

The General Retirement System of the City of Detroit

Annual Actuarial Valuation of Component II
June 30, 2019





February 26, 2020

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, 2019**.

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 2021 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 5 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.

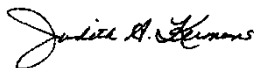
David T. Kausch and Judith A. Kermans are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

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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DTK/JAK/KGA:dj



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SECTION A

VALUATION RESULTS

Executive Summary

(\$ in Millions)

Valuation Date	June 30, 2019	June 30, 2018
Contributions For Fiscal Year Ending	June 30, 2021	June 30, 2020
POA Mandated Employer Contributions	\$ 48.3	\$ 48.3
Membership		
Number of:		
Active Members	2,793	3,018
Retirees and Beneficiaries	11,557	11,684
Inactive, Nonretired Members	3,209	3,236
Total	17,559	17,938
Valuation Payroll	\$ 142.2	\$ 149.4
Assets		
Market Value (1)	\$ 1,798.9	\$ 1,940.6
Return on Market Value (net of administrative expenses)	2.64 %	8.64 %
Actuarial Information		
Actuarial Accrued Liability (2)	\$ 2,866.1	\$ 2,929.1
Unfunded Actuarial Accrued Liability: (2) - (1)	1,067.2	988.4
Funded Ratio: (1) / (2)	62.77 %	66.25 %
Risk Metrics		
Actuarial Accrued Liability Divided by Payroll	20.2	19.6
Market Value of Assest Divided by Payroll	12.6	13.0

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	Other	Transfers from DWSD	
2020	45.4	(2.5)	-	-	0.4	2.5	2.5	48.3
2021	45.4	(2.5)	-	-	0.4	2.5	2.5	48.3
2022	45.4	(2.5)	-	-	0.4	2.5	2.5	48.3
2023	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 as of June 30, 2019.

The chart below shows this allocation.

	General	D.O.T.	Subtotal	Library	DWSD	Totals
	\$ Thousands					
Unfunded Liabilities (6/30/2019)	\$ 558,215	\$ 268,414	\$ 826,629	\$ 14,287	\$ 226,237	\$1,067,153
% of Subtotal	67.5%	32.5%	100.0%	N/A	N/A	
FY 2020 Contributions	\$ 253	\$ 122	\$ 375	\$ 2,500	\$ 45,400	\$ 48,275
Transfers	\$ 2,500	\$ -	\$ 2,500	\$ -	\$ (2,500)	\$ -
FY 2020 UAAL Contributions	\$ 2,753	\$ 122	\$ 2,875	\$ 2,500	\$ 42,900	\$ 48,275

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)

	(\$ Millions)				
	General City	D.O.T.	DWSD	Library	System Total
UAAL as of June 30, 2019	\$ 558.2	\$ 268.4	\$ 226.2	\$ 14.3	\$ 1,067.2
Anticipated POA Contribution (EOY)	2.8	0.1	42.9	2.5	48.3
Anticipated Expenses@	-	-	-	-	-
Interest at 6.75%	37.7	18.1	15.3	1.0	72.0
Projected UAAL as of June 30, 2020	\$ 593.1	\$ 286.4	\$ 198.6	\$ 12.8	\$ 1,090.9
Anticipated POA Contributions for FY2021	2.8	0.1	42.9	2.5	48.3
Estimated Employer Contributions for FY 2024 #!					
Alternate 1:Level Principal	\$ 71.9	\$ 35.1	\$ 10.5	\$ 0.8	\$ 118.2
Alternate 2:Level Dollar##	\$ 56.0	\$ 27.3	\$ 8.2	\$ 0.6	\$ 92.1

Totals may not add due to rounding.

@ 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 2. 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 benefit payments. This scenario is included at System's request (see page 4).

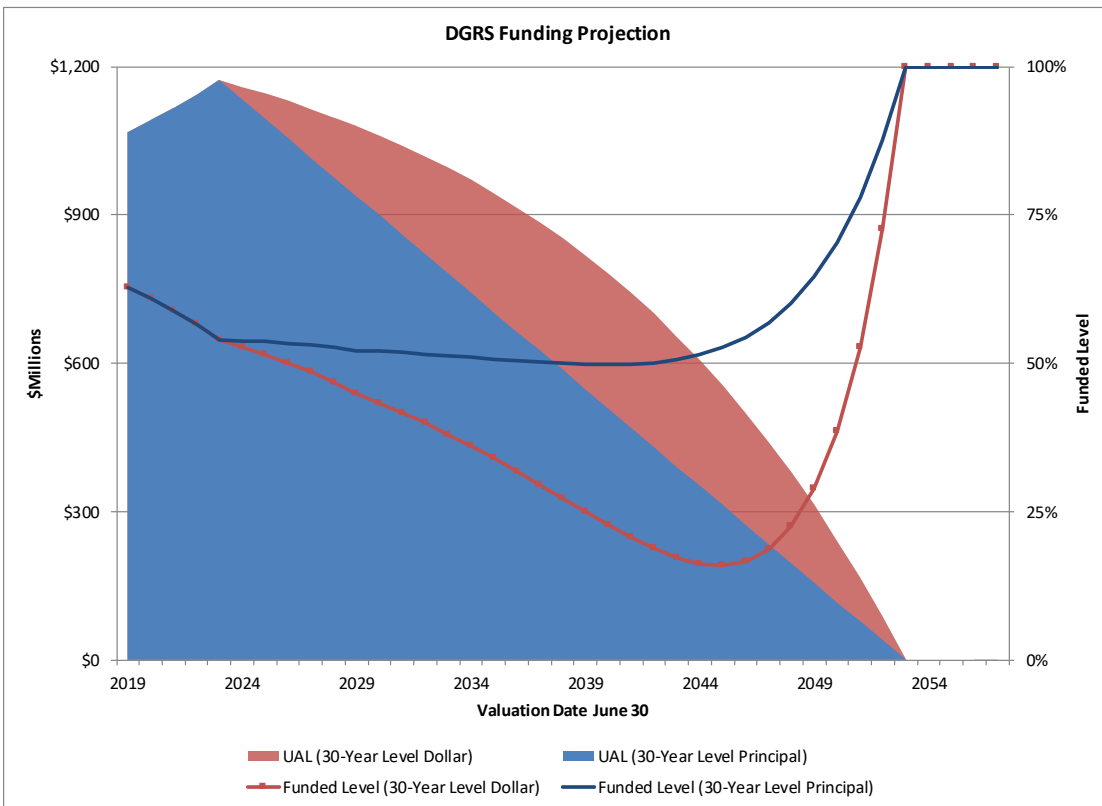
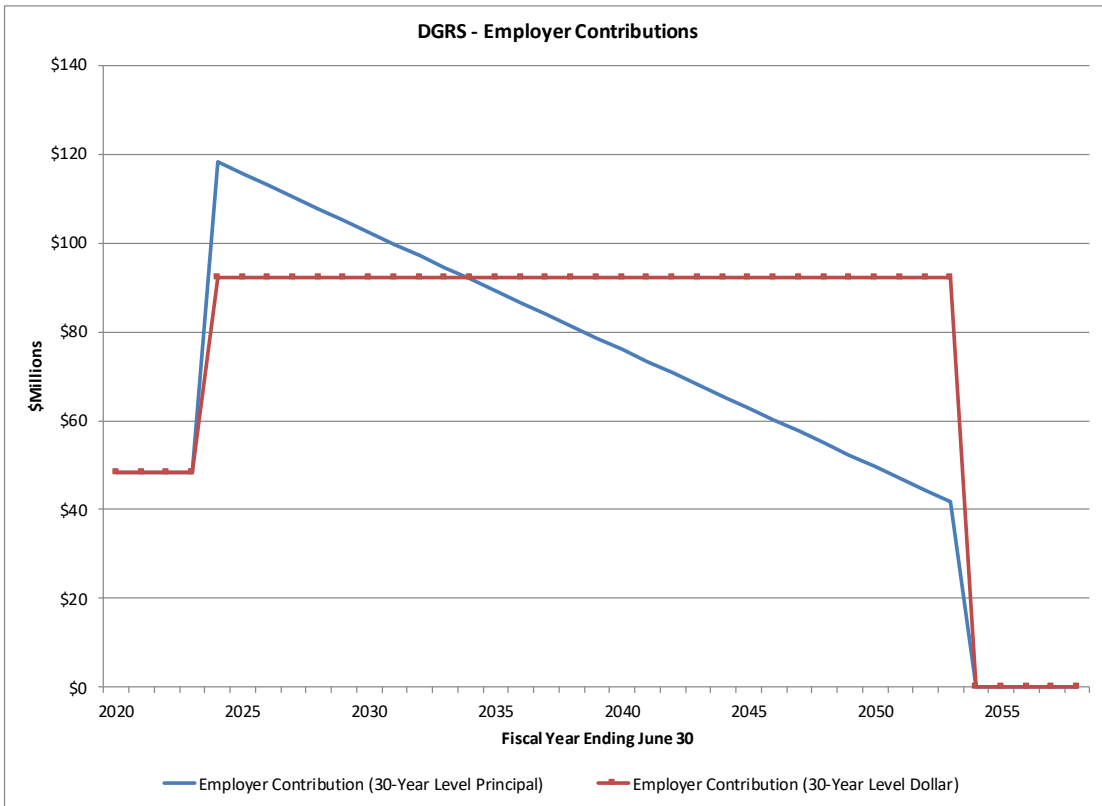
The POA contributions are well below actuarially determined amounts and, as such, result in a defunding of the plan between now and June 30, 2023, which was contemplated by the POA. In fact, the anticipated POA contributions do not project benefit restoration even if all assumptions are met (including the POA mandated assumed rate of return of 6.75%).

Also, the FY 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 in a side fund 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. Under this scenario, the Plan is only 16% funded in 2045.

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 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 2021 (Funding Policy 1)	\$ 109.1	\$ 59.6	\$ 36.5	\$ 2.3	\$ 207.6
(2) Illustrative Contribution for FY 2021 (Funding Policy 2)	59.8	28.9	20.0	1.3	110.0
(3) Actual Contributions for FY 2021 (POA)	2.8	0.1	42.9	2.5	48.3
Fiscal Year 2021 Shortfall - Funding Policy 1: (1) - (3)	\$ 106.3	\$ 59.5	\$ (6.4)	\$ (0.2)	\$ 159.3
Fiscal Year 2021 Shortfall - Funding Policy 2: (2) - (3)	\$ 57.0	\$ 28.8	\$ (22.9)	\$ (1.2)	\$ 61.7

We understand the Employer continues to set aside money in a separate side fund 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 (vs. the Police and Fire Group) 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 from a budgeting perspective. 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, 2019	June 30, 2018
Accrued Pension Liabilities (Employer Financed)		
Retirees and beneficiaries	\$2,091,442,091	\$2,137,530,791
Inactive members future deferred pensions	256,076,056	262,312,745
Active members	292,534,990	312,344,059
Total accrued pensions	2,640,053,137	2,712,187,595
Pension fund balances	1,689,006,631	1,835,845,241
Unfunded accrued pension liabilities	\$ 951,046,506	\$ 876,342,354
Accrued Annuity Liabilities (Member Financed)		
Retirees and beneficiaries Future annuities	\$ 105,757,686	\$ 108,453,718
Member annuities & future refunds	120,248,768	108,420,640
Total accrued annuity liabilities	226,006,454	216,874,358
Annuity fund balances	109,900,196	104,778,401
Unfunded accrued annuity liabilities*	\$ 116,106,258	\$ 112,095,957
Totals		
Actuarial Accrued Liabilities (AAL)	\$2,866,059,591	\$2,929,061,953
Market Value of Assets (MVA)	1,798,906,827	1,940,623,642
Unfunded Actuarial Accrued Liabilities (UAAL)	\$1,067,152,764	\$ 988,438,311
POA Funded Status	62.8%	66.3%

* Liabilities are gross before accounting for ASF claw-back. Assets currently include a receivable of approximately \$101.9 million related to the ASF claw-back. We believe the receivable is included in the Pension fund balances.

Historical Results (\$ Millions)				
	2017	2016	2015	2014
Total AAL	\$2,995.8	\$3,032.3	\$3,139.1	\$3,222.4
MVA	1,966.7	1,933.5	2,131.3	2,015.2
UAAL	1,029.1	1,098.8	1,007.8	1,207.1
POA Funded Status	65.6%	63.8%	67.9%	62.5%



Funded Ratio - POA

	Defined Benefit	ASF	Total
A Actuarial Accrued Liability (AAL)	\$2,745,810,823	\$120,248,768	\$2,866,059,591
B Market Value of Assets	\$1,678,658,059	\$120,248,768	\$1,798,906,827
C Unfunded Actuarial Accrued Liability (A-B)	\$1,067,152,764	\$ 0	\$1,067,152,764
D Funded Ratio (B/A)	61.1%	100.0%	62.8%

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 the POA). It determines an amount (AAL) 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 (MBL)	\$3,952,857,325	\$120,248,768	\$4,073,106,093
B Market Value of Assets	\$1,678,658,059	\$120,248,768	\$1,798,906,827
C Unfunded Market-Based Liability (A-B)	\$2,274,199,266	\$ 0	\$2,274,199,266
D Funded Ratio (B/A)	42.5%	100.0%	44.2%

The Solvency Funded Ratio is a market-based measurement of the pension obligation. It estimates the amount (MBL) the plan would need to invest in low risk securities to provide the benefits with greater certainty. For this purpose, the MBL is computed at 3.13% interest as of June 30, 2019, based on the long-term municipal bond rate ("20-Year Municipal GO AA Index" rate from the Fidelity Index as of June 28, 2019). 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 less favorable than assumed during the year ending June 30, 2019. 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, 2018 (BOY)	\$ 500.1	\$ 244.7	\$ 229.6	\$ 14.0	\$ 988.4
(2) Actual POA Contribution (EOY)	22.8	0.1	42.9	2.5	68.3
(3) Interest at 6.75%	33.8	16.5	15.5	0.9	66.7
(4) Projected UAAL* as of June 30, 2019	\$ 511.1	\$ 261.1	\$ 202.2	\$ 12.4	\$ 986.9
(5) Actual UAAL* as of June 30, 2019	558.2	268.4	226.2	14.3	1,067.2
Gain (Loss): (4) - (5)	\$ (47.1)	\$ (7.3)	\$ (24.0)	\$ (1.9)	\$ (80.3)
Gain (Loss) From Investments	\$ (41.9)	\$ (6.7)	\$ (20.6)	\$ (3.2)	\$ (72.4)
Gain (Loss) from ASF Audit Transfers	\$ (11.4)	\$ (1.9)	\$ (5.9)	\$ (0.9)	\$ (20.0)
Gain (Loss) from Excess Interest Transfers (Inc. FY 2019)	\$ (1.3)	\$ (0.6)	\$ (0.5)	\$ (0.2)	\$ (2.5)
Gain (Loss) From Liabilities	\$ 7.5	\$ 1.9	\$ 2.9	\$ 2.4	\$ 14.7

* *Unfunded actuarial accrued liability.*

Source of Actuarial Gain/(Loss)

Type of Risk Area	Gain (Loss) in Period	
	Totals (\$ in Millions)	Percent of Liabilities
Data Improvements	(7.3)	(0.3)%
ASF Audit Transfers	(20.0)	(0.7)%
Excess Interest Transfers (Inc. FY 2019)	(2.5)	(0.1)%
Risks Related to Experience		
Economic Risk Areas:		
Investment Return	(72.4)	(2.6)%
Demographic Risk Areas:		
Full and Reduced Service Retirements	9.7	0.3 %
Death Benefits[^]	0.1	0.0 %
Disability Benefits	(0.2)	0.0 %
Other Terminations	7.2	0.3 %
Post-Retirement Mortality	5.1	0.2 %
Total Gain (or Loss) Related to Experience	(50.5)	(1.8)%
Total Gain (or Loss) During Period	(80.3)	(2.8)%
Beginning of Year Accrued Liabilities	2,820.6	100.0 %

[^] *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, 2018 valuation to our estimate from this valuation (June 30, 2019).

The June 30, 2019 loss primarily due to investments decreased the funded percent more than expected and puts additional strain on the plan. For example, the projected funded level decreases to a minimum of about 16% funded in 2045 under the 30-year, level dollar contribution scenario, down from 23% based on the 2018 valuation. This means that the 30-year, level dollar scenario has an increased risk of the assets being depleted.

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 6/30/18 Valuation	\$ 66.5	\$ 33.3	\$ 7.3	\$ 0.5	\$ 107.7
Gain (Loss) From Investments	5.5	0.9	2.7	0.4	9.5
Gain (Loss) from ASF Audit Transfers	1.5	0.2	0.8	0.1	2.6
Gain (Loss) from Excess Interest Transfers (Inc. FY 2019)	0.2	0.1	0.1	-	0.3
Gain (Loss) From Liabilities	(1.0)	(0.2)	(0.4)	(0.3)	(1.9)
Modified Contributions (see below)	-	-	-	-	-
Actual FY 2019 Contribution above/(below) Expected	(0.9)	0.9	-	-	-

* 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 6/30/18 Valuation	\$ 51.8	\$ 26.0	\$ 5.7	\$ 0.4	\$ 83.9
Gain (Loss) From Investments	4.3	0.7	2.1	0.3	7.4
Gain (Loss) from ASF Audit Transfers	1.2	0.2	0.6	0.1	2.0
Gain (Loss) from Excess Interest Transfers (Inc. FY 2019)	0.1	0.1	-	-	0.3
Gain (Loss) From Liabilities	(0.8)	(0.2)	(0.3)	(0.2)	(1.5)
Modified Contributions (see below)	-	-	-	-	-
Actual FY 2019 Contribution above/(below) Expected	(0.7)	0.7	-	-	-

* Totals may not add due to rounding.

Demographic Experience

	Number Count		
	Actual	Expected	A/E%
	A	E	
Retirement (including early)	80	262	31%
Disability	0	19	0%
Vested Terminations	145	57	255%
Other Terminations (including pre-retirement death)	131	43	303%
Post-Retirement Death	457	443	103%



Comments (Continued)

Retirements

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

Vested Terminations were nearly three times the number expected. If this is an anomaly this year, it might result in losses in future years.

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 change this year is included in the "Data Improvements" source of losses on page 8. This year 131 members were added as active to this plan. This resulted in an increase in accrued liabilities of approximately \$6.5 million, after accounting for those members that were known to come from the deferred and retiree rolls.

Annuity Savings Fund (ASF) Claw-Back Data

For the June 30, 2015 valuation, the System's 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, 2019 status valuation also included a receivable for the remaining claw-back payments. We have assumed this information, received by the System's auditors, was reasonable. This assumption is in compliance with the Actuarial Standards of Practice.

Annuity Savings Fund (ASF) Claw-Back Calculation

During FY 2019, the Board took corrective action to begin collecting ASF claw-back amounts for members who retired between 2015 and 2019 without a prior claw-back. The action included forgiving a certain portion of interest that would have otherwise been collected. This resulted in an experience loss of approximately \$3.2 million.

Annuity Savings Fund (ASF) Audit

As a result of an audit of the financial statements compared to the member data, \$23.6 million was transferred from the PAF to the ASF during the year ending June 30, 2019. Since the ASF balance is equal to the ASF accrued liability, the UAAL of the System increased by the \$23.6 million as a result of this transfer.

Annuity Reserve Fund (ARF)

Typically, we would compare the Annuity Reserve Fund (ARF) to the ARF liabilities and recommend a transfer if liabilities exceed assets. However, the annuity claw-back receivable created by the Bankruptcy (which relates to the ARF and the ASF) makes this analysis much more complicated. If the System would like us to perform this calculation, we will need additional information not routinely provided for the valuation. Please let us know if this is needed.

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

Comments (Continued)

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 will be rehired in the future. Rehires will, therefore, cause a loss when they occur.

Great Lakes Water Authority (GLWA) Members

For this valuation (6/30/2019) 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, 2019 in the Component I plan).

Allocation of Contributions Between General and DOT

Our understanding of the allocation of contributions between General and DOT is discussed on page 2 of this report. Based on the reported assets, a different allocation method appears to have been used in FY 2019. If the System supplies us with this asset allocation 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 earnings 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 9% during FY 2018, we expect that there will be a transfer of excess ASF interest in FY 2020. Approximately \$4.1 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 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.

In FY 2019, approximately \$9.0 million was transferred from Component II (Legacy) to Component I (Hybrid) due to excess interest earned in FY 2017. This was the first year of such a transfer. The amount was approximately \$2.5 million more than we had estimated in the June 30, 2018 valuation. We believe the difference relates to an audit of the ASF balances which resulted in the System increasing the ASF reserve. This also resulted in a revision to our estimate of the transfer expected to occur in FY 2020 (from \$3.4 million to \$4.1 million).

We understand that the System has adopted a procedure for computing the ASF interest credits lagging the actual experience of the assets. We have not reviewed or audited this procedure.

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 Funded Transition Cost 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)
2020	\$ 120,248,768	\$ 15,364,239	\$ 110,799,437	2018	8.64%		\$ 4,076,433	<100%	100%	\$ 4,076,433
2021	110,799,437	15,364,239	100,854,016	2019	2.64%		-	<100%	100%	-

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; and
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:

	2019	2018
Ratio of the market value of assets to total payroll*	6.4	7.4
Ratio of actuarial accrued liability to payroll*	10.2	11.1
Ratio of actives to retirees and beneficiaries	0.2	0.2
Ratio of net cash flow to market value of assets	-10.5%	-9.5%
Duration of the actuarial accrued liability	8.7	8.9

* Payroll for this purpose is Component I payroll of \$280.1 million for 2019 and \$263.3 million for 2018.

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 7 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 23.

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 3 for estimated FY 2024 contributions) to fund DWSD liabilities.

Future Results

While FY 2020 investment performance has not yet been provided to us, the S&P 500 and the Dow Jones Industrial Average have so far both returned substantially more than 6.75%. If the Retirement System's experience is similar, this should result in upward pressure on the funded status and downward pressure on the FY 2024 contribution requirements.

The POA mandated contributions for FY 2020 and beyond are expected to defund the Retirement System, even if all assumptions are realized. In FY 2020 through FY 2023, the POA mandated contributions are expected to be approximately 67% 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 \$250 million compared to FY 2019 contribution of \$68.3 million. See benefit projections on page 27.

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 decreased this year from 66.3% to 62.8% as a result of:

- Defunding of the plan due to contributions substantially less than the actuarially determined amounts would have been. This defunding was mandated by the POA;
- Poor investment experience; and
- ASF activity as discussed on page 11.

Liability by Division - POA

(\$ Thousands)

	General	D.O.T.	DWSD	Library	Totals
Accrued Pension Liabilities					
Retirees and beneficiaries	\$1,136,697	\$300,097	\$599,339	\$ 55,310	\$2,091,443
Inactive members future deferred pensions	139,341	31,041	80,207	5,487	256,076
Active members	161,233	72,770	36,110	22,422	292,535
Total accrued pension liabilities	1,437,271	403,908	715,656	83,219	2,640,054
Pension fund balances	944,403	145,468	525,821	73,314	1,689,006
Unfunded accrued pension liabilities	492,868	258,440	189,835	9,905	951,048
Accrued Annuity Liabilities					
Retirees and beneficiaries#	58,793	10,424	33,258	3,283	105,758
Members annuities & future refunds	61,870	30,005	19,704	8,670	120,249
Total accrued annuity liabilities	120,663	40,429	52,962	11,953	226,007
Annuity fund balances	55,316	30,455	16,559	7,570	109,900
Unfunded accrued annuity liabilities#	65,347	9,974	36,403	4,383	116,107
Totals					
Actuarial Accrued Liabilities	1,557,934	444,337	768,618	95,172	2,866,061
Accrued Assets	999,719	175,923	542,380	80,884	1,798,906
Funded Ratio	64.2%	39.6%	70.6%	85.0%	62.8%
Unfunded Actuarial Accrued Liabilities	\$ 558,215	\$268,414	\$226,238	\$ 14,288	\$1,067,155

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 \$101.9 million for future claw-back payments.



SECTION B

FUND ASSETS

Statement of Plan Assets (Reported Assets at Market Value)

Market Value - June 30, 2019	
Cash and Cash Equivalents	\$ 51,631,036
Investments at Fair Value	1,643,478,100
Receivables	115,241,526
Cash and Investments held as collateral for securities lending	81,947,607
Capital Assets- Net	1,197,282
Accounts Payable	(94,588,724)
Total Current Assets	\$ 1,798,906,827

Market Value of Assets

Reserve Accounts (Market Value)

Funds	Fund Balances	
	June 30, 2019	June 30, 2018
Annuity Savings	\$ 120,248,768	\$ 108,420,640
Annuity Reserve	(10,348,572)	(3,642,239)
Pension Accumulation	(223,815,149)	(117,705,957)
Pension Reserve	1,912,821,780	1,953,551,198
Total Fund Balances	\$ 1,798,906,827	\$1,940,623,642

Revenues and Expenditures (Market Value)

	Pension Funds	Annuity Funds	Total Funds
Balance, July 1, 2018	\$1,835,845,240	\$104,778,402	\$1,940,623,642
Prior valuation audit adjustment	1	\$ (1)	0
Market Value July 1, 2018	\$1,835,845,241	\$104,778,401	\$1,940,623,642
Revenues			
Employer Contributions	67,900,000	0	67,900,000
Employee Contributions	0	0	0
Foundation Contributions	375,000	0	375,000
Annuity Interest	6,437,966	0	6,437,966
Investment Income (Net of Investment Expenses)	41,547,812	5,622,191	47,170,003
Transfer In (ASF from PAF to tie to System Report)	0	23,611,981	23,611,981
Transfer In (ASF from PAF)	0	129,555	129,555
Other Income	605,738	(161,137)	444,601
Total	\$ 116,866,516	\$ 29,202,590	\$ 146,069,106
Expenditures			
Benefit Payments	224,709,220	10,444,512	235,153,732
Refund of Member Contributions	0	13,636,283	13,636,283
ASF Recoupment Write Off	3,214,754	0	3,214,754
Transfer Out (PAF to ASF to tie System Report)	23,611,981	0	23,611,981
Transfer Out (Transition Cost \$9,015,677)	9,145,232	0	9,145,232
Administrative Expenses	3,023,939	0	3,023,939
Total	\$ 263,705,126	\$ 24,080,795	\$ 287,785,921
Market Value June 30, 2019	\$1,689,006,631	\$109,900,196	\$1,798,906,827
Market Value Rate of Return (Net of all expenses)	2.5%	5.2%	2.6%
Net Cash Flow as Percent of Assets	(10.3)%	(0.3)%	(9.8)%

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, 2018	Adjustment	Contributions	Benefit Payments	Other	Investment Return (Net of All Expenses)	June 30, 2019
Annuity Savings Fund							
General	\$ 54,566,238	\$ 0	\$ 0	\$ (6,739,915)	\$ 11,290,218	\$ 2,753,433	\$ 61,869,974
D.O.T.	30,852,797	0	0	(4,265,720)	1,838,413	1,579,074	30,004,564
DWSD	15,158,137	0	0	(2,180,547)	5,837,869	888,682	19,704,141
Library	7,843,468	0	0	(450,102)	875,721	401,002	8,670,089
Totals	108,420,640	0	0	(13,636,284)	19,842,221	5,622,191	120,248,768
Annuity Reserve Fund							
General	(2,652,058)	0	0	(5,903,156)	2,000,840	0	(6,554,374)
D.O.T.	656,362	0	0	(875,512)	669,918	0	450,768
DWSD	(825,765)	0	0	(3,247,767)	928,822	0	(3,144,710)
Library	(820,778)	0	0	(418,076)	138,598	0	(1,100,256)
Totals	(3,642,239)	0	0	(10,444,511)	3,738,178	0	(10,348,572)
Pension Accumulation Fund							
General	(24,208,026)	(100,442,331)	22,765,012	0	(15,675,108)	21,009,426	(96,551,027)
D.O.T.	(90,557,713)	(32,333,206)	109,988	0	(4,743,172)	3,719,989	(123,804,114)
DWSD	(28,059,583)	(45,727,473)	42,900,000	0	(6,936,633)	12,190,169	(25,633,520)
Library	25,119,365	(5,476,792)	2,500,000	0	(1,573,348)	1,604,287	22,173,512
Totals	(117,705,957)	(183,979,802)	68,275,000	0	(28,928,261)	38,523,871	(223,815,149)
Pension Reserve Fund							
General	1,066,519,669	100,442,331	0	(126,007,919)	0	0	1,040,954,081
D.O.T.	268,328,794	32,333,206	0	(31,390,169)	0	0	269,271,831
DWSD	566,455,527	45,727,473	0	(60,728,037)	0	0	551,454,963
Library	52,247,208	5,476,792	0	(6,583,095)	0	0	51,140,905
Totals	1,953,551,198	183,979,802	0	(224,709,220)	0	0	1,912,821,780
Retirement System Totals	\$1,940,623,642	\$ 0	\$68,275,000	\$ (248,790,015)	\$ (5,347,862)	\$ 44,146,062	\$1,798,906,827

SECTION C

PARTICIPANT DATA

Reconciliation of Raw Data

Active Members

A) Count reported in Legacy file	2,952
B) In Legacy file but not in Hybrid file	(21)
C) Hired after plan closed	(94)
D) Non-active Status	(22)
E) Agency "88"	(22)
F) Non-eligible class code & bargaining unit	-
G) No hire date in Hybrid file	-
H) Zero salary in Hybrid file	-
I) Number of records to value	<u>2,793</u>

Inactive Vested Members

A) Number of records reported on data file	3,314
B) In Legacy active file but not otherwise in database and not in Hybrid active file	3
C) Valued as inactive in prior year and would not have otherwise been valued in Legacy this year	10
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	31
E) Less than 8 years of vesting service	<u>(149)</u>
F) Number of records to value	3,209

Retired Members and Beneficiaries

A) Number of records reported on data file	43,696
B) Number of records in P/F plan	(16,344)
C) Records not currently in receipt of benefits based on reported status codes	(15,481)
D) Component I (Hybrid) Records	<u>(314)</u>
E) Number of records valued	11,557

Reconciliation of Year-to-Year Data as of June 30, 2019

	Active		Term.	Retirees		Totals
	Count	Pay#	Count	Count	Monthly Benefits	Count
2018	3,018	\$149,373,313	3,236	11,684	\$18,695,491	17,938
Change in Pay/Pensions	N/A	4,007,800	N/A	N/A	(107,402)	
Rehired (Not Vested)	95	4,904,226	-			95
Rehired (Vested)	36	1,558,261	(30)	(6)	(10,218)	-
New Beneficiary				94	90,014	94
Retired	(80)	(3,907,381)	(134)	235	344,035	21
Non-Duty Disabled				-	-	-
Duty Disabled				-	-	-
Assumed Death/Removals			(11)	(457)	(621,537)	(468)
Vested Term	(145)	(7,397,273)	148			3
Non-Vested Terminated	(131)	(6,323,886)				(131)
Data Adjustment	-	-	-	7	12,961	7
2019	2,793	\$142,215,060	3,209	11,557	\$18,403,344	17,559

This represents current pay and is not used for the Component II (Legacy) valuation.

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, 2019 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 2019 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.

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 January 31, 2020 for additional information regarding data reconciliation, processing instructions, and assumptions regarding unresolved issues. Note, this letter disclosed our remaining data processing procedures and assumptions and details our reconciliation and final valuation data. System staff has approved the detail and final data disclosed in this letter.



Summary of Member Data June 30, 2019 Active Members

	General	D.O.T.	DWSD	Library	Totals [^]
Number	1,667	542	358	226	2,793
% Change in active members	(8.2)%	(6.9)%	(5.8)%	(5.8)%	(7.5)%
Annual payroll (\$ millions)	\$ 91.4	\$ 21.4	\$ 18.5	\$ 10.8	\$ 142.1
Average pay	\$54,836	\$39,568	\$51,725	\$47,963	\$50,918
% Change in average pay	3.8 %	(0.1)%	3.4 %	1.1 %	2.9 %

[^] May not add due to rounding.

Retired Members and Survivor Beneficiaries

	General	D.O.T.	DWSD	Library	Totals
Number	6,828	1,637	2,771	321	11,557
Annual benefits (\$ millions) #	\$ 129.4	\$ 31.7	\$ 63.3	\$ 6.7	\$ 231.1
Average benefits #	\$18,949	\$19,354	\$22,858	\$20,979	\$20,000
% Change in reported average benefit	(0.1)%	0.1 %	(1.5)%	(1.8)%	(0.5)%

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

Inactive Vested Members

	General	D.O.T.	DWSD	Library	Totals
Number	1,805	397	918	89	3,209
Average AFC	\$38,968	\$41,888	\$48,194	\$32,983	\$41,802
Average service	15.7	15.3	15.6	14.4	15.6
Annual benefits (\$ millions)	\$ 18.0	\$ 4.1	\$ 11.3	\$ 0.7	\$ 34.1
Average benefits	\$9,971	\$10,270	\$12,348	\$ 7,955	\$10,632
% Change in average service	(1.0)%	(2.2)%	(1.5)%	0.8 %	(1.3)%
% Change in average AFC	(1.4)%	(1.4)%	(0.4)%	(0.2)%	(1.2)%

Active Members as of June 30, 2019 by Attained Age and Years of Service Retirement System Totals

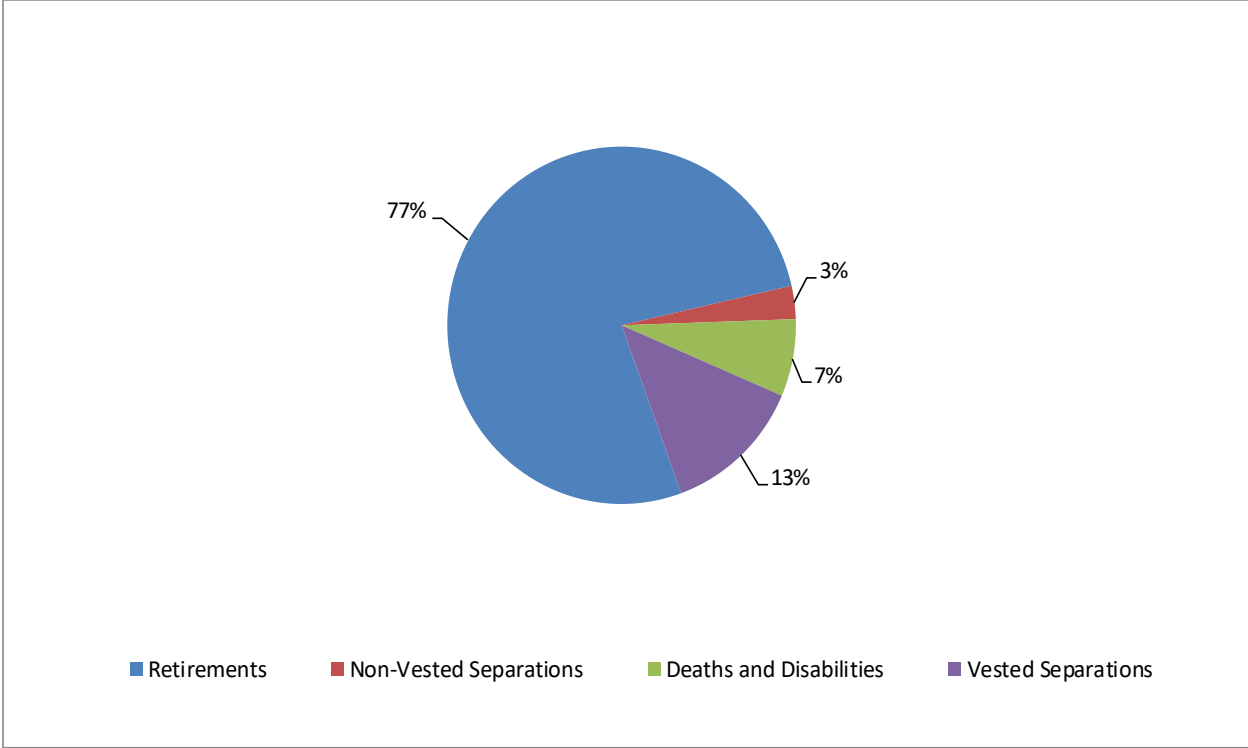
Attained Age	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	No.	Valuation Payroll
20-24	3	2						5	\$ 143,416
25-29	11	13	3					27	1,111,083
30-34	14	44	16	1				75	3,392,765
35-39	13	39	41	36	1			130	6,077,416
40-44	16	46	55	90	38	4		249	12,412,119
45-49	17	51	76	119	131	24	1	419	21,456,901
50-54	9	43	68	134	214	69	52	589	30,636,987
55-59	14	47	58	115	182	103	153	672	33,745,022
60-64	7	27	40	76	92	64	139	445	23,249,486
65-69	3	20	20	12	26	9	35	125	6,895,493
70-74	0	6	4	7	9	2	9	37	2,235,146
75-79	1	1	2	5	3	1	7	20	859,226
Totals	108	339	383	595	696	276	396	2,793	\$142,215,060

Group Averages:

Age: 52.7 years
Benefit Service: 15.2 years
Eligibility Service: 19.6 years
Annual Pay: \$50,918

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



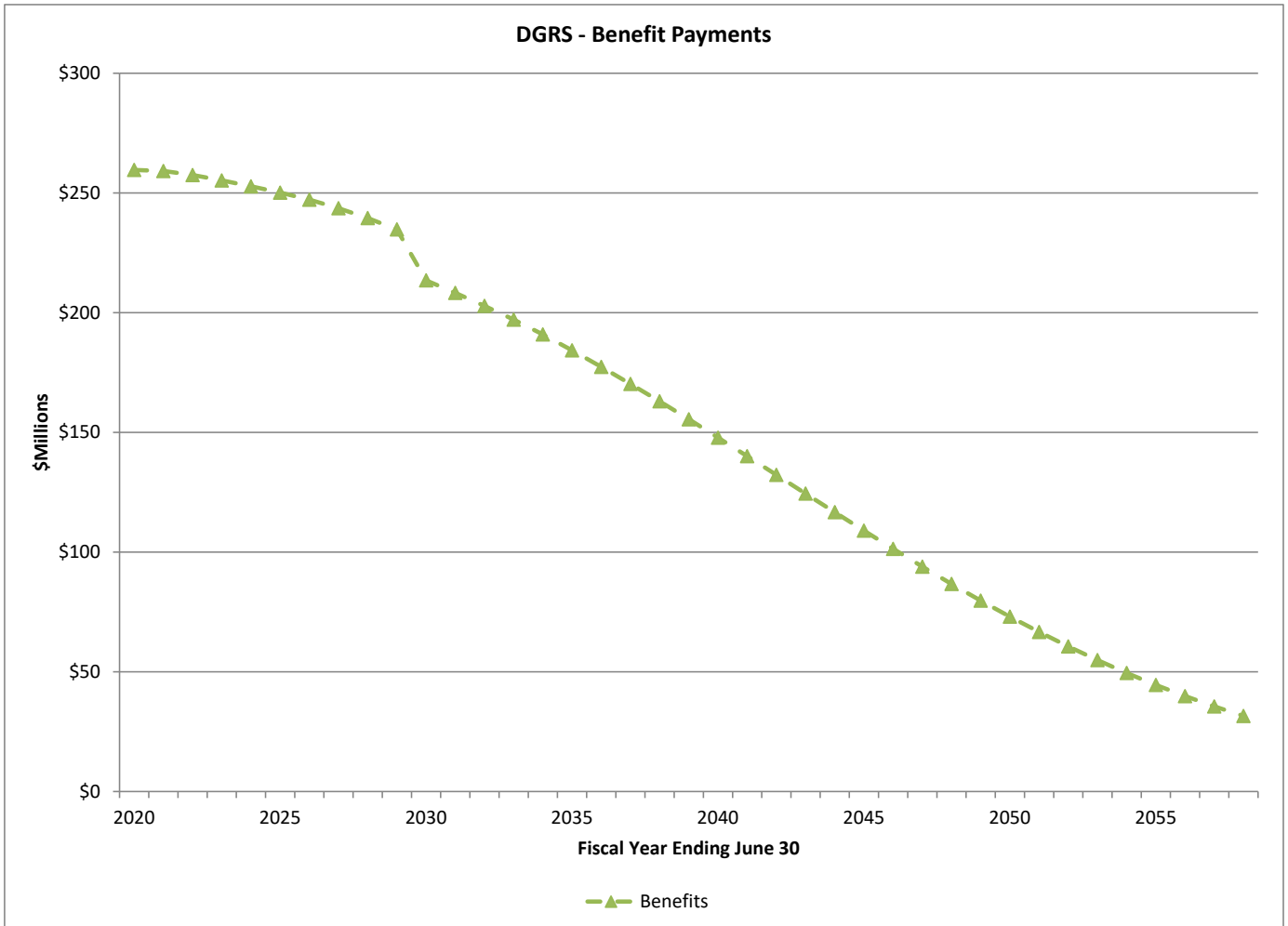
The chart shows the expected future development of the present population in simplified terms. The Retirement System presently covers 2,793 active members. Eventually, 77 people are expected to terminate covered employment prior to retirement and forfeit eligibility for an employer provided benefit. 2,529 people are expected to receive monthly retirement benefits either by retiring directly from active service, or by retiring from vested deferred status. 187 people are expected to become eligible for benefits as a result of death-in-service or disability.

Actual versus expected retirements for the 2019 fiscal year is shown below:

Year Ended June 30,	Expected	Actual
2019	262	80

Expected Benefit Payments

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



Retirees and Beneficiaries June 30, 2019

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*	7	\$ 8,819	0	\$ 0	2	\$ 1,216	9	\$ 10,035
20-24	1	3,627					1	3,627
25-29	6	6,943					6	6,943
30-34	13	5,269	0	0			13	5,269
35-39	10	5,333	1	761	2	2,811	13	8,905
40-44	13	10,003	9	3,918	1	773	23	14,694
45-49	49	47,537	21	14,448	4	1,853	74	63,838
50-54	213	359,029	58	45,309	12	13,687	283	418,025
55-59	596	1,129,438	126	109,140	25	25,892	747	1,264,470
60-64	1,601	3,054,757	249	328,785	38	45,808	1,888	3,429,350
65-69	2,082	3,693,559	188	220,578	43	58,809	2,313	3,972,946
70-74	1,969	3,555,259	154	176,881	37	66,216	2,160	3,798,356
75-79	1,334	2,151,055	68	63,619	32	37,178	1,434	2,251,852
80-84	919	1,286,501	50	43,052	26	28,507	995	1,358,060
85-89	663	826,649	21	17,764	36	36,057	720	880,470
90-94	552	608,277	29	20,889	36	29,630	617	658,796
95 and Over	238	238,834	3	2,803	20	16,071	261	257,708
Totals	10,266	\$16,990,889	977	\$1,047,947	314	\$364,508	11,557	\$18,403,344

* May include records with defective birth dates.

Includes survivor beneficiaries of deceased retirees.



Retirees and Beneficiaries June 30, 2019 Tabulated by Year of Retirement

Year of Retirement	No.	Monthly Allowances	
		Total	Average
1950 & before	4	\$ 7,141	\$1,785
1951-1955	3	4,535	1,512
1956-1960	1	329	329
1961-1965	8	3,457	432
1966-1970	24	10,578	441
1971-1975	78	47,499	609
1976-1980	245	178,463	728
1981-1985	506	506,780	1,002
1986-1990	660	708,013	1,073
1991-1995	1,193	1,480,205	1,241
1996-2000	1,440	2,149,378	1,493
2001-2005	1,895	3,557,795	1,877
2006-2010	2,072	3,901,192	1,883
2011-2015	2,469	4,318,743	1,749
2016	399	717,334	1,798
2017	246	353,341	1,436
2018	229	332,819	1,453
2019	85	125,742	1,479
Totals	11,557	\$18,403,344	\$1,592

SECTION D

METHODS AND ASSUMPTIONS

Summary of Assumptions and Methods Used for Actuarial Valuations Adopted by the 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 33 and 34. 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 35. 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 the 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.

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 2019	Future Life Expectancy (Years)	
	Men	Women
45	38.73	42.07
50	33.77	37.01
55	29.00	32.10
60	24.45	27.35
65	20.14	22.78
70	16.15	18.46
75	12.52	14.50
80	9.33	10.98

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 1068	143 212	584 212 x 0.95	188 212 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

Benefit Service	Exact Fractional service is used to determine the amount of benefit payable.
Decrement Operation	Disability and mortality decrements do not operate during the first five years of service. Disability and withdrawal do not operate during retirement eligibility.
Decrement Timing	Decrements of all types are assumed to occur mid-year.
Eligibility Testing	Eligibility for benefits is determined based upon the age nearest birthday and rounded service on the date the decrement is assumed to occur.
Forfeitures	None.
Incidence of Contributions	Contributions are assumed to be received at the end of the year.
Marriage Assumption	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.
Normal Form of Benefit	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.
Service Credit Accruals	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.
Administrative Expenses	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.
Sick Leave	Sick leave banks as of June 30, 2014 were included in the 2014 data file provided by the System.
Member Contributions	Member contributions to this Component II plan are assumed to have ceased with the bankruptcy.
Pop-Up Benefits	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

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

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.

ASF. Annuity Savings Fund

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.

PAF. Pension Accumulation Fund.

Plan of Adjustment or POA. The 8th 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.