practice and relevant ASOPs. As a component of our review we have also reviewed the results and recommendations of the December 31, 2014 experience study, and subsequent changes to certain economic assumptions approved by the Board at December 31, 2016.

## Applicable ASOPs

**Actuarial Standards of Practice No. 27**, *Selection of Economic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries in selecting and recommending economic assumptions. ASOP No. 27 has been restated effective for any actuarial work product with a measurement date on or after September 30, 2014.

The following process is set forth by ASOP 27 in selecting an identified economic assumption:

- a. Identify any components of the assumption
- b. Evaluate relevant data
- c. Consider factors specific to the measurement
- d. Consider other general factors
- e. Select a reasonable assumption

The standard also requires the actuary to review the entire assumption set upon selection of each individual assumption to validate internal consistency, and make adjustments as necessary.

The standard defines a reasonable assumption as follows:

*3.6 — Selecting a Reasonable Assumption—Each economic assumption selected by the actuary should be reasonable. For this purpose, an assumption is reasonable if it has the following characteristics:*

- a. *It is appropriate for the purpose of the measurement;*
- b. *It reflects the actuary's professional judgment;*
- c. *It takes into account historical and current economic data that is relevant as of the measurement date;*
- d. *It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and*
- e. *It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included and disclosed under section 3.5.1, or when alternative assumptions are used for the assessment of risk.*

*3.6.1 — Reasonable Assumption Based on Future Experience or Market Data—The actuary should develop a reasonable economic assumption based on the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof.*

*3.6.2 —Range of Reasonable Assumptions—The actuary should recognize the uncertain nature of the items for which assumptions are selected and, as a result, may consider several different assumptions reasonable for a given measurement. The actuary should also recognize that different actuaries will apply different professional judgment and may choose different reasonable assumptions. As a result, a range of reasonable assumptions may develop both for an individual actuary and across actuarial practice.*

ASOP 27 provides assumption specific guidance for each of the assumptions below. The remainder of this section of our report presents our review of selected economic assumptions to establish that the retained actuaries have followed the ASOP's general guidance and the assumption-specific guidance provided by the ASOP.

## **Inflation**

The inflation assumption is not directly used to measure the liabilities of the plan; rather it is a component of all economic assumptions, including payroll growth, investment return, and salary increase.

### **Applicable ASOPs**

The Actuarial Standards of Practice has brief guidance regarding inflationary data to consider, as noted below:

**ASOP No. 27, Section 3.7.1 – Data** –*The actuary should review appropriate inflation data. These data may include consumer price indices, the implicit price deflator, forecasts of inflation, yields on government securities of various maturities, and yields on nominal and inflation-indexed debt.*

### **Retained Actuary's Assumption**

The ERF uses an inflation assumption of 2.75%.

### **Experience Study Considerations**

The inflation assumption was revised as of December 31, 2016 from 3.00% (selected in the December 31, 2014 experience study) to 2.75%.

In the experience study, the retained actuary considered the average annual inflation in each of the ten consecutive five-year periods over the last fifty years:

Average Annual Inflation, CPI-U, Five Fiscal Year Averages			
1965-1969	3.38%	1990-1994	3.59%
1970-1974	6.01%	1995-1999	2.35%
1975-1979	8.09%	2000-2004	2.68%
1980-1984	7.48%	2005-2009	2.60%
1985-1989	3.66%	2010-2014	2.02%

The retained actuary also considered historical Consumer Price Index (CPI) data for various lengths of time over the past century, noting that inflation continues at relatively low levels from a historical perspective:

Average Annual Change in CPI-U, Through 2014	
Last 5 years	2.00%
Last 10 years	2.30%
Last 20 years	2.40%
Last 30 years	2.80%
Since 1913 (first available year)	3.20%

The retained actuary also considered several benchmarking sources for information on the inflation assumption used in the industry, including:

- 2014 capital market assumption sets for eight investment consulting firms: PCA, BNY Mellon, Towers Watson, Mercer, JP Morgan, Hewitt Ennis Knupp, RV Kuhns, and New England Pension Consulting (NEPC). The average assumption for inflation was 2.46%, with a range of 2.20% to 3.00%.
- The spread between 20-year non-indexed U.S. treasury bonds and 20-year inflation-indexed U.S. treasury bonds. This led to an implied 20-year inflation of 1.79% as of December 31, 2014, and 2.36% as of December 31, 2013.
- The Social Security Administration's 2014 Trustees Report, which projects a long-term annual inflation of 2.00%, 2.70%, and 3.40% in the low cost, intermediate cost, and high cost scenarios.
- The Public Funds Survey that is prepared on behalf of the National Association of State Retirement Administrators (NASRA) and the National Council on Teacher Retirement (NCTR). This report surveys about 125 plans, including all of the largest public funds. The latest survey at the time of the study showed that the median inflation rate assumed for large public retirement systems in the U.S. is 3.00%, with about 40% of the surveyed systems using 3.00% and a majority of the remaining plans using higher assumptions.

Ultimately, the retained actuary proposed retaining the prior assumption of 3.00% based on all of the information.

### **Comments and Recommendations**

The experience study considered both historical and forward-looking data. To supplement the experience study analysis, which is now several years old, we considered more recent benchmarking information to validate the current inflation assumption of 2.75%. The forward-looking 30-year inflation forecasts from the Office of the Chief Actuary of the Social Security Administration provided in the 2018 OASDI Trustees Report is as follows:

Scenario	CPI
Low Cost	2.0%
Intermediate Cost	2.6%
High Cost	3.2%

Based on the historical data collected in the experience study as well as the forward-looking data considered in the experience study, the recommended inflation assumption of 3.00% is on the high-end of the range. As of December 31, 2016, the assumption was revised to 2.75%.

Based on the information above, an inflation assumption of 2.75% is reasonable.

### **Payroll Growth and Wage Inflation**

The assumed aggregate payroll growth is used in the amortization of the unfunded actuarial accrued liability. Payroll growth is chosen using a building block approach in which the inflation assumption is added to the assumed real wage growth. Real wage growth includes wage growth due to productivity, but excludes individual compensation increases above wage growth, also called “merit” increases.

### **Applicable ASOPs**

The section of ASOP No. 27 addressing payroll growth provides the actuary with general guidance but is far from prescriptive:

**ASOP No. 27, Section 3.11.3 — Rate of Payroll Growth**—*As a result of terminations and new participants, total payroll generally grows at a different rate than does a participant’s salary or the average of all current participants combined. As such, when a payroll growth assumption is needed, the actuary should use an assumption that is consistent with but typically not identical to the compensation increase assumption. One approach to setting the payroll growth assumption may be to reduce the compensation increase assumption by the effect of any assumed merit increases. The actuary should apply professional judgment in determining whether, given the purpose of the measurement, the payroll growth assumption should be based on a closed or open group and, if the latter, whether the size of that group should be expected to increase, decrease, or remain constant.*

### **Retained Actuary’s Assumption**

The ERF uses a payroll growth assumption of 2.75% and a wage inflation assumption of 3.25%. Therefore, the ERF's payroll growth assumption is the same as the inflation assumption while the real wage growth assumption is 0.50%, net of the ERF's inflation assumption.

### **Experience Study Considerations**

The retained actuary acknowledges that, in theory, the payroll growth assumption should be equal to the wage inflation assumption (3.50%). However, the retained actuary anticipates slower growth over the next fifteen years as baby boomers retire and are replaced by younger employees with lower salaries. The retained actuary also analyzed historical payroll growth from December 31, 2005 to December 31, 2014. They observed an average growth of 0.7% per year, and 2.0% per year if adjusting for population changes which is approximately equal to the actual inflation over the same timeframe, 2.31%.

The historical data suggests that a payroll growth assumption that is lower than the wage inflation assumption but equal to the inflation assumption is reasonable. Therefore, the retained actuary recommended 3.00% in the experience study. As of December 31, 2016, the wage inflation assumption was adjusted to 3.25% and payroll growth assumption was adjusted to 2.75% to be consistent with the 25 basis points decrease in the inflation assumption.

### **Comments and Recommendations**

National real wages can be studied by reviewing increases in the historical Average Wage Index, or AWI, published by the Social Security Administration. The AWI from 1977 to 2017, is shown below. Real Payroll Growth is the AWI less the CPI-U.

Period	Years	AWI	CPI-U (US)	Real Payroll Growth
2012-2017	5	2.31%	1.02%	1.29%
2007-2017	10	1.99%	1.30%	0.69%
1997-2017	20	2.82%	2.06%	0.76%
1987-2017	30	3.24%	2.46%	0.78%
1977-2017	40	3.98%	3.37%	0.61%

Also, the Office of the Chief Actuary of the Social Security Administration provided real payroll growth forecasts for a 30-year period in the 2018 OASDI Trustees Report:

Scenario	Payroll Differential
Low Cost	1.82%
Intermediate Cost	1.20%
High Cost	0.58%

Based on the information above, as well as the retained actuary's commentary on the future outlook and historical payroll growth, the 0.50% real wage growth assumption and payroll growth assumption that is the same as the inflation assumption are reasonable.

## Investment Return

The investment return assumption reflects anticipated returns on the plan's current and future assets. It is also used to calculate the present value of all plan liabilities and generally has the greatest impact of all assumptions reviewed in this report. The investment return assumption is chosen using a building block approach in which the inflation assumption is added to the assumed real rate of return.

