HEALTH WEALTH CAREER

THE CONTRIBUTORY PENSION PLAN FOR SALARIED EMPLOYEES OF MCMASTER UNIVERSITY INCLUDING MCMASTER DIVINITY COLLEGE 2000

REPORT ON THE ACTUARIAL VALUATION FOR FUNDING PURPOSES AS AT JULY 1, 2018

MARCH 2019

Financial Services Commission of Ontario Registration Number: 1079920

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To prepare the results in this report, actuarial assumptions are used to model a single scenario from a range of possibilities for each valuation basis. The results based on that single scenario are included in this report. However, the future is uncertain and the Plan's actual experience will differ from those assumptions; these differences may be significant or material. Different assumptions or scenarios within the range of possibilities may also be reasonable, and results based on those assumptions would be different. Furthermore, actuarial assumptions may be changed from one valuation to the next because of changes in regulatory and professional requirements, developments in case law, plan experience, changes in expectations about the future, and other factors.

The valuation results shown in this report also illustrate the sensitivity to one of the key actuarial assumptions, the discount rate. We note that the results presented herein rely on many assumptions, all of which are subject to uncertainty, with a broad range of possible outcomes, and the results are sensitive to all the assumptions used in the valuation.

Should the Plan be wound up, the going concern funded status and solvency financial position, if different from the wind-up financial position, become irrelevant. The hypothetical wind-up financial position estimates the financial position of the Plan assuming it is wound up on the valuation date. Emerging experience will affect the wind-up financial position of the Plan assuming it is wound up in the future. In fact, even if the Plan were wound up on the valuation date, the financial position would continue to fluctuate until the benefits are fully settled.

Decisions about benefit changes, granting new benefits, investment policy, funding policy, benefit security, and/or benefit-related issues should not be made solely on the basis of this valuation, but only after careful consideration of alternative economic, financial, demographic, and societal factors, including financial scenarios that assume future sustained investment losses.

Funding calculations reflect our understanding of the requirements of the Pension Benefits Act (Ontario), the Income Tax Act, and related regulations that are effective as of the valuation date. Mercer is not a law firm, and the analysis presented in this report is not intended to be a legal opinion. You should consider securing the advice of legal counsel with respect to any legal matters related to this report.

CONTENTS

1
SUMMARY OF RESULTS

(000'S)	01.07.18	01.07.17
Going Concern Financial Status		
Smoothed value of assets	$1,983,556	$1,828,584
Going concern funding liabilities	$1,892,602	$1,859,365
Provision for adverse deviations in respect of the going concern liabilities	$234,374	N/A
Funding excess (shortfall)	($143,420)	($30,781)
Hypothetical Wind-up Financial Position		
Wind-up assets	$2,055,505	$1,902,836
Wind-up liability	$2,252,753	$2,244,977
Wind-up excess (shortfall)	($197,248)	($342,141)
Transfer ratio	91%	85%
Next required valuation date	July 1, 2021	July 1, 2020

(000'S)	2018/2019	2017/2018
Funding Requirements in the Year Following the Valuation [1]		
Total current service cost	$56,413	$55,096
Estimated members' required contributions	($28,481)	($25,242)
Estimated University's current service cost	$27,932	$29,854
Provision for adverse deviations in respect of current service cost	$7,228	N/A
Total	$35,160	$29,854
University's current service cost and provision for adverse deviations in respect of the current service cost expressed as a percentage of members' required contributions	123%	118%
Minimum special payments[2]	$6,028	$6,028
Estimated minimum University contribution	$41,188	$35,882
Estimated maximum eligible University contribution	$232,408	$371,943

[1] Provided for reference purposes only. Contributions must be remitted to the Plan in accordance with the Minimum Funding Requirements and Maximum Eligible Contributions sections of this report.

[2] Special payments with respect to the first year following the valuation date only. The full special payment schedule is outlined in Appendix A.

2
INTRODUCTION

TO MCMASTER UNIVERSITY

At the request of McMaster University, we have conducted an actuarial valuation of The Contributory Pension Plan for Salaried Employees of McMaster University Including McMaster Divinity College 2000 (the “Plan”), sponsored by McMaster University (the “University”), as at the valuation date, July 1, 2018. We are pleased to present the results of the valuation.

PURPOSE

The purpose of this valuation is to determine:

- The funded status of the Plan as at July 1, 2018 on going concern, hypothetical wind-up, and solvency bases;
- The minimum required funding contributions from July 1, 2018, in accordance with the *Pension Benefits Act (Ontario)* (the “Act”); and
- The maximum permissible funding contributions from July 1, 2018, in accordance with the *Income Tax Act.*

The information contained in this report was prepared for the internal use of the University, and for filing with the Financial Services Commission of Ontario and with the Canada Revenue Agency, in connection with our actuarial valuation of the Plan. This report will be filed with the Financial Services Commission of Ontario and with the Canada Revenue Agency. This report is not intended or suitable for any other purpose.

