

# The General Retirement System of the City of Detroit

Annual Actuarial Valuation of Component II  
June 30, 2018



February 25, 2019

Board of Trustees  
The General Retirement System of the City of Detroit

Dear Board Members:

This report provides key results from the **Annual Actuarial Valuation** of the annuity and pension liabilities of the General Retirement System of the City of Detroit – Component II benefits. The date of the valuation was **June 30, 2018**.

The City of Detroit filed for bankruptcy on July 18, 2013. A final Plan of Adjustment (“POA”) was confirmed on November 7, 2014 and the official exit from bankruptcy was on December 10, 2014. In connection with the POA, very significant changes were made to the benefits that the General Retirement System provides and to the contributions that it will receive. In particular, the benefits provided by the Retirement System were divided into two separate plans, referred to as “Component I” and “Component II.” The benefits provided in each component are effective July 1, 2014 and are described in detail in Emergency Manager Order No. 44, dated December 8, 2014. In very general terms, Component I provides benefits for service rendered on and after July 1, 2014 and Component II provides benefits for service rendered prior to July 1, 2014.

The results provided herein relate solely to the Component II benefits. Component I benefits will be the subject of a separate report. The purposes of the valuation are to measure the funding progress of Component II in accordance with the terms of the POA and to provide illustrative actuarially determined contribution amounts, given POA conditions and assumptions for Fiscal Year 2020 for Component II, for comparison with the contribution amounts provided in the POA. The results of the valuation are not applicable for other purposes. In particular, the information provided in this report is not suitable for financial reporting in connection with GASB Statement No. 67. Such information is provided in a separate report. Information regarding potential benefit restoration as allowed for in the POA will also be provided in a separate report, at the Board’s request.

The contribution amounts on page 4 include POA stipulated contributions plus two illustrative contribution amounts from alternate funding policies. Users of this report should be aware that contributions made at these amounts do not guarantee benefit security.

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report.

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

The valuation was based upon records maintained and furnished by the Retirement System staff concerning active members, retirees and beneficiaries, and financial accounts as of the valuation date. Data was checked for year-to-year consistency, but was not audited by the actuary. We are not responsible for the completeness or accuracy of the data. Certain necessary data was not available in time to be considered in this report and, therefore, it was necessary for us to use approximations. Please see related discussion in the Comments section as well as the Data section of this report.

The assumptions used in the valuations concerning future experience are summarized in Section D of this report. Except for the assumed rate of investment return, the actuarial assumptions used for the valuation are set by the Board based upon advice of the actuary and other parties. The assumed rate of investment return was set to 6.75% in the POA and is, therefore, a “prescribed assumption set by another party” as discussed in Actuarial Standard of Practice No. 4. In our judgement, all of the actuarial assumptions used for the valuation are reasonable for purposes of the measurement being made.

This report has been prepared by individuals who have substantial experience valuing public sector retirement systems. To the best of our knowledge, this report is complete and accurate and was made in accordance with Actuarial Standards of Practice promulgated by the Actuarial Standards Board.

The signing individuals are independent of the plan sponsor.

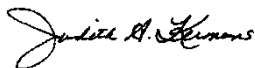
David T. Kausch and Judith A. Kermans are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

This report does not evaluate the plan sponsor’s ability or willingness to make contributions to the Retirement System. Given the funded level of Component II, plan sponsor contributions are critical if further benefit reductions are to be avoided. Indeed, the employer contributions set forth in the POA are expected to lead to a decrease in the funded status through June 30, 2023 (as contemplated by the POA), even if all assumptions are met.

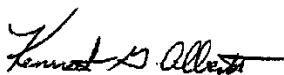
Respectfully submitted,



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# Table of Contents

	<u>Page</u>
<b>Section A</b>	<b>Valuation Results</b>
	Principle Valuation Results ..... 1-5
	POA Liability and Funded Ratio..... 6
	Solvency Liability ..... 6
	Comments ..... 7-15
	POA Liability by Division..... 16
<b>Section B</b>	<b>Fund Assets</b>
	Statement of Plan Assets ..... 17
	Market Value of Assets ..... 18
	Allocation of Assets Used for Valuation..... 19
<b>Section C</b>	<b>Participant Data</b>
	Reconciliation of Raw Data ..... 20
	Active Member Data and Assumptions Included in Valuation ..... 21-25
	Retiree and Beneficiary Data Included in Valuation ..... 26-27
<b>Section D</b>	<b>Methods and Assumptions</b> ..... 28-34
<b>Section E</b>	<b>Plan Provisions</b> ..... 35-37
<b>Section F</b>	<b>Glossary</b> ..... 38-39

## **SECTION A**

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### **VALUATION RESULTS**

## Valuation Results

Required contributions to the Plan through FY 2023 are provided in the POA. Certain agreements (as allowed for in the POA) have resulted in some of the contributions being accelerated. The schedule below details our understanding of the remaining contributions required by the POA.

### Contribution Source (\$ millions)

Fiscal Year	For DWSD Liabilities		For Other Liabilities					Total
	DWSD	Transfers	UTGO	State	DIA	Transfers from		
						Other	DWSD	
<b>2019</b>	45.4	(2.5)	-	-	0.4	22.5	2.5	68.3
<b>2020</b>	45.4	(2.5)	-	-	0.4	2.5	2.5	48.3
<b>2021</b>	45.4	(2.5)	-	-	0.4	2.5	2.5	48.3
<b>2022</b>	45.4	(2.5)	-	-	0.4	2.5	2.5	48.3
<b>2023</b>	45.4	(2.5)	-	-	0.4	2.5	2.5	48.3

We have assumed the contributions outlined above as called for in the POA (with adjustments) will not change. An estimate of the probability of those payments being made was outside the scope of this project, not required by Actuarial Standards, and was not made.

In order to develop divisional valuation results in accordance with POA provisions, we allocated the above contributions to the various divisions as instructed by the Retirement System staff. This was done by allocating DWSD transfer amounts to the General City division and remaining DWSD contributions to the DWSD division; allocating \$2.5 million per year to the Library; and allocating remaining contributions to DOT and General in proportion to their unfunded liabilities.

The chart below shows this allocation.

	General	D.O.T.	Subtotal	Library	DWSD	Totals
	\$ Thousands					
<b>Unfunded Liabilities</b>	\$ 500,083	\$ 244,736	\$ 744,819	\$ 13,978	\$ 229,641	\$ 988,438
% of Subtotal	67.1%	32.9%	100.0%	N/A	N/A	
FY 2019 Contributions	\$ 13,680	\$ 6,695	\$ 20,375	\$ 2,500	\$ 45,400	\$ 68,275
Transfers	\$ 2,500	\$ -	\$ 2,500	\$ -	\$ (2,500)	\$ -
<b>FY 2019 UAAL Contributions</b>	<b>\$ 16,180</b>	<b>\$ 6,695</b>	<b>\$ 22,875</b>	<b>\$ 2,500</b>	<b>\$ 42,900</b>	<b>\$ 68,275</b>

A different allocation procedure would produce different results. If a different allocation procedure should be used, please let us know and we will revise this report.

## Valuation Results (Continued)

### Unfunded Actuarial Accrued Liability (UAAL)<sup>+</sup>

	(\$ millions)				
	General City	D.O.T.	DWSD	Library	System Total
UAAL as of June 30, 2018	\$ 500.1	\$ 244.7	\$ 229.6	\$ 14.0	\$ 988.4
Anticipated POA Contribution (EOY)	16.2	6.7	42.9	2.5	68.3
Anticipated Expenses@	-	-	-	-	-
Interest at 6.75%	33.8	16.5	15.5	0.9	66.7
Projected UAAL as of June 30, 2019	\$ 517.7	\$ 254.6	\$ 202.2	\$ 12.4	\$ 986.9
<b>Anticipated POA Contributions for FY2020</b>	<b>2.7</b>	<b>0.1</b>	<b>42.9</b>	<b>2.5</b>	<b>48.2</b>
<b>Estimated Employer Contributions for FY 2024 #!</b>					
<b>Alternate 1:Level Principal</b>	<b>\$ 66.6</b>	<b>\$ 33.3</b>	<b>\$ 7.3</b>	<b>\$ 0.5</b>	<b>\$ 107.7</b>
<b>Alternate 2:Level Dollar##</b>	<b>\$ 51.9</b>	<b>\$ 25.9</b>	<b>\$ 5.7</b>	<b>\$ 0.4</b>	<b>\$ 83.9</b>

Totals may not add due to rounding.

+ Unfunded Actuarial Accrued Liability.

@ In accordance with Plan Document, the mandated 6.75% rate of return is net of investment and administrative expenses.

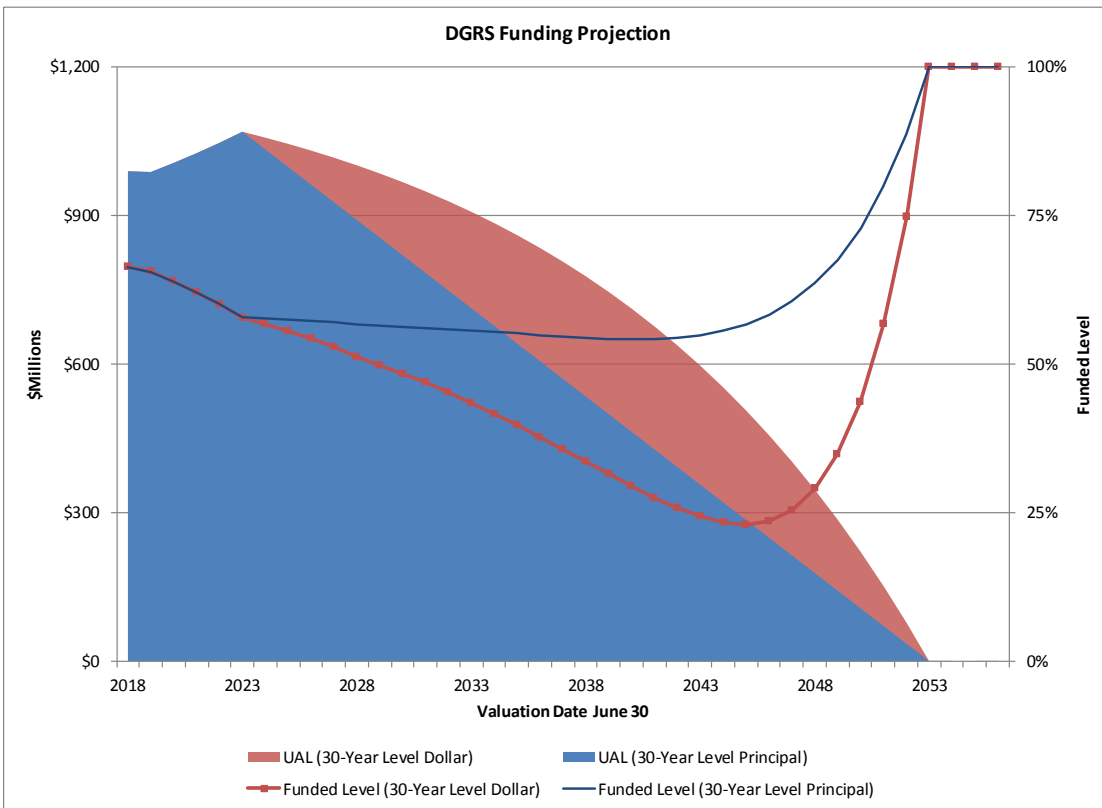
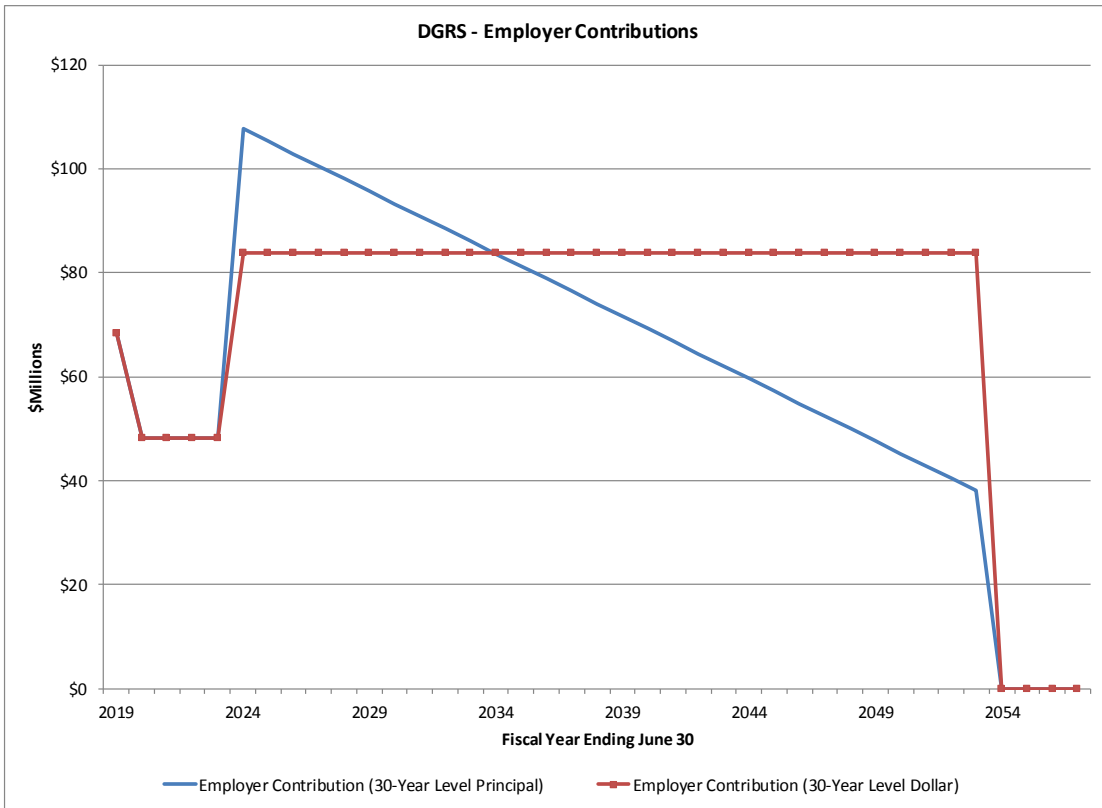
# Assuming the POA contributions through 2023 and a 30-year closed amortization thereafter. When determining the Fiscal Year 2024 illustrative amounts, only the total contributions and the DWSD contributions are stipulated in the POA. The remaining amounts were allocated to the other groups as described on page 1. A different allocation would result in different results by group.

! Total employer contributions, including amounts paid by employer but funded from other sources as required by POA.

## Contributions at this level may not be sufficient to prevent fund depletion prior to satisfaction of all liabilities. Included at System's request.

The POA contributions result in a defunding of the plan between now and June 30, 2023, which was contemplated by the POA. In fact, the anticipated POA contributions do not project benefit restoration even if all assumptions are met (including the POA mandated assumed rate of return of 6.75%). Also, the 2020 to 2023 contributions are less than the amount of nominal interest that accrues on the UAAL. The Estimated Employer Contribution for FY 2024 is based on a projection of results assuming only the POA contributions are made and all future experience between the valuation date and FY 2024 is as assumed. Actual experience will result in changes to this estimate and the final result (from the June 30, 2022 actuarial valuation) could be materially different than shown above.

We understand that the City has set aside additional money to be contributed to the pension plans in the future. This potential additional contribution has not been taken into account in this valuation.



Notes: 30-year amortization periods are assumed to begin in FY 2024.

30-year level dollar may result in fund depletion and pay-as-you-go funding before the end of the 30-year period.



## Valuation Results (Continued)

We have recommended that the Board establish a funding policy for the contribution determinations on and after fiscal year 2024. The Board has accepted this recommendation and has begun the process. Once that process has been completed we will incorporate the adopted policy into future valuation reports. Until that process is completed, we will continue to show the following two possible policies.

In the chart below, the first policy funds the UAAL over the expected remaining active service life of this group. The second policy is similar to the Board’s pre-bankruptcy policy, but with accelerated principle payments of the UAAL to prevent insolvency prior to the end of the funding period. The illustrations are intended to show that there are a broad range of possible funding policies, but are not intended to provide a specific recommendation or a minimum or maximum level of contributions.

**Funding Policy 1** is based on amortizing the UAAL over the average remaining service life of active members (7 years for general; 6 years for DOT; 7 years for DWSD; and 7 years for Library) using level dollar amortization.

**Funding Policy 2** is based on amortizing the UAAL with level principal payments over a closed 30-year period plus interest. This method is also known as level principal declining interest amortization.

### Illustrative Contribution Shortfall

	(\$ millions)				
	General City	D.O.T.	DWSD	Library	System Total
(1) Illustrative Contribution for FY 2020 (Funding Policy 1)	\$ 95.2	\$ 53.0	\$ 37.2	\$ 2.3	\$ 187.7
(2) Illustrative Contribution for FY 2020 (Funding Policy 2)	52.2	25.7	20.4	1.3	99.5
(3) Actual Contributions for FY 2020 (POA)	2.7	0.1	42.9	2.5	48.2
Fiscal Year 2020 Shortfall - Funding Policy 1: (1) - (3)	\$ 92.5	\$ 52.9	\$ (5.7)	\$ (0.2)	\$ 139.5
Fiscal Year 2020 Shortfall - Funding Policy 2: (2) - (3)	\$ 49.5	\$ 25.6	\$ (22.5)	\$ (1.2)	\$ 51.3

**We understand the Employer continues to set aside money in a separate account to contribute to the Pension Plans in the future. Since the account is outside of the trust fund and the portion of the fund this Plan will receive has not been determined, we have not taken those assets into account in our calculations. We commend the Employer for taking proactive steps to manage the estimated increase in funding requirements beginning in FY 2024. In the meantime, we recommend continued consideration of increasing contributions actually deposited into the trust.**

In addition, as the Board works through the funding policy, we would suggest considering a funding period less than 30 years. Given the fact that not all of the retiree liabilities are funded, a period of 15 years or less should be considered.

## Valuation Results (Concluded)

Present Value	June 30, 2018	June 30, 2017
<b>Accrued Pension Liabilities (Employer Financed)</b>		
Retirees and beneficiaries	\$2,137,530,791	\$2,182,334,703
Inactive members future deferred pensions	262,312,745	269,387,584
Active members	312,344,059	311,667,455
<b>Total accrued pensions</b>	<b>2,712,187,595</b>	<b>2,763,389,742</b>
Pension fund balances	1,835,845,241	1,839,375,685
Unfunded accrued pension liabilities	\$ 876,342,354	\$ 924,014,057
<b>Accrued Annuity Liabilities (Member Financed)</b>		
Retirees and beneficiaries Future annuities	\$ 108,453,718	\$ 111,482,100
Member annuities & future refunds	108,420,640	120,921,554
<b>Total accrued annuity liabilities</b>	<b>216,874,358</b>	<b>232,403,654</b>
Annuity fund balances	104,778,401	127,353,290
Unfunded accrued annuity liabilities*	\$ 112,095,957	\$ 105,050,364
<b>Totals</b>		
<b>Actuarial Accrued Liabilities</b>	<b>\$2,929,061,953</b>	<b>\$2,995,793,396</b>
<b>Market Value of Assets</b>	<b>1,940,623,642</b>	<b>1,966,728,975</b>
<b>Unfunded Actuarial Accrued Liabilities</b>	<b>\$988,438,311</b>	<b>\$1,029,064,421</b>

\* Liabilities are gross before accounting for ASF claw-back. Assets currently include a receivable of approximately \$104.9 million related to the ASF claw-back. We believe the receivable is included in the Pension fund balances.

## Funded Ratio - POA

	Defined Benefit	ASF	Total
A Actuarial Accrued Liability	\$2,820,641,313	\$108,420,640	\$2,929,061,953
B Market Value of Assets	\$1,832,203,002	\$108,420,640	\$1,940,623,642
C Unfunded Actuarial Accrued Liability (A-B)	\$988,438,311	\$ 0	\$988,438,311
D Funded Ratio (B/A)	65.0%	100.0%	66.3%

The **POA Funded Ratio** measurement above is an expected return-based measurement of the pension obligation. It is based upon the mandated 6.75% interest rate assumption (assumption prescribed by another party). It determines an amount that will be sufficient to provide benefits if the portfolio earns the expected 6.75% return on assets and all other assumptions are met. This measure is appropriate for assessing the need for or amount of future contributions (if all assumptions are met). This measure is not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligation, in other words, of transferring the obligation to a third party in a market value type transaction.

## Funded Ratio - Solvency

	Defined Benefit	ASF	Total
A Market-Based Liability	\$3,860,731,601	\$108,420,640	\$3,969,152,241
B Market Value of Assets	\$1,832,203,002	\$108,420,640	\$1,940,623,642
C Unfunded Actuarial Accrued Liability (A-B)	\$2,028,528,599	\$ 0	\$2,028,528,599
D Funded Ratio (B/A)	47.5%	100.0%	48.9%

The Solvency Funded Ratio is a market-based measurement of the pension obligation. It estimates the amount the plan would need to invest in low risk securities to provide the benefits with greater certainty. For this purpose, the solvency liability is computed at 3.62% interest as of June 30, 2018, based on the long-term municipal bond rate ("20-Year Municipal GO AA Index" rate from the Fidelity Index as of June 29, 2018). We are not able to assess the credit quality of the plan sponsor and, as such, no adjustment has been made for the credit quality of the plan sponsor. This measure may not be appropriate for assessing the need for or amount of future contributions. This measure may not be appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligation.

**The difference between the two measures (POA and Solvency) is one illustration of the savings the sponsor anticipates by taking on the risk in a diversified portfolio.**

## Comments

### Experience

Experience was more favorable than assumed during the year ending June 30, 2018. The chart below shows the estimated gain by division.

### Development of Actuarial Gain/(Loss)

	(\$ millions)				
	General City	D.O.T.	DWSD	Library	System Total
(1) UAAL as of June 30, 2017 (BOY)	\$ 508.9	\$ 235.6	\$ 266.9	\$ 17.6	\$ 1,029.1
(2) Actual POA Contribution (EOY)	22.8	0.1	42.9	2.5	68.3
(3) Interest at 6.75%	34.4	15.9	18.0	1.2	69.5
(4) Projected UAAL* as of June 30, 2018	\$ 520.5	\$ 251.4	\$ 242.1	\$ 16.3	\$ 1,030.3
(5) Actual UAAL* as of June 30, 2018	500.1	244.7	229.6	14.0	988.4
Gain (Loss): (4) - (5)	\$ 20.5	\$ 6.7	\$ 12.4	\$ 2.3	\$ 41.9
Gain (Loss) From Investments	\$ 21.1	\$ 3.9	\$ 11.7	\$ 1.3	\$ 38.0
Gain (Loss) From Liabilities	\$ (0.6)	\$ 2.7	\$ 0.7	\$ 1.0	\$ 3.9

\* Unfunded actuarial accrued liability.

### Source of Actuarial Gain/(Loss)

Type of Risk Area	Gain (Loss) in Period	
	Totals (\$ in millions)	Percent of Liabilities
<b>Data Improvements*</b>	(4.8)	(0.2)%
<b>Risks Related to Assumptions</b>		
<b>Economic Risk Areas:</b>		
<b>Investment Return</b>	38.0	1.3 %
<b>Demographic Risk Areas:</b>		
<b>Full and Reduced Service Retirements</b>	8.5	0.3 %
<b>Death Benefits^</b>	0.1	0.0 %
<b>Disability Benefits</b>	(0.3)	0.0 %
<b>Other Terminations</b>	0.4	0.0 %
<b>Post-Retirement Mortality</b>	0.0	0.0 %
<b>Total Gain (or Loss) Related to Assumptions</b>	46.7	1.6 %
<b>Total Gain (or Loss) During Period</b>	41.9	1.5 %
<b>Beginning of Year Accrued Liabilities</b>	2,874.9	100.0 %

\* Including adjustments to modeling as a result of improved data.

^ Estimate may not be accurate due to limitations related to the data provided.

## Comments (Continued)

### Experience (Continued)

The estimated FY 2024 contributions are very sensitive to changes in year-to-year experience. The chart below reconciles our estimate from the June 30, 2017 valuation to our estimate from this valuation (June 30, 2018).

#### Reconciliation of Projected June 30, 2024 Contributions – Level Principal

	(\$ millions)				
	General City	D.O.T.	DWSD	Library	System Total*
Estimated FY 2024 Employer Contribution (Level Principal) from 6/30/17 Valuation	\$ 70.3	\$ 33.4	\$ 9.1	\$ 0.8	\$ 113.5
Experience Gain (Loss) of \$41.9 Million	(2.9)	(0.9)	(1.7)	(0.3)	(5.8)
Modified Contributions (see below)	-	-	-	-	-
Actual FY 2018 Contribution above/(below) Expected	(0.9)	0.9	-	-	-
Estimated FY 2024 Employer Contribution (Level Principal) from 6/30/18 Valuation	\$ 66.5	\$ 33.3	\$ 7.3	\$ 0.5	\$ 107.7

\*Totals may not add due to rounding.

#### Reconciliation of Projected June 30, 2024 Contributions – Level Dollar

	(\$ millions)				
	General City	D.O.T.	DWSD	Library	System Total*
Estimated FY 2024 Employer Contribution (Level Dollar) from 6/30/17 Valuation	\$ 54.8	\$ 26.0	\$ 7.1	\$ 0.6	\$ 88.5
Experience Gain (Loss) of \$41.8 Million	(2.2)	(0.7)	(1.4)	(0.2)	(4.6)
Modified Contributions (see below)	-	-	-	-	-
Actual FY 2018 Contribution above/(below) Expected	(0.7)	0.7	-	-	-
Estimated FY 2024 Employer Contribution (Level Dollar) from 6/30/18 Valuation	\$ 51.8	\$ 26.0	\$ 5.7	\$ 0.4	\$ 83.9

\*Totals may not add due to rounding.

### Demographic Experience

	Number Count		
	Actual	Expected	A/E%
	A	E	
Retirement (including early)	78	234	33%
Disability	0	20	0%
Vested Terminations	138	59	234%
Other Terminations (including pre-retirement death)	94	51	185%
Post-Retirement Death	444	447	99%

### Retirements

Retirements were less than half the number expected. If this is an anomaly this year, it might result in losses in future years.

## Comments (Continued)

### New Members

We continue to see active members added to the Legacy data. We have assumed these were either data corrections or re-hires. We have observed this every year since 2014. The annual addition has been around 200-300 members each year. The change this year is included in the “Data Improvements” source of losses on page 7.

### ASF Claw-Back Data

For the June 30, 2015 valuation, the Systems auditors determined a receivable in accordance with GAAP accounting that was included in the reported June 30, 2015 assets. The reported assets for the June 30, 2018 status valuation also included a receivable for the remaining claw-back payments. While we did not audit any of the assets, we reviewed the change in this receivable for reasonableness.

### Annuity Reserve Fund (ARF)

In general, assets were reviewed for reasonableness. During that review, we discovered that the ARF was not credited any interest. As a result, we recommend that all the reserve amounts be reviewed.

### Plan Provisions

Section B-1 (b) of the plan provides that members who terminate employment and are subsequently rehired before incurring a six-year break in service are eligible to earn additional vesting and eligibility service under the plan. For purposes of this valuation, we have assumed no terminated members are rehired.

### Great Lakes Water Authority (GLWA) Members

The Retirement System does not currently identify GLWA employees. The DWSD division had a large number of terminations in 2016. We have discussed with the Board’s legal counsel whether or not GLWA employees are considered active members for purposes of Component II and do not have a definitive answer. We have treated these numbers as terminated members who are entitled to either a vested deferred benefit or a refund of ASF contributions. We recommend the Board’s legal counsel research this point. If it is determined that these members are still active and are continuing to earn vesting and eligibility service under the plan, then we recommend the Retirement System work with GLWA to identify these members.

For this valuation (6/30/2018) we received a separate file indicating the June 30, 2014 DWSD status of members. Any members that were indicated as being DWSD division members on that file were valued under the DWSD for this valuation, regardless of the division reported on the main valuation data (which we understand to be the division as of June 30, 2018 in the Component I plan).

## Comments (Continued)

### Allocation of Contributions between General and DOT

Our understanding of the allocation of contributions between General and DOT is discussed on page 1 of this report. Based on the reported assets, a different allocation method appears to have been used in FY2018. If the System supplies us with this asset method actually used, we can incorporate that method in future valuations.

### Annuity Savings Fund (ASF) Interest Credits

The ASF fund is credited with the lesser of 5.25% interest and the total fund earnings. We understand that any earning in excess of 5.25% (that otherwise would have been credited to the ASF fund if not for the 5.25% cap) will be transferred to Component I assets, to the extent needed, for funding of transition liability. Since ASF liabilities are equal to ASF balances, we did not model any such future excess earnings as part of this valuation. However, since the fund earned approximately 11% during FY 2017 and approximately 9% during FY 2018, we expect that there will be a transfer of excess ASF interest in FY 2019 and FY 2020 related to this year's performance. Approximately \$9.9 million was added to the liabilities in this report to account for anticipated excess earnings expected to occur as a result of return on assets in the 2017 and 2018 fiscal year. We have discussed this additional liability with the Plan's accountants and have been instructed that the excess earnings should not be included as a liability in the GASB 67 and 68 reports.

## Comments (Continued)

### Estimated Excess Interest Transfers

Fiscal Year Transfer is Expected	ASF Balance BOY	Assumed ASF Payment	ASF Balance EOY	FY 2 Years Prior to Transfer		Investment Return Excess Percent	ASF Return Excess	Estimated Component I Transition Cost	Funded Status	Resulting Percent Transfer	Assets to be Trasferred Out (BOY)
				Year	Estimated Return						
(A)	(B)	(C)	(D)	(E)	(F)	(G) = (F) - 5.25%	(H) = (G) x (B)	(I)	(J)	(K) = (H) x (J)	(K) = (H) x (J)
2019	\$ 108,420,640	\$ 13,852,954	\$ 99,900,781	2017	11.45%		\$ 6,722,080	<100%	100%	\$ 6,722,080	\$ 6,722,080
2020	99,900,781	13,852,954	90,933,630	2018	8.64%		3,386,636	<100%	100%	3,386,636	3,386,636

We understand this calculation will be performed by staff and may be different than shown above. The estimates above are used to approximate the effect on UAAL.

Section E-16(c) of the Combined General Plan is shown below:

*In any Plan Year during the period beginning on or after July 1, 2014 and ending June 30, 2023 in which the annual rate of return credited to the accounts of members investing in the Annuity Savings Fund as provided in paragraph (b) is less than the actual rate of return net of expenses of the Retirement System's invested assets for the second Plan Year immediately preceding the Plan Year in which the annual rate of return is credited ("ASF Return Excess"), an amount equal to the value of the ASF Return Excess shall be transferred to the Pension Accumulation Fund maintained under Component I of the Combined Plan and shall be used to fund the Transition Cost relating to Component I. The Transition Cost is a measure of the liability that Component I of the Retirement System has at its inception; due to the fact that at its inception, members in Component I of the Retirement System receive vesting and eligibility credit under Component I for service that was earned prior to July 1, 2014 and is otherwise credited to members under Component II of the Retirement System. Transition Cost is calculated by the Plan Actuary. In the event there is an ASF return excess for a Plan Year following the Plan Year in which such transfers have fully funded the Transition Costs relating to Component I, fifty percent (50%) of such ASF Return Excess shall be transferred to the Pension Accumulation Fund maintained under Component II and the remaining fifty percent (50%) of such ASF Return Excess shall be transferred to Component I and credited to the Rate Stabilization Fund maintained under Component I. "Transition Cost" shall be determined by the Plan Actuary.*



## Comments (Continued)

### Risks Associated with Measuring the Accrued Liability and Actuarially Determined Contribution

The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

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

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

1. Investment risk – actual investment returns may differ from the expected returns;
2. Asset/Liability mismatch – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. Contribution risk – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. Salary and Payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. Longevity risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed;
6. Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

The timely receipt of the actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

## Comments (Continued)

### Plan Maturity Measures

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures include the following:

	2018
Ratio of the market value of assets to total payroll*	7.4
Ratio of actuarial accrued liability to payroll*	11.1
Ratio of actives to retirees and beneficiaries	0.2
Ratio of net cash flow to market value of assets	-9.5%
Duration of the actuarial accrued liability	8.9

*\*Payroll for this purpose is Component I payroll of \$263.3 million.*

#### Ratio of Market Value of Assets to Payroll

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 2.0 times the payroll, a return on assets 5% different than assumed would equal 10% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

#### Ratio of Actuarial Accrued Liability to Payroll

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

The ratio of liability to payroll may also be used as a measure of sensitivity of the liability itself. For example, if the actuarial accrued liability is 2.5 times the payroll, a change in liability 2% other than assumed would equal 5% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

## Comments (Continued)

### Ratio of Actives to Retirees and Beneficiaries

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

### Ratio of Net Cash Flow to Market Value of Assets

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make benefits payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

### Duration of Actuarial Accrued Liability

The duration of the actuarial accrued liability may be used to approximate the sensitivity to a 1% change in the assumed rate of return. For example, duration of 10 indicates that the liability would increase approximately 10% if the assumed rate of return were lowered 1%.

### Additional Risk Assessment

The Solvency Liability shown on page 6 may be considered as a risk assessment. Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, and stress tests. We included additional risk assessments in the funding policy discussions based on the 2017 actuarial valuation. We can update those at the Board's request.

### Census Data and Approximations

Data was reported separately for Component I and Component II. Additional time was needed to reconcile these two data sets as they came from different source data. Processing time for the valuation could be shortened if data for future valuations is reconciled before being provided to GRS. We would be happy to work with the Retirement System staff to help them provide the information that is needed for the valuation. Additional information about the data approximations and assumptions may be found on page 21.

### Actuarial Assumptions

The Retirement System routinely has five-year experience studies in accordance with the City ordinance. The last experience study for the period from July 1, 2007 through June 30, 2012 was started but not completed due to the bankruptcy. We conducted a review of the mortality experience in 2013. We recommend that the System consider the experience study schedule. The next experience study would be scheduled for the period from July 1, 2012 through June 30, 2017. However, in order to avoid distortions from the bankruptcy, the next experience study could be scheduled to begin just after the City emerged from bankruptcy. This, however, would suggest a study based on the period July 1, 2015 through June 30, 2020. We understand the Board has chosen to follow this suggestion and has scheduled the next experience study to begin subsequent to the June 30, 2020 valuation.

## Comments (Concluded)

### Restoration

This valuation assumes no future restoration of Component II benefits (consistent with the expectation of the POA). Any future restoration will be reflected beginning in the next valuation after being granted.

### DWSD (Water/Sewer) Projections

Based on this valuation, the DWSD (Water/Sewer) division is not expected to be fully funded by 2024. As a result, their contributions will continue to be needed in FY 2024 (see page 2 for estimated FY 2024 contributions) to fund DWSD liabilities.

### Future Results

FY 2019 investment performance has been extremely volatile. At the end of the second quarter, national indexes were mostly negative. If the Retirement System's experience is similar and the trend continues for the remainder of this year, this will result in downward pressure on the funded status and upward pressure on the FY 2024 contribution requirement estimates (above what is shown in this report).

The POA mandated contributions for FY 2019 and beyond are expected to defund the Retirement System, even if all assumptions are realized. In FY 2019, the POA mandated contributions are slightly more than the interest on the projected UAAL. In FY 2020 through FY 2023, the POA mandated contributions are expected to be approximately 70% of the interest on the projected UAAL. This defunding was contemplated in the POA.

### Recommendation

**We recommend that every potential action be taken to generate contributions to the Retirement System above those provided in the POA. Benefit payments to retirees in the Plan were almost \$240 million compared to FY 2018 contribution of \$68.3 million. See benefit projections on page 22.**

### Prior Recommendation

We understand that the Retirement System has undergone a service and AFC audit on active member data in lieu of computing frozen accrued benefits.

### Prior Recommendation

The Board is currently working on the development of a funding policy for FY 2024 and beyond.

### Conclusion

The funded status of the plan improved this year from 65.6% to 66.3% as a result of investment performance.

## Liability by Division - POA

(\$Thousands)

	General	D.O.T.	DWSD	Library	Totals
<b>Accrued Pension Liabilities</b>					
Retirees and beneficiaries	\$1,166,962	\$300,662	\$612,183	\$ 57,724	\$2,137,531
Inactive members future deferred pensions	139,854	33,967	83,184	5,308	262,313
Active members	172,220	78,692	37,358	24,074	312,344
<b>Total accrued pension liabilities</b>	<b>1,479,036</b>	<b>413,321</b>	<b>732,725</b>	<b>87,106</b>	<b>2,712,188</b>
Pension fund balances	1,042,312	177,771	538,396	77,367	1,835,846
Unfunded accrued pension liabilities	436,724	235,550	194,329	9,739	876,342
<b>Accrued Annuity Liabilities</b>					
Retirees and beneficiaries#	60,706	9,842	34,487	3,419	108,454
Members annuities & future refunds	54,566	30,853	15,158	7,843	108,420
<b>Total accrued annuity liabilities</b>	<b>115,272</b>	<b>40,695</b>	<b>49,645</b>	<b>11,262</b>	<b>216,874</b>
Annuity fund balances	51,914	31,509	14,332	7,023	104,778
Unfunded accrued annuity liabilities#	63,358	9,186	35,313	4,239	112,096
<b>Totals</b>					
<b>Actuarial Accrued Liabilities</b>	<b>1,594,308</b>	<b>454,016</b>	<b>782,370</b>	<b>98,368</b>	<b>2,929,062</b>
<b>Accrued Assets</b>	<b>1,094,226</b>	<b>209,280</b>	<b>552,728</b>	<b>84,390</b>	<b>1,940,624</b>
<b>Funded Ratio</b>	<b>68.6%</b>	<b>46.1%</b>	<b>70.6%</b>	<b>85.8%</b>	<b>66.3%</b>
<b>Unfunded Actuarial Accrued Liabilities</b>	<b>\$ 500,082</b>	<b>\$244,736</b>	<b>\$229,642</b>	<b>\$ 13,978</b>	<b>\$988,438</b>

Totals may be off slightly due to rounding.

# Liabilities are shown gross, before the annuity savings claw-back. The pension fund balance includes a receivable of approximately \$104.9 million for future claw-back payments.

**SECTION B**

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**FUND ASSETS**

## Statement of Plan Assets (Reported Assets at Market Value)

<b>Market Value - June 30, 2018</b>	
Cash and Cash Equivalents	\$ 179,460,709
Investments at Fair Value	1,668,833,586
Receivables	111,876,197
Cash and Investments held as collateral for securities lending	80,544,567
Capital Assets- Net	550,318
Accounts Payable	(100,641,735)
<b>Total Current Assets</b>	<b>\$ 1,940,623,642</b>

## Market Value of Assets

### Reserve Accounts (Market Value)

Funds	Fund Balances	
	June 30, 2018	June 30, 2017
Annuity Savings	\$ 108,420,640	\$ 120,921,554
Annuity Reserve	(3,642,239)	6,431,736
Pension Accumulation	(117,705,957)	(122,691,271)
Pension Reserve	1,953,551,198	1,962,066,956
<b>Total Fund Balances</b>	<b>\$ 1,940,623,642</b>	<b>\$1,966,728,975</b>

### Revenues and Expenditures (Market Value)

	Pension Funds	Annuity Funds	Total Funds
Balance, July 1, 2017	\$1,839,375,685	\$127,353,290	\$1,966,728,975
Prior valuation audit adjustment	(1)	1	0
Market Value July 1, 2017	\$1,839,375,684	\$127,353,291	\$1,966,728,975
<b>Revenues</b>			
Member Contributions	0	0	0
Employer Contributions	0	0	0
DIA Contributions	0	0	0
State of Michigan Contributions	0	0	0
UTGO Contributions	68,275,000	0	68,275,000
ASF Recoupment Interest	6,622,392	0	6,622,392
Investment Income (Net)	153,781,306	1,641,887	155,423,193
Other	1,364,014	(127,359)	1,236,655
Transfers	(569,413)	569,413	0
<b>Total</b>	<b>\$ 229,473,299</b>	<b>\$ 2,083,941</b>	<b>\$ 231,557,240</b>
<b>Expenditures</b>			
Benefit Payments	228,783,800	10,518,138	239,301,938
Refund of Member Contributions	0	14,140,692	14,140,692
Other	906,525	0	906,525
Expenses	3,313,418	0	3,313,418
<b>Total</b>	<b>\$ 233,003,743</b>	<b>\$ 24,658,830</b>	<b>\$ 257,662,573</b>
Market Value June 30, 2018	\$1,835,845,240	\$104,778,402	\$1,940,623,642
Market Value Rate of Return (Net of all expenses)	9.1%	1.3%	8.6%

Rates of return are dollar weighted estimates assuming contributions occur at the end of the year and remaining items are mid-year cash flows. "ASF Recoupment Interest" and "Other" items are treated as investment cash flows.

Note that interest credits to the ASF (and other reserves) are determined by plan provisions and Board policy (including any timing issues) as calculated by Retirement System staff.



## Allocation of Assets Used for Valuation by Reserve Account and Division

	June 30, 2017	Adjustment	Contributions	Benefit Payments	Other	Investment Return (net of all expenses)	June 30, 2018
<b>Annuity Savings Fund</b>							
General	\$ 60,816,110	\$ 0	\$ 0	\$ (6,721,829)	\$ (330,069)	\$ 802,026	\$ 54,566,238
D.O.T.	34,542,789	0	0	(4,370,220)	212,155	468,073	30,852,797
DWSD	17,078,550	0	0	(2,379,913)	200,534	258,966	15,158,137
Library	8,484,105	0	0	(668,731)	(84,728)	112,822	7,843,468
Totals	120,921,554	0	0	(14,140,693)	(2,108)	1,641,887	108,420,640
<b>Annuity Reserve Fund</b>							
General	2,703,410	0	0	(5,958,875)	603,407	0	(2,652,058)
D.O.T.	1,638,328	0	0	(853,570)	(128,396)	0	656,362
DWSD	2,531,453	0	0	(3,252,587)	(104,631)	0	(825,765)
Library	-441,455	0	0	(453,105)	73,782	0	(820,778)
Totals	6,431,736	0	0	(10,518,137)	444,162	0	(3,642,239)
<b>Pension Accumulation Fund</b>							
General	(14,827,904)	(121,183,536)	22,764,999	0	3,359,309	85,679,106	(24,208,026)
D.O.T.	(69,665,193)	(37,893,535)	110,001	0	1,107,809	15,783,205	(90,557,713)
DWSD	(60,756,455)	(54,987,947)	42,900,000	0	1,875,687	42,909,132	(28,059,583)
Library	22,558,281	(6,203,025)	2,500,000	0	167,664	6,096,445	25,119,365
Totals	(122,691,271)	(220,268,043)	68,275,000	0	6,510,469	150,467,888	(117,705,957)
<b>Pension Reserve Fund</b>							
General	1,073,976,463	121,183,536	0	(128,640,330)	0	0	1,066,519,669
D.O.T.	262,092,465	37,893,535	0	(31,657,206)	0	0	268,328,794
DWSD	573,255,053	54,987,947	0	(61,787,473)	0	0	566,455,527
Library	52,742,975	6,203,025	0	(6,698,792)	0	0	52,247,208
Totals	1,962,066,956	220,268,043	0	(228,783,801)	0	0	1,953,551,198
<b>Retirement System Totals</b>	<b>\$1,966,728,975</b>	<b>\$ 0</b>	<b>\$68,275,000</b>	<b>\$ (253,442,631)</b>	<b>\$ 6,952,523</b>	<b>\$ 152,109,775</b>	<b>\$1,940,623,642</b>

## SECTION C

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### PARTICIPANT DATA

# Reconciliation of Raw Data

## Active Members

A) Count reported in PF_Benefits table:	3,241
B) In PF_Benefits file but not in Hybrid file:	(40)
C) Hired after plan closed:	(95)
D) Non-active Status:	(46)
E) Agency "88":	(23)
F) Non-eligible class code & bargaining unit:	(12)
G) No hire date in Hybrid file:	-
H) Zero salary in Hybrid file:	(7)
I) Rehire estimated termination prior to 2012	-
J) Actives excluding DROP:	<u>3,018</u>

## Inactive Vested Members

A) Number of records reported on data file	3,296
B) In Legacy active file but not otherwise in database and not in Hybrid active file	17
C) Valued as inactive in prior year and would not have otherwise been valued in Legacy this year	30
D) Valued as a vested active member in prior year but not in this year's active file and would not have otherwise been valued in Legacy this year	49
E) Non-eligible class code & bargaining unit	(21)
F) Valued as Legacy retiree	-
G) Less than 8 years of service	<u>(135)</u>

## Retired Members and Beneficiaries

A) Number of records reported on data file:	42,943
B) Number of records in P/F plan:	(16,000)
C) Records not currently in receipt of benefits based on reported status codes:	(15,012)
D) Component I (Hybrid) Records:	<u>(247)</u>
E) Number of records valued:	11,684

# Data Approximations and Assumptions

## Active

For active members, frozen AFC amounts and frozen service as of June 30, 2014 was reported. For purposes of this valuation, we matched the June 30, 2018 actives to the active data reported for the June 30, 2014 valuation to check against AFC as of June 30, 2014. In cases where the frozen AFC as reported in the 2018 data file was less than 75% of the AFC as reported on the 2014 data file, the AFC as reported on the 2014 data file was used. This boundary was determined after an analysis of the raw AFC data showed that the AFC for several members was unreasonably low. In cases where AFC was reported in to be \$0 in both the current data file and the 2014 data file, the current salary was used in place of the AFC. The class code used to distinguish between LSA and DPOA was taken from the 2014 data file.

## Deferred

Data provided for deferred vested members was incomplete. As part of the processing of deferred member data, in cases where AFC was incomplete, we used \$30,000 to estimate the AFC. Since vesting service is not directly provided on the file, we estimated vesting service based on reported Component II (Legacy) benefit service increased by Component I (Hybrid) benefit service as reported on the corresponding Component I (Hybrid) file. Members with estimated vesting service of less than 8 years were assumed to be non-vested and were not valued. We estimated the commencement date with the following rules:

- Age 55 if 30 or more years of service and hired before July 1986;
- Age 60 if less than 30 years of service, but more than 10 years of service and hired before 1986; and
- Age 62 for all others.

Entire amount of deferred benefits was assumed to commence at the same time regardless of the date of hire.

## Retired and Beneficiary

It is our understanding that the current pension amount provided in the retiree data includes the 4.5% reduction as mandated in the POA. However, for members that retired prior to July 2015, the other pension amounts provided in the data (original pension amount, equated pension amount, and prior year's pension amount) did not reflect the 4.5% reduction and, as such, were reduced by 4.5% when valuing any related liability. Other adjustments/assumptions include:

- In cases where the benefit is identified to be a joint and survivor benefit and a beneficiary is not listed in the data, it was assumed that male spouses were 3 years older than females;
- Benefits for dependent children are assumed to cease at age 21; and
- For non-converted disabled members, converted benefits are:
  - assumed to commence at age 60; and
  - estimated, based on reported service and projected service from the date of disability to age 60.

Please see our correspondence dated December 18, 2018 for additional information regarding data reconciliation, processing instructions, and assumptions regarding unresolved issues. Note, this letter disclosed our data procedures and assumptions and we received confirmation from staff.

## Summary of Member Data June 30, 2018 Active Members

	General	D.O.T.	DWSD	Library	Totals <sup>^</sup>
Number	1,816	582	380	240	3,018
% Change in active members	0.9 %	(5.5)%	5.0 %	(2.8)%	(0.2)%
Annual payroll (\$ millions)	\$ 95.9	\$ 23.1	\$ 19.0	\$ 11.4	\$ 149.4
Average pay	\$52,815	\$39,616	\$50,038	\$47,457	\$49,494
% Change in average pay	6.4 %	2.0 %	4.7 %	8.0 %	5.8 %

<sup>^</sup> May not add due to rounding.

### Retired Members and Survivor Beneficiaries

	General	D.O.T.	DWSD	Library	Totals
Number	6,957	1,635	2,765	327	11,684
Annual benefits (\$ millions) #	\$ 132.0	\$ 31.6	\$ 64.2	\$ 7.0	\$ 234.8
Average benefits #	\$18,972	\$19,335	\$23,207	\$21,373	\$20,092
% Change in reported average benefit	0.0 %	0.8 %	(0.5)%	(1.5)%	(0.1)%

# Includes annuities. Does not include reductions resulting from the annuity claw-backs.

### Inactive Vested Members

	General	D.O.T.	DWSD	Library	Totals
Number	1,789	408	952	87	3,236
Average FAC	\$39,503	\$42,473	\$48,371	\$33,055	42,313
Average service	15.8	15.6	15.8	14.3	15.8
Annual benefits (\$ millions)	\$ 18.3	\$ 4.4	\$ 11.9	\$ 0.7	\$ 35.4
Average benefits	\$10,250	\$10,835	\$12,542	\$7,947	\$10,936
% Change in average service	(0.6)%	(1.9)%	0.2 %	(7.7)%	(0.7)%
% Change in average FAC	(1.7)%	(0.7)%	(0.0)%	4.0 %	(0.9)%

## Active Members as of June 30, 2018 by Attained Age and Years of Service Retirement System Totals

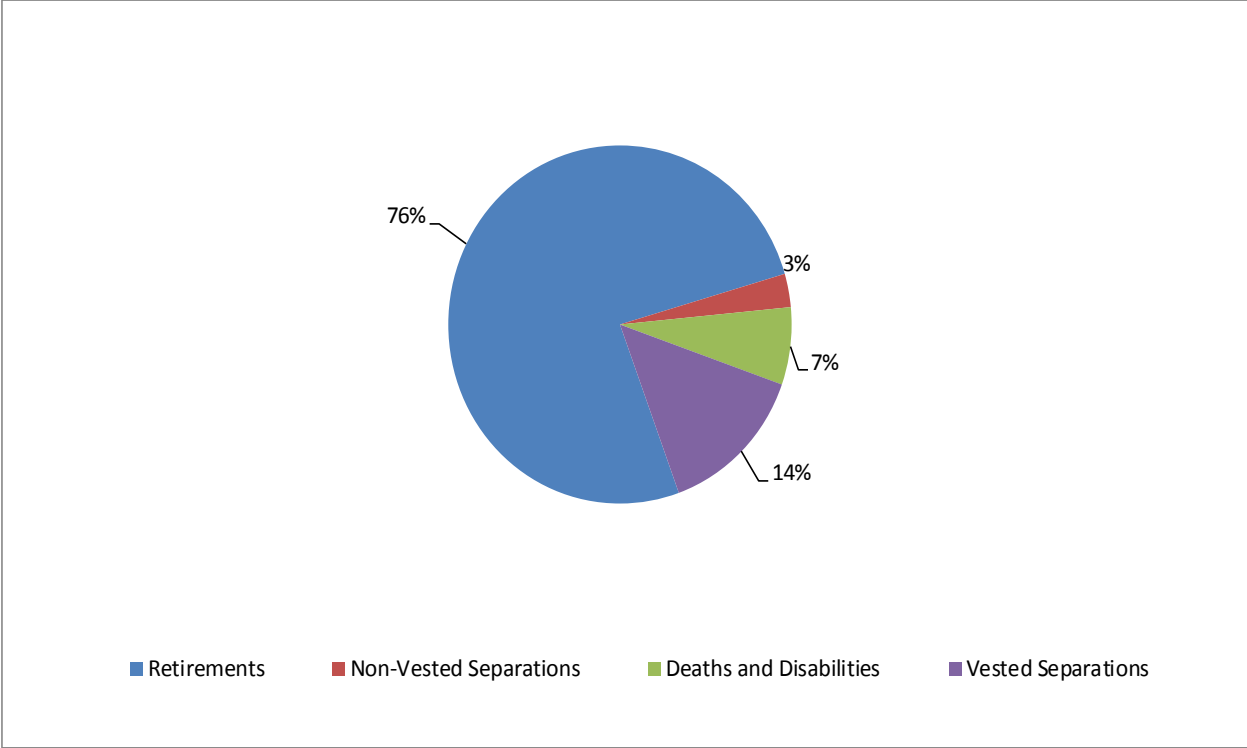
Attained Age	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	No.	Valuation Payroll
20-24	8	2						10	\$ 316,935
25-29	32	8	2					42	1,643,477
30-34	34	34	23	0				91	3,807,867
35-39	21	39	59	43	0			162	7,506,189
40-44	34	52	74	99	46	2		307	14,758,172
45-49	33	51	80	155	144	28	2	493	24,806,298
50-54	21	50	61	151	212	84	54	633	31,810,368
55-59	26	42	67	129	171	120	135	690	34,489,651
60-64	15	29	46	73	89	72	105	429	21,732,720
65-69	6	17	18	18	15	8	26	108	5,959,729
70-74	2	6	4	4	7	2	8	33	1,679,402
75-79	0	2	4	6	1	2	5	20	862,505
<b>Totals</b>	<b>232</b>	<b>332</b>	<b>438</b>	<b>678</b>	<b>685</b>	<b>318</b>	<b>335</b>	<b>3,018</b>	<b>\$149,373,313</b>

Group Averages:

Age: 51.8 years  
Benefit Service: 15.0 years  
Eligibility Service: 18.6 years  
Annual Pay: \$49,494

Service shown in this schedule is Legacy benefit service plus Hybrid Benefit service. Hybrid service provided on the data file was reduced by two months to account for additional service granted past the valuation date.

# Expected Terminations from Active Employment for Current Active Members



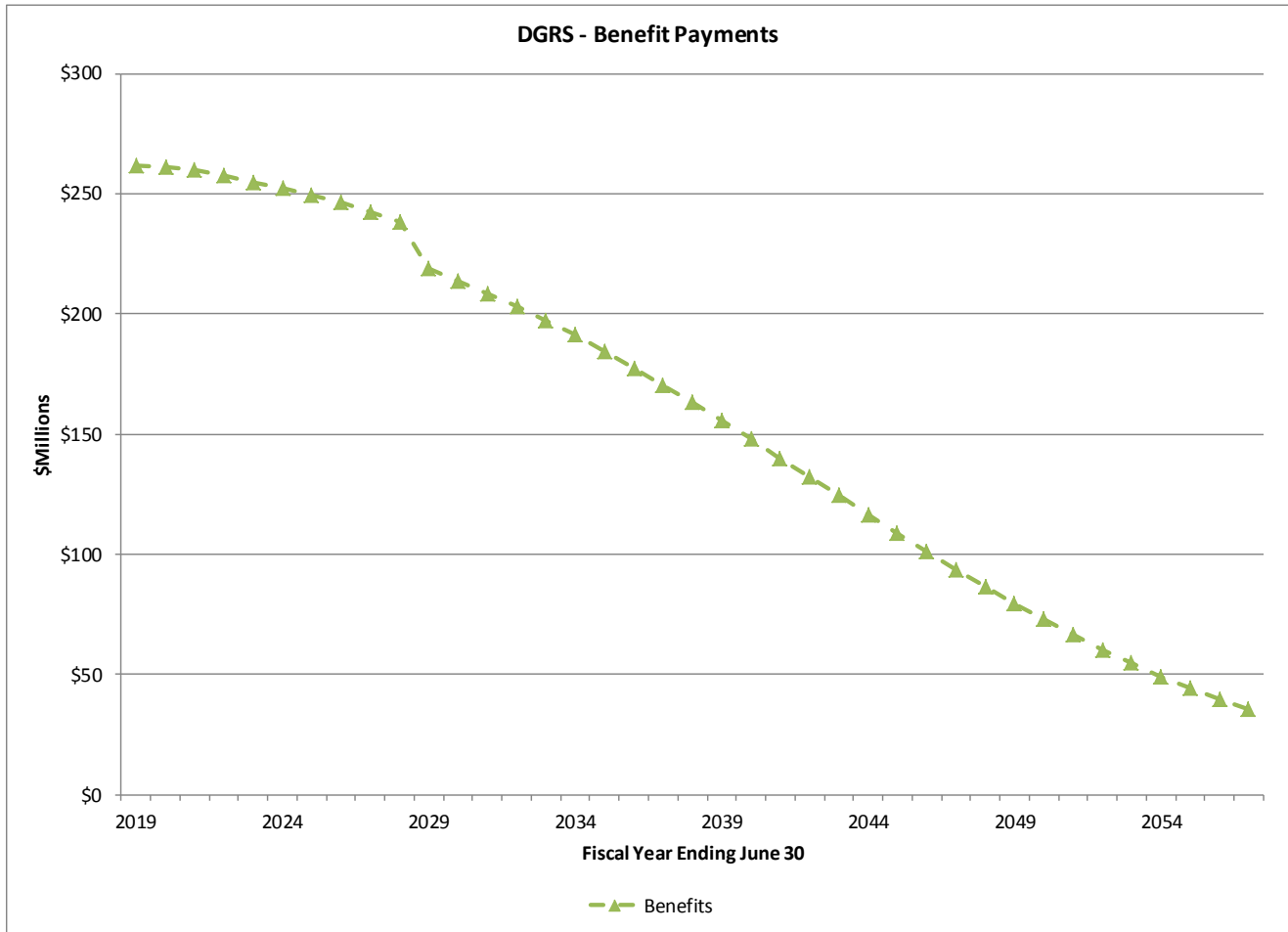
The chart shows the expected future development of the present population in simplified terms. The Retirement System presently covers 3,018 active members. Eventually, 105 people are expected to terminate covered employment prior to retirement and forfeit eligibility for an employer provided benefit. 2,700 people are expected to receive monthly retirement benefits either by retiring directly from active service, or by retiring from vested deferred status. 213 people are expected to become eligible for benefits as a result of death-in-service or disability.

Actual versus expected retirements for the 2018 fiscal year is shown below:

Year Ended June 30,	Expected	Actual
2018	234	78

# Expected Benefit Payments

Shown below is a graph of projected benefit payments remaining in the Retirement System.





## Retirees and Beneficiaries June 30, 2018

### Tabulated by Attained Ages

### Retirement System Totals

Attained Ages	Age & Service#		Disability		Death-in-Service		Totals	
	No.	Monthly Allowances	No.	Monthly Allowances	No.	Monthly Allowances	No.	Monthly Allowances
Under 20*	9	\$ 13,698	0	\$ 0	2	\$ 895	11	\$ 14,593
20-24	1	3,627					1	3,627
25-29	8	7,069					8	7,069
30-34	10	3,399	0	0			10	3,399
35-39	11	7,530	3	1,650			14	9,180
40-44	17	11,822	8	3,667	2	1,310	27	16,799
45-49	59	66,487	28	18,359	4	1,953	91	86,799
50-54	260	432,728	68	49,456	12	14,646	340	496,830
55-59	686	1,361,293	154	131,807	33	37,852	873	1,530,952
60-64	1,641	3,205,433	254	348,667	37	45,006	1,932	3,599,106
65-69	2,142	3,840,621	185	219,793	45	69,489	2,372	4,129,903
70-74	1,882	3,385,841	144	159,367	33	51,173	2,059	3,596,381
75-79	1,249	1,986,783	70	61,052	36	40,669	1,355	2,088,504
80-84	873	1,226,017	41	32,732	27	29,596	941	1,288,345
85-89	729	887,065	24	19,759	42	39,328	795	946,152
90-94	558	609,339	28	21,248	34	28,261	620	658,848
95 and Over	212	202,248	4	3,185	19	13,570	235	219,003
<b>Totals</b>	<b>10,347</b>	<b>\$17,251,000</b>	<b>1,011</b>	<b>\$1,070,742</b>	<b>326</b>	<b>\$373,748</b>	<b>11,684</b>	<b>\$18,695,490</b>

\* May include records with defective birth dates.

# Includes survivor beneficiaries of deceased retirees.

## Retirees and Beneficiaries June 30, 2018 Tabulated by Year of Retirement

Year of Retirement	No.	Monthly Allowances	
		Total	Average
1950 & before	4	\$ 7,141	\$1,785
1951-1955	2	3,295	1,648
1956-1960	2	554	277
1961-1965	12	5,271	439
1966-1970	30	14,373	479
1971-1975	138	84,469	612
1976-1980	314	245,674	782
1981-1985	632	651,170	1,030
1986-1990	749	834,222	1,114
1991-1995	1,336	1,712,878	1,282
1996-2000	1,495	2,351,666	1,573
2001-2005	2,081	3,936,590	1,892
2006-2010	2,277	4,426,316	1,944
2012	775	1,446,946	1,867
2013	451	720,789	1,598
2014	400	645,546	1,614
2015	278	413,880	1,489
2016	401	738,472	1,842
2017	233	348,493	1,496
2018	74	107,745	1,456
<b>Totals</b>	<b>11,684</b>	<b>\$18,695,490</b>	<b>\$1,600</b>

## SECTION D

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### METHODS AND ASSUMPTIONS

# Summary of Assumptions and Methods Used for Actuarial Valuations Adopted by Board of Trustees

All assumptions are estimates of future experience except as noted. The rationale for the assumptions is based on experience studies where noted.

## ***Economic Assumptions***

***The investment return rate*** used in making the valuation was 6.75% per year, compounded annually (net after investment and administrative expenses). This assumption is prescribed by the Eighth Amended Plan for the Adjustment of Debts of the City of Detroit (POA).

***Price inflation*** is not directly used in the valuation. For purposes of assessing the reasonability of the investment return assumptions, we assumed price inflation of 2.50% per year.

## ***Non-Economic Assumptions***

***The mortality table*** used to measure retired life mortality was 100% of the RP-2014 Blue Collar Annuitant Table for set-forward 1 year for males and 100% of the RP-2014 Blue Collar Annuitant Table set-forward 1 year for females. Tables were extended below age 50 with a cubic spline to the published Juvenile rates. Pre-retirement mortality is based on the corresponding Employee tables with corresponding set forward. The tables are projected to be fully generational, based on the 2-dimensional, sex distinct mortality improvement scale MP-2014 (which was published and intended to be used with RP-2014). 75% of all deaths-in-service are assumed to be non-duty related. This table was first used as of June 30, 2014. For disabled members, the same tables are used. The rationale for the mortality assumption is based on the 2008-2013 Mortality Experience Study issued February 4, 2015.

***The probabilities of retirement*** for members eligible to retire are shown on pages 31 and 32. These probabilities were revised for the June 30, 2008 valuation. The rationale is based on the 2002-2007 Experience Study.

***The probabilities of separation*** from service (including *death-in-service* and *disability*) are shown for sample ages on page 30. These probabilities were revised for the June 30, 2008 valuation. The rationale is based on the 2002-2007 Experience Study.

# Summary of Assumptions and Methods Used for Actuarial Valuations Adopted by Board of Trustees (Concluded)

## ***Funding Methods***

***The unit credit cost method*** was used in determining age & service pension liabilities, vesting liabilities, and casualty pension liabilities. Under this method, there is no normal cost since benefits are frozen and there are no future accruals and actuarial accrued liability is the present value of each individual's accrued benefit.

***Unfunded Actuarial Accrued Liabilities.*** Actual employer contributions through June 30, 2023 are set by the POA. The amortization period and method after 2023 has not yet been established by the Board.

***Employer contribution*** dollars were assumed to be paid at the end of the employer fiscal year.

***Present assets*** are set equal to the Market Value.

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***The data about persons now covered and about present assets*** was furnished by the System's administrative staff. Although examined for general reasonableness, the data was not audited by the Actuary.

# Single Life Retirement Values

**Based on RP-2014 Blue Collar  
100% of Male Rates Set-Forward 1 Year  
100% of Female Rates Set-Forward 1 Year**

Sample Attained Ages in 2018	Future Life Expectancy (years)	
	Men	Women
45	38.62	41.96
50	33.66	36.91
55	28.90	32.01
60	24.35	27.26
65	20.05	22.69
70	16.07	18.38
75	12.45	14.42
80	9.26	10.91

## Probabilities of Age/Service Retirement for Members Eligible to Retire

Retirement Ages	Percent of Eligible Active Members Retiring within Next Year with Unreduced Benefits		
	EMS	D.O.T.	Others
45	25%		
46	25%		
47	25%		
48	22%		
49	20%		
50	18%	55%	50%
51	15%	50%	50%
52	15%	50%	45%
53	15%	50%	45%
54	15%	55%	40%
55	15%	50%	30%
56	15%	50%	30%
57	15%	50%	30%
58	15%	50%	30%
59	15%	55%	40%
60	40%	40%	25%
61	30%	30%	25%
62	30%	30%	25%
63	30%	30%	25%
64	30%	30%	25%
65	30%	30%	35%
66	30%	30%	30%
67	30%	30%	25%
68	30%	50%	25%
69	30%	50%	25%
70	100%	100%	20%
71			20%
72			20%
73			20%
74			20%
75			20%
76			20%
77			20%
78			20%
79			20%
80			100%
Ref	537	1648	1647

Rationale for assumption is 2002 to 2007 Experience Study. Additional retirement rates for Component I (Hybrid Plan) eligibility are not reflected in this valuation due to materiality.

# Probabilities of Early Retirement for Members Eligible for Early Retirement

Retirement Ages	Percent of Eligible Active Members Retiring within Next Year with Reduced Benefits
55	7%
56	8%
57	9%
58	10%
59	12%
60	12%
61	12%
62	12%
63	12%
64	12%
Ref	1649

Rationale for assumption is 2002 to 2007 Experience Study.



## Sample Rates of Separation from Active Employment Before Retirement

Sample Ages	Years of Service	% of Active Members Separating within Next Year			
		Withdrawal			
		EMS	D.O.T.	Others	
Men	Women				
ALL	0	11.00%	18.00%	18.00%	20.00%
	1	10.00%	16.00%	15.00%	16.00%
	2	8.00%	14.00%	13.00%	14.00%
	3	8.00%	11.00%	11.00%	12.00%
	4	7.00%	9.00%	10.00%	10.00%
25	5 & Over	6.70%	8.00%	7.60%	7.60%
30		5.90%	7.60%	7.22%	7.22%
35		5.20%	5.56%	5.28%	5.28%
40		4.40%	4.26%	4.05%	4.05%
45		3.40%	3.69%	3.51%	3.51%
50		2.40%	3.50%	3.33%	3.33%
55		2.00%	3.50%	3.33%	3.33%
60		0.00%	3.50%	3.33%	3.33%
Ref		338	143	584	188
		1068	212	212 x 0.95	212 x 0.95

Sample Ages	% of Active Members Becoming Disabled within Next Year			
	D.O.T.		Others	
	Ordinary	Duty	Ordinary	Duty
25	0.02%	0.03%	0.01%	0.25%
30	0.05%	0.08%	0.04%	0.29%
35	0.14%	0.21%	0.11%	0.34%
40	0.27%	0.42%	0.21%	0.39%
45	0.51%	0.79%	0.40%	0.45%
50	0.66%	1.03%	0.51%	0.52%
55	0.76%	1.18%	0.59%	0.60%
60	0.86%	1.34%	0.67%	0.70%
Ref	23	x 0.45	23	x 0.70
	23	x 0.35	423	x 0.90

Rationale for assumption is 2002 to 2007 Experience Study.

## Miscellaneous and Technical Assumptions

<b>Benefit Service</b>	Exact Fractional service is used to determine the amount of benefit payable.
<b>Decrement Operation</b>	Disability and mortality decrements do not operate during the first five years of service. Disability and withdrawal do not operate during retirement eligibility.
<b>Decrement Timing</b>	Decrements of all types are assumed to occur mid-year.
<b>Eligibility Testing</b>	Eligibility for benefits is determined based upon the age nearest birthday and rounded service on the date the decrement is assumed to occur.
<b>Forfeitures</b>	None.
<b>Incidence of Contributions</b>	Contributions are assumed to be received at the end of the year.
<b>Marriage Assumption</b>	100% of males and 100% of females are assumed to be married for purposes of death-in-service benefits. Male spouses are assumed to be three years older than female spouses for active member valuation purposes.
<b>Normal Form of Benefit</b>	Straight life is the normal form of benefit. The Board adopted assumptions for Actuarial Equivalence to be an 80%/20% unisex blend of RP-2014 mortality (Male/Female) with Blue Collar Adjustment, set ahead one year for males and females, projected 11 years with MP-2014, an interest rate of 6.75, and no COLA for optional forms of payment and early retirement reduction. Assumptions for annuitizing member contributions are the same except for using a 60%/40% unisex blend and a 5.25% assumed rate of interest. Prior to that, actuarial equivalent factors were based on 7.5% interest and 1984 Group Annuity Mortality table.
<b>Service Credit Accruals</b>	Service accruals stop as of June 30, 2014 for measurement of Component II liabilities. However, future service in Component I may be used to satisfy benefit eligibility requirement in Component II. Members who became duty disabled prior to June 30, 2014 are assumed to get projected service from date of disability to conversion date. Member who become disabled after June 30, 2014 are assumed to get their frozen accrued benefit as of June 30, 2014 at date of conversion.
<b>Administrative Expenses</b>	The investment return assumption is mandated to be net of investment and administrative expense in the plan document. No other provision for administrative expenses is included in this valuation.
<b>Sick Leave</b>	Sick leave banks as of June 30, 2014 were included in the 2014 data file provided by the System.
<b>Member Contributions</b>	Member contributions to this Component II plan are assumed to have ceased with the bankruptcy.
<b>Pop-Up Benefits</b>	For current retirees with a pop-up benefit, the value of the pop-up was estimated by valuing a non-pop-up option and increasing the associated liabilities by 2%.

Rationale for assumption is 2002 to 2007 Experience Study, modified as necessary for changes in data or administration.

## **SECTION E**

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### **PLAN PROVISIONS**

# Summary of Benefit Provisions Evaluated

## Component II Frozen Benefits

All Component II benefits are frozen as of June 30, 2014 based on service and average final compensation accrued as of that date and the provisions of the Detroit General Retirement System as it existed on June 30, 2014. Frozen benefits are further reduced by 4.5% and all future cost-of-living adjustments (“COLAs”) were eliminated. Benefits resulting from the Annuity Savings Fund and benefits paid from the Annuity Reserve Fund were subject to a separate reduction described as a “Claw-back.” Details of the claw-back provision are complicated and can be found in the Eighth Amended Plan of Adjustment. The benefits evaluated in this report are the frozen reduced benefits after adjusting the assets for the claw-back. Component II benefits are payable after separation from service, upon meeting the eligibility conditions of the plan as it existed on June 30, 2014, regardless of whether the individual is eligible to receive a Component I benefit at that time.

Our understanding of the June 30, 2014 plan provisions is provided below for completeness. The material below does not have legal standing and is not intended to cover all potential situations that could occur. If there are discrepancies between the description below and appropriate legal documents, the latter necessarily govern.

## Age and Service Pension

**Eligibility** - Any age (minimum age 55 for non-EMS members hired after 1995) with 30 years of service (25 for EMS members), or age 60 with 10 years of service, or age 65 with 8 years of service.

**Annual Amount - EMS Members:** Sum of a) a basic pension of \$12 for each of the first 10 years of service, plus b) a pension equal to 2.0% of AFC multiplied by years of service. Maximum benefit is 90% of AFC.

**Other Members:** Sum of a) a basic pension of \$12 for each of the first 10 years of service, plus b) a pension equal to the first 10 years of service multiplied by 1.6% of AFC, plus 1.8% of AFC for each year of service greater than 10 years up to 20 years, plus 2.0% of AFC for each year of service greater than 20 years up to 25 years, plus 2.2% of AFC for each year of service greater than 25 years. Future benefit accruals for certain active members (depending on bargaining unit) were reduced to 1.5% of final average compensation per year of service.

**Type of Average Final Compensation (AFC)** - Highest 3 consecutive years out of the last 10. Pension benefits will not be diminished if compensation is reduced because of a fiscal emergency. Effective July 1, 1999, in computing the AFC, a member shall have the option of adding the value of 25% of unused accrued sick leave to the earnings used in computing the AFC. Longevity is added to AFC in accordance with the following schedule: \$150 after 5 years, \$300 after 10 years, \$450 after 15 years, \$600 after 20 years, and \$750 after 25 years.

## Early Retirement

**Eligibility** - Any age with 25 or more years of service (min. age 55 for members hired after 1995).

**Annual Amount** - Same as regular retirement but actuarially reduced.

# Summary of Benefit Provisions Evaluated (Continued)

## ***Deferred Retirement (Vested Benefit)***

**Eligibility** - Hired prior to 7-1-80: Age 40 with 8 years of service. Hired on or after 7-1-80: Any age with 10 years of service.

**Benefit Commencement - APTE hired prior to July 1, 1988:** Benefit begins at the age the member would have become eligible for regular retirement if service had continued. **SAAA, Non-Union and lawyers hired prior to June 30, 1986:** Benefit begins at the age the member would have become eligible for regular retirement. **Others:** Benefits based on service rendered by June 30, 1986 begin at the age the member would have become eligible for regular retirement. Benefits based on service rendered after July 1, 1986 begin at age 62.

**Annual Amount** - Same as regular retirement but based on average final compensation and service at the time of termination.

## ***Duty Disability Retirement***

**Eligibility** - Service related disability before eligibility for service retirement prior to and July 1, 2014. No service requirement.

**Annual Amount** - An annuity which is the actuarial equivalent of the accumulated contributions at date of disability plus a pension of two-thirds of average final compensation at time of disability. The maximum annual pension is \$5,700 (\$9,000 for EMS). At the earliest of when the member would have accrued 30 years of service credit (25 for EMS) or age 60, the annuity is recomputed assuming contributions would have continued at a salary level equal to final compensation. The pension is recomputed with additional service credit granted from the date of disability to age 60 (or 30 years of service credit) or June 30, 2014, whichever is earlier. Benefits payable prior to conversion/re-computation, if any, were assumed to be paid outside the trust.

## ***Non-Duty Disability Retirement***

**Eligibility** - Disability from any cause before age 60 with 10 or more years of service prior to July 1, 2014.

**Annual Amount** - Computed in the same manner as a regular retirement benefit. Maximum annual pension to age 60 is \$6,000. Benefit is recomputed at age 60 with no maximum. Benefits payable prior to age 60, if any, were assumed to be paid from outside the trust.

## ***Duty Death Before Retirement***

**Eligibility** - Death from service related causes. No age or service requirements.

**Annual Amount** - One-third of final compensation as of June 30, 2014 to the surviving spouse for life or until remarriage, plus an equal share of 1/4 of final compensation to each unmarried child under age 18. If there is no eligible spouse, eligible children each receive 1/4 of final compensation; if there are more than 2 such children, each child shares an equal part of 1/2 of final compensation. Maximum total amount for spouse and children is \$9,000 annually. If there is no eligible spouse or children, dependent parents each receive 1/6 of deceased's final compensation, to a total maximum of \$600 annually.

# Summary of Benefit Provisions Evaluated (Concluded)

## ***Non-Duty Death Before Retirement***

**Eligibility** - Death-in-service at any age with 15 years of service; or after age 60 with 10 years of service; or after age 65 with 8 years of service.

**Annual Amount** - To Surviving Spouse: Computed as a regular retirement benefit but reduced in accordance with a 100% joint and survivor election for members with 20 or more years of service. For members with 15 years of service but less than 20, benefit is reduced in accordance with a 50% joint and survivor election. To Dependent Children if no Surviving Spouse: \$9,000 payable to age 19 of the youngest child or for life if child is physically or mentally impaired for members with 20 or more years of service (\$6,000 if less than 20 years of service).

## ***Post-Retirement Cost-of-Living Adjustments***

Benefit is increased annually by 2.25% of the **original** pension amount at retirement. Post-retirement cost-of-living increases were eliminated on future accruals for certain active members (depending on bargaining unit).

## ***Member Contributions***

Members have the option of choosing one of four contribution amounts: (1) 0%; (2) 3.0% of compensation up to the Social Security wage base, plus 5.0% of compensation in excess of the Social Security wage base; (3) 5.0% of total compensation; or (4) 7.0% of total compensation. Member contributions can be paid as a lump sum or annuitized at retirement to provide an annuity in addition to the pension (which is not affected by the level of member contributions).

## **SECTION F**

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### **GLOSSARY**

## Glossary

**Actuarial Accrued Liability.** The difference between (i) the actuarial present value of future plan benefits, and (ii) the actuarial present value of future normal cost. Sometimes referred to as “accrued liability” or “past service liability.”

**Accrued Service.** The service credited under the plan which was rendered before the date of the actuarial valuation.

**Actuarial Assumptions.** Estimates of future plan experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

**Actuarial Cost Method.** A mathematical budgeting procedure for allocating the dollar amount of the “actuarial present value of future plan benefits” between the actuarial present value of future normal cost and the actuarial accrued liability. Sometimes referred to as the “actuarial funding method.”

**Actuarial Equivalent.** A single amount or series of amounts of equal value to another single amount or series of amounts, computed on the basis of the rate(s) of interest and mortality tables used by the plan.

**Actuarial Present Value.** The amount of funds presently required to provide a payment or series of payments in the future. It is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.

**AFC.** Average Final Compensation.

**Amortization.** Paying off an interest-bearing liability by means of periodic payments of interest and principal, as opposed to paying it off with a lump sum payment.

**APTE.** Association of Professional and Technical Employees.

**Contribution Budgeting Liability.** An expected return based measure of pension obligation.

**DIA.** Detroit Institute of Art.

**D.O.T.** Department of Transportation.

**DWSD.** Detroit Water and Sewerage Department.

**EMS.** Emergency Medical Service.



## Glossary

**Experience Gain (Loss).** A measure of the difference between actual experience and that expected based upon a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used.

**GASB.** The Governmental Accounting Standards Board.

**GLWA.** Great Lakes Water Authority.

**Normal Cost.** The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. Sometimes referred to as “current service cost.” Any payment toward the unfunded actuarial accrued liability is not part of the normal cost.

**POA.** The 8<sup>th</sup> Amended Plan for the Adjustment of the Debt of the City of Detroit.

**Reserve Account.** An account used to indicate that funds have been set aside for a specific purpose and are not generally available for other uses.

**SAAA.** Senior Accountants, Analysts, and Appraisers Association.

**Solvency Liability.** A market-based measure of the present value of accrued benefits at a municipal bond discount rate unadjusted for the credit quality of the plan sponsor.

**Unfunded Actuarial Accrued Liability.** The difference between the actuarial accrued liability and valuation assets. Sometimes referred to as “unfunded accrued liability.”

**UTGO.** Unlimited Tax General Obligation.

**Valuation Assets.** The value of current plan assets recognized for valuation purposes.