



City of Houston
HPOPS Pension Reform
Cost Analysis

March 15, 2017



March 15, 2017

Mr. Kelly Dowe
Chief Business Officer and Finance Director
City of Houston
611 Walker
Houston, TX 77002

Re: HPOPS Pension Reform Cost Analysis

Dear Kelly:

The City of Houston has worked with the HPOPS Board to reform the pension system with the goal of budget neutrality and cost avoidance, reducing the unfunded liability, and creating a mechanism to better manage pension costs and liabilities in the future. Retirement Horizons Inc. (RHI) was engaged by the City of Houston to perform an actuarial analysis of the anticipated savings and projected cost levels associated with the new plan design based on the Pension Reforms being considered. This report replaces all previous reports and analyses provided regarding potential plan changes in relation to Pension Reform, including the report issued January 17, 2017, as those analyses may have used different potential plan provisions or assumptions and methods, or data. Our report is organized as follows:

- Section 1 – Executive Summary and Results
- Section 2 – City Pension Funding Policy
- Section 3 – Detailed Forecast Results
- Section 4 – Commentary on Results
- Section 5 – Summary of Plan Provisions
- Section 6 – Actuarial Methods and Assumptions
- Section 7 – Data Sources

The results of this study are based on information provided by the City of Houston and HPOPS, including the June 30, 2016 fair market value of assets and the new benefit provisions. This analysis is based on actuarial methods and assumptions summarized in this report based on the presumption that the Pension Reforms are enacted by the Texas State Legislature, and the interest rate assumption will be prescribed by law. Each of the other non-prescribed assumptions was selected by the City of Houston Finance Department and described herein.

RHI has relied upon the census data and other information noted in *Section 7*. We performed testing compared to grouped data shown in the HPOPS actuary's 2016 valuation report to assure the reasonableness of the underlying input and the results of the study, but RHI did not perform a full audit of the member census data.

RHI has not received a formal HPOPS actuarial communication related to the plan provisions described in this report, but we have confirmed the main actuarial assumptions and methods used by the HPOPS actuary. Any differences in other assumptions and methods would create different results. However, even if such information had been received, there will generally be some differences in results produced by different actuaries due to the nature of using different valuation systems.

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The actual costs and savings could be materially different in the future if actual plan experience differs significantly from the underlying valuation basis. Differences could occur for a number of reasons such as plan experience differing from the underlying demographic and economic assumptions or changes in plan provisions other than those specifically noted. Due to the limited scope of this report, analysis of the potential range of such future measurements has not been performed.

The results in this report and any measures of funded status should not be relied upon for assessing the sufficiency of plan assets for settlement of plan termination liabilities.

The information contained in this report was prepared as requested by the City of Houston and solely for the purpose of forecasting future contribution requirements under the City's funding policy, and should not be used for any other purpose. As significantly different results from those contained in this report may be needed for other purposes, this report should only be provided to other parties in its entirety.

The signing actuaries for this report are members of the Society of Actuaries and other professional actuarial organizations and meet the "Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion." The undersigned are available to answer questions regarding the information contained in this report or to provide further explanations or details as needed.

Respectfully submitted by Retirement Horizons Inc.



David A. Sawyer, FSA EA MAAA
Senior Consultant



Carly A. Nichols, FSA EA MAAA
Actuarial Consultant

Executive Summary and Results

Pension Reform Plan Design Overview

Below is a summary of our understanding of the key plan design features of the HPOPS Retirement system compared to the Pension Reform changes, with more details provided in *Section 5*:

<i>Plan Comparison</i>	<i>Current HPOPS (Baseline)</i>	<i>Pension Reform</i>
Pension Formula (% of Final Average Pay)	Pre-2004 Hires: 2.75% first 20 years of service, plus 2.0% after 20 years of service Post-2004 Hires: 2.25% first 20 years of service, plus 2.0% after 20 years of service, max. 80% of Final Average Pay	Same
Final Average Pay (FAP)	Average of last three years, including executive level pay but not overtime	Average of last three years, including only classified pay , not executive level pay or overtime
Retirement Eligibility	Pre-2004 Hires: 20 years of service Post-2004 Hires: Age 55 with 10 years of service	Same Rule of 70
Employee Contributions	Pre-2004 Hires: 9.0% of pay Post-2004 Hires: 10.25% of pay	10.50% of pay for all members
DROP (Pre-2004 Hires) <ul style="list-style-type: none"> • Member Contr. • Monthly Annuity • Interest Credited • Number of Years in DROP 	<ul style="list-style-type: none"> • 8.75% of pay • With COLA as applicable • Average of 5 years of return on plan assets, with a minimum of 3% and a maximum of 7% • No limit 	<ul style="list-style-type: none"> • No employee contributions to DROP • No COLA on benefit while in DROP • 65% of 5-year average of return on trust assets, with a minimum of 2.5% • 20 years
Post-DROP Annuity	Greater of annuity at DROP exit or annuity at DROP entry recalculated to use FAP at DROP exit	No recalculation ; annuity at DROP entry
Retiree COLA	80% of CPI-U, with a floor of 2.4% and a cap of 8.0%, beginning at earlier of DROP entry or retirement	5-year investment return less 5%, with a floor of 0% and a cap of 4%, beginning later of retirement or age 55, with a 3-year freeze for members under age 70
PROP	Ability to defer DROP balance plus portion of monthly annuity benefit	No future annuity deferrals

The Pension Reform plan provisions were provided by the City of Houston via email on November 8, 2016.