In accordance with pension benefits legislation, the next actuarial valuation of the Plan will be required as at a date not later than July 1, 2021, or as at the date of an earlier amendment to the Plan.

TERMS OF ENGAGEMENT

In accordance with our terms of engagement with McMaster University, our actuarial valuation of the Plan is based on the following material terms:

- It has been prepared in accordance with applicable pension legislation and actuarial standards of practice in Canada.

- As instructed by the University, we have not reflected a margin for adverse deviations in the going concern valuation in excess of the provision for adverse deviations prescribed by the Act.

- We have reflected the University's decisions for determining the solvency funding requirements, summarized as follows:

  – The same plan wind-up scenario was hypothesized for both hypothetical wind-up and solvency valuations.

  – Although permissible, no benefits were excluded from the solvency liabilities.

  – The solvency financial position was determined on a market value basis.

  See the Valuation Results - Solvency section of the report for more information.

EVENTS SINCE THE LAST VALUATION AT JULY 1, 2017

Pension Plan

There have been no special events since the last valuation date.

This valuation reflects the provisions of the Plan as at July 1, 2018. Since the date of the last valuation, the Plan was amended to provide special adjustments to required contributions for certain employee classes in situations where the University's contributions for any month are below certain thresholds. The Plan was also amended to increase required contributions for various employee classes as a result of recent negotiations and other decisions. The Plan text was restated effective January 1, 2019 to incorporate these and other amendments since the last statement of the Plan and to incorporate legislative changes and to make other housekeeping changes. All amendments have been reflected in this valuation. We are aware of one pending definitive amendment coming into effect during the period covered by this report – see the Subsequent Events section below for details. The Plan provisions are summarized in Appendix F.

Assumptions

We have used the same going concern valuation assumptions and methods as were used for the previous valuation, except for the following:

	CURRENT VALUATION		PREVIOUS VALUATION	
Post-retirement pension increases:	Unifor Hired on or After May 1, 2010		Unifor Hired on or After May 1, 2010	
	Year	**Rate**	**Year**	**Rate**
	2019	1.89%	2018	1.46%
	2020	2.00%	2019	2.00%
	2021	1.47%	2020	1.52%
	2022	2.24%	2021	0.99%
	2023	1.14%	2022	1.79%
	2024 onwards	0.60%	2023 onwards	0.70%
	Other		Other	
	Year	**Rate**	**Year**	**Rate**
	2019	1.89%	2018	1.46%
	2020	2.00%	2019	2.00%
	2021	1.97%	2020	2.00%
	2022	2.03%	2021	1.49%
	2023	1.64%	2022	2.29%
	2024 onwards	1.10%	2023 onwards	1.20%
Portability – basis for determining commuted values	Interest rates: 2.9% per year for 10 years; 3.2% per year thereafter		Interest rates: 2.3% per year for 10 years; 3.3% per year thereafter	

A summary of the going concern methods and assumptions is provided in Appendix C.

The hypothetical wind-up and solvency assumptions have been updated to reflect market conditions at the valuation date. A summary of the hypothetical wind-up and solvency methods and assumptions is provided in Appendix D.

Regulatory Environment and Actuarial Standards

There have been a number of changes to the Act and regulations which impact the funding of the Plan.

On December 14, 2017, Bill 177, Stronger, Fairer Ontario Act, 2017 received Royal Assent. Bill 177 contained amendments to the Act to enable the new funding framework previously announced by the Government of Ontario in May, 2017. The new funding framework changed minimum funding requirements from both a going concern and solvency perspective. The regulations to the Act supporting the new funding rules were published on April 20, 2018 with effect from May 1, 2018. Valuation reports with effect on or after December 31, 2017 that are filed on or after May 1, 2018 reflect the new rules. The amended regulations also allow for a transition from the funding rules that applied immediately before May 1, 2018 to the new funding rules over a three-year phase-in period starting in the first year following the valuation date of this report.

The funding relief measures that were introduced for pension plans in the broader public sector have also been amended. In general, the new funding framework applies for valuation dates on and after December 31, 2017 to broader public sector pension plans that received solvency funding relief. However, for these plans, the additional restrictions on funding of benefit improvements and contribution holidays contained in the solvency funding relief rules that apply for a prescribed period have been retained.