### **Applicable ASOPs**

In selecting or recommending an investment return assumption, ASOP No. 27, Section 3.8 provides actuaries with guidance. The standard recommends the actuary review the investment data as follows.

**ASOP No. 27, Section 3.8.1 — Data**—*The actuary should review appropriate investment data. These data may include the following:*

- a. *current yields to maturity of fixed income securities such as government securities and corporate bonds;*
- b. *forecasts of inflation, GDP growth, and total returns for each asset class;*
- c. *historical and current investment data including, but not limited to, real and nominal returns, the inflation and inflation risk components implicit in the yield of inflation-protected securities, dividend yields, earnings yields, and real estate capitalization rates; and*
- d. *historical plan performance.*

*The actuary may also consider historical and current statistical data showing standard deviations, correlations, and other statistical measures related to historical or future expected returns of each asset class and to inflation. Stochastic simulation models or other analyses may be used to develop expected investment returns from this statistical data.*

The standards also state the actuary may adjust or customize the data above to reflect asset allocation, investment volatility and investment manager performance among other factors, and that combining estimated components of the investment return assumption and using multiple return rates in lieu of a single rate is also acceptable.

### **Retained Actuary's Assumption**

The ERF uses an annual rate of investment return assumption of 7.75%, which consists of a 2.75% inflation assumption and a 5.00% real rate of return assumption.

### **Experience Study Considerations**

The investment return assumption was revised as of December 31, 2016 from 8.00% to 7.75% to be consistent with the adjustment of the inflation assumption from 3.00% to 2.75%.

In the experience study, the retained actuary considered several sources of information. First, it considered information on peers from the Public Funds Survey, where it showed that the median investment return assumption was 7.75% and close to 50% of funds had an investment return

assumption of 8.00% or higher. The retained actuary caveated this exhibit, acknowledging that many firms were currently in the process of revising downward their assumption, so the figures from the survey were inflated.

Secondly, the retained actuary considered the most recent 20 years of market returns for the ERF:

Year Ended December 31	Market Value Investment Return	Year Ended December 31	Market Value Investment Return
1995	20%	2005	8%
1996	14%	2006	17%
1997	20%	2007	4%
1998	17%	2008	-31%
1999	17%	2009	31%
2000	-3%	2010	16%
2001	-5%	2011	1%
2002	-10%	2012	14%
2003	27%	2013	17%
2004	16%	2014	6%

	5 Years	10 Years	20 Years
Arithmetic Return	10.80%	8.30%	9.80%
Geometric Return	10.62%	7.00%	8.80%

In addition to looking at the ERF's historical rates of return, the retained actuary considered the expected return based on the ERF's target asset allocation. Considering the ERF's target asset allocation, they used capital market assumptions published by eight independent investment consulting firms to determine the expected rate of return. They also considered the 20-year expected return from the eight sources:

Investment Consultant*	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return	Actuary Inflation Assumption	Expected Nominal Return Net of Expenses	Distribution of 20-Year Average Geometric Net Nominal Return (25th, 50th, 75th percentile)	Probability of Exceeding 8.00%
1	7.37%	3.00%	4.37%	3.00%	7.37%	4.93% / 6.70% / 8.49%	31.00%
2	7.37%	2.75%	4.62%	3.00%	7.62%	5.16% / 6.94% / 8.74%	35.00%
3	7.79%	2.50%	5.29%	3.00%	8.29%	5.14% / 7.29% / 9.49%	41.00%
4	7.65%	2.22%	5.43%	3.00%	8.43%	5.94% / 7.74% / 9.56%	46.00%
5	8.19%	2.20%	5.99%	3.00%	8.99%	5.99% / 8.07% / 10.19%	51.00%
6	8.50%	2.50%	6.00%	3.00%	9.00%	6.13% / 8.13% / 10.18%	52.00%
7	8.35%	2.25%	6.10%	3.00%	9.10%	5.85% / 8.06% / 10.31%	51.00%
8	8.44%	2.26%	6.18%	3.00%	9.18%	6.53% / 8.42% / 10.34%	56.00%
<b>Average</b>	<b>7.96%</b>	<b>2.46%</b>	<b>5.50%</b>	<b>3.00%</b>	<b>8.50%</b>	<b>5.71% / 7.67% / 9.66%</b>	<b>45.00%</b>

\* The eight consultants were PCA, BNY Mellon, NEPC, Mercer, Towers Watson, JP Morgan, R.V. Kuhns, and Hewitt Ennis Knupp

Based on the information discussed above, the retained actuary recommended that the investment return assumption be 8.00%, net of investment expenses. This would be composed of an inflation rate of 3.00%, a real return of 5.50% (including 0.50% for active management), and a gross return of 8.50%. This would then be offset by 0.50% for investment expenses, for a nominal return assumption of 8.00%.

As of December 31, 2016, the inflation rate was decreased by 25 basis points and no other components were changed, resulting in an expected nominal return of 7.75%.

### **Comments and Recommendations**

The retained actuary considered sufficient applicable data to make an investment return assumption recommendation. While the original assumption was determined based on an underlying inflation rate of 3.00%, the valuation report noted that the assumption was revised downward with the revised inflation assumption of 2.75%. As disclosed in the valuation report, the assumption is also based on the anticipated risk premiums for each of the portfolio's asset classes, as well as the ERF's target asset allocation.

Overall, the experience study contained sufficient information to support the selection of the assumption. The retained actuary considers other sources of information, including analysis of both historical information and future outlook. The experience study discloses the target asset allocation and integrates this into the analysis.

We have assessed the validity of the 2.75% inflation assumption above. In this section, we assessed the validity of the 5.00% real return assumption based on the provided target asset allocation. A survey released by Horizon Actuarial Services, LLC provides alternate expected returns by asset classes. The survey provides capital market assumptions specific to projections over 10 years and 20 years. The investment return assumption, as noted by the SOA's Report of the Blue Ribbon Panel on Public Pension Plan Funding, should be using rates of return that can be achieved over the next 20 to 30-year period. Therefore, we selected the 20-year time horizon for our analysis.

Using the survey's expected returns by asset class for the 20-year horizon, the asset allocation modeled by the retained actuary, and adjusting for inflation differences and expenses, we have the following results:

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return (Horizon) <sup>1</sup>
Domestic Equities	15.00%	6.25%
International Equities	15.00%	6.98%
Global Equities	15.00%	6.98%
High Yield Fixed Income	15.00%	3.96%
Core Fixed Income	15.00%	2.15%
Real Estate	10.00%	5.19%
Real Assets	10.00%	3.99%
Private Equity	5.00%	9.69%
<b>Weighted Average Real Return</b>		<b>5.35%</b>
<b>Weighted Average Nominal Return</b>		<b>8.10%</b>

<sup>1</sup>Expected return for the 20-year time horizon for those consultants that responded to the survey, adjusted by Horizon's inflation expectation of 2.48%, as noted in Exhibit 15 of the Horizon Actuarial 2018 Survey of Capital Market Assumptions.

The expected real rate of return based on the target asset allocation is 5.35%.

While the investment return assumption was chosen using the underlying target asset allocation, we also verified if the actual asset allocation aligns with the target asset allocation. Page 21 of the valuation report discloses the actual asset allocation as of December 31, 2017:

Asset Class	Target Allocation	Actual December 31, 2017 Allocation
Index Funds <sup>1</sup>	10.0%	4.7%
Fixed Income <sup>2</sup>	30.0%	26.7%
Equities <sup>3</sup>	45.0%	54.1%
Real Estate <sup>4</sup>	10.0%	8.8%
Private Equity <sup>5</sup>	5.0%	5.6%

<sup>1</sup> Real Assets

<sup>2</sup> High Yield and Core

<sup>3</sup> Domestic, International, and Global

<sup>4</sup> Real Estate

<sup>5</sup> Private Equity

The actual allocation is comparable to the target allocation.

Based on the information above, the real rate of return assumption of 5.00% as well as the investment return of 7.75% are reasonable.

**Salary Increase**

The salary increase assumption is used to project an employee’s salary from the valuation date to the assumed termination date(s). It is comprised of inflation, real wage growth and a merit scale. Inflation and real wage growth were already discussed above. This section focuses on the determination of the merit scale.

**Applicable ASOPs**

In selecting or recommending a total wage scale, ASOP No. 27, Section 3.10 provides actuaries with guidance. The standard recommends the actuary review the compensation data as follows.

**ASOP No. 27, Section 3.10.1— Data—***The actuary should review available compensation data. These data may include the following:*

- a. the plan sponsor’s current compensation practice and any anticipated changes in this practice;*
- b. current compensation distributions by age or service;*
- c. historical compensation increases and practices of the plan sponsor and other plan sponsors in the same industry or geographic area; and*
- d. historical national wage increases and productivity growth.*

*The actuary should consider available plan-sponsor-specific compensation data, but the actuary should carefully weigh the credibility of these data when selecting the compensation increase assumption.*

**Retained Actuary’s Assumption**

The ERF uses the following service-based assumption for merit, promotion, and longevity increases:

Years of Service	Merit, Promotion, Longevity	Years of Service	Merit, Promotion, Longevity
0	3.00%	10	0.75%
1	3.00%	11	0.75%
2	2.75%	12	0.50%
3	2.00%	13	0.50%
4	1.50%	14	0.50%
5	1.50%	15	0.50%
6	1.50%	16	0.50%
7	1.00%	17	0.50%
8	1.00%	18	0.25%
9	0.75%	19 & Over	0.00%

These assumptions are combined with a flat 3.25% “general” component which is composed of inflation and real wage growth.

### **Experience Study Considerations**

The actual salary experience was examined for a ten-year period. However, 2010-2012 was excluded from the analysis because the City experienced severe financial hardship in these years. The retained actuary believed that salary experience was considered an anomaly for these years and was not representative of the long-term projections of salaries.

The retained actuary separated the analysis into two parts – the assumption for longer-service employees and the additional increases to be applied to shorter-service employees.

The assumption for longer-service employees is equal to “wage inflation” which is composed of general inflation and real national wage growth which were discussed above. Shorter-service employees also receive merit, promotion, and longevity-based increases. The retained actuary studied the excess of salary increases above inflation from 2005 through 2015, excluding 2010, 2011, and 2012. The actual salary increases observed were significantly higher than the prior assumption, and also extended to 20 years (previously, the merit/promotion/longevity assumption stopped at ten years). The retained actuary increased the merit/promotion/longevity increase schedule between 0.25% to 0.75%.

### **Comments and Recommendations**

The retained actuary is appropriately using the building blocks approach, with the salary assumption equal to 2.75% inflation plus 0.50% real wage growth plus a merit/promotion/longevity scale for employees with 0-20 years of service.

Page 35 of the valuation report shows the pay experience of employees who were active at the beginning and end of year. This analysis shows that actual pay is close to expected based on experience for 2015 – 2017.

Based on the information above, the salary increase assumption is reasonable.

## **Cost-of-Living Adjustment**

The cost-of-living-adjustment (COLA) assumption is used to estimate the plan’s future COLA adjustments for retirees, which are often based on an inflation index.

### **Applicable ASOPs**

The section of ASOP No. 27 addressing COLA’s provides the actuary with general guidance but is far from prescriptive:

**ASOP No. 27, Section 3.11.2 — Cost-of-Living Adjustments — Plan benefits or limits affecting plan benefits (including the Internal Revenue Code (IRC) section 401(a)(17) compensation limit and section 415(b) maximum annuity) may be automatically adjusted for inflation or assumed to be adjusted for inflation in some manner (for example, through regular plan amendments). However, for some purposes**

*(such as qualified pension plan funding valuations), the actuary may be precluded by applicable laws or regulations from anticipating future plan amendments or future cost-of-living adjustments in certain IRC limits.*

### **COLA Plan Provision**

As described in Section 28 of Chapter 40A, an annual cost-of-living adjustment to the base pension benefit shall be made based on the greater of:

- The percentage of change in the price index from October of the current year over October of the previous year, up to:
  - 5% for a Tier A retiree or beneficiary; or
  - 3% for a Tier B retiree or beneficiary; or
- The percentage of annual average change in the price index for the latest 12 months available, up to:
  - 5% for a Tier A retiree or beneficiary; or
  - 3% for a Tier B retiree or beneficiary.

### **Retained Actuary's Assumption**

Annual cost-of-living adjustments are assumed to occur on average at the rate of 2.75% per annum for Tier A members and 2.35% for Tier B members (due to the lower maximum on cost-of-living-adjustments).

### **Experience Study Considerations**

The December 31, 2014 experience study was conducted before the plan changes as of December 31, 2016. As a result of these plan changes, members hired after December 31, 2016 are part of Tier B, which has different COLA provisions, as outlined above. The experience study's recommendations apply to Tier A participants, and the retained actuary has developed a separate assumption for Tier B participants.

The experience study does not specifically detail the COLA assumption. The COLA assumption was assumed to be 3.00%, the same as the inflation assumption. The COLA assumption was revised as of December 31, 2016 from 3.00% to 2.75% for Tier A, and was selected to be 2.35% for Tier B.

### **Comments and Recommendations**

The ERF's COLA assumption ties to inflation, with the added complexity of a 5% maximum for Tier A and a 3% maximum for Tier B. Section 3.5.1 of ASOP 27 provides guidance on assumptions for plan provisions that are difficult to measure, such as a COLA with a maximum:

*Depending on the purpose of the measurement, the actuary may determine that it is appropriate to adjust the economic assumptions to provide for considerations such as adverse deviation or plan provisions that are difficult to measure, as discussed in ASOP No. 4. Any such adjustment made should be disclosed in accordance with section 4.1.1.*

For Tier A, it is reasonable that the COLA assumption is the same as the inflation assumption – the maximum COLA of 5% is well above the assumed inflation of 2.75%. For Tier B, due to the lower

maximum COLA of 3%, it is reasonable that the COLA assumption is adjusted downward to 2.35% to reflect the impact of the 3% maximum, as per Section 3.5.1 of ASOP 27.

Based on the information above, the COLA assumption is reasonable.

# Review of Demographic Assumptions

Actuarial assumptions used in the valuation of retirement benefits are generally broken into two categories: economic and demographic. This section of the report considers only those assumptions we have categorized as demographic, which include any non-economic assumption and generally include assumptions regarding how the workforce will behave.

## Applicable ASOPs

**Actuarial Standard of Practice No. 35**, *Selection of Demographic and other Noneconomic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries in selecting demographic and other assumptions not covered by ASOP No. 27. ASOP No. 35 has been restated effective for any actuarial work product with a measurement date on or after June 30, 2015. Because the assumptions resulting from this experience study will be used in actuarial valuations with measurement dates no sooner than July 1, 2015, we consider this standard applicable.

As set forth by ASOP 35, the actuary should follow the process below for selecting demographic assumptions, as applicable:

- a. Identify the types of assumptions
- b. Consider the relevant assumption universe
- c. Consider assumption formats
- d. Select the specific assumptions
- e. Select a reasonable assumption

The standard defines a *reasonable* assumption as follows:

*3.3.5 — Selecting a Reasonable Assumption—Each demographic assumption selected by the actuary should be reasonable. For this purpose, an assumption is reasonable if it has the following characteristics:*

- a. It is appropriate for the purpose of the measurement;*
- b. It reflects the actuary's professional judgment;*
- c. It takes into account historical and current demographic data that is relevant as of the measurement date;*
- d. It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data (if any), or a combination thereof; and*
- e. It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included (as discussed in section 3.10.1), and disclosed under section 4.1.1 or when alternative assumptions are used for the assessment of risk.*

*3.4 — Range of Reasonable Assumptions—The actuary should recognize the uncertain nature of the items for which assumptions are selected and, as a result, may consider several different assumptions equally*

*reasonable for a given measurement. The actuary should also recognize that different actuaries will apply different professional judgment and may choose different reasonable assumptions. As a result, a range of reasonable assumptions may develop both for an individual actuary and across actuarial practice.*

The standard also discusses consistency among selection of demographic assumptions and requires the actuary to review the combined effect of all non-prescribed assumptions selected by the actuary (both demographic assumptions selected in accordance with this standard and economic assumptions selected in accordance with ASOP No. 27).

*3.7 — Consistency among Demographic Assumptions Selected by the Actuary for a Particular Measurement—With respect to any particular measurement, each demographic assumption selected by the actuary should be consistent with the other assumptions selected by the actuary unless the assumption, considered individually, is not material (see section 3.10.2). For example, if an employer’s business is in decline and the effect of that decline is reflected in the turnover assumption, it should also be reflected in the retirement assumption.*

ASOP 35 provides assumption specific guidance for each of the assumptions below. The remainder of this section of our report presents our review of selected demographic assumptions to establish that the retained actuaries have followed the ASOP’s general guidance and the assumption-specific guidance provided by the ASOP.

## **Mortality**

The mortality assumption is used to determine when an active employee or retired employee will become deceased.

### **Applicable ASOPs**

**ASOP No. 35, Section 3.5.3 — Mortality and Mortality Improvement—***The actuary should take into account factors such as the following in the selection of mortality and mortality improvement assumptions:*

- a. the possible use of different assumptions before and after retirement (for example, in some small plan cases a reasonable model for mortality may be to assume no mortality before retirement);*
- b. the use of a different assumption for disabled lives, which in turn may depend on the plan’s definition of disability and how it is administered; and*
- c. the use of different assumptions for different participant subgroups and beneficiaries.*

*The actuary should reflect the effect of mortality improvement both before and after the measurement date. With regard to mortality improvement, the actuary should do the following:*

- i. adjust mortality rates to reflect mortality improvement before the measurement date. For example, if the actuary starts with a published mortality table, the mortality rates may need to be adjusted to reflect mortality improvement from the effective date of the table to the measurement date. Such an adjustment is not necessary if, in the actuary’s professional judgment, the published mortality table reflects expected mortality rates as of the measurement date.*

- ii. *include an assumption as to expected mortality improvement after the measurement date. This assumption should be disclosed in accordance with section 4.1.1, even if the actuary concludes that an assumption of zero future improvement is reasonable as described in section 3.3.5. Note that the existence of uncertainty about the occurrence or magnitude of future mortality improvement does not by itself mean that an assumption of zero future improvement is a reasonable assumption.*

## **Background on Recent National Mortality Studies**

### *Base Mortality Tables*

In October 2014, the Society of Actuaries (“SOA”) published several reports of the Retirement Plans Experience Committee (“RPEC”). The RP-2014 Mortality Tables Report<sup>1</sup> reflects observed data for single-employer defined benefit pension plans covering the years 2004 – 2008 (central year, 2006). The RPEC observed that this data was relatively consistent with the data underlying the RP 2000 mortality tables (that is, from 1990 – 1994, central year 1992) adjusted for longevity improvements using MP-2014<sup>2</sup>. The rates in the RP-2014 tables were developed on a liability weighted basis (i.e. exposures and deaths were weighted by compensation for actives and by benefit amount for retirees).

As a supplement to the RP-2014 Mortality Tables Report, the Society of Actuaries also published the Supplement to the RP-2014 Mortality Tables Report, RPH-2014 Headcount-Weighted Tables<sup>3</sup>. The rates in these tables, denoted RPH-2014 (for Retirement Plans by Headcount), were calculated using the same underlying datasets and methods as those used in the development of the corresponding RP-2014 tables, but with exposures and deaths weighted by headcount rather than by amount.

As a result of comments received on the prior RP-2014 study, which included only data from private pension plans, the SOA and the RPEC initiated a mortality study of public pension plans in January 2015. The primary focus of this study was a comprehensive review of recent mortality experience of public retirement plans in the United States. The objectives of this study were the following:

1. Develop mortality tables based exclusively on public-sector pension plan experience.
2. Provide new insights into the composition of gender-specific pension mortality by factors such as job category (e.g., Teachers, Public Safety, General), salary/benefit amount, health status (i.e., healthy or disabled), geographic region and duration since event.

In October, 2018 the Pub-2010 Public Retirement Plans Mortality Tables Report<sup>4</sup> was published, with job category-specific mortality base tables for Teachers, Public Safety, and General populations. Additional factors were considered and subset mortality tables were released based on income

<sup>1</sup> RP-2014 Mortality Tables Report (<https://www.soa.org/Files/Research/Exp-Study/research-2014-rp-report.pdf>)

<sup>2</sup> Mortality Improvement Scale MP-2014 Report (<http://www.soa.org/Research/Experience-Study/pension/research-2014-mp.aspx>)

<sup>3</sup> Supplement to the RP-2014 Mortality Tables Report (<https://www.soa.org/Files/Research/Exp-Study/research-2014-rp-supplement.pdf>)

<sup>4</sup> Pub-2010 Public Retirement Plans Mortality Tables Report (<https://www.soa.org/Files/resources/research-report/2019/pub-2010-mort-report.pdf>)

level, with which they determined mortality had a strong correlation. Separate tables were also developed for contingent survivors, as their experience was determined to differ from that of other annuitants. We believe that this study is the most credible basis on which to base public sector mortality at this time.

### *Mortality Improvement Scale*

The RPEC's Mortality Improvement Scale MP-2014 Report<sup>5</sup> reflects data from the Social Security Administration through 2009. As discussed in the report, the historical data was graduated and then projected from the resulting smoothed 2007 values to reach an ultimate rate of 1%<sup>6</sup> after 20 years (from 2007<sup>7</sup>). As discussed in the RPEC's Mortality Improvement Scale MP-2014 Report<sup>8</sup>, we believe this is a reasonable ultimate rate and convergence period.

The Society of Actuaries published the MP-2015 scale of longevity improvements in October 2015, the MP-2016 scale of longevity improvements in October 2016, the MP-2017 scale of longevity improvements in October 2017, and the MP-2018 scale of longevity improvements in October 2018. The MP-2015 scale reflected two additional years of Social Security data, the MP-2016 scale reflected an additional three<sup>9</sup> years (beyond those reflected in MP-2015) of Social Security data, the MP-2017 scale reflected one additional year (beyond those reflected in MP-2016) of Social Security data and the MP-2018 scale reflected one additional year (beyond those reflected in MP-2017) of Social Security data.

### **Retained Actuary's Assumption**

The following table shows the current mortality assumptions for each group of participants:

Participant Group	Assumption
Disabled Lives	RP-2000 Disabled Mortality Table for male annuitants*, set forward one year
Healthy Retirees	RP-2000 Blue Collar Healthy Mortality Table for annuitants*, with a 109% multiplier for males and a 103% multiplier for females, and fully generational mortality using improvement Scale BB.
Active Members	RP-2000 Healthy Mortality Table, set forward 4 years for males and set backward 5 years for females

\*As discussed in the recommendations below, the combined (employee and annuitant) table is actually used in the valuation.

<sup>5</sup> [www.soa.org/Research/Experience-Study/pension/research-2014-mp.aspx](http://www.soa.org/Research/Experience-Study/pension/research-2014-mp.aspx)

<sup>6</sup> The ultimate rate is actually 1% at ages up to 85, then grading down to 0.85% at 95 and 0% at 110.

<sup>7</sup> To avoid so-called edge effect distortions, the last two years of actual data (2008 and 2009) were replaced with the first two years of smoothed data.

<sup>8</sup> [www.soa.org/Research/Experience-Study/pension/research-2014-mp.aspx](http://www.soa.org/Research/Experience-Study/pension/research-2014-mp.aspx)

<sup>9</sup> SSA published data was used for 2012 and 2013, while preliminary data was used for 2014.

### Experience Study Considerations

The actual mortality experience was examined for disabled lives, healthy retirees, and active members, separately for males and females. The following tables contains the results of the ERF's experience over the study period including the ratio of actual deaths to expected deaths (based on the prior assumption).

#### Healthy Retirees

Summary of Healthy Retirement Mortality for Males - 2010 to 2015					
Age	Actual Deaths	Expected Deaths		Ratio A/E	
		Prior Assumption	Current Assumption	Prior Assumption	Current Assumption
50-54	3.0	2.8	2.7	106%	109%
55-59	23.0	12.5	12.3	184%	186%
60-64	56.0	42.1	40.3	133%	139%
65-69	63.0	61.4	58.2	103%	108%
70-74	51.0	73.3	67.7	70%	75%
75-79	84.0	88.4	76.9	95%	109%
80-84	91.0	105.7	87.0	86%	105%
85-89	76.0	95.1	76.5	80%	99%
90 and over	59.0	64.9	56.6	91%	104%
<b>Total - Male</b>	<b>506.0</b>	<b>546.1</b>	<b>478.2</b>	<b>93%</b>	<b>106%</b>

Summary of Healthy Retirement Mortality for Females - 2010 to 2015					
Age	Actual Deaths	Expected Deaths		Ratio A/E	
		Prior Assumption	Current Assumption	Prior Assumption	Current Assumption
50-54	1.0	1.0	1.0	101%	96%
55-59	5.0	3.8	3.3	133%	149%
60-64	20.0	15.2	13.5	131%	148%
65-69	21.0	22.2	20.8	95%	101%
70-74	23.0	21.6	21.1	107%	109%
75-79	19.0	23.5	22.1	81%	86%
80-84	32.0	33.5	31.0	95%	103%
85-89	37.0	38.2	34.0	97%	109%
90 and over	53.0	41.6	37.0	127%	143%
<b>Total - Female</b>	<b>211.0</b>	<b>200.6</b>	<b>183.8</b>	<b>105%</b>	<b>115%</b>

The retained actuary explains that if mortality improvement is not being applied, an "ideal" Actual/Expected ratio is around 110% to introduce some conservatism, since mortality will improve in the future. However, if mortality improvement is being applied, a 100% Actual/Expected ratio is

preferred. The retained actuary chose to include mortality improvement Scale BB and adjusted the base table for males and females to target an Actual/Expected ratio of close to 100%.

#### Disabled Retirees

Summary of Disabled Mortality – 2010 to 2015					
		Expected Deaths		Ratio A/E	
Age	Actual Deaths	Prior Assumption	Current Assumption	Prior Assumption	Current Assumption
Males	36.0	31.1	31.1	116%	116%
Females	11.0	19.2	19.2	57%	57%
<b>Total</b>	<b>47.0</b>	<b>50.3</b>	<b>50.3</b>	<b>93%</b>	<b>93%</b>

The retained actuary proposed no change to the prior assumption, since for males and females combined the actual experience matches the assumption relatively well, and there are so few deaths to observe in the study period.

#### Active Employees

Summary of Active Mortality – 2010 to 2015					
		Expected Deaths		Ratio A/E	
Age	Actual Deaths	Prior Assumption	Current Assumption	Prior Assumption	Current Assumption
Males	34.0	72.0	72.0	47%	47%
Females	10.0	29.0	29.0	34%	34%
<b>Total</b>	<b>44.0</b>	<b>101.0</b>	<b>101.0</b>	<b>44%</b>	<b>44%</b>

The retained actuary proposed no change to the prior assumption despite there being many fewer deaths than assumed since there is not sufficient data to warrant a change.

#### **Comments and Recommendations**

In accordance with ASOP 35 Section 3.5.3, the retained actuary considered the mortality for participants in post-retirement status, disabled retirement status, and pre-retirement (active) status. Within each of these participant groups, male and female experience was considered separately.

We have several recommendations regarding the mortality assumption:

- We recommend that the next experience study validate the overall A/E ratio for healthy female retirees. Page 21 of the experience study states that, “the proposed rates produce an overall A/E ratio of 100%.” However, as seen in the table provided on page 21 of the experience study, the overall A/E ratio is 115%.
- We recommend revising the mortality description for disabled lives and other benefit recipients in the valuation report, as it states that the “annuitant” tables are used instead of the “combined employee and annuitant” as indicated by our sample lives review.

- We recommend using a mortality improvement scale for each type of mortality decrement. Mortality improvement is applied for healthy retirees, but not for actives or disabled retirees. While healthy retiree mortality is by far the most impactful assumption, the retained actuary should be consistent in its assumption regarding mortality improvements.
- We recommend that the next experience study review the appropriateness of updating the base mortality table to a more recently published table. The mortality base table assumption should be based on more recent tables and reflect the employee base covered under the ERF to the extent that such plan experience is credible. The RP-2000 tables were published in 2000 and based on data from 1990 to 1994. At the time of the experience study, the RP-2014 mortality tables were the most current basis available and could have been considered as the base table for ERF. For mortality base tables, the most recently available tables are not necessarily the best fit for the plan if the plan has at least partially credible data and can prove otherwise. However, the subsequent release of the Pub-2010 tables should be considered and we recommend that the appropriateness of these tables be considered for this population.
- We recommend updating the improvement to a more recently published table. Improvement Scale BB was published in 2012 and is based on data from the Social Security Administration through 2007. Updated versions of improvement scale MP are published each year.
- We recommend that the next experience study discuss the basis for the selection of the Blue-Collar adjustment, the set back/forward period, and the multiplier adjustment, including a credibility analysis. If there is no credible experience, we recommend using a standard published mortality table. The experience study does not provide sufficient discussion for the selection of these adjustments or if credible experience exists by cohort. The retained actuary noted that there was no sufficient credible data to warrant a change in the active employee mortality, despite there being 56% fewer actual deaths than expected, but does not discuss the rationale for continuing to use set back/forward adjustments without mortality improvement scale.
- We recommend updating the healthy retiree mortality table to be a best estimate, targeting an A/E ratio of 100%. The experience study report stated the following for the development of the healthy retiree mortality assumption:

*We generally want to keep the ratio for this assumption around 110% (i.e., 10% more deaths than expected) to introduce some conservatism, because we would anticipate life expectancies to continue to increase somewhat in the future. However, an A/E ratio of 100% is targeted if generational mortality (i.e., improvement scale BB) is included in the mortality assumption. ... We also propose using improvement scale BB to incorporate future expected improvements in mortality. The proposed rates produce an overall A/E ratio of 106%. The A/E ratio in the "core" age band from age 60-80 is now 109%.*

Since the current mortality assumption has a generational mortality improvement scale, we would have expected the retained actuary to target an A/E of 100%, as described above. However, the current rates produced an overall A/E ratio of 106% for male and 115% for females, leading to a more conservative assumption. Page 41 of the valuation report also

shows that retiree mortality continues to be conservative as the experience for 2015 – 2017 is 110.71% higher than expected.

## Retirement

The retirement assumption is used to determine when an employee is expected to commence benefits.

### **Actuarial Standards**

**ASOP No. 35, Section 3.5.1 — Retirement**—*The actuary should take into account factors such as the following:*

- a. *employer-specific or job-related factors such as occupation, employment policies, work environment, unionization, hazardous conditions, and location of employment;*
- b. *the plan design, where specific incentives may influence when participants retire;*
- c. *the design of, and date of anticipated payment from, social insurance programs (for example, Social Security or Medicare); and*
- d. *the availability of other employer-sponsored postretirement benefit programs (for example, postretirement health coverage or savings plan).*

### **Retained Actuary's Assumption**

The ERF uses a separate retirement assumption for Tier A and Tier B members.

For Tier A, rates are based on age and gender. For participants over age 60, rates are also separated for those with less than 18 years of service and greater than 18 years of service. Additionally, there are separate rates for the first year in which a participant is eligible for unreduced retirement.

For Tier B, rates are based on age and gender, and are also separated for those with less than 40 years of service and greater than 40 years of service.

The assumption related to retirement from deferred status is not disclosed.

### **Experience Study Considerations**

The December 31, 2014 experience study was conducted before the plan changes as of December 31, 2016. As a result of these plan changes, members hired after December 31, 2016 are part of Tier B, which has a different benefit formula, early retirement provisions, and normal retirement age, among other changes. The experience study's recommendations apply to Tier A participants, and the retained actuary has developed a separate assumption for Tier B participants. Therefore, our commentary regarding the experience study only applies to the Tier A assumption.

The retained actuary considered data from the prior nine years to evaluate the retirement assumption. First, they investigated the effect of first eligibility on retirement rates, as generally rates are higher the first year an active becomes eligible for unreduced retirement. The following table contains the results of the ERF's experience over the study period:

Age	Actual Retirements	Expected Retirements		Ratio A/E	
		Prior Assumption	Current Assumption	Prior Assumption	Current Assumption
At First Eligibility - Male	417.0	427.5	458.6	98%	91%
Past First Eligibility - Male	431.0	540.5	506.3	80%	85%
<b>Total - Male</b>	<b>848.0</b>	<b>968.0</b>	<b>964.9</b>	<b>88%</b>	<b>88%</b>
At First Eligibility - Female	203.0	202.0	228.5	100%	89%
Past First Eligibility - Female	253.0	333.2	305.0	76%	83%
<b>Total - Female</b>	<b>456</b>	<b>535</b>	<b>534</b>	<b>85%</b>	<b>85%</b>

The data supports a different assumption between male and female, as well as a different assumption between first eligibility and past first eligibility. The retained actuary stated that they would like for there to be some conservatism in the assumption, and therefore they recommended a small increase in the retirement rates for the group.

Additionally, the retained actuary studied retirement behavior for members in their sixties, based on whether they had less than or greater than 18 years of service:

Age	Actual Retirements	Expected Retirements		Ratio A/E	
		Prior Assumption	Current Assumption	Prior Assumption	Current Assumption
Less than 18 years of service - Male	328.0	398.6	373.1	82%	88%
18 or more years of service - Male	280.0	349.6	339.3	80%	83%
<b>Total - Male</b>	<b>608.0</b>	<b>748.2</b>	<b>712.4</b>	<b>81%</b>	<b>85%</b>
Less than 18 years of service - Female	163.0	190.5	190.5	86%	86%
18 or more years of service - Female	156.0	209.2	188.0	75%	83%
<b>Total - Female</b>	<b>319</b>	<b>400</b>	<b>379</b>	<b>80%</b>	<b>84%</b>

Overall, the summary of changes to the assumption is as follows:

- Early retirement rates remained unchanged.
- The current rates for male and female members retiring in their fifties are slightly higher at first eligibility and lower beyond first eligibility compared to those previously assumed. Higher retirement rates at first eligibility are included in the current structure for males and females.
- For ages sixty and over, different rates are used depending on whether the member has more or less than 18 years of service. The current rates are lower than the prior rates for members retiring after attaining age 60.

As mentioned above, this does not include an analysis for the assumption that applies to Tier B employees.

### **Comments and Recommendations**

We have several recommendations regarding the retirement assumption:

- We recommend that the valuation report include a statement that the retirement assumptions, and others as appropriate, are not “best estimates” and include a degree of conservatism. In the experience study, the retained actuary stated the following:

*An ideal A/E ratio is slightly below 100%. An A/E ratio of less than 100% implies that member's retire less often (work longer) than we expect, which is good for the funding position of the plan.*

And additionally:

*However, we would like for there to be some conservatism in this assumption, so we are recommending a small increase in the retirement rates for this group.*

The current assumptions are conservative as can be seen by the A/E ratios, which range from 83% to 91%. Page 36 of the valuation report also shows that retirement rates continues to be conservative as the experience for 2015 – 2017 is mostly lower than expected. The ASOPs do not specifically prohibit this practice, and, in fact, ASOP 35 states that it is appropriate to adjust the demographic assumptions to provide for adverse deviation as long as it is appropriately disclosed.

- We recommend that the valuation report disclose the assumption for retirements from deferred vested status and consider studying the retirement behavior of deferred vested participants. The valuation report does not disclose this assumption.
- We recommend that the valuation report provide detail on the basis for the selection of the Tier B retirement assumption. Tier B retirement assumption was added to the valuation as of December 31, 2017 as this is the first year there are Tier B employees but there was no discussion of the basis for selecting the assumption. While there will not be sufficient experience to analyze their retirement behavior until Tier B employees start to retire (20-30 years from now), based on the changes in Tier B benefits, we would expect Tier B employees to work longer.
- We recommend that the next experience study provide additional detail on the actual versus expected retirement assumption by age for completeness.
- We recommend that the retained actuary consider having separate assumption for the first year in which someone becomes eligible for Tier B, since the data supported such a separation for Tier A.

## Withdrawal

The withdrawal assumption is used to determine when an employee who is not eligible for retirement will terminate employment.

### **Actuarial Standards**

**ASOP No. 35, Section 3.5.2 — Termination of Employment—***The actuary should take into account factors such as the following:*

- a. *employer-specific or job-related factors such as occupation, employment policies, work environment, unionization, hazardous conditions, and location of employment; and*
- b. *plan provisions, such as early retirement benefits, vesting schedule, or payout options.*

### **Retained Actuary's Assumption**

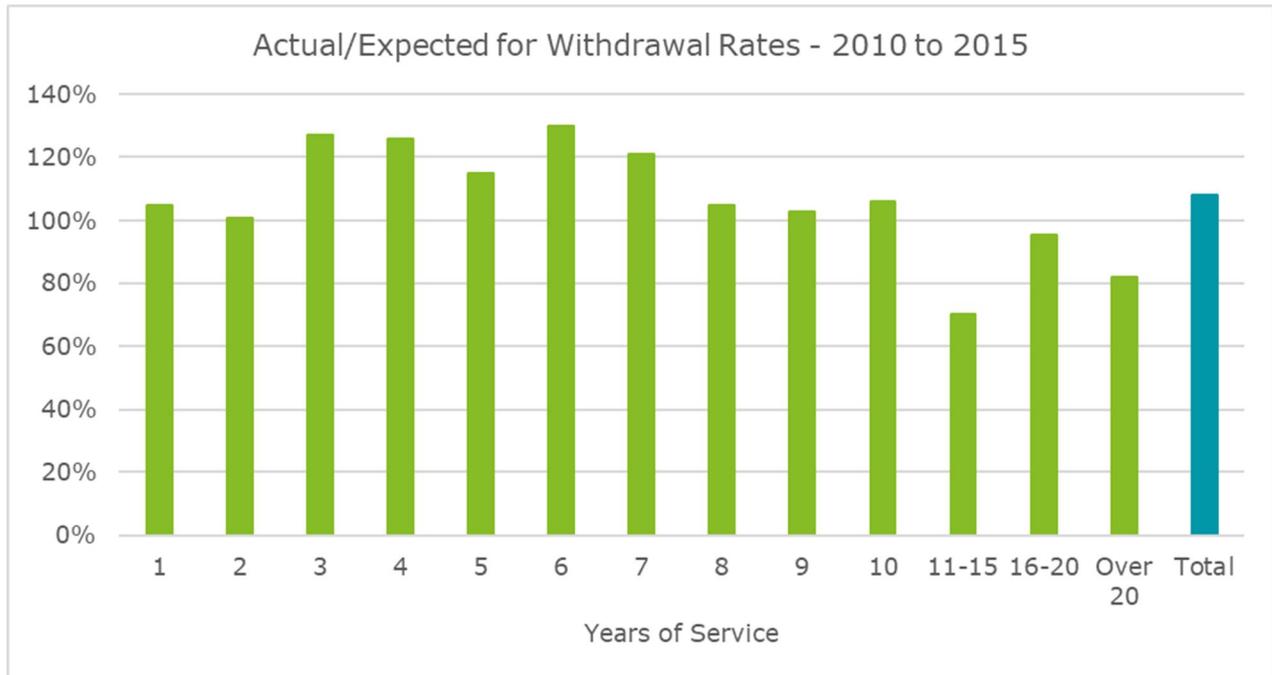
The ERF uses service-based withdrawal rates as follows:

Years of Service	Rate	Years of Service	Rate
0	21.00%	7	5.75%
1	16.00%	8	4.90%
2	13.00%	9	4.60%
3	10.50%	10-14	3.70%
4	8.50%	15-19	2.20%
5	6.75%	20 & Over	1.40%
6	6.25%		

There is 0% assumption of termination for members eligible for retirement.

### **Experience Study Considerations**

The actual turnover experience was examined from 2010 to 2015. The retained actuary found that the patterns of termination have a strong relationship with service. The retained actuary proposed no change to the termination rates, considering the actual rates were quite close to expected.



### **Comments and Recommendations**

The withdrawal assumption is based on years of service. This is a robust basis for the assumption because it reflects the general tendency of shorter-tenured employees to incur higher rates of turnover. The assumed rates reflect higher expected turnover within the first several years of service, which is not uncommon. Based on the information provided, the withdrawal assumption appears reasonable for Tier A employees.

We recommend adding a separate withdrawal assumption for Tier B employees. As Tier B benefits are less valuable, withdrawal rates may increase as participants are less likely to remain with the City to preserve their pension benefits. Unlike the retirement assumption, which will take 20-30 years to develop meaningful experience, termination rates, especially for early years of service, can be immediately studied.

### **Disability**

The disability assumption is used to determine when an employee becomes disabled and qualifies for disability benefits.

### **Actuarial Standards**

**ASOP No. 35, Section 3.5.4 — Disability and Disability Recovery—***The actuary should take into account factors such as the following:*

- a. *the plan's definition of disability (for example, whether the disabled person is eligible for Social Security benefits); and*
- b. *the potential for recovery. For example, if the plan requires continued disability monitoring and if the plan's definition of disability is very liberal, an assumption for rates of recovery may*

*be appropriate. Alternatively, the probability of recovery may be reflected by assuming a lower incidence of disability than the actuary might otherwise assume.*

### **Retained Actuary's Assumption**

The ERF uses a disability incidence table with sample rates as follows:

Age	Rate
30	0.03%
40	0.06%
50	0.24%
60	0.60%

20% of disabilities are assumed to be service related.

### **Experience Study Considerations**

There were 36 members approved for a disability benefit during the five-year study period ending 12/31/2014, producing A/E ratios shown in the table below:

		Expected Retirements	Ratio A/E
	Actual Retirements	Prior/Current Assumption	Prior/Current Assumption
Ordinary	34.0	37.0	92%
Duty	2.0	20.0	10%
Male	27.0	34.1	79%
Female	9.0	22.9	39%
<b>Total</b>	<b>36</b>	<b>57</b>	<b>63%</b>

The retained actuary recommended no change to the assumption. Based on the experience, the assumption was a reasonable fit for males, but a less reasonable assumption for females. The retained actuary decided not to make any changes to the rates or adopt a gender-specific table, considering the very small sample size of the experience.

Additionally, the retained actuary reviewed duty versus ordinary (service-based versus non-service based) disability incidence. The prior assumption was that 35% of disabilities will be duty related. The actual experience shows that during the study period duty related disabilities were around 10% of all disabilities (2 out of 36, rounded to the nearest 10%). Therefore, the retained actuary recommended reducing the assumption such that 20% of disabilities be assumed to be duty-related.

### **Comments and Recommendations**

The current disability rates appear reasonable and consistent with the experience reviewed. Using a single table for males and females groups is an appropriate simplification due to the small sample size and inability to infer significant information about each group separately.

Duty (service) related disability and ordinary (non-service) related disability must be separated because the duty-related disability benefit includes a \$1,000 per month floor. We agree with the methodology used to select the assumption for the percentage of duty-related disabilities.

Due to the very small sample size, we recommend supplementing historical data with industry-standard data for disability incidence for similar job types.

## Marital Status

It is common for actuaries to make an assumption regarding the marital status of plan participants for use in assuming future benefit eligibility and election. Like the inflation assumption, the marital status assumption is often a component of several other assumptions.

### **Actuarial Standards**

**ASOP No. 35, Section 3.6.3 — Marriage, Divorce, and Remarriage—** *The actuary should consider whether marriage, divorce, or remarriage affects the payment of benefits, the amount or type of benefits, or the continuation of benefit payments. If such an assumption is selected, it may also be necessary to make an assumption regarding beneficiary ages.*

### **Retained Actuary's Assumption**

75% of male participants and 50% of female participants are assumed to be married.

### **Experience Study Considerations**

During the study period, 78% of males retiring were married, while 50% of females retiring were married. The retained actuary recommended no change to the assumption of 75% for males and 50% for females.

### **Comments and Recommendations**

The observed data supported no change to the assumption. Based on the information provided, the method and assumption is reasonable.

## Age of Survivor

Future Joint & Survivor annuity payment amounts are based in part on the age of the survivor. Because valuation mortality and interest rates are not equal to those used to calculate optional forms of payment, the age of survivors impacts liability amounts.

### **Actuarial Standards**

**ASOP No. 35, Section 3.6.7 — Missing or Incomplete Data—** *At times, the actuary may find that the data provided are incomplete due to missing elements such as birth dates or hire dates. Provided that the*

*actuary has determined, in accordance with ASOP No. 23, Data Quality, that the overall data are of sufficient quality to complete the assignment, the actuary may need to make reasonable assumptions for the missing data elements. In making such assumptions, the actuary should consider the relevant data actually supplied. For example, it may be appropriate to assume a missing birth date is equal to the average birth date for other participants who have complete data and who have the same service credits as the participant whose date of birth is missing.*

### **Retained Actuary's Assumption**

The female spouse is assumed to be 3 years younger than the male spouse.

### **Experience Study Considerations**

During the study period, males who retired were slightly less than 3 years older than their spouse, while female members were 3.7 years younger than their spouse. The retained actuary recommended no change to the assumption of a 3 year age difference for both male and female members.

### **Comments and Recommendations**

The observed data supported no change to the assumption. Based on the information provided, the method and assumption is reasonable.

## **Form of Payment**

In cases where participants receive no subsidy among payment forms and valuation actuarial equivalence matches that of optional payment forms, this assumption is not necessary. However, because valuation mortality and interest rates are not equal to those used to calculate optional forms of payment and because the ERF subsidizes pop-up benefits, this assumption impacts liabilities.

### **Actuarial Standards**

**ASOP No. 35, Section 3.5.5 — Optional Form of Benefit Assumption—***The actuary should consider factors such as the following:*

- a. the benefit forms and benefit commencement dates available under the plan being valued;*
- b. the historical or expected experience of elections under the plan being valued and similar plans; and*
- c. the degree to which particular benefit forms may be subsidized.*
- d. cost projections, including those made in conjunction with establishing or modifying the plan's design; and*
- e. determinations of actuarial present values.*

### **Retained Actuary's Assumption**

For Tier A it is assumed that 60% of married active male members and 84% of married active female employees will elect a Joint & 50% Survivor form of payment. Taking into consideration the marriage

assumption and the inherent subsidy in the System's Joint & 100% Survivor factors, the male employees are valued with Joint and 29.0% Survivor annuities and the female employees are valued with Joint and 16.5% Survivor annuities. It is also assumed that 100% of Tier B employees will elect the normal form of payment under Tier B.

Additionally, with respect to refunds of contributions, it is assumed that members elect the most valuable termination benefit (they have the choice between a refund of employee contributions and a deferred annuity).

### **Experience Study Considerations**

Like the other assumptions, the experience study only applies to Tier A.

The retained actuary compared the expected benefit payments based on the actual actuarial equivalence factors specified in Chapter 40A to the expected benefit payments by the valuation software using valuation assumptions. The retained actuary found that there was a considerable discrepancy between these two amounts due to differing assumptions between the two methods. Based on the Marital Status assumption, the assumption for married participants electing the Joint & 50% survivor form of payment, and the difference between the valuation assumptions and Chapter 40A assumptions, the actuary concluded that assuming a Joint and 29% Survivor annuity for males and a Joint and 16.5% Survivor annuity for females is appropriate.

### **Comments and Recommendations**

The plan provisions allow active participants who terminate prior to retirement eligibility to elect either a lump sum refund of accumulated employee contributions made (without interest), or a deferred annuity at retirement age based on the benefit provisions. There may be a significant difference in the future plan liability between a refund of employee contributions and the deferred annuity. Based on the information provided, the assumption that these participants will elect the more valuable of the options is reasonable.

We recommend that the valuation report disclose the actuarial equivalence assumption. The actuarial equivalence factors are used to calculate the amount of the actuarially reduced Joint and 100% survivor annuity with 10 years certain. A form of payment assumption is needed because the actuarial equivalence assumptions to calculate the benefits differ from the valuation assumptions, and because the 10-year certain and life annuity and the Joint and 50% survivor annuity with 10 years certain are unreduced for Tier A (both the Joint and 50% option and the Joint and 100% option are actuarially reduced for Tier B). Both of these features will create gain or loss when an active transitions to a retiree.

# Validation of Actuarial Valuation Results

This section will validate the retained actuary's calculation of several key items in the valuation report, including Actuarial Accrued Liability (AAL), Normal Cost, ADC, and AVA.

## Actuarial Accrued Liability and Normal Cost

Representative sample lives have been selected and reviewed as summarized in the *Review of Sample Lives* section below. By confirming decrement rates, benefit amounts, and select Present Value of Benefit calculations, we determined the reasonableness of liabilities and normal cost for sample participants.

## Actuarially Required Contribution and Actual Employer Contribution

The ERF's contribution policy is outlined in Section 40A-7 of Chapter 40A and is discussed in detail in the *Review of Actuarial Methods* section. The ADC is a component of the ERF's contribution, but the actual employer contribution is determined differently. The purpose of this section is to verify the retained actuary's calculation of the ADC, as well as to verify the determination of the actual employer contribution.

Based on the information provided, including the UAAL, Normal Cost, and Administrative Expenses, we were able to verify the ADC as shown below (in \$000's).

<i>(In thousands of \$'s)</i>		Retained Actuary	Deloitte
		12/31/2017	12/31/2017
<b>1</b>	<b>UAAL</b>	776,232	
<b>2</b>	<b>Payment to Amortize UAAL over 30 Years</b>	50,730	51,095
<b>3</b>	<b>Normal Cost</b>	82,871	
<b>4</b>	<b>Administrative Expenses</b>	5,883	
<b>5</b>	<b>ADC</b>	139,484	139,849

The actual employer contribution is determined via the Current Adjusted Total Obligation Rate (CATOR). The methodology for the determination of the CATOR is outlined in the *Review of Actuarial Methods* section. We independently calculated the Current Adjusted Total Obligation Rate (CATOR) and it reflects the funding method outlined in the actuarial valuation report and Section 40A-7 of Chapter 40-A.

The results confirm that the actuary's calculation is consistent with the method described in the valuation report.

## Actuarial Value of Assets

The components of the ERF's AVA are the Market Value of Assets (MVA) as of the Valuation Date, as well as the excess (shortfall) between expected investment return and actual investment income for each of the five previous years. As discussed in the *Review of Actuarial Methods* section above, the ERF "reset" its AVA determination such that the AVA as of December 31, 2017 is equal to the MVA. In future years, we will validate the calculation of the excess (shortfall) between expected investment return and actual investment income, as well a match of the retained actuary's AVA calculation.

# Report Content

In this section, we review the content of the actuarial report for required disclosures.

## Applicable ASOPs

**Actuarial Standard of Practice No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions***, provides guidance regarding nearly all aspects of the actuarial valuation method, including several cross-references to other ASOPs cited in this review.

**Actuarial Standard of Practice No. 41, *Actuarial Communications***, provides guidance for any written, electronic, or oral communication issued by an actuary with respect to actuarial services. The standard specifically identifies disclosures that must be made within Actuarial Reports like the annual valuation provided by the ERF.

Generally, an actuarial report should:

- Accurately and fairly represent the financial condition of the System
- Be written so that it can be reasonably understood by the intended audience
- Make disclosures necessary to allow a qualified actuary to approximate the results, if required data were provided.

The standards above identify what must be reported within the reviewed valuations. We have recommended additional disclosure where we judged its value to be worth the effort of production.

## Comments and Recommendations

The actuarial report meets applicable actuarial standards of practice and appears to accurately represent the funded status of the plan. However, we do recommend making the following additions to the report:

- Demonstrate the sensitivity of the discount rate assumption by providing the following key metrics using a discount rate 1% higher and 1% lower than the prescribed rate:
  - Actuarial Accrued Liability
  - Unfunded Actuarial Accrued Liability
  - Funded Ratio
- Disclose the undiscounted cash flows, a beneficial tool for understanding the financial obligation presented by the plan. This could be for a 10 to 20 year period, showing current and future retirees separately.

- Include a description of how closely current actual and target asset allocations align with the target asset allocation used to select the investment return assumption during the experience study

# Review of Sample Lives

## Summary of Reviewed Sample Lives

Sample life output is used by actuaries to confirm the actuarial assumptions, plan provisions, and actuarial methods used in actuarial valuations.

The retained actuary provided sample life data for active and inactive participants. For inactive sample lives, the present value of benefits was provided. For active sample lives, the present value of benefits, accrued liability, and normal cost were provided. The tables below summarize the sample lives that Deloitte reviewed.

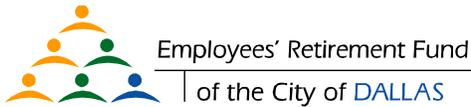
Status	Number of Sample Lives Reviewed
Active	8
Terminated Vested	3
Retiree	5
Disabled	2
QDRO	3
Beneficiary	2

Our review of representative sample lives consists of the following:

- Review the data provided for the sample participants to confirm its consistency with the valuation data. All data was consistent with the valuation data.
- Review sample life results for compliance with the plan provisions, assumptions and methods disclosed in the actuarial valuation report using our actuarial valuation software. Results were within a reasonable threshold.

# Responses Received

Attached are the responses received from the board and the retained actuaries after reviewing the preliminary draft audit report. Comments have been incorporated into the final report, as appropriate.



"Provide retirement and superior service to advance  
the financial security of our members"

April 30, 2019

Deloitte Consulting LLP  
Attn: Michael de Leon  
Jeannie Chen

I am pleased to provide Gabriel, Roeder, Smith & Company's (GRS) responses to the actuarial audit report prepared by Deloitte Consulting LLP of the Employees' Retirement Fund (ERF) December 31, 2017 actuarial valuation report and the December 31, 2014 experience study. Deloitte, in the official capacity as the independent actuary selected by the City of Dallas to conduct the actuarial audit, may include the attached responses from GRS in the final report to the City of Dallas in compliance with Texas Government Code Section 802.1012.

The report prepared by Deloitte notes that, "Plan provisions, methods and assumptions disclosed in the December 31, 2017 actuarial valuation report were appropriately valued based on (Deloitte's) review of the sample life outputs." The Deloitte report also includes 26 recommendations to provide additional detail, improve the understanding of the actuarial work performed, and to provide sensitivity analyses. Of the 26 recommendations:

- 16 relate to recommendations for the valuation report:
  - 12 have either already been resolved or will be implemented with the 2018 actuarial valuation report;
  - 1 recommendation was postponed by the ERF pending finalization of Actuarial Standards of Practice No. 4;
  - 1 will be addressed in connection with the ERF's 2020 experience study; and
  - 2 are under consideration for the 2019 valuation report.
- 10 relate to recommendations for the experience study:
  - 3 will be addressed in connection with the ERF's 2020 experience study; and
  - 7 are under consideration for the 2020 experience study.

Please let me know if you have any questions.

Sincerely,

Cheryl D. Alston  
Executive Director

Copy: John Jenkins, Board of Trustees Chair, Employees' Retirement Fund of Dallas  
M. Elizabeth Reich, Chief Financial Officer, City of Dallas



April 29, 2019

Ms. Cheryl Alston  
Executive Director  
Employees' Retirement Fund of the City of Dallas  
1920 McKinney Avenue, 10<sup>th</sup> Floor  
Dallas, TX 75201

**Re: Response to Actuarial Audit of the Employees' Retirement Fund of the City of Dallas**

Dear Cheryl:

Gabriel, Roeder, Smith & Company ("GRS") offers our comments below on the "Draft" actuarial audit report prepared by Deloitte Consulting LLP, dated April of 2019. The report provides Deloitte's actuarial audit, at the behest of the City of Dallas as required by Texas Government Code Section 802.1012, of the Employees' Retirement Fund of the City of Dallas (ERF).

**General Comments**

We are pleased with the results of the actuarial audit of ERF. We would like to quote the following two passages from the report:

- From the *Actuarial Opinion* section of the actuarial audit report:

**"In our opinion, the December 31, 2017 actuarial valuation and the December 31, 2014 experience study for the ERF were performed in compliance with the applicable standards of practice issued by the Actuarial Standards Board."**

- From the Executive Summary section of the actuarial audit report:

**"Plan provisions, methods and assumptions disclosed in the December 31, 2017 actuarial valuation report were appropriately valued based on our review of the sample life outputs."**

These statements should provide both ERF Staff and the Board with the confidence that the actuarial results they are receiving are both accurate and in compliance with the actuarial standards of practice.

In the remainder of our letter, we will respond to specific recommendations made by Deloitte in its Summary of Key Findings and Recommendations section of the actuarial audit report.

**1) Valuation Report Plan Provisions – Findings/Recommendations:**

Disclose the Tier A early retirement adjustment table found in Section 40A-16 of Chapter 40A and the Tier B actuarial equivalence factors mentioned in 40A-16(d)

**GRS Response:** We will add this information to the next valuation report.

**2) Valuation Report Plan Provisions – Findings/Recommendations:**

Disclose the eligibility requirements for Tier A Tier B benefits

**GRS Response:** We will add this information to the next valuation report.

**3) Valuation Report Plan Provisions – Findings/Recommendations:**

Enhance the Summary of death benefit provisions to include the service eligibility tiers and optional forms available in each tier, according to Section 40A-21(d)-(f)

**GRS Response:** We will add this information to the next valuation report.

**4) Valuation Report Plan Provisions – Findings/Recommendations:**

Update Tier B's maximum percentage of annual change disclosed in item (d) from 5% to 3%

**GRS Response:** This typo will be corrected in the next valuation report.

**5) Valuation Report Data – Findings/Recommendations:**

Confirm the consistency between the ERF-provided data and the valuation data for the beneficiary date of birth

**GRS Response:** This issue has already been resolved.

**6) Valuation Report Data – Findings/Recommendations:**

Disclose judgmental data adjustments or assumptions made in the data or note that none exist, to address Section 3.4c of ASOP 23

**GRS Response:** We will add a statement about any data adjustments, or lack thereof, to the next valuation report.

**7) Valuation Report Funding Method – Findings/Recommendations:**

Determine the ADC based on funding policy best practices

**GRS Response:** The use of a 30-year open amortization period has been in place since the changes to Chapter 40A establishing the current contribution requirements were made. While there are certainly better funding policies than a 30-year open amortization policy, there is not one "Best Practice" funding policy. In addition, changes to Actuarial Standards of Practice (ASOP) No. 4 are being considered that may impact what would be considered a "Best Practice". We will discuss this issue with the Board and make a decision about possible disclosure of an additional ADC following those discussions.

**Update:** Following discussion with the Board, it was decided to postpone for at least a year the inclusion of an additional ADC. If ASOP No. 4 is finalized before the next valuation then an additional ADC compliant with the revised ASOP No. 4 will be included.

**8) Valuation Report Funding Method – Findings/Recommendations:**

Disclose the history of fully funded year.

**GRS Response:** We have never seen an historical table showing the projected full funding date in a valuation report. However, just because we have never seen one doesn't mean that the idea should be dismissed. We will consider this issue in the next actuarial valuation report.

**9) Valuation Report Assumptions – Findings/Recommendations:**

Include a statement that the retirement assumptions, and others as appropriate, are not "best estimates" and include a degree of conservatism

**GRS Response:** We will add a statement to our valuation report telling the reader to review the experience study report for more information on the development and rationale behind the selection of the assumptions.

**10) Valuation Report Retirement Assumption – Findings/Recommendations:**

Provide detail on the basis for the selection of the Tier B retirement assumption

**GRS Response:** Tier B was added after the last experience study. The next study will provide the justification for the assumption, which is based on our professional expertise and not on plan experience.

**11) Valuation Report Retirement Assumption – Findings/Recommendations:**

Disclose the assumption for retirements from deferred vested status and consider studying the retirement behavior of deferred vested participants

**GRS Response:** We will disclose the assumption. Tier A employees with less than 18 years of experience cannot commence prior to age 60 and there is no reason for them to commence later than age 60. This covers more than 90% of the deferred members. We will consider a separate assumption for employees with more than 18 years of service at the next experience study.

**12) Valuation Report Mortality Assumption – Findings/Recommendations:**

Revise the mortality description for disable lives and other benefit recipients as the actuarial report incorrectly states that the "annuitant" tables are used instead of the "combined employee and annuitant" table

**GRS Response:** We will correct the description in the next actuarial valuation report.

**13) Valuation Report Form of Payment Assumption – Findings/Recommendations:**

Disclose the actuarial equivalence assumption

**GRS Response:** We will disclose the assumption in the next actuarial valuation report.

**14) Valuation Report Content – Findings/Recommendations:**

Demonstrate the sensitivity of the discount rate assumption by providing key metrics using a discount rate 1% higher and 1% lower than the prescribed rate

**GRS Response:** GRS will consider adding additional sensitivity information with the GASB 51 disclosures in the next valuation report, after discussions about the issue with the Board.

**Update:** Following discussions with the Board, it was decided that the recommended sensitivity analysis will be included in the next valuation report.

**15) Valuation Report Content – Findings/Recommendations:**

Disclose 10-20 years of undiscounted cash flows

**GRS Response:** GRS will add this to the next actuarial valuation report.

**16) Valuation Report Content – Findings/Recommendations:**

Include a description of how closely current and actual target asset allocations align with the target asset allocation used to select the investment return assumption during the experience study

**GRS Response:** GRS will consider this recommendation.

**17) Experience Study Mortality – Findings/Recommendations:**

Validate the overall Actual/Expected (A/E) ratio for healthy female retirees

**GRS Response:** There appears to have been a typo in the experience study report which led to this recommendation.

**18) Experience Study Mortality – Findings/Recommendations:**

Use a mortality improvement scale for each type of mortality decrement

**GRS Response:** GRS will consider this recommendation at the next experience study.

**19) Experience Study Mortality – Findings/Recommendations:**

Review the appropriateness of updating the base mortality table to the Pub-2010 mortality tables

**GRS Response:** GRS will consider this recommendation at the next experience study.

**20) Experience Study Mortality – Findings/Recommendations:**

Consider a more recently-published mortality improvement scale

**GRS Response:** GRS will consider this recommendation at the next experience study.

**21) Experience Study Mortality – Findings/Recommendations:**

Discuss the basis for the selection of the Blue-Collar adjustment, the set back/forward period, and the multiplier adjustment, including a credibility analysis

**GRS Response:** The proposed assumptions were based on the assumptions used for TMRS (a much larger retirement system in Texas covering municipal employees). This was discussed in the presentation material presented to the Board but was inadvertently left out of the experience study report.

**22) Experience Study Mortality – Findings/Recommendations:**

Update the healthy retiree mortality table to be a best estimate, targeting an A/E ratio of 100%

**GRS Response:** Credibility was not given to Dallas ERF's data. Please see our response to Item 21.

**23) Experience Study Retirement – Findings/Recommendations:**

Provide additional detail on the actual versus expected retirement assumption by age for completeness

**GRS Response:** GRS will consider this recommendation at the next experience study.

**24) Experience Study Retirement – Findings/Recommendations:**

Consider separate assumption for the first year in which someone becomes eligible for Tier B, since the data supported such a separation for Tier A

**GRS Response:** GRS will consider this recommendation at the next experience study.

**25) Experience Study Withdrawal – Findings/Recommendations:**

Add a separate withdrawal assumption for Tier B employees

**GRS Response:** Turnover behavior early in a career is tied less to plan provisions than to the employee's employment decisions. While plan provisions can impact turnover later in the career, there is no experience for Tier B on which to base separate rates. At the next experience study we will consider separate termination rates for Tier B for longer periods of service due to the plan provisions differences.

**26) Experience Study Disability – Findings/Recommendations:**

Supplement historical data with industry-standard data for disability incidence for similar job types to develop a more credible assumption

**GRS Response:** GRS will consider this recommendation at the next experience study.

Ms. Cheryl Alston  
April 29, 2019  
Page 6

If you have any questions or need any additional clarifying information with regard to our comments, please do not hesitate to contact either one of us.

Sincerely,



Lewis Ward  
Consultant



Mark R. Randall, MAAA, FCA, EA  
Chief Executive Officer

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