Executive Summary and Results

City Pension Funding Policy Objectives

Under the administration of Mayor Sylvester Turner, the City of Houston will implement a new, more fiscally responsible Pension Funding Policy designed to reverse the trend of steadily increasing unfunded pension liabilities and begin to "bend the curve down." The three objectives of the new funding policy, as presented to the City Council Budget and Fiscal Affairs Committee Subcommittee on Pensions and Debt Service, are summarized below:

- Achieve cost avoidance and budget neutrality
- Reduce unfunded liability
- Achieve a solution that removes pension issues from the table

Plan Changes – City Contribution Rate

The City is expected to pay approximately 33.96% of payroll for FY 2017, as adjusted for the Meet & Confer agreement and including an additional amount since the system is less than 80% funded. The July 1, 2016 Actuarial Valuation Report dated October 7, 2016 from the HPOPS actuary shows for an Actuarially Determined Contribution Rate of 41.74% of payroll for FY 2018 using a long-term interest rate assumption of 8.00% and a rolling or open 30-year amortization period, prior to the additional amount for the funded status below 80%.

Before Pension Reform, the City Contribution Rate for FY 2018 is expected to be 59.35% using a long-term interest rate assumption of 7.00% and a rolling or open 30-year amortization period. Pension Reform includes a new Funding Policy designed to fully amortize the Unfunded Actuarial Liability over a 30 year closed period. The City Contribution Rate for FY 2018 under Pension Reform using a long-term interest rate assumption of 7.00% and a closed 30-year amortization period is expected to decrease by 17.28%, to 42.07%, before inclusion of Pension Obligation Bonds (POBs). With POBs, it is expected to decrease by an additional 9.72%, to 32.35%.

Plan Changes – City Net Pension Liability

The June 30, 2016 GASB Net Pension Liability at a long-term interest rate assumption of 8.00% and using the salary increase rates detailed in this report is estimated to be \$2.674 billion. (This differs from the amount of \$2.541 billion reported by the HPOPS actuary due to the use of different salary increase rates.) Using a long-term interest rate assumption of 7.00%, the projected June 30, 2016 GASB Net Pension Liability is estimated to be \$3.437 billion before Pension Reform. The Pension Reforms are anticipated to be effective July 1, 2017, but if they had been adopted by June 30, 2016, the GASB Net Pension Liability would have been expected to decrease by \$1.068 billion, to \$2.369 billion, before inclusion of POBs. With POBs, it would have been expected to decrease by an additional \$0.678 billion, to \$1.691 billion. This is consistent with the objective to reduce unfunded liability. Please note the GASB results are separate from the City Contribution Rate and do not impact plan funding. Please see *Section 3* for more information about GASB results.

Executive Summary and Results

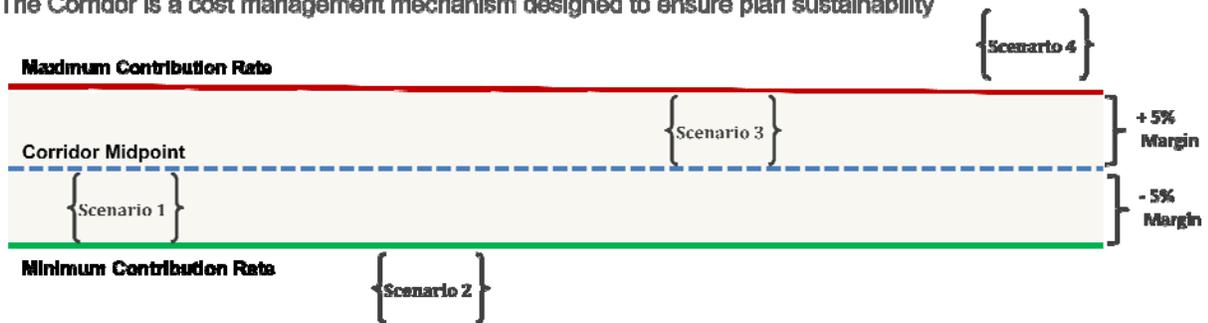
Risk Sharing Corridor

The mechanism to meet Mayor Turner's objective of achieving a solution that removes pension issues from the table is the Risk Sharing Corridor, which sets a minimum and maximum City Contribution Rate. In a falling-cost environment, gains are used to accelerate the payoff of unfunded liabilities or reduce the interest rate. In a rising-cost environment, adjustments are made to the amortization period, employee contributions, or benefits to reduce the City Contribution Rate.

Below is an illustration created by FirstSouthwest for the City of Houston summarizing the Risk Sharing Corridor.

Overview of Risk Sharing

The Corridor is a cost management mechanism designed to ensure plan sustainability



Declining Pension Costs		Rising Pension Costs	
Scenario 1: Inside Corridor – between Midpoint and Minimum	Scenario 2: Outside Corridor – Below Minimum	Scenario 3: Inside Corridor – between Midpoint and Maximum	Scenario 4: Outside Corridor – above Maximum
<ul style="list-style-type: none"> •City Contribution Rate is in between Minimum and Midpoint •City over funds, creating cushion for future •Return to the Midpoint (if <90% funded) 	<ul style="list-style-type: none"> •City Contribution Rate is below Minimum •Pay down pension liability faster •Take risk of underfunding off the table (by lowering assumed rate of return) 	<ul style="list-style-type: none"> •City Contribution Rate is in between the Midpoint and the Maximum •Risk of increasing pension costs are paid by the City 	<ul style="list-style-type: none"> •City Contribution Rate is above the Maximum •Use cushion, if any, built in Scenario 1, prior to remedies, to decrease City Contribution to Midpoint •Ensures costs remain sustainable
Corridor Midpoint = proposed benefits package estimated cost			

City Pension Funding Policy

Historical Funding Policy

In general, the actuarially determined contribution rate (ADR) has been set by the HPOPS Board based on the most recent valuation by the Fund's actuary, equal to normal cost plus amortization of the unfunded actuarial accrued liability, calculated under the level percentage of payroll method with 30-year open period. Additionally, the City's contribution is further adjusted under the applicable Meet & Confer agreement. It is important to recognize that the Board can select different actuarial methods and assumptions to perform these calculations.

The City's contribution to HPOPS is expected to be \$133.0 million for FY 2017 before the additional amount due to a funded status under 80%, as estimated by the HPOPS actuary based on the Meet & Confer agreement. The measurement was based on the projected unit credit actuarial cost method, asset smoothing over no more than five years for the actuarial value of assets, a rolling or open 30-year amortization period, and a long-term interest rate assumption of 8.0%.

Interest Rate Assumptions

HPOPS used a long-term investment return assumption of 8.0% for funding valuation purposes. However, the calculations in the forecast section of this report are based on a long-term interest rate assumption of 7.0% selected by the City of Houston using the data, assumptions, methods, and plan provisions described in this report.

Below is a summary of liabilities and costs under the two discount rate assumptions, before Pension Reform was considered. All other actuarial assumptions were consistent with the valuation basis described in *Sections 5 and 6*. The Actuarial Accrued Liability shown below is the value as of the beginning of FY 2017. Due to the budgeting process, any change in the City Contribution Rate from the plan changes would not occur until FY 2018. The Net Pension Liability results reflect the salary increase rates shown in this report.

Unfunded Actuarial Liability Results

Values Before Pension Reform as of July 1, 2016 (\$000s)	8.0%	7.0%
Actuarial Accrued Liability	\$6,573,225	\$7,257,864
Market Value of Assets	\$4,080,460	\$4,080,460
Unfunded Actuarial Liability	\$2,492,765	\$3,177,404

GASB Net Pension Liability Results

Values Before Pension Reform as of July 1, 2016 (\$000s)	8.0%	7.0%
Total Pension Liability	\$6,754,190	\$7,517,863
Fiduciary Net Position	\$4,080,460	\$4,080,460
Net Pension Liability	\$2,673,730	\$3,437,403

City Pension Funding Policy

New Standardized Funding Policy

Upon passage of the legislation supporting the pension reforms, the City of Houston will use a long-term interest rate assumption of 7.00% (subject to adjustment as discussed below) and will implement a new standardized funding policy, including the following key elements:

- Ultimate entry age normal actuarial cost method
- Amortization of the Unfunded Actuarial Liability over a 30-year or shorter closed period for each base
- An asset method which smoothes gains and losses over no more than five years, with the value as of June 30, 2016 set to fair market value
- Explicit recognition of administrative costs as a component of the contribution

Please note the projected cost assumes that future actuarial experience, including DROP duration, is consistent with the underlying measurement basis. For example, the potential cost could be lower if HPOPS has favorable experience generating actuarial gains. Conversely, the potential cost could be higher if unfavorable experience generates actuarial losses.

Ultimate Entry Age Normal

Each of the City of Houston retirement systems uses different actuarial methods and assumptions for their determination of the actuarially determined contribution rates. HPOPS currently uses the Projected Unit Credit method, with attribution to assumed DROP exit. This method is intended to reflect benefits based on current service but pay projected to assumed exit, and does not produce a stable contribution rate as a percentage of payroll. The Ultimate Entry Age Normal method is intended to produce a stable contribution rate as a percentage of payroll. The Normal Cost is calculated for all members based on provisions in effect for new hires, with the Actuarial Accrued Liability equal to the difference between the Present Value of Future Benefits, calculated based on the provisions for each individual member, and the Present Value of Future Normal Cost based on the provisions for new hires.

Closed Period Amortization

The new Pension Funding Policy uses 30-year closed period amortization method, rather than a rolling 30-year open period as permitted in the actuarially determined contribution rate for each retirement system. The initial base will be amortized over a 30-year closed period as a level percentage of payroll, with a separate closed period amortization base established for subsequent changes in the Unfunded Actuarial Liability due to actuarial gain/loss, assumption changes or plan changes. Additional mechanics of the amortization method are discussed below under *Risk Sharing Corridor*.

Asset Method

The Pension Funding Policy will measure the Unfunded Actuarial Liability based on the fair market value of assets upon initial adoption, rather than applying asset smoothing as used in the calculation of the actuarially determined contribution rate (ADR). In future years, asset smoothing over no more than five years will be used. This should result in less year-to-year volatility of contributions.

City Pension Funding Policy

Risk Sharing Corridor

The mechanism to meet Mayor Turner's objective of achieving a solution that removes pension issues from the table is the Risk Sharing Corridor.

The Corridor sets a minimum and maximum City Contribution Rate. The Corridor Midpoint is set for each year based on an initial 31-year projection of City Contribution Rates, assuming no actuarial gains or losses and the plan provisions are as in effect after Pension Reform. The Corridor Minimum and Maximum for each year are set by reference to this Midpoint.

If a Risk Sharing Valuation Study determines the City Contribution Rate differs from the Midpoint, in most cases, steps are taken to bring the Rate back toward the Midpoint. In a falling-cost environment, gains are used to accelerate the payoff of unfunded liabilities or reduce the interest rate. In a rising-cost environment, adjustments are made to the amortization period, employee contributions, or benefits to reduce the City Contribution Rate.

Amortization Period and Payoff Year

Initially, actuarial losses, including the unfunded actuarial liability at the outset of the agreement, have an Amortization Period of thirty years, with a corresponding Payoff Year. Actuarial gains have an Amortization Period and corresponding Payoff Year equal to that of the largest loss base.

If the City Contribution Rate decreases more than expected in a given year, Payoff Years of existing bases may be moved up in time, though to no earlier than twenty years from the original amortization date. If the Rate increases, Payoff Years may be moved back in time, although to no later than the original Payoff Year, since the amortization periods are closed.

Interest Rate

Initially the interest rate will be 7.00%. However, if the City Contribution Rate decreases more than expected in a given year, and Payoff Years have already been accelerated, the interest rate may decrease.

City Pension Funding Policy

Valuation Terminology

Under generally accepted accounting principles, the cost of pension benefits are viewed as a component of compensation paid to an employee for services rendered over their period of active employment, so the cost is effectively borne by the generation of owners/taxpayers that benefit from the employee services rendered.

In the actuarial valuation process, a mathematical model is developed to project the future stream of plan benefits and expenses. The model incorporates current plan provisions and member census data, using the actuarial assumptions to predict future events. Periodic updates of the actuarial valuation are necessary to ensure the model is financially sound, comparing emerging plan asset and liability experience to valuation projections to measure actuarial gains and losses. Minor fluctuations from year-to-year are common, but a pattern of significant differences indicate the long-term actuarial assumptions may need adjustment.

Discounting the stream of expected future plan payouts for the time value of money produces the *actuarial present value of projected benefits (PVB)*. The *PVB* represents the hypothetical amount of plan assets that would be necessary to fully fund all future plan costs for current plan participants, assuming future plan experience follows the actuarial assumptions over time. This measure of pension liability includes benefits that have not yet been earned for current employees, including the effect of expected future pay increases as well as projected service.

An actuarial cost method is basically a mathematical formula used to allocate the *PVB* over periods of employee service in a systematic fashion. The portion assigned as of the measurement date for the current year is referred to as the *normal cost (NC)*, and the cumulative portion allocated for employee service credit prior to the measurement date is referred to as the *actuarial accrued liability (AAL)*.

The *unfunded actuarial accrued liability (UAL)*, equals the excess, if any, of the *AAL* over the value of plan assets. At the time a plan is first established, a *UAL* will exist if prior service credit is recognized for benefit accrual purposes, sometimes referred to as a past service liability. Over the life cycle of a mature retirement system, a *UAL* may also emerge due to plan improvements that credit past service, or actuarial losses from unfavorable plan experience compared to the long-term actuarial assumptions.

The Funding Policy amount produced by the actuarial cost method is basically equal to the normal cost plus amortization of the *UAL* over a reasonable period of time. There are several alternative actuarial cost methods that can be used under generally accepted actuarial standards of practice, each of which, when properly applied, will determine annual contributions that will accumulate with interest to meet plan obligations for benefit payments and expenses as they come due.

As previously noted, HPOPS results use the Ultimate Entry Age Normal actuarial cost method. Under this method, the *NC* is determined based on provisions in effect for new hires, and the *AAL* is the difference between the *PVB* and the present value of future normal costs.

Detailed Forecast Results

Forecast of Corridor Midpoint - 7% Interest Rate - Before Pension Obligation Bonds

FY	Baseline Forecast				With Pension Reform				Cost Avoidance
	City Normal Cost Rate	Admin. Expenses	Amort. of UAL	City Cont. Rate	City Normal Cost Rate	Admin. Expenses	Amort. of UAL	City Cont. Rate	
2017				33.96%				33.96%	0.00%
2018	13.68%	1.00%	44.67%	59.35%	12.31%	1.00%	28.76%	42.07%	17.28%
2019	13.71%	1.00%	43.93%	58.64%	12.34%	1.00%	28.76%	42.10%	16.54%
2020	13.73%	1.00%	43.21%	57.94%	12.36%	1.00%	28.76%	42.12%	15.82%
2021	13.76%	1.00%	42.50%	57.26%	12.39%	1.00%	28.76%	42.15%	15.11%
2022	13.78%	1.00%	41.79%	56.57%	12.41%	1.00%	28.76%	42.17%	14.40%
2023	13.80%	1.00%	41.10%	55.90%	12.43%	1.00%	28.76%	42.19%	13.71%
2024	13.82%	1.00%	40.41%	55.23%	12.45%	1.00%	28.76%	42.21%	13.02%
2025	13.85%	1.00%	39.74%	54.59%	12.48%	1.00%	28.76%	42.24%	12.35%
2026	13.87%	1.00%	39.07%	53.94%	12.50%	1.00%	28.76%	42.26%	11.68%
2027	13.89%	1.00%	38.41%	53.30%	12.52%	1.00%	28.76%	42.28%	11.02%
2028	13.90%	1.00%	37.76%	52.66%	12.53%	1.00%	28.76%	42.29%	10.37%
2029	13.92%	1.00%	37.12%	52.04%	12.55%	1.00%	28.76%	42.31%	9.73%
2030	13.93%	1.00%	36.48%	51.41%	12.56%	1.00%	28.76%	42.32%	9.09%
2031	13.94%	1.00%	35.86%	50.80%	12.57%	1.00%	28.76%	42.33%	8.47%
2032	13.96%	1.00%	35.25%	50.21%	12.59%	1.00%	28.76%	42.35%	7.86%
2033	13.97%	1.00%	34.64%	49.61%	12.60%	1.00%	28.76%	42.36%	7.25%
2034	13.98%	1.00%	34.04%	49.02%	12.61%	1.00%	28.76%	42.37%	6.65%
2035	13.99%	1.00%	33.45%	48.44%	12.62%	1.00%	28.76%	42.38%	6.06%
2036	14.00%	1.00%	32.88%	47.88%	12.63%	1.00%	28.76%	42.39%	5.49%
2037	14.00%	1.00%	32.31%	47.31%	12.63%	1.00%	28.76%	42.39%	4.92%
2038	14.01%	1.00%	31.74%	46.75%	12.64%	1.00%	28.76%	42.40%	4.35%
2039	14.01%	1.00%	31.19%	46.20%	12.64%	1.00%	28.76%	42.40%	3.80%
2040	14.01%	1.00%	30.65%	45.66%	12.64%	1.00%	28.76%	42.40%	3.26%
2041	14.01%	1.00%	30.12%	45.13%	12.64%	1.00%	28.76%	42.40%	2.73%
2042	14.01%	1.00%	29.59%	44.60%	12.64%	1.00%	28.76%	42.40%	2.20%
2043	14.01%	1.00%	29.08%	44.09%	12.64%	1.00%	28.76%	42.40%	1.69%
2044	14.01%	1.00%	28.57%	43.58%	12.64%	1.00%	28.76%	42.40%	1.18%
2045	14.01%	1.00%	28.07%	43.08%	12.64%	1.00%	28.76%	42.40%	0.68%
2046	14.01%	1.00%	27.58%	42.59%	12.64%	1.00%	28.76%	42.40%	0.19%
2047	14.00%	1.00%	27.10%	42.10%	12.63%	1.00%	28.76%	42.39%	-0.29%
2048	14.00%	1.00%	26.63%	41.63%	12.63%	1.00%	0.00%	13.63%	28.00%

Please note: The City Normal Cost Rate shown above includes the impact of generational mortality improvement.

Detailed Forecast Results

Forecast of Corridor Midpoint - 7% Interest Rate - With Pension Obligation Bonds

FY	Baseline Forecast				With Pension Reform				Cost Avoidance
	City Normal Cost Rate	Admin. Expenses	Amort. of UAL	City Cont. Rate	City Normal Cost Rate	Admin. Expenses	Amort. of UAL	City Cont. Rate	
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2019	13.71%	1.00%	43.93%	58.64%	12.34%	1.00%	19.04%	32.38%	26.26%
2020	13.73%	1.00%	43.21%	57.94%	12.36%	1.00%	19.04%	32.40%	25.54%
2021	13.76%	1.00%	42.50%	57.26%	12.39%	1.00%	19.04%	32.43%	24.83%
2022	13.78%	1.00%	41.79%	56.57%	12.41%	1.00%	19.04%	32.45%	24.12%
2023	13.80%	1.00%	41.10%	55.90%	12.43%	1.00%	19.04%	32.47%	23.43%
2024	13.82%	1.00%	40.41%	55.23%	12.45%	1.00%	19.04%	32.49%	22.74%
2025	13.85%	1.00%	39.74%	54.59%	12.48%	1.00%	19.04%	32.52%	22.07%
2026	13.87%	1.00%	39.07%	53.94%	12.50%	1.00%	19.04%	32.54%	21.40%
2027	13.89%	1.00%	38.41%	53.30%	12.52%	1.00%	19.04%	32.56%	20.74%
2028	13.90%	1.00%	37.76%	52.66%	12.53%	1.00%	19.04%	32.57%	20.09%
2029	13.92%	1.00%	37.12%	52.04%	12.55%	1.00%	19.04%	32.59%	19.45%
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2031	13.94%	1.00%	35.86%	50.80%	12.57%	1.00%	19.04%	32.61%	18.19%
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2033	13.97%	1.00%	34.64%	49.61%	12.60%	1.00%	19.04%	32.64%	16.97%
2034	13.98%	1.00%	34.04%	49.02%	12.61%	1.00%	19.04%	32.65%	16.37%
2035	13.99%	1.00%	33.45%	48.44%	12.62%	1.00%	19.04%	32.66%	15.78%
2036	14.00%	1.00%	32.88%	47.88%	12.63%	1.00%	19.04%	32.67%	15.21%
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2039	14.01%	1.00%	31.19%	46.20%	12.64%	1.00%	19.04%	32.68%	13.52%
2040	14.01%	1.00%	30.65%	45.66%	12.64%	1.00%	19.04%	32.68%	12.98%
2041	14.01%	1.00%	30.12%	45.13%	12.64%	1.00%	19.04%	32.68%	12.45%
2042	14.01%	1.00%	29.59%	44.60%	12.64%	1.00%	19.04%	32.68%	11.92%
2043	14.01%	1.00%	29.08%	44.09%	12.64%	1.00%	19.04%	32.68%	11.41%
2044	14.01%	1.00%	28.57%	43.58%	12.64%	1.00%	19.04%	32.68%	10.90%
2045	14.01%	1.00%	28.07%	43.08%	12.64%	1.00%	19.04%	32.68%	10.40%
2046	14.01%	1.00%	27.58%	42.59%	12.64%	1.00%	19.04%	32.68%	9.91%
2047	14.00%	1.00%	27.10%	42.10%	12.63%	1.00%	19.04%	32.67%	9.43%
2048	14.00%	1.00%	26.63%	41.63%	12.63%	1.00%	0.00%	13.63%	28.00%

Please note: Pension Obligation Bonds were assumed to be issued December 31, 2017 and discounted with interest to June 30, 2016. The City Normal Cost Rate shown above includes the impact of generational mortality improvement.

Detailed Forecast Results

GASB Net Pension Liability

The Governmental Accounting Standards Board (GASB) has issued Statements Nos. 67 and 68 related to accounting for pension plans. These Statements put forth specific requirements for some of the actuarial methods to be used in plan accounting, and these can differ from the methods used for plan funding. For HPOPS, these differences are summarized below:

- Use of the Entry Age Normal actuarial cost method, with attribution to assumed DROP entry, rather than Ultimate Entry Age Normal
- Use of the market value of assets, with no smoothing allowed

Statements Nos. 67 and 68 refer to the actuarial liability as the Total Pension Liability and the asset value as the Fiduciary Net Position. The difference in the two is termed the Net Pension Liability (NPL). Below is a table showing the estimated NPL before and after Pension Reform for HPOPS:

7.00% Interest Rate - Before Pension Obligation Bonds

(Results in \$000s)	June 30, 2016 NPL Before Pension Reform	June 30, 2016 NPL After Pension Reform	Reduction in NPL
	\$3,437,403	\$2,368,821	\$1,068,582

7.00% Interest Rate - With Pension Obligation Bonds

(Results in \$000s)	June 30, 2016 NPL Before Pension Reform	June 30, 2016 NPL After Pension Reform	Reduction in NPL
	\$3,437,403	\$1,691,202	\$1,746,201

Commentary on Results

The detailed forecast assumes no actuarial gains or losses; that is, it assumes experience will match the actuarial assumptions. Any gains or losses that arise may produce different unfunded actuarial liability amounts than anticipated in the forecast, so the Amortization of UAL component of the City Contribution Rate may change over time as well.

As noted previously, the Ultimate Entry Age Normal actuarial cost method produces a normal cost based on the plan provisions in effect for new hires. The reduction in Net Employer Normal Cost is greater than the reduction in Gross Normal Cost due to the increase in employee contributions from 10.25% to 10.50% of pay. The estimated change in gross and net employer normal costs is shown below as a percentage of payroll:

7.00% Interest

Baseline		With Pension Reform		Difference	
Gross Normal Cost	Net Employer Normal Cost	Gross Normal Cost	Net Employer Normal Cost	Gross Normal Cost	Net Employer Normal Cost
23.93%	13.68%	22.81%	12.31%	-1.12%	-1.37%

Please note: Normal Cost Rates may change over time as actuarial gains and losses occur. These gains and losses may be due to changes in census data, plan provisions, and assumptions and methods. Additionally, the Normal Cost Rate will change slightly to incorporate generational mortality improvement.

Most of the changes under Pension Reform impact active plan members rather than retirees. However, changes to the COLA do impact retired members and beneficiaries. Below is the estimated change in Actuarial Accrued Liability for active members and inactive members separately:

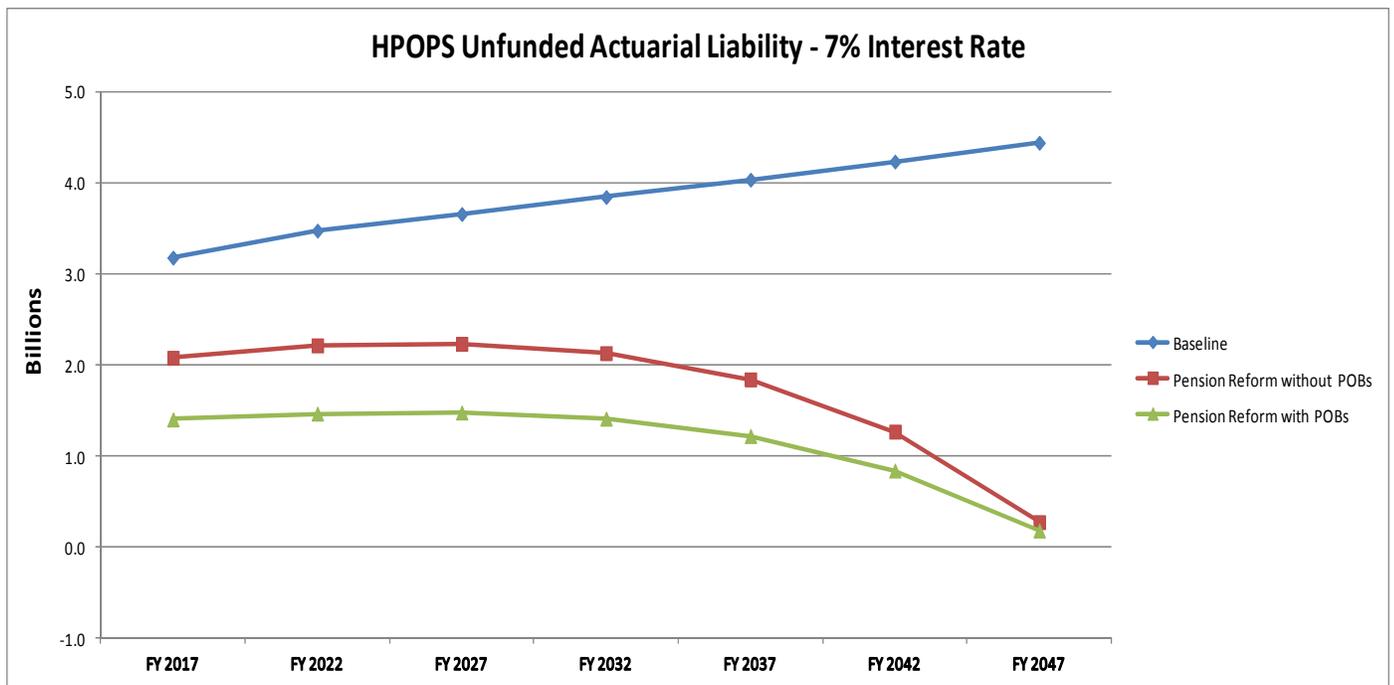
7.00% Interest Rate (\$000s)	Baseline AAL	Pension Reform AAL	Difference
Active Members	\$3,531,630	\$2,784,792	(\$746,838)
Inactive Members	\$3,726,234	\$3,373,804	(\$352,430)
Total	\$7,257,864	\$6,158,596	(\$1,099,268)

Commentary on Results

Payoff of Unfunded Actuarial Liability

The graph below shows the projected Unfunded Actuarial Liability (UAL) both before and after Pension Reform, with the changes that will become effective by June 30, 2017 reflected in the FY 2017 results. The results reflect a 7.00% interest rate. The Baseline results reflect a rolling or open 30-year amortization period, while the Pension Reform results reflect the new Funding Policy of a 30-year closed amortization period.

Prior to the new City Funding Policy, the use of an open amortization period means the UAL was expected to continue to grow in the future. However, under Pension Reform, the Unfunded Actuarial Liability in FY 2017 is reduced and is projected to be paid off in thirty years.



Please note: The results shown above assume experience will exactly match the actuarial assumptions; that is, they assume there will be no gains or losses. If experience is consistently more favorable than assumptions, the Payoff Year of the Unfunded Actuarial Liability could be as soon as 2037. If unfavorable experience causes recurring losses, the Payoff Year for these new losses may extend beyond 2047. However, the Payoff Year for the initial Unfunded Actuarial Liability will never be later than 2047.

Summary of Plan Provisions

Eligibility and Participation

Any police officer shall automatically become a participant in the plan upon graduation from the police academy.

Final Average Pay (FAP)

The average of the 78 bi-weekly payroll periods of salary prior to the retirement date, before reduction for pre-tax employee contributions and salary deferrals but excluding overtime and executive level pay.

Credited Service

Elapsed time from date of hire, for all periods of service classified as full-time, fully paid, active duty employment with the City of Houston Police Department.

Retirement Benefit

Eligibility

➤ Sworn prior to October 9, 2004

20 years of service.

➤ Sworn after October 9, 2004

Age 55 with 10 years of service. The **Pension Reform** will grant eligibility upon reaching the Rule of 70, when age plus service total at least 70.

Amount

➤ Sworn prior to October 9, 2004

Accrued benefit of 2.75% of FAP times credited service up to 20 years of service, plus 2.0% of FAP for credited service in excess of 20 years. In addition, the member will receive a 5,000 lump sum.

➤ Sworn after October 9, 2004

Accrued benefit of 2.25% of FAP times credited service up to 20 years of service, plus 2.0% of FAP for credited service in excess of 20 years, up to a maximum of 80% of FAP.

Termination Benefit

Eligibility

Termination of employment prior to satisfying the retirement eligibility requirements.

Amount

➤ Sworn prior to October 9, 2004

Less than 10 years of service: Lump Sum refund of member contributions without interest.

At least 10 but less than 20 years of service:

Choice of

- Refund of contributions without interest, or
- Monthly benefit of 2.75% of final average pay per year of service, payable at age 60

• Sworn after October 9, 2004:

Lump sum of member contribution without interest

Summary of Plan Provisions

On-Duty Disability

Eligibility

No age or service requirements.

Amount

Officers who are not capable of performing their normal and customary police officer duties receive the greater of their accrued retirement benefit or 45% of FAP (100% of FAP for officers with a Catastrophic Disability). If sworn prior to October 9, 2004, the benefit is the greater of the accrued retirement benefit of 55% of FAP, and the member will receive a \$5,000 lump sum.

Off-Duty Disability

Eligibility

No age or service requirements.

Benefit

Officers who are not capable of performing their normal and customary police officer duties receive the greater of their accrued retirement benefit or 22.5% of FAP (27.5% of FAP if sworn prior to October 9, 2004, plus \$5,000 lump sum).

Active Member Death

Eligibility

No age or service requirements.

Duty Related Benefit

100% of current pay. In addition, if the member was sworn before October 9, 2004, the beneficiary will receive a \$5,000 lump sum.

Non-Duty Related Benefit

Greater of the accrued retirement benefit or Off-Duty Disability benefit. In addition, if the member was sworn before October 9, 2004, the beneficiary will receive a \$5,000 lump sum.

Allocation to Beneficiaries

The benefit amount above is payable to a surviving spouse, or allocated 50% to the surviving spouse with the remaining 50% divided equally among any eligible children, or otherwise paid to any eligible parents.

Retired Member Death

Eligibility

Retired and receiving monthly pension.

Amount

100% of monthly pension the retired member was receiving. The benefit is paid for at least five years following the member's retirement date, even if the beneficiary dies.

Allocation to Beneficiaries

The benefit amount above is payable to a surviving spouse, or allocated 50% to the surviving spouse with the remaining 50% divided equally among any eligible children, or otherwise paid to any eligible parents.

Summary of Plan Provisions

Supplemental Annuity

An extra monthly benefit of \$150 is payable for life to any retired or disabled member or to an eligible survivor of a deceased member.

Cost of Living Adjustment

80% of the increase in CPI-U per year for any retired member or member in DROP, limited to a floor of 2.4% and a cap of 8%. The **Pension Reform** will raise the eligibility age to 55 and limit the COLA to the five-year investment return less 5%. The COLA will be no less than 0% nor greater than 4%. There will be no COLA for members under 70 for the first three years after the effective date.

DROP

Upon reaching retirement eligibility, members sworn prior to October 9, 2004 may enter the Deferred Retirement Option Plan (DROP). The member's monthly annuity (with COLA, as applicable) is added to a notional account, along with member contributions. Interest is credited on the account using the 5-year average of the Fund's rate of return, with a minimum of 3% and a maximum of 7%. Upon exiting the DROP for retirement, the member's monthly benefit is the greater of the benefit at DROP exit, including COLA increases, or the benefit based on service at DROP entry and FAP at DROP exit.

Pension Reform will limit DROP interest to 65% of the 5-year compound average of the Fund's rate of return, with a minimum of 2.5%. Additionally, the number of years in the DROP will be limited to 20. Member contributions will no longer be added to the DROP balance, COLA adjustments will not be provided on the monthly benefit while in DROP, and the monthly benefit will not be recalculated on DROP exit.

PROP

Members sworn prior to October 9, 2004 may participate in the Post Retirement Option Plan (PROP) at or after service retirement. The member may elect to have all or a portion of his or her DROP account or \$5,000 lump sum, or a portion of the monthly annuity added to a notional account. Taxes on these benefit are deferred until a distribution is taken. Interest is credited on the account using the 5-year average of the Fund's rate of return, with a minimum of 3% and a maximum of 7% (same as DROP).

Summary of Plan Provisions

Pension Reform will limit PROP interest to the same rate as credited to DROP balances. Additionally, no new amounts will be eligible for deferral into the PROP.

PLOP

Members sworn after October 9, 2004 are eligible for the Partial Lump Sum Option Plan (PLOP) at service retirement eligibility. The member receives a reduced monthly benefit plus a lump sum of up to 20% of the value of the unreduced annuity.

Contribution Rates

Members

- Sworn prior to October 9, 2004 9% of total pay, with 8.75% credited to DROP accounts.

- Sworn after October 9, 2004 10.25% of pay.

Pension Reform will increase this rate to 10.50% for all members.

City

Based on Meet & Confer agreements.

Pension Reform will be based on the results of the risk sharing valuation.

Actuarial Methods and Assumptions

Actuarial Cost Methods

Measurement Date	Census data as of July 1, 2016 for all members. Plan changes assumed to take effect July 1, 2016, with changes to City Budget Cost Rate effective July 1, 2017 (Fiscal Year 2018).
Actuarial Value of Assets	Fair market value of assets as of June 30, 2016, with smoothing of future gains and losses over a period of no more than five years (that is, initial Actuarial Value equal to Fair Market Value with smoothing thereafter). Gains may be used to offset outstanding losses, and vice versa, to accelerate the amortization.
Actuarial Cost Method	<u>The Ultimate Entry Age Normal Actuarial Cost Method</u> As used in the City Funding Policy, a method under which the actuarial present value of all potential future projected benefits of each individual included in the valuation is calculated, assuming continued service and pay increases. The <i>normal cost</i> is calculated as the average uniform percentage of payroll which, if applied to the compensation of each participant during the entire period of anticipated covered service, would meet the cost of all benefits payable based on benefits provisions for new hires. The portion of the actuarial present value of future benefits not provided for at the valuation date by the present value of future normal costs is called the <i>actuarial accrued liability</i> .

Key Economic Assumptions

Interest Rate	7.0% except where noted within the report, as prescribed by the City of Houston.
Inflation	2.25%.
Wage Inflation	2.75%.
Payroll Growth	2.75%.

Actuarial Methods and Assumptions

Individual Pay Increase Rate

A service-related assumption:

Service	Rate
1	14.75%
2	11.75%
3	10.00%
4	8.75%
5	8.25%
6	7.75%
7	7.00%
8	6.75%
9	6.25%
10	6.00%
11	5.75%
12	5.50%
13	5.25%
14	5.00%
15	4.75%
16	4.50%
17	4.25%
18+	2.75%

DROP Interest Crediting Rate

Baseline: 5.90% with a 7.00% interest rate and 6.4% with an 8.00% interest rate

Pension Reform: 5.10%

COLA

Baseline: 2.70%

Pension Reform: 2.00%

Actuarial Methods and Assumptions

Demographic Assumptions

Mortality Rates

- Healthy retirees The RP2000 Combined Healthy Mortality Tables with Blue Collar Adjustment with male rates multiplied by 109% and female rates multiplied by 103%. The rates are projected on a fully generational basis by scale BB.

- Disabled males and females The RP2000 Disabled Retiree Mortality Tables without adjustment. The rates are projected on a fully generational basis by scale BB.

- Active members The RP2000 Combined Healthy Mortality Tables with Blue Collar Adjustment with male rates multiplied by 54% and female rates multiplied by 51%. The rates are projected on a fully generational basis by scale BB. An additive factor of .0003 is applied to all active mortality rates.

Retirement Rates

Age	Service		
	<25	25 - 29	30+
40 - 49	4.0%	6.0%	10.0%
50 - 54	4.0%	6.0%	10.0%
55 - 59	6.8%	10.2%	17.0%
60 - 64	9.6%	14.4%	24.0%
65+	100.0%	100.0%	100.0%

For members hired after October 9, 2004, 30% is added to the retirement rate at age 55.

Members are assumed to enter DROP at first eligibility and remain in DROP until retirement.

Under **Pension Reform**, for members sworn after October 9, 2004, the rates above were adjusted to remove the additional 30% at age 55. Instead, rates in the first year of eligibility were increased by 30%, less 3% for each year below age 55. For members currently in DROP, the rates above were multiplied by 1.1.

Actuarial Methods and Assumptions

Disability Rates

Age	Males	Females
20	0.1149%	0.1149%
25	0.1145%	0.1145%
30	0.1197%	0.1197%
35	0.1321%	0.1321%
40	0.1516%	0.1516%
45	0.1785%	0.1785%
50	0.2126%	0.2126%
55	0.2538%	0.2538%
60	0.3023%	0.3023%

Percentage of Deaths and Disabilities in the Line of Duty

- Deaths 100%
- Disabilities 100%

Termination Rates

Sample Rates

Service	Termination Rate
1	2.71%
3	1.95%
5	1.40%
7	1.01%
9	0.72%
11	0.52%
13	0.37%
15	0.27%
17	0.19%
19	0.14%
20+	0.10%

For participants sworn prior to October 9, 2004 with at least 10 years of service but less than 20 years, 50% are assumed to elect a contribution refund, and 50% are assumed to elect a deferred monthly benefit.

Actuarial Methods and Assumptions

Percentage married	90% of participants are assumed to be married. No beneficiaries other than the spouse assumed.
Age difference	Husbands assumed to be three years older than wives.
Development of Valuation Pay	Valuation pay is projected by increasing the maximum of the past five years of pay or \$31,000 with the nominal individual pay increase rate. Historical valuation pay for years before data was available was regressed with the nominal individual pay increase rate.
Payment of DROP Balances	Installments over 10 years. The value of the DROP balance is multiplied by a factor which reflects the difference between the assumed DROP interest crediting rate and the interest rate assumption (0.943 at 6.4% DROP interest crediting and 8.0% interest, 0.960 at 5.90% DROP interest crediting and 7.0% interest, and 0.931 at 5.10% DROP interest crediting and 7.0% interest)
Administrative Expenses	1.00% of payroll
Funding Policy	The City is assumed to contribute the City Contribution Rate from the prior year. This amount is measured as the normal cost plus 30-year amortization of the Unfunded Actuarial Liability (UAL) less the member contributions, adjusted with interest to mid-year. The 30-year amortization of the UAL is calculated as a level percent of pay (closed period).

Data Sources

Data and inputs used in this report were provided from the following sources:

- Individual census data as of July 1, 2016 was provided by the HPOPS actuary on October 7, 2016.
- The fair value of assets of \$4,080,460,000 as of June 30, 2016 is from HPOPS July 1, 2016 Actuarial Valuation Report dated October 7, 2016. We understand this amount includes a contribution receivable based on the plan's funded status being below 80% as of July 1, 2015.
- Fiscal Year 2017 payroll of \$423,742,546 was based on the highest year in the past five in the individual census data projected forward with one year of assumed salary increase. Adjustments were made to use a minimum pay of \$31,000.
- Pension Reform plan provisions were provided by the City of Houston via email on November 8, 2016.