SUBSEQUENT EVENTS

We have been notified that the University has negotiated an increase to employee contribution rates for the MUALA employee group of the Plan effective from August 1, 2019. This change has been reflected in the valuation. After checking with representatives of the University, to the best of our knowledge there have been no other events subsequent to the valuation date which, in our opinion, would have a material impact on the results of the valuation. Our valuation reflects the financial position of the Plan as of the valuation date and does not take into account any experience after the valuation date.

IMPACT OF CASE LAW

This report has been prepared on the assumption that all claims on the Plan after the valuation date will be in respect of benefits payable to members of the Plan determined in accordance with the Plan terms and that all Plan assets are available to provide for these benefits. It is possible that court and regulatory decisions and changes in legislation could give rise to additional entitlements to benefits under the Plan and cause the results in this report to change. By way of example, we bring your attention to the following decisions:

- The Ontario Court of Appeal’s 2003 decision in *Aegon Canada Inc. and Transamerica Life Canada versus ING Canada Inc.* restricted the use of original plan surplus where two or more pension plans were merged.

- The Supreme Court of Canada's 2004 decision in *Monsanto Canada Inc. versus Superintendent of Financial Services* upheld the requirement, with retroactive effect, to distribute surplus on partial plan wind-up under the *Pension Benefits Act (Ontario).*

We are not in a position to assess the impact that such decisions or changes could have on the assumption that all plan assets on the valuation date are available to provide for benefits determined in accordance with the Plan terms. If such a claim arises subsequent to the date of this report, the consequences will be dealt with in a subsequent report. We are making no representation as to the likelihood of such a claim.

3
VALUATION RESULTS – GOING CONCERN

FINANCIAL STATUS

A going concern valuation compares the relationship between the value of Plan assets and the present value of expected future benefit cash flows in respect of accrued service, assuming the Plan will be maintained indefinitely.

The results of the current valuation, compared with those from the previous valuation, are summarized as follows:

(000'S)	01.07.18	01.07.17
Assets		
Market value of assets	$2,056,405	$1,903,736
Asset smoothing adjustment	($72,849)	($75,152)
Smoothed value of assets	$1,983,556	$1,828,584
Going concern funding target		
Going concern liabilities:		
• Active members	$882,404	$877,132
• Pensioners and survivors	$966,090	$935,184
• Deferred pensioners	$44,108	$47,049
• Subtotal	$1,892,602	$1,859,365
Provision for adverse deviations in respect of going concern liabilities as prescribed by the Act	$234,374	N/A
Total	$2,126,976	$1,859,365
Funding excess (shortfall)[3]	($143,420)	($30,781)

[3] Funding excess (shortfall) may or may not be equal to the going concern excess (unfunded liability) as described in the Act. Details of the going concern excess (unfunded liability) are provided in Appendix A.

The going concern liabilities at July 1, 2018 do not include an additional margin for adverse deviations beyond the provision for adverse deviations prescribed by the Act.

RECONCILIATION OF FINANCIAL STATUS (000'S)

Funding excess (shortfall) as at previous valuation		($30,781)
Interest on funding excess (shortfall) at 5.60% per year		($1,724)
University's special payments, with interest		$30,730
Expected funding excess (shortfall)		($1,775)
Net experience gains (losses)		
• Net investment return	$51,239	
• Impact of asset smoothing	$6,512	
• Increases in pensionable earnings	$3,806	
• Increases in YMPE/maximum pension	$5,964	
• Indexation	($4,452)	
• Mortality	($1,156)	
• Retirement	$6,177	
• Termination	($2,050)	
• Interest on employee contributions	($7,405)	
Total experience gains (losses)		$58,635
Impact of changes in assumptions		
• Post-retirement pension increase assumption	$14,111	
• Interest rates for determining commuted values	$3,177	
Total assumption changes impact		$17,288
Change in provision for adverse deviations in respect of the going concern liabilities		($234,374)
Refinements to valuation method		$21,726
Net impact of other elements of gains and losses		($4,920)
Funding excess (shortfall) as at current valuation		($143,420)

CURRENT SERVICE COST

The current service cost is an estimate of the present value of the additional expected future benefit cash flows in respect of pensionable service that will accrue after the valuation date, assuming the Plan will be maintained indefinitely. A provision for adverse deviations in respect of the current service cost is determined in accordance with the Act.

