# City of Pittsburgh Municipal Pension Fund

## Actuarial Valuation as of January 1, 2019

**January 2020**

**DRAFT**

Prepared by:

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Philadelphia

for

The City of Pittsburgh

Date: January 2020

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# I. Introduction

In accordance with the City's request, we have completed an actuarial valuation of the Municipal Pension Fund (the Plan) as of January 1, 2019. The valuation was based on personnel data as supplied by the City and on financial data as supplied by the City's auditor. The valuation results are presented in this report.

## Act 205

The Pennsylvania Municipal Pension Fund Funding Standard and Recovery Act was signed into law as Act 205 of 1984. As required, we have prepared the January 1, 2019 valuation and this report thereon in accordance with the provisions of Act 205.

A copy of this report will be filed as an attachment to Form PC-203C which must be filed with the Municipal Pension Reporting Program by March 31, 2020.

## Preamble

Please read the Preamble to the report very carefully. It contains important general information and concepts. It also explains how the results of the January 1, 2019 valuation, as published in this report, normally form the basis for the Plan's 2020 and 2021 Minimum Municipal Obligation (MMO).

## Changes in Actuarial Assumptions and Plan Provisions Since the Last (1/1/2017) Valuation

There have been no changes in actuarial assumptions or Plan provisions since the last valuation.

Other important results and products of the January 1, 2019 valuation are presented in the Actuarial, Financial and Demographic Exhibits which make up the bulk of the report.

## Certification

Assumptions used for the valuation were selected by the City based on a completed experience study through January 1, 2017. We believe the assumptions are reasonable and appropriate for this valuation.

The report was prepared under my supervision. I, Jason Fine, am a member of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,

By: ______________________ Date: January 2020

Jason L. Fine
Enrolled Actuary No.: 17-06680

# II. Preamble

## The Plan

The City of Pittsburgh sponsors a defined benefit pension plan for its City Municipal Employees known as the Municipal Pension Fund. A summary of the Plan's provisions is set forth in Appendix B of this report. The Plan is subject to the funding and reporting requirements of the Pennsylvania Municipal Pension Plan Funding Standard and Recovery Act (Act 205 of 1984, or Act 205). Act 205 requires that an actuarial valuation of the Plan be performed every other year. Actuarial valuations are performed for the Plan as of January 1 of each odd-numbered year. The January 1, 2019 valuation would normally form the basis for the Plan's 2020 and 2021 Financial Requirements and the City's 2020 and 2021 Minimum Municipal Obligation (MMO).

## MMO Reporting Deadline

For a particular year, the City's Chief Administrative Officer must report the Plan's Financial Requirements and the City's MMO to the City Council by the last business day in September of the year preceding the particular year in question. Thus, the Plan's Financial Requirements and the City's MMO for 2020 were required to be reported to City Council by September 30, 2019.

## Financial Requirements

The Plan's 2020 Financial Requirements would normally consist of the following elements:

***Normal Cost.*** This is the cost of benefits allocated to the year 2020 under the Plan's actuarial cost method and the methodology of Act 205. It would normally be determined by multiplying the Normal Cost Rate as determined in the 2019 valuation by an estimate of 2019 W-2 wages of Plan members.

***Administrative Expenses.*** This is an estimate of the administrative expenses of the Plan expected to be paid from Plan assets in 2020 and would normally be determined by multiplying the Administrative Expense Rate as determined in the 2019 valuation by the estimate of 2019 W-2 wages of Plan members.

***Amortization Requirement (if applicable).*** This would normally be determined in the 2019 valuation and is the amount required to amortize the Plan's Unfunded Actuarial Accrued Liability as of January 1, 2019 over the number of years prescribed under Act 205 as amended by Act 44 of 2009.

# II. Preamble (continued)

## Minimum Municipal Obligation (MMO)

The City's MMO for 2020 is set equal to the Plan's Financial Requirements for 2020 less the sum of estimated member contributions for 2020 less, if applicable, a funding adjustment equal to 10% of the Plan's surplus with regard to accrued liabilities. The actual contribution that the City would be required to make in 2020 would be the 2020 MMO less State Aid deposited in the Plan in 2020.

As shown on page 4, the City's 2020 MMO is $15,053,215, prior to reflecting the receipt of any State Aid.

## Actuarially Recommended Contribution (ARC)

One of the cost components of the Minimum Municipal Obligation is an amortization payment calculated according to rules prescribed in Act 205. The minimum amortization under Act 205 reflects the utilization of provisions of Act 82 of 1998 for which the City qualified. Under those provisions, the Unfunded Actuarial Accrued Liability as of January 1, 1998 is being amortized over 40 years calculated pursuant to special procedures (described in Appendix C: Glossary). Bases for subsequent years are established according to the normal procedures of Act 205 and amortized over various periods according to the source of the change in unfunded liability such as experience gains or losses, benefit changes, and assumption changes These periods are not limited by average future service because the City qualifies for Distress Level II (funded ratio more than 50% but less than 70%) according to the requirements under Act 205.

Since the Act 82 amortization methodology does not result in an actuarially appropriate funding level, this report also presents and Actuarially Recommended Contribution (ARD) reflecting a recommended amortization payment. The ARC is based on a 30-year "fresh start" amortization payment commencing as of January 1, 2011 and additional amortization bases added thereafter according to the normal procedures of Act 205.

As shown on page 4, the City's 2020 ARC is $19,016,123, prior to reflecting the receipt of any State Aid.

# III. City's Minimum Municipal Obligation (MMO) for 2020

| | | | |
|---|---|---|---|
| 1. | Estimated 2019 W-2 Wages of Active Members | $ | 91,902,511 |
| 2. | Normal Cost Rate (from Exhibit A-1) | | 7.7938% |
| 3. | Administrative Expense Rate (from Exhibit A-1) | | 0.7460% |
| 4. | Normal Cost for 2020: (1) x (2) | $ | 7,162,698 |
| 5. | Administrative Expense for 2020: (1) x (3) | | 685,593 |
| 6. | Amortization Requirement (from Exhibit A-5a) | | 10,670,999 |
| 7. | Plan's 2020 Financial Requirements: (4) + (5) + (6) | $ | 18,519,290 |
| 8. | Estimated 2020 Member Contributions | | 3,466,075 |
| 9. | Funding Adjustment | | N/A |
| 10. | City's 2020 Minimum Municipal Obligation: (7) - (8) - (9) | $ | 15,053,215* |

# City's Actuarially Recommended Contribution (ARC) for 2020

| | | | |
|---|---|---|---|
| 1. | City's 2020 MMO (line 10 above) | | $ 15,053,215 |
| 2. | a) Actuarially Recommended Amortization Payment (Exhibit A-5b) | $14,633,907 | |
| | b) Amortization Requirements for MMO (Exhibit A-5a) | $10,670,999 | |
| 3. | Difference in Amortization: (2a) – (2b) | | $ 3,962,908 |
| 4. | City's Actuarially Recommended Contribution for 2020: (1) + (3) | | $ 19,016,123* |

As shown above, the difference between the MMO and ARC is the difference between the required amortization (MMO) and the recommended amortization (ARC).

*City's actual contribution will be equal to the MMO/ARC less the actual amount of State Aid received in 2020.

# IV. Valuation Highlights

| | 1/1/2019 | 1/1/2017 |
|---|---|---|
| **Funding** | | |
| Present Value of Benefits | $ 445,359,347 | $ 421,191,765 |
| Actuarial Accrued Liability | $ 388,411,894 | $ 371,330,236 |
| Actuarial Value of Assets | $ 240,346,840 | $ 224,014,919 |
| Funding Ratio | 61.88% | 60.33% |
| Market Value of Assets | $ 223,576,031 | $ 210,405,662 |
| **Demographic** | | |
| Total Active | 1,767 | 1,718 |
| Total Pensionable Compensation | $ 83,458,398 | $ 81,206,424 |
| Average Annual Pensionable Compensation | $ 47,232 | $ 47,268 |
| Total In-Payment Status | | |
| Retirement | 1,366 | 1,343 |
| Total Retirement Benefits | $ 23,264,811 | $ 19,215,019 |
| Average Annual Benefit | $ 17,031 | $ 14,308 |
| Disabled | 217 | 233 |
| Total Disabled Benefits | $ 3,225,979 | $ 2,937,415 |
| Average Annual Benefit | $ 14,866 | $ 12,607 |
| Survivor | 108 | 103 |
| Total Survivor Benefits | $ 854,752 | $ 733,091 |
| Average Annual Benefit | $ 7,914 | $ 7,117 |
| Total Deferred | 59 | 56 |
| **Cost Components** | | |
| Normal Cost as percentage of total payroll | 7.7938% | 7.6110% |
| Administrative Expense as percentage of total payroll | 0.7460% | 0.7000% |
| Minimum Amortization Payment for MMO | $ 10,670,999 | $ 10,402,353 |
| Actuarially Recommended Amortization Payment for ARC | $ 14,633,907 | $ 13,800,362 |

# V. Actuarial Exhibits

## Exhibit A-1: Normal Cost of Plan Benefits

| *Type of Plan Benefit* | *Normal Cost Expressed As A* *Dollar Amount* | *% of 2018 W-2 Wages* |
|---|---|---|
| Retirement | $ 5,121,064 | 5.2094% |
| Disability | 810,471 | 0.8245 |
| Survivor | 67,856 | 0.0690 |
| Refund of Member Contributions | 499,734 | 0.5084 |
| Medicare Premium | 608,277 | 0.6188 |
| Vested Terminations | 554,168 | 0.5637 |
| Sub Total | $ 7,661,570 | 7.7938% |
| Estimated Average Administrative Fees for 2018 and 2019 | 733,359 | 0.7460% |
| Grand Total | $ 8,394,929 | 8.5398% |

NOTES:

1. The normal cost for Plan Benefits is the portion of total Plan liabilities for current active members assigned to a particular plan year in accordance with the Entry Age Actuarial Cost Method, and the actuarial assumptions described in Appendix A.
2. In accordance with Act 205 the administrative expenses of the Plan (actuarial, legal, investment, etc.) may be paid from Plan assets.
3. 2018 W-2 wages for the Plan's 1,767 active members as of 1/1/2019 was $98,303,851.

# V. Actuarial Exhibits (continued)

## Exhibit A-2: Actuarial Accrued Liability as of January 1, 2019

| | | | |
|---|---|---|---|
| 1. | Present Value of Benefits of Active Members | | |
| | (a) Retirement Benefits | $ | 161,429,918 |
| | (b) Disability Benefits | | 13,196,961 |
| | (c) Survivor Benefits | | 1,715,051 |
| | (d) Refund of Member Contributions | | 3,067,590* |
| | (e) Medicare Premium | | 11,429,158 |
| | (f) Vested Termination | | 6,534,214 |
| | (g) Total | $ | 197,372,892 |
| 2. | Present Value of Benefits of Deferred Vested Benefits | $ | 9,003,578 |
| 3. | Member Refunds Due and Unpaid | $ | 0 |
| 4. | Present Value of Benefits of Benefit Recipients | | |
| | (a) Retirement Benefits | $ | 204,655,457 |
| | (b) Disability Benefits | | 26,912,580 |
| | (c) Surviving Spouse Benefits | | 7,414,837 |
| | (d) Surviving Child Benefits | | 0 |
| | (e) Other | | 0 |
| | (f) Total | $ | 238,982,874 |
| 5. | Present Value of Other Plan Benefits | $ | 0 |
| 6. | Present Value of All Plan Benefits: (1.g) + (2) + (3) + (4.f) + (5) | $ | 445,359,344 |
| 7. | Present Value of Future Normal Costs | $ | 56,947,450 |
| 8. | Actuarial Accrued Liability at 1/1/2019: (6) - (7) | $ | 388,411,894 |

* The amount of accumulated active member contributions without interest as of January 1, 2019 is $33,243,080.

# V. Actuarial Exhibits (continued)

## Exhibit A-3: Unfunded Actuarial Liability as of January 1, 2019

As of January 1, 2019, the Plan had an Unfunded Actuarial Accrued Liability (UAAL) since the Actuarial Value of Plan Assets did not exceed the Plan's Actuarial Accrued Liability, as follows:

| | | | |
|---|---|---|---|
| 1. | Actuarial Accrued Liability at 1/1/2019 (Exhibit A-2) | $ | 388,411,894 |
| 2. | Actuarial Value of Assets at 1/1/2019 (Exhibit F-1) | | 240,346,840 |
| 3. | UAAL at 1/1/2019: (1) - (2) | $ | 148,065,054 |

## Analysis of Change in the Plan's Unfunded Actuarial Liability from January 1, 2017 to January 1, 2019

| | | |
|---|---|---|
| 1. | Unfunded Actuarial Accrued Liability at 1/1/2017 | $ 147,315,317 |
| 2. | Normal Cost (including expenses) due 1/1/2017 | 7,513,042 |
| 3. | Normal Cost (including expenses) due 1/1/2018 | 7,824,699 |
| 4. | Net interest to 1/1/2019 | 23,831,219 |
| 5. | Total Expected Contributions with interest through 1/1/19 | (42,379,624) |
| 6. | Increase (decrease) due to change in assumptions | 0 |
| 7. | Increase (decrease) due to Plan amendments | 0 |
| 8. | Expected Unfunded Actuarial Accrued Liability at 1/1/2019 | $ 144,104,653 |
| 9. | Net actuarial loss (gain) for 2017 and 2018 | 3,960,401 |
| 10. | Actual Unfunded Actuarial Accrued Liability at 1/1/2019 | $ 148,065,054 |

# V. Actuarial Exhibits (continued)

## Exhibit A-4: Development of Actuarial (Gain)/Loss from January 1, 2017 – December 31, 2018

| | | |
|---|---|---|
| 1. | (Gain)/Loss on Actuarial Value of Assets | $ 4,664,648 |
| 2. | (Gain)/Loss on Demographics | 10,018,071 |
| 3. | (Gain)/Loss on Contributions (in excess of expected MMOs with interest) | (10,722,318)* |
| 4. | 2017/2018 Total (Gain)/Loss | 3,960,401** |

*Contribution (gain)/loss over expected ARCs was $(5,393,188).
**Total loss on ARC amortization for the period was $9,289,531.

# V. Actuarial Exhibits (continued)

## Exhibit A-5: Costs to Amortize the Unfunded Actuarial Accrued Liability

### a. Amortization of Unfunded Actuarial Accrued Liability

| Source | | Original Amount | Year Established | Target Year | | Unamortized Balance | | Annual Amortization Amount |
|---|---|---|---|---|---|---|---|---|
| Initial | $ | 53,226,758 | 1998 | 2037 | $ | 89,301,977 | $ | 3,132,592 |
| Ben. Mod. - Actives | $ | 15,075,742 | 2002 | 2021 | $ | 3,959,983 | $ | 1,413,385 |
| Investment Loss | | 15,617,085 | 2002 | 2032 | | 11,023,944 | | 1,193,004 |
| Assumption Change | $ | (5,300,394) | 2003 | 2022 | $ | (1,785,023) | $ | (494,141) |
| Ben. Mod. - Actives | $ | 6,262,573 | 2003 | 2022 | $ | 2,109,058 | $ | 583,842 |
| Investment Loss | $ | 20,777,261 | 2003 | 2032 | $ | 15,183,598 | $ | 1,643,159 |
| Assumption Change | $ | (55,417) | 2005 | 2024 | $ | (25,958) | $ | (5,117) |
| Ben. Mod. - Actives | $ | 7,325,991 | 2005 | 2024 | $ | 3,431,560 | $ | 676,450 |
| Experience Gain | $ | (7,233,308) | 2005 | 2019 | $ | (778,121) | $ | (778,121) |
| Experience Gain | $ | (3,323,763) | 2007 | 2021 | $ | (991,222) | $ | (353,784) |
| Assumption Change | $ | (9,457,779) | 2009 | 2028 | $ | (6,391,194) | $ | (858,281) |
| Experience Loss | $ | 40,849,981 | 2009 | 2028 | $ | 27,604,808 | $ | 3,707,082 |
| Experience Gain | $ | (56,098,421) | 2011 | 2030 | $ | (42,606,448) | $ | (5,068,467) |
| Assumption Change | $ | 31,572,286 | 2013 | 2027 | $ | 22,774,906 | $ | 3,294,086 |
| Experience Gain | $ | (6,447,817) | 2013 | 2032 | $ | (5,361,015) | $ | (580,165) |
| Experience Loss | $ | 14,589,666 | 2015 | 2034 | $ | 13,063,970 | $ | 1,310,877 |
| Assumption Change | $ | 12,558,768 | 2017 | 2031 | $ | 11,542,773 | $ | 1,306,049 |
| Experience Loss | | 2,152,962 | 2017 | 2036 | | 2,047,057 | | 193,184 |
| Experience Loss | $ | 3,960,401 | 2019 | 2038 | $ | 3,960,401 | $ | 355,365 |
| Total | | | | | $ | 148,065,054 | $ | 10,670,999 |

### b. Recommended Amortization for Actuarially Recommended Contribution (ARC)

The following amortization schedule was established with the January 1, 2011 actuarial valuation to develop a more appropriate amortization of the Plan’s unfunded liability.

| Source | | Original Amount | Year Established | Target Year | | Unamortized Balance | | Annual Amortization Amount |
|---|---|---|---|---|---|---|---|---|
| Initial | $ | 95,641,110 | 2011 | 2040 | $ | 86,028,302 | $ | 7,402,698 |
| Experience Loss | $ | (3,290,204) | 2013 | 2032 | $ | (2,735,629) | $ | (296,048) |
| Assumption Change | $ | 31,572,286 | 2013 | 2027 | $ | 22,774,906 | $ | 3,294,086 |
| Experience Loss | $ | 17,989,040 | 2015 | 2034 | $ | 16,107,857 | $ | 1,616,310 |
| Experience Loss | $ | 5,318,956 | 2017 | 2036 | $ | 5,057,314 | $ | 477,267 |
| Assumption Change | $ | 12,558,768 | 2017 | 2031 | $ | 11,542,773 | $ | 1,306,049 |
| Experience Loss | $ | 9,289,531 | 2019 | 2038 | $ | 9,289,531 | $ | 833,545 |
| Total | | | | | $ | 148,065,054 | $ | 14,633,907 |

# VI. Financial Exhibits

## Exhibit F-1: Pension Plan Assets at Fair Market Value as of January 1, 2019

| *Asset Description* | | *Fair Market Value* |
|---|---|---|
| Investments in City of Pittsburgh Aggregated Pension Trust | $ | 155,486,002 |
| Parking tax revenue receivable | $ | 68,090,029 |
| Total | $ | 223,576,031 |

Note: Accounting Method is Accrual Basis

### Actuarial Value of Assets as of January 1, 2019

The Actuarial Value of Assets as of January 1, 2019 is determined in accordance with the method described in Appendix A as follows:

| | | | |
|---|---|---|---|
| 1. | Actuarial Value of Assets at January 1, 2017 | $ | 224,014,919 |
| 2. | Non-investment increases* during 2017 and 2018 | | 44,780,279 |
| 3. | Non-investment decreases* during 2017 and 2018 | | (56,587,340) |
| 4. | Credited interest for 2017 and 2018: .1289 x (1) + .0625 x [(2) - (3)] | | 28,138,982 |
| 5. | Preliminary Actuarial Value of Assets as of January 1, 2019: (1) + (2) - (3) + (4) | $ | 240,346,840 |
| 6. | Market Value of Assets at January 1, 2019 x .8 | | 177,865,423 |
| 7. | Market Value of Assets at January 1, 2019 x 1.2 | | 266,798,135 |
| 8. | Actuarial Value of Assets at January 1, 2019: (5) but not less than (6) nor more than (7) | $ | 240,346,840 |

**Includes pass-through and excludes parking-tax contributions*

# VI. Financial Exhibits (continued)

## Exhibit F-2: Asset Reconciliation January 1, 2017 to December 31, 2018

| | | Year Beginning January 1 | | |
|---|---|---|---|---|
| | | 2017 | | 2018 |
| 1. Market Value at January 1 | $ | 210,405,662 | $ | 230,862,830 |
| 2. Revenues During Year | | | | |
| a) Member Contributions | $ | 3,502,184 | $ | 3,656,188 |
| b) Municipal Contributions - State Aid Portion | | 7,026,925 | | 6,919,817 |
| c) Municipal Contribution - Local Portion* | | 9,620,637 | | 10,512,620 |
| d) Interest on Late City Contributions | | 0 | | 0 |
| e) Parking-tax contribution | | 3,060,161 | | 6,120,858 |
| f) Dividends and Interest | | 1,766,591 | | 1,719,415 |
| g) Net Appreciation | | 20,495,976 | | (9,485,167) |
| h) Net Realized Capital Gains | | 0 | | 0 |
| i) Net Unrealized Capital Gains | | 0 | | 0 |
| j) Other Revenues | | 27,966 | | 26,722 |
| k) Adjustment | | 1,244,908 | | 0 |
| l) Total Revenues | $ | 46,745,348 | $ | 19,470,453 |
| 3. Expenses During Year | | | | |
| a) Benefit Payments* | $ | 24,841,131 | $ | 25,039,471 |
| b) Contributions Withdrawn | | 799,346 | | 999,911 |
| c) Administrative Costs | | 647,703 | | 717,870 |
| d) Net Realized Capital Losses | | 0 | | 0 |
| e) Net Unrealized Capital Losses | | 0 | | 0 |
| f) Other Expenses | | 0 | | 0 |
| g) Total Expenses | $ | 26,288,180 | $ | 26,757,252 |
| 4. Market Value at December 31: (1) + (2.l) - (3.g) | $ | 230,862,830 | $ | 223,576,031 |
| • Total Investment Growth During Year | $ | 22,262,567 | $ | (7,765,752) |
| • Average Assets on Deposit During Year | $ | 209,502,963 | $ | 231,102,307 |
| • Approximate Annual Rate of Return | | 10.63% | | (3.36)% |

**Excludes pass-through contributions of $1,679,006 in 2017 and $1,862,902 in 2018.*

# VI. Financial Exhibits (continued)

## Exhibit F-3: Administrative Costs Paid from Pension Plan During 2017 and 2018

| *Type* | *2017* | *2018* |
|---|---|---|
| Administrative Expense | $ 363,518 | $ 386,478 |
| Investment Expense | 284,185 | 331,392 |
| Total | $ 647,703 | $ 717,870 |

# VII. Demographic Exhibits

## Exhibit D-1: Active Members Demographic Data as of January 1, 2019

| | *Number* |
|---|---|
| 1. Active members @ 1/1/2017 | 1,718 |
| 2. New entrants | 371 |
| 3. Separations from active service | |
| a) Refund of contributions | 170 |
| b) Separation with deferred benefit | 21 |
| c) Separation with neither refund or deferred benefit | 15 |
| d) Disability | 3 |
| e) Death | 4 |
| f) Retirement with service retirement benefit | 109 |
| g) Total separations | 322 |
| 4. Active members @ 1/1/2019: (1) + (2) - (3.g) | 1,767 |

# VII. Demographic Exhibits (continued)

## Exhibit D-2: Benefit Recipients Demographic Data as of January 1, 2019

| | | | Number |
|---|---|---|---|
| 1. | Benefit recipients @ 1/1/2017 | | 1,679 |
| 2. | New benefit recipients (including beneficiaries) | | 160 |
| 3. | Terminations | | |
| | a) | Death | 145 |
| | b) | Other | 3 |
| | c) | Total Terminations | 148 |
| 4. | Benefit recipients @ 1/1/2019: (1) + (2) - (3.c) | | 1,691* |

*includes 108 beneficiaries and 217 disabled

# Appendix A

## Summary of Economic and Demographic Actuarial Assumptions and Cost Method

### I. Economic Actuarial Assumptions

***A. Interest.*** 7.25% per annum compounded annually

***B. Salary Scale.*** 4.0% per annum compounded annually (includes inflation)

***C. Inflation.*** 2.75% per annum compounded annually

***D. Social Security Benefits.***

*Active Participants*. Offset based on social security law in 2019

*Retired Participants*. Offset based on actual benefit at age 65 or older

***E. Medicare Premiums.*** For 2019, new enrollees are $135.50 per month and is assumed to increase 5.0% per year

***F. Actuarial Value of Assets*** as of the current valuation date is determined in accordance with (1) subject to the limitation described in (2) as follows:

(1) The Actuarial Value of Assets as of the last valuation date plus non-investment increases less non-investment decreases since the last valuation date plus interest credited at the last valuation's assumed interest rate less one-percent assuming non-investment increases and decreases occur at the mid-point between the last and current valuation date.

(2) The Actuarial Value of Assets as determined under (1) will be limited to a maximum of 120% and a minimum of 80% of the fair market value of assets as of the current valuation date.

***G. Administrative Expenses:*** Administrative expenses payable from Plan assets during the year beginning on the valuation date are assumed to equal 104.5% of such expenses in the preceding year.

# Appendix A (continued)

## Summary of Economic and Demographic Actuarial Assumptions and Cost Method (continued)

### II. Demographic Actuarial Assumptions

***Mortality.*** RP-2000 Mortality Tables, with adjustments to reflect Pittsburgh Pension Plan mortality experience as confirmed by experience studies. The adjusted rates are based on the following:

a. *Active Participants*. RP-2000 Employee Mortality Rates projected with rates derived from the long-range demographic assumptions from the 2015 Social Security Administration's Trustee Report.
b. *Retired/Term Vested Participants*. RP-2000 Healthy Annuitant Mortality Rates adjusted by blue collar ratios, projected from 2000 with rates derived from the long-range demographic assumptions from the 2015 Social Security Administration's Trustee Report.
c. *Disability Retirees*. Same as Retired, but with ages set forward six years.
d. *Surviving Beneficiaries*. RP-2000 Healthy Annuitant Mortality Rates adjusted by ratios of female beneficiary experience to overall female RP-2000 Healthy Mortality Rates (Appendix of *RP-2000 Mortality Tables Report*), set forward one year and projected from 2000 with rates derived from the long-range demographic assumptions from the 2015 Social Security Administration's Trustee Report.

Sample Base Rates (Rounded):

| Age | Active Male Participant | Male Regular Retiree | Male Disabled Retiree | Male Beneficiary |
|---|---|---|---|---|
| 45 | 0.15% | 0.19% | 0.59% | 0.20% |
| 55 | 0.30% | 0.77% | 1.15% | 0.86% |
| 65 | 0.76% | 1.82% | 2.93% | 1.91% |
| 75 | N/A | 4.77% | 7.82% | 4.51% |
| 85 | N/A | 12.64% | 19.98% | 12.81% |

| Age | Active Female Participant | Female Regular Retiree | Female Disabled Retiree | Female Beneficiary |
|---|---|---|---|---|
| 45 | 0.11% | 0.15% | 0.25% | 0.15% |
| 55 | 0.25% | 0.32% | 0.70% | 0.55% |
| 65 | 0.58% | 1.25% | 2.07% | 1.47% |
| 75 | N/A | 3.38% | 5.42% | 3.31% |
| 85 | N/A | 9.23% | 14.87% | 9.01% |

# Appendix A (continued)

## Summary of Economic and Demographic Actuarial Assumptions and Cost Method (continued)

***Disablement.***

| Sample Rates | | |
|---|---|---|
| Age | Male | Female |
| 30 | 0.05% | 0.06% |
| 40 | 0.11% | 0.21% |
| 50 | 0.34% | 0.43% |
| 60 | 1.00% | 0.77% |

***Withdrawal.***

| Sample Rates | | |
|---|---|---|
| | Years of Service | |
| Age | <6 | 6+ |
| 20 | 9.84% | 8.20% |
| 25 | 9.58% | 7.98% |
| 30 | 9.21% | 7.67% |
| 35 | 8.62% | 7.18% |
| 40 | 7.68% | 6.40% |
| 45 | 6.29% | 5.24% |
| 50 | 4.18% | 3.49% |
| 55 | 1.53% | 1.28% |
| 60 | 0.15% | 0.12% |

***Retirement Age.*** Percentage of employees eligible for retirement who retirement at each age:

Non-Emergency Employees:

| Age | <20 Years of Svc | 20+ Years of Svc | Age | <20 Years of Svc | 20+ Years of Svc |
|---|---|---|---|---|---|
| 50 | 4 | 4 | 62 | 20 | 25 |
| 51-54 | 3 | 3 | 63-64 | 20 | 20 |
| 55 | 3.5 | 3.5 | 65 | 20 | 25 |
| 56-57 | 3.5 | 3.5 | 66 | 40 | 40 |
| 58-59 | 3.5 | 5 | 67-69 | 50 | 50 |
| 60 | 6.5 | 12 | 70-74 | 70 | 70 |
| 61 | 10 | 20 | 75+ | 100 | 100 |

# Appendix A (continued)

## Summary of Economic and Demographic Actuarial Assumptions and Cost Method (continued)

Emergency Medical Services Employees:

| Age | |
|---|---|
| 50 | 3 |
| 51-54 | 3 |
| 55 | 40 |
| 56-57 | 20 |
| 58-59 | 20 |
| 60 | 20 |
| 61 | 20 |
| 62 | 40 |
| 63-64 | 40 |
| 65 | 100 |

***Marital Status.*** 80% of male participants and 65% of female participants are assumed to be married with female spouses assumed to be two years younger.

### III. Cost Method

Liabilities and costs were determined by the Entry Age Actuarial Cost Method.

### Changes in Assumptions Since the Last (1/1/2017) Valuation

None.

# Appendix B

## Summary of Plan Provisions as of January 1, 2019

The Summary of Plan Provisions below is included to clarify the basis of our actuarial valuation and is not meant to govern the operation of the Plan. The summary represents our understanding of the benefits provided by the Plan, based upon documentation provided by the Plan Sponsor and our understanding of the way in which the Plan Sponsor operates the Plan.

***Plan Year***. Twelve-month period beginning January 1 and ending December 31

***Plan Established***. May 28, 1915

**Principal Definitions**

***Member***. Any full-time employee of the City of Pittsburgh or full-time employee of the Pittsburgh Water and Sewer Authority hired before January 1, 2019. Employees of the City Bureau of Police or Firefighters are not eligible for participation in the Municipal Plan.

***Retirement Benefit Commencement Date***. Assumed to be the first day of the month coincident with or next following eligibility for and election to retire

***Service Increment***.

- Additional monthly benefit of 1.0% of average compensation for each completed year of service in excess of 20 years to a maximum of $100

***Service***. Completed years of service calculated from date of hire through date of retirement or severance

***Normal Form of Payment***. Monthly pension benefit payable for life

**Participation Requirements**

***Entry Date***. Date of hire, following 90-day probationary period

**Compensation**

- Base wages plus “acting” or “in-grade” pay

***Average Compensation***

- Compensation averaged over the 3-year period prior to retirement or severance
- For members hired after December 31, 1987, compensation averaged over the 4-year period prior to retirement or severance

# Appendix B (continued)

## Summary of Plan Provisions (continued)

### Normal Retirement

***Eligibility***.

- For Emergency Medical Services Employees - Later of age 55 or completion of 8 years of service
- For all other Employees - Later of age 60 or completion of 8 years of service

***Monthly Benefit***.

- Equal to 50% of average compensation plus service increment, if any
- Prorated for service less than 20 years
- Upon reaching Social Security Normal Retirement Age, benefit is reduced by 50% of social security benefit (offset). This reduction does not apply to all PWSA employees or EMS employees hired on or after January 1, 2006. City non-union employees and union employees, whose union negotiated to eliminate the offset, who were hired on or before June 29, 2004, will not be subject.

### Late Retirement

***Eligibility***. Employment beyond normal retirement

***Amount of Benefit***. Normal retirement benefit based upon average compensation as calculated at actual retirement

### Early Retirement

***Eligibility***. Later of age 50 or completion of 8 years of service

***Amount of Benefit***.

- Normal retirement benefit based upon average compensation as calculated at actual retirement
- May be deferred to age 60 or paid immediately, reduced by ½ percent per month for each month that payment commences prior to age 60

### Disability

***Eligibility***.

- Permanent disablement in line of duty or
- Permanent disablement (not in line of duty) after completing 8 years of service

***Benefit Amount***. Normal retirement benefit at time of disablement, not prorated for years less than 20. For participants hired after December 31, 1974, the benefit is offset for social security benefit upon reaching age 65. The reduction shall not exceed 50% of the total benefit

Appendix B (continued)

# Summary of Plan Provisions (continued)

***Benefit Commencement Date***.

- First day of calendar month following determination of disablement, and
- Continuing for the duration of disability prior to normal retirement date and life thereafter

**Vesting**

- Attainment of age 40 and completion of 8 years of service
- Normal retirement benefit if contributions continue to age 50
- Benefit deferred to age 60, a benefit reduced for early retirement may be elected at age 50

**Death Benefits**

- For death after early retirement eligibility, 50% of pension that would have been payable if member retired on date of death, payable to surviving spouse
- For death before early retirement eligibility, return of member's accumulated contributions to beneficiary

**Supplemental Medical**

- Only employees hired prior to January 1, 1988 are eligible
- Eligible retired members and spouses will receive an additional monthly benefit equal to coverage premium

**Employee Contributions**

- 5.0 percent of compensation if hired prior to January 1, 1988; 4.0% if hired on or after January 1, 1998
- For non-union employees and members of unions that negotiated for interest credit, who were hired before June 29, 2004 shall receive 5.0% interest per annum

## Changes Since Last (1/1/2017) Valuation

There have been no changes in Plan provisions since the last actuarial valuation.

# Appendix C

## Glossary

**Accrued Benefit.** The portion of the participant's retirement that is attributable to service completed before the calculation date. The calculation typically uses actual service as of the calculation date and may involve other factors such as average pay at the determination date and projected service through the retirement eligibility date.

**Act 205 of 1984.** Municipal Pension Plan Funding Standard and Recovery Act of December 18, 1984, P.L. 1005, No. 205. The Act control pension funding in Pennsylvania. This Act also provides for reporting of actuarial information and for a recovery program for qualifying municipalities.

**Actuarial Accrued Liability**. This is the plan's liability for all benefits accrued as of the valuation date. It includes the liability for all benefits currently payable to retired members (since such benefits are 100% accrued) plus the liability for benefits accrued by active members as of the valuation date, i.e., future benefit accruals, are not included.

**Actuarial Assumptions**. Factors used by the actuary to forecast future events. These factors include items relating to future economic conditions, the survival of the participants and their beneficiaries, and the length of employment.

**Actuarial Cost Method**. A means of assigning costs to periods of employment. This method is used to determine a funding level that will provide sufficient assets to pay benefits for each participant upon retirement. Act 205 specifies that the entry age normal cost method, as described in the Act, should be used for this determination.

**Actuarial Experience Gain or Loss**. The effect on the actuarial accrued liability of differences between events as predicted by the actuarial assumptions and those that actually occurred. This difference can increase or decrease the contribution in future years.

**Actuarial Present Value**. The lump sum value that is equivalent to an expected series of future payments. This value is determined by using the actuarial assumptions. An actuarial present value, as of the valuation date, represents the amount of funds that would be sufficient to provide the series of payments, if experience precisely matches the actuarial assumptions.

**Actuarial Value of Assets**. The value of current plan assets which is used by the actuary to evaluate the current funding status and determine future funding requirements. Under Act 205, a corridor limitation requires that this value be between 80 to 120 percent of the fair market value of the assets.

**Administrative Expenses**. This is an estimate of the administrative expenses that will be paid from plan assets. The average of the actual administrative expenses for the year preceding the valuation year and estimated administrative expenses for the valuation year is expressed as a percentage of active members' total payroll and this percentage is used to determine the plan's estimated administrative expense for the two years following the valuation year.

# Appendix C (continued)

## Glossary (continued)

**Amortization Payment**. The annual payment required to eventually eliminate the unfunded actuarial accrued liability according to the schedule established in Act 205.

**Amortization Requirement**. This is the additional contribution (i.e., in addition to the Normal Cost and Administrative Expenses) that will fund the plan's Unfunded Accrued Liability over the number of years prescribed by Act 205.

**"Fresh-Start" Amortization**. A process of taking the unfunded actuarial accrued liability at the valuation date and amortizing over a prescribed number of years, usually 30. This would replace the pre-existing amortization schedule and be used as the new amortization schedule going forward.

**Funded Ratio**. The actuarial value of assets divided by the actuarial accrued liability.

**Funding Adjustment**. If the plan has a surplus with regard to its Actuarial Accrued Liability, there is no Amortization Requirement. Rather, the plan's Financial Requirements are, in accordance with Act 205, reduced by an amount equal to 10% of the surplus. Note that the Funding Adjustment is equivalent to a negative Amortization Requirement. The 10% credit allowance is equivalent to amortizing the surplus over a period of approximately 17 years based on typical valuation interest rates.

**General Municipal Pension System State Aid**. Annually municipalities receive a portion of the insurance premium tax levied on casualty insurance companies headquartered outside of Pennsylvania. If they have paid Policefighters, they also receive a portion of the premium tax on out-of-state Police insurance companies. These taxes are distributed according to formulae contained in Act 205.

**Minimum Municipal Obligation**. The amount that must be contributed to a pension plan b a municipality for a given year. The calculation of this amount uses the normal cost, anticipated administrative expenses, amortization payment or funding adjustment, and anticipated employee contributions to determine a municipality's contribution requirement. General Municipal Pension System State Aid may be used to reduce the contribution.

**Normal Cost**. This is the portion of total plan liabilities for current active members assigned to a particular plan year. I may be thought of as the cost of benefits that will be accrued by active members during the year. The Normal Cost is expressed as a percentage of active members' total payroll in the valuation and this percentage is used to determine the Normal Cost for the two years following the valuation year.

**Present Value of Plan Benefits (PVB)**. This is the discounted value based on the valuation interest assumption) at the valuation date of all plan benefits expected to be paid on or after the valuation date. The amount of expected benefits and date of payment for a particular individual is determined by plan provisions and the valuation assumptions with regard to salary increases, mortality (i.e., life expectancy), turnover, disability, retirement, etc., i.e., any contingency which can affect the amount and timing of future benefit payments.

Appendix C (continued)

## Glossary (continued)

**Unfunded Actuarial Accrued Liability**. This is equal to the excess of the plan's Actuarial Accrued Liability over Valuation assets. Note that, if the Valuation Assets exceed the Actuarial Accrued Liability, the plan has a negative Unfunded Actuarial Accrued Liability, i.e., a surplus with regard to its Actuarial Accrued Liability.

**Valuation Assets**. This is the actuarial value of plan assets as of the valuation date. Valuation Assets are usually set equal to the fair market value of assets although assets are sometimes valued under a method that smooths the effect of market fluctuations.

**Vesting**. The participant's non-forfeitable right to receive a benefit, provided that the participant survives until benefit eligibility.

## Appendix D

# Debt Service Schedule by Plan Year Pension Bond Issue of December 15, 1996

| | Date of Original Borrowing | Total Principal Borrowed | Total Principal to this Plan | Percentage to this Plan | Date of Refinancing |
|---|---|---|---|---|---|
| | 12/15/1996 | $37,710,000.00 | $37,710,000.00 | 100% | N/A |
| Plan Year | Required Principal Payment | Required Interest Payment | Annual Debt Service | Premium or Discount Amortized | Principal Balance at Valuation Date |
| 1998 | | $1,834,529.78 | $1,834,529.78 | | $37,710,000.00 |
| 1999 | $525,000.00 | 2,564,976.25 | 3,089,976.25 | | 37,710,000.00 |
| 2000 | 560,000.00 | 2,533,905.00 | 3,093,905.00 | | 37,185,000.00 |
| 2001 | 590,000.00 | 2,499,965.00 | 3,089,965.00 | | 36,625,000.00 |
| 2002 | 630,000.00 | 2,463,050.00 | 3,093,050.00 | | 36,035,000.00 |
| 2003 | 670,000.00 | 2,423,065.00 | 3,093,065.00 | | 35,405,000.00 |
| 2004 | 715,000.00 | 2,379,772.50 | 3,094,772.50 | | 34,735,000.00 |
| 2005 | 760,000.00 | 2,332,930.00 | 3,092,930.00 | | 34,020,000.00 |
| 2006 | 810,000.00 | 2,282,285.00 | 3,092,285.00 | | 33,260,000.00 |
| 2007 | 865,000.00 | 2,227,631.25 | 3,092,631.25 | | 32,450,000.00 |
| 2008 | 925,000.00 | 2,169,008.75 | 3,094,008.75 | | 31,585,000.00 |
| 2009 | 985,000.00 | 2,106,210.00 | 3,091,210.00 | | 30,660,000.00 |
| 2010 | 1,055,000.00 | 2,038,890.00 | 3,093,890.00 | | 29,675,000.00 |
| 2011 | 1,125,000.00 | 1,966,950.00 | 3,091,950.00 | | 28,620,000.00 |
| 2012 | 1,200,000.00 | 1,890,225.00 | 3,090,225.00 | | 27,495,000.00 |
| 2013 | 1,285,000.00 | 1,808,220.00 | 3,093,220.00 | | 26,295,000.00 |
| 2014 | 1,375,000.00 | 1,717,690.00 | 3,092,690.00 | | 25,010,000.00 |
| 2015 | 1,475,000.00 | 1,617,940.00 | 3,092,940.00 | | 23,635,000.00 |
| 2016 | 1,580,000.00 | 1,511,015.00 | 3,091,015.00 | | 22,160,000.00 |
| 2017 | 1,695,000.00 | 1,396,390.00 | 3,091,390.00 | | 20,580,000.00 |
| 2018 | 1,820,000.00 | 1,273,365.00 | 3,093,365.00 | | 18,885,000.00 |
| 2019 | 1,950,000.00 | 1,141,415.00 | 3,091,415.00 | | 17,065,000.00 |
| 2020 | 2,095,000.00 | 998,792.50 | 3,093,792.50 | | 15,115,000.00 |
| 2021 | 2,250,000.00 | 844,545.00 | 3,094,545.00 | | 13,020,000.00 |
| 2022 | 2,415,000.00 | 678,937.50 | 3,093,937.50 | | 10,770,000.00 |
| 2023 | 2,590,000.00 | 501,260.00 | 3,091,260.00 | | 8,355,000.00 |
| 2024 | 2,780,000.00 | 310,625.00 | 3,090,625.00 | | 5,765,000.00 |

# Debt Service Schedule by Plan Year Pension Bond Issue of March 10, 1998

| | Date of Original Borrowing | Total Principal Borrowed | Total Principal to this Plan | Percentage to this Plan | Date of Refinancing |
|---|---|---|---|---|---|
| | 3/10/1998 | $255,865,000.00 | $57,569,624.42 | 22.3% | N/A |
| Plan Year | Required Principal Payment | Required Interest Payment | Annual Debt Service | Premium or Discount Amortized | Principal Balance at Valuation Date |
| 1998 | | $1,873,403.84 | $1,873,403.84 | $0 | $57,569,624.42 |
| 1999 | $225,000.00 | 3,740,451.43 | 3,965,451.43 | | 57,569,624.42 |
| 2000 | 225,000.00 | 3,727,795.18 | 3,952,795.18 | | 57,344,624.42 |
| 2001 | 225,000.00 | 3,715,071.43 | 3,940,071.43 | | 57,119,624.42 |
| 2002 | 225,000.00 | 3,702,111.43 | 3,927,111.43 | | 56,894,624.42 |
| 2003 | 225,000.00 | 3,689,050.18 | 3,914,050.18 | | 56,669,624 .42 |
| 2004 | 225,000.00 | 3,675,853.93 | 3,900,853.93 | | 56,444,624.42 |
| 2005 | 563,624.99 | 3,652,273.94 | 4,215,898.93 | | 56,219,624.42 |
| 2006 | 521,999.99 | 3,619,574.69 | 4,141,574.68 | | 55,655,999.43 |
| 2007 | 553,499.99 | 3,586,902.44 | 4,140,402.43 | | 55,133,999.44 |
| 2008 | 577,124.99 | 3,552,346.23 | 4,129,471.22 | | 54,580,499.45 |
| 2009 | 623,249.99 | 3,512,858.03 | 4,136,108.02 | | 54,003,374.46 |
| 2010 | 677,249.99 | 3,469,880.22 | 4,147,130.21 | | 53,380,124.47 |
| 2011 | 726,749.99 | 3,426,005.22 | 4,152,755.21 | | 52,702,874.48 |
| 2012 | 1,775,249.98 | 3,347,373.91 | 5,122,623.89 | | 51,976,124.49 |
| 2013 | 2,471,624.98 | 3,212,979.43 | 5,684,604.41 | | 50,200,874.51 |
| 2014 | 2,630,249.97 | 3,049,022.22 | 5,679,272.19 | | 47,729,249.53 |
| 2015 | 2,860,874.97 | 2,870,560.66 | 5,731,435.63 | | 45,098,999.56 |
| 2016 | 3,050,999.97 | 2,678,424.72 | 5,729,424.69 | | 42,238,124.59 |
| 2017 | 4,105,124.96 | 2,445,850.66 | 6,550,975.62 | | 39,187,124.62 |
| 2018 | 2,977,874.97 | 2,215,653.17 | 5,193,528.14 | | 35,081,999.66 |
| 2019 | 4,506,749.95 | 1,970,149.48 | 6,476,899.43 | | 32,104,124.69 |
| 2020 | 4,814,999.95 | 1,662,531.73 | 6,477,531.68 | | 27,597,374.74 |
| 2021 | 5,143,499.95 | 1,333,901.23 | 6,477,401.18 | | 22,782,374.79 |
| 2022 | 5,495,624.94 | 982,810.12 | 6,478,435.06 | | 17,638,874.84 |
| 2023 | 5,871,374.95 | 607,699.11 | 6,479,074.06 | | 12,143,249.90 |
| 2024 | 6,271,874.95 | 206,971.86 | 6,478,846.81 | | 6,271,874.95 |

# Appendix E

## Plan Maturity Measures

Assets are accumulated over participants' careers to pay future benefits. The natural growth of liabilities and assets is referred to as plan maturity. As the plan matures, the size of the plan grows relative to the active members' payroll and will cause changes in the assets or liabilities to have a larger effect on the Actuarially Recommended Contribution (ARC). The following table shows a history of the plan's maturity and the effect of a 1% change in plan assets or liabilities on the ARC.

| Actives Per Retirees | Ratio of Assets to Payroll | Effect on ARC of a 1% Change in Assets | Ratio of Actuarial Accrued Liability to Payroll | Effect on ARC of a 1% Change in Liability |
|---|---|---|---|---|
| 1.0 | 2.9 | $ 220,000 | 4.7 | $ 350,000 |