The current service cost and the provision for adverse deviations in respect of the current service cost, during the year following the valuation date, compared with the corresponding values determined in the previous valuation, is as follows:

(000'S)	2018/2019	2017/2018
Total current service cost	$56,413	$55,096
Estimated members' required contributions	($28,481)	($25,242)
Estimated University's current service cost	$27,932	$29,854
University's current service cost expressed as a percentage of members' required contributions	98%	118%
Provision for adverse deviations in respect of the current service cost (based on the percentage defined in Appendix A)		
• As a dollar amount per year	$7,228	N/A
• As a percentage of members' required contributions	25%	N/A
University's current service cost and provision for adverse deviations in respect of current service cost		
• As a dollar amount per year	$35,160	$29,854
• As a percentage of members' required contributions	123%	118%

The key factors that have caused a change in the University's current service cost excluding the provision for adverse deviations since the previous valuation are summarized in the following table:

University's current service cost as at previous valuation	118%
Demographic changes	0%
Plan amendment to increase member contributions	(18%)
Changes in assumptions	(2%)
University's current service cost as at current valuation	98%

DISCOUNT RATE SENSITIVITY (000'S)

The following table summarizes the effect on the going concern funding target and current service cost shown in this report of using a discount rate which is 1% lower than that used in the valuation. The effect of a change in the discount rate on the provision for adverse deviations[4] is not shown in the table below.

SCENARIO	VALUATION BASIS	REDUCE DISCOUNT RATE BY 1%
Going concern funding liabilities	$1,892,602	$2,148,800
Current service cost		
Total current service cost	$56,413	$66,357
Estimated members' required contributions	($28,481)	($28,481)
Total University's current service cost	$27,932	$37,876

[4] The provision for adverse deviations of 13.8% in respect of the current service cost and going concern liabilities.

4
VALUATION RESULTS – HYPOTHETICAL WIND-UP

FINANCIAL POSITION

When conducting a hypothetical wind-up valuation, we determine the relationship between the respective values of the Plan's assets and its liabilities assuming the Plan is wound up and settled on the valuation date, assuming benefits are settled in accordance with the Act and under circumstances consistent with the hypothesized scenario on the valuation date. More details on such scenario are provided in Appendix D.

The hypothetical wind-up financial position as of the valuation date, compared with that at the previous valuation, is as follows:

(000'S)	01.07.18	01.07.17
Assets		
Market value of assets	$2,056,405	$1,903,736
Termination expense provision	($900)	($900)
Wind-up assets	$2,055,505	$1,902,836
Present value of accrued benefits for:		
• Active members	$1,113,978	$1,129,481
• Pensioners and survivors	$1,076,952	$1,058,018
• Deferred pensioners	$61,823	$57,478
Total wind-up liability	$2,252,753	$2,244,977
Wind-up excess (shortfall)	($197,248)	($342,141)
Transfer Ratio	91%	85%

WIND-UP INCREMENTAL COST

The wind-up incremental cost is an estimate of the present value of the projected change in the hypothetical wind-up liabilities from the valuation date until the next scheduled valuation date, adjusted for the benefit payments expected to be made in that period.

The hypothetical wind-up incremental cost determined in this valuation, compared with the corresponding value determined in the previous valuation, is as follows:

(000'S)	01.07.18	01.07.17
Number of years covered by report	3 years	3 years
Total hypothetical wind-up liabilities at the valuation date (A)	$2,252,753	$2,244,977
Present value at the valuation date of projected hypothetical wind-up liability at the next required valuation (including expected new entrants) plus expected benefit payments until the next required valuation (B)	$2,506,892	$2,533,789
Hypothetical wind-up incremental cost (B – A)	$254,139	$288,812

The incremental cost is not an appropriate measure of the contributions that would be required to maintain the financial position of the Plan on a hypothetical wind-up basis unchanged from the valuation date to the next required valuation date, if actual experience is exactly in accordance with the going concern valuation assumptions. This is because it does not reflect the fact that the expected return on plan assets (based on the going concern assumptions) is greater than the discount rate used to determine the hypothetical wind-up liabilities.

DISCOUNT RATE SENSITIVITY (000'S)

The following table summarizes the effect on the hypothetical wind-up liabilities shown in this report of using a discount rate which is 1% lower than that used in the valuation:

SCENARIO	VALUATION BASIS	REDUCE DISCOUNT RATE BY 1%
Total hypothetical wind-up liability	$2,252,753	$2,588,334

5
VALUATION RESULTS – SOLVENCY

OVERVIEW

The Act also requires the financial position of the Plan to be determined on a solvency basis. The financial position on a solvency basis is determined in a similar manner to the Hypothetical Wind-up Basis, except for the following:

EXCEPTIONS	REFLECTED IN VALUATION BASED ON THE TERMS OF ENGAGEMENT
The circumstance under which the Plan is assumed to be wound up could differ for the solvency and hypothetical wind-up valuations.	The same circumstances were assumed for the solvency valuation as were assumed for the hypothetical wind-up valuation.
Certain benefits can be excluded from the solvency financial position. These include: (a) any escalated adjustment (e.g. indexing), (b) certain plant closure benefits, (c) certain permanent layoff benefits, (d) special allowances other than funded special allowances, (e) consent benefits other than funded consent benefits, (f) prospective benefit increases, (g) potential early retirement window benefit values, and (h) pension benefits and ancillary benefits payable under a qualifying annuity contract.	No benefits were excluded from the solvency liabilities shown in this valuation.
The financial position on the solvency basis needs to be adjusted for any Prior Year Credit Balance.	Not applicable.
The solvency financial position can be determined by smoothing assets and the solvency discount rate over a period of up to 5 years.	Smoothing was not used.
The benefit rate increases coming into effect after the valuation date can be reflected in the solvency valuation.	Not applicable.

FINANCIAL POSITION

The financial position on a solvency basis, compared with the corresponding figures from the previous valuation, is as follows:

(000'S)	01.07.18	01.07.17
Assets		
Market value of assets	$2,056,405	$1,903,736
Termination expense provision	($900)	($900)
Net assets	$2,055,505	$1,902,836
Liabilities		
Total hypothetical wind-up liabilities	$2,252,753	$2,244,977
Difference in circumstances of assumed wind-up	$0	$0
Value of excluded benefits	$0	$0
Liabilities on a solvency basis	$2,252,753	$2,244,977
Surplus (shortfall) on a solvency basis	($197,248)	($342,141)
Transfer Ratio	91%	85%

6
MINIMUM FUNDING REQUIREMENTS

The Act prescribes the minimum contributions that McMaster University must make to the Plan. The minimum contributions in respect of a defined benefit component of a pension plan are comprised of going concern current service cost, the provision for adverse deviations in respect of the current service cost and special payments to fund any funding shortfall or solvency shortfall that exceeds the level as set out under the Act.

On the basis of the assumptions and methods described in this report, no special payments are required. However, since the available actuarial surplus is zero, the Act requires the University to contribute the current service cost including the provision for adverse deviations. The determination of the provision for adverse deviations is shown in Appendix A. On the basis of the assumptions and methods described in this report, the rule for determining the minimum required University monthly contributions, as well as an estimate of the employee and University contributions, from the valuation date until the next required valuation are as follows:

	UNIVERSITY'S CONTRIBUTION RULE		
Period beginning	Monthly current service cost[5]	Provision for adverse deviations[4]	Monthly special payments
July 1, 2018	98%	25%	$502,338
July 1, 2019	98%	25%	$1,573,773
July 1, 2020	98%	25%	$1,573,773

[5] Expressed as a percentage of members' required contributions.

Period beginning	Monthly Employee Contribution	ESTIMATED UNIVERSITY'S CONTRIBUTIONS		
		Minimum monthly special payments	Monthly current service cost and provision for adverse deviations[6]	Minimum monthly contributions
July 1, 2018	$2,373,000	$502,338	$2,930,000	$3,432,338
July 1, 2019	$2,373,000	$1,573,773	$2,930,000	$4,503,773
August 1, 2019	$2,374,000	$1,573,773	$2,929,000	$4,502,773
July 1, 2020	$2,374,000	$1,573,773	$2,929,000	$4,502,773

The estimated employee contributions and University current service cost have been adjusted starting with the period beginning August 1, 2019 to reflect the negotiated increase in employee contributions for the MUALA employee group effective August 1, 2019. The estimated contribution amounts above are based on projected active members' required contributions. Therefore, the actual University's current service cost and provision for adverse deviations in respect of the current service cost may be different from the above estimates and, as such, the contribution requirements should be monitored closely to ensure contributions resume in accordance with the Act.

Appendix A includes details on the determination of the provision for adverse deviations.

OTHER CONSIDERATIONS

Differences Between Valuation Bases

There is no provision in the minimum funding requirements to fund the difference between the hypothetical wind-up and reduced solvency shortfalls, if any.

In addition, although minimum funding requirements do include a requirement to fund the going concern current service cost and a provision for adverse deviations in respect of the current service cost, there is no requirement to fund the expected growth in the hypothetical wind-up or solvency liability after the valuation date, which could be greater.

Timing of Contributions

Funding contributions are due on a monthly basis. Contributions for current service cost and the provision for adverse deviations including the expense allowance must be made within 30 days following the month to which they apply. Special payment contributions must be made in the month to which they apply.

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[6] The provision for adverse deviations in respect of the current service cost is estimated to be $602,000 per month for each period.

Retroactive Contributions

The University must contribute the excess, if any, of the minimum contribution recommended in this report over contributions actually made in respect of the period following the valuation date. This contribution, along with an allowance for interest, is due no later than 60 days following the date this report is filed.

Payment of Benefits

The Act imposes certain restrictions on the payment of lump sums from the Plan when the transfer ratio revealed in an actuarial valuation is less than one. If the transfer ratio shown in this report is less than one, the Plan administrator should ensure that the monthly special payments are sufficient to meet the requirements of the Act to allow for the full payment of benefits, and otherwise should take the prescribed actions.

Additional restrictions are imposed when:

- The transfer ratio revealed in the most recently filed actuarial valuation is less than one and the administrator knows or ‘ought to know’ that the transfer ratio of the Plan has declined by 10% or more since the date the last valuation was filed.
- The transfer ratio revealed in the most recently filed actuarial valuation is greater than or equal to one and the administrator knows or ‘ought to know’ that the transfer ratio of the Plan has declined to less than 0.9 since the date the last valuation was filed.

As such, the administrator should monitor the transfer ratio of the Plan and, if necessary, take the prescribed actions.

Letters of Credit

Minimum funding requirements in respect of required special payments that otherwise require monthly contributions to the pension fund may be met, in the alternative, by establishing an irrevocable letter of credit subject to the conditions established by the Act. Required solvency special payments in excess of those met by a letter of credit must be met by monthly contributions to the pension fund.

7
MAXIMUM ELIGIBLE CONTRIBUTIONS

The *Income Tax Act* (the "ITA") limits the amount of employer contributions that can be remitted to the defined benefit component of a registered pension plan.

In accordance with Section 147.2 of the ITA and *Income Tax Regulation* 8516, for a plan which is underfunded on either a going concern or on a hypothetical wind-up basis, the maximum permitted contributions are equal to the employer's current service cost, including the provision for adverse deviations in respect of the current service cost and the explicit expense allowance if applicable, plus the greater of the going concern funding shortfall and hypothetical wind-up shortfall.

For a plan which is fully funded on both going concern and hypothetical wind-up bases, the employer can remit a contribution equal to the employer's current service cost, including the provision for adverse deviations in respect of the current service cost and explicit expense allowance if applicable, as long as the surplus in the plan does not exceed a prescribed threshold. Specifically, in accordance with Section 147.2 of the ITA, for a plan which is fully funded on both going concern and hypothetical wind-up bases, the plan may not retain its registered status if the employer makes a contribution while the going concern funding excess exceeds 25% of the going concern funding target.

Notwithstanding the above, any contributions that are required to be made in accordance with pension benefits legislation are eligible contributions in accordance with Section 147.2 of the ITA and can be remitted.

SCHEDULE OF MAXIMUM CONTRIBUTIONS

The University is permitted to fully fund the greater of the going concern and hypothetical wind-up shortfalls, as well as make current service cost contributions including the provision for adverse deviations in respect of the current service cost. The portion of this contribution representing the payment of the hypothetical wind-up shortfall can be increased with interest at 3.04% per year from the valuation date to the date the payment is made, and must be reduced by the amount of any deficit funding made from the valuation date to the date the payment is made.

Assuming the University contributes the greater of the going concern and the hypothetical wind-up shortfall of $197,248,000 as of the valuation date, the rule for determining the estimated maximum eligible annual contributions, as well as an estimate of the maximum eligible contributions until the next valuation, are as follows:

	UNIVERSITY'S CONTRIBUTION RULE		ESTIMATED UNIVERSITY'S CONTRIBUTIONS
Year beginning	Monthly current service cost including provision for adverse deviation[7]	Deficit Funding	Monthly current service cost
July 1, 2018	123%	N/A	$2,930,000
July 1, 2019	123%	N/A	$2,930,000
August 1, 2019	123%	N/A	$2,929,000
July 1, 2020	123%	N/A	$2,929,000

The employer's current service cost and provision for adverse deviations in respect of the current service cost shown in the above table was estimated based on projected members' required contributions. The actual employer's current service cost and provision for adverse deviations will be different from these estimates and, as such, the contribution requirements should be monitored closely to ensure compliance with the ITA.

[7] Expressed as a percentage of members' required contributions.

8
ACTUARIAL OPINION

In our opinion, for the purposes of the valuations,

- The membership data on which the valuation is based are sufficient and reliable.
- The assumptions are appropriate.
- The methods employed in the valuation are appropriate.

This report has been prepared, and our opinions given, in accordance with accepted actuarial practice in Canada. It has also been prepared in accordance with the funding and solvency standards set by the Pension Benefits Act (Ontario).

Chad Spence
Fellow of Society of Actuaries
Fellow of the Canadian Institute of Actuaries

Angelita Graham
Fellow of Society of Actuaries
Fellow of the Canadian Institute of Actuaries

March 18, 2019
Date

March 18, 2019
Date

APPENDIX A

SPECIAL PAYMENTS AND PRESCRIBED DISCLOSURE

SPECIAL PAYMENTS

The present values as at July 1, 2018 of the monthly special payments determined in the previous valuation are as follows:

Present Value of Monthly Special Payments Determined from July 1, 2017 Valuation

TYPE OF DEFICIT	START DATE	SPECIAL PAYMENT	END DATE	PRESENT VALUE OF REMAINING PAYMENTS AS AT 01.07.18	
				GOING CONCERN BASIS[8]	SOLVENCY BASIS[9]
Going concern	July 1, 2015	$502,338	June 30, 2023	$26,323,000	$27,957,000
Solvency	July 1, 2018	$1,282,135	June 30, 2025		$95,635,000
Total				$26,233,000	$123,592,000

The valuation revealed a going concern unfunded liability of $137,567,000. In accordance with the Regulation, the going concern unfunded liability must be amortized over a period not exceeding 10 years, beginning 12 months after July 1, 2018. In addition, the special payment set out for the 2018/19 plan year as identified in the prior valuation report to fund any going concern unfunded liability or plan amendments, must continue to be made in the 2018/19 plan year.

8 Calculation only considers going concern special payments and is based on a going concern discount rate.

9 Calculation considers both solvency and going concern special payments (six years only) and is based on the average solvency discount rate.

Since the solvency excess ($231,599,000) is greater than or equal to the present value of the special payments set out in the prior valuation report to fund any reduced solvency deficiency, consolidated prior solvency deficiencies, or solvency deficiency, the solvency special payments revealed in the previous valuation are no longer required.

As such, special payments must be made as follows:

TYPE OF PAYMENT	START DATE	END DATE	MONTHLY SPECIAL PAYMENT	PRESENT VALUE GOING CONCERN BASIS[10]
Prior going concern over 1 year	July 1, 2018	June 30, 2019	$502,338	$5,853,000
New going concern	July 1, 2019	June 30, 2029	$1,573,773	$137,567,000
Total				$143,420,000

TRANSITIONAL RULES

Transitional rules under the Act state that any increase in contributions caused by the new funding rules above what the old funding rules determined under the Regulations in effect immediately before May 1, 2018 would have required can be phased-in over the three-year period following the first report filed under the new framework, with no requirement for an increase in the first year.

The minimum funding requirements that would have been required in each of plan years 2018/2019, 2019/2020 and 2020/2021 under the old funding rules would have been higher than minimum funding requirements under the new funding rules. As such, the transitional rules have no impact on the minimum funding requirements.

[10] Calculation only considers going concern special payments and is based on a going concern discount rate.

DEFINITIONS

The Act defines a number of terms as follows:

DEFINED TERM	DESCRIPTION				RESULT
Going concern assets	Total smoothed value of assets plus the sum of the following:				$1,989,409,000
	(a)	the present value of special payments in respect of any past service unfunded liability identified in a previously filed report		$0	
	(b)	the present value of special payments in respect of any plan amendment that increases going concern liabilities		$0	
	(c)	present value of special payments in respect of going concern unfunded liabilities identified in a previously filed report that are scheduled for payment within one year of the date of this report		$5,853,000	
Going concern excess / (unfunded liability)	The amount by which the Going Concern Assets exceed the sum of the following:				($137,567,000)
	(a)	the going concern liabilities			
		(i)	liabilities excluding the value of escalated adjustments	$1,698,365,000	
		(ii)	liabilities in respect of escalated adjustments	$194,237,000	
	(b)	the provision for adverse deviations in respect of the going concern liabilities excluding the value of escalated adjustments		$234,374,000	
	(c)	Prior Year Credit Balance		$0	
Going concern funded ratio	The ratio of:				105%
	(a)	Total smoothed value of assets (excluding letters of credit) less the Prior Year Credit Balance; to			
	(b)	going concern liabilities			
Prior Year Credit Balance	Accumulated excess of contributions made to the pension plan in excess of the minimum required contributions (note: only applies if the University chooses to treat the excess contributions as a Prior Year Credit Balance).				$0
Solvency Assets	Market value of assets including accrued or receivable income and excluding the value of any qualifying annuity contracts.				$2,056,405,000

DEFINED TERM	DESCRIPTION		RESULT
Solvency Asset Adjustment	The sum of:		
	(a)	the difference between smoothed value of assets and the market value of assets	$0
	(b)	the present value of going concern special payments required to liquidate any past service unfunded liability	$0
	(c)	the present value of going concern special payments identified in July 1, 2017 valuation and scheduled for payment between July 1, 2018 and June 30, 2019	$5,931,000
	(d)	the present value of going concern special payments (identified in this report) that are scheduled for payment within 6 years following the valuation date	$85,003,000
	(e)	the present value of any previously scheduled solvency special payments (excluding those identified in this report)	$0
	(f)	the total value of all letters of credit in respect of the special payments due before the valuation date, subject to the limit of 15% of solvency liabilities	$0
			$90,934,000
Solvency Liabilities	Liabilities determined as if the plan had been wound up on the valuation date, including liabilities for plant closure benefits or permanent layoff benefits that would be immediately payable if the employer's business were discontinued on the valuation date of the report, but, if elected by the plan sponsor, excluding liabilities for,		$2,252,753,000
	(a)	any escalated adjustment,	
	(b)	excluded plant closure benefits,	
	(c)	excluded permanent layoff benefits,	
	(d)	special allowances other than funded special allowances,	
	(e)	consent benefits other than funded consent benefits,	
	(f)	prospective benefit increases,	
	(g)	potential early retirement window benefit values, and	
	(h)	pension benefits and ancillary benefits payable under a qualifying annuity contract.	
Solvency Liability Adjustment	The amount by which Solvency Liabilities are adjusted as a result of using a solvency valuation interest rate that is the average of market interest rates calculated over the period of time used in the determination of the smoothed value of assets.		$0

DEFINED TERM	DESCRIPTION	RESULT
Solvency Deficiency	The amount, if any, by which the sum of:	
	(a) the Solvency Liabilities	$2,252,753,000
	(b) the Solvency Liability Adjustment	$0
	(c) the Prior Year Credit Balance	$0
		$2,252,753,000
	Exceeds the sum of	
	(d) the Solvency Assets net of estimated termination expenses[11]	$2,055,505,000
	(e) the Solvency Asset Adjustment	$90,934,000
		$2,146,439,000
		$106,314,000
Reduced Solvency Deficiency / (Solvency Excess)	The amount by which the sum of:	
	(a) 85% of the Solvency Liabilities	$1,914,840,000
	(b) 85% of the Solvency Liability Adjustment	$0
	(c) the Prior Year Credit Balance	$0
		$1,914,840,000
	Exceeds the sum of:	
	(d) the Solvency Assets net of estimated termination expenses[8]	$2,055,505,000
	(e) the Solvency Asset Adjustment	$90,934,000
		$2,146,439,000
		($231,599,000)
Transfer Ratio	The ratio of: (a) Solvency Assets minus the lesser of the Prior Year Credit Balance and the minimum required employer contributions including the provision for adverse deviations until the next required valuation; to (b) the sum of the Solvency Liabilities and liabilities for benefits, other than benefits payable under qualifying annuity contracts that were excluded in calculating the Solvency Liabilities.	91%

[11] In accordance with accepted actuarial practice, for purposes of determining the financial position, the market value of plan assets was reduced by a provision for estimated termination expenses payable from the Plan's assets that may reasonably be expected to be incurred in terminating the Plan and to be charged to the Plan.

DEFINED TERM	DESCRIPTION	RESULT
Solvency Ratio	The ratio of: (a) Solvency Assets related to defined benefits and ancillary benefits plus the total amount of any letters of credit minus the Prior Year Credit Balance (b) the sum of the Solvency Liabilities related to defined benefits and ancillary benefits	91%

PROVISION FOR ADVERSE DEVIATIONS

The provision for adverse deviations has been established in accordance with regulations taking into account the following parameters:

DEFINED AMOUNT		RESULTS
Fixed Income Component (L)	The sum of the Plan's target allocation of assets (excluding those allocated to annuity contacts and meeting the minimum rating requirement) as described in the regulations according to the investment policy applicable at the valuation date: **Investment** — **Target** Universe bonds — 15.0% Long-term bonds — 15.0% Real return bonds — 5.0%	35.0%
Alternative Investment Component (M)	The sum of the Plan's target allocation of assets (excluding those allocated to annuity contacts) meeting requirements as described in the regulations according to the investment policy applicable at the valuation date: **Investment** — **Target** Real assets — 1.0%	1.0%
Investment Component (N)	Plan's target asset allocation for mutual, pooled or segregated funds	0.0%
Investment Component Fixed Income % (P)	Portion of Investment Component (N) that is allocated to investment categories accounted for in Fixed Income Component (L)	0.0%

Investment Component Alternative Investment % (Q)	Portion of Investment Component (N) that is allocated to investment categories accounted for in Alternative Income Component (M)	0.0%
Annuity Contract Allocation (R)	Annuity contracts that have been purchased from an insurance University and excluded from the Fixed Income Component (L) and Alternative Investment Component (M)	0.0%

Combined Target Asset Allocation for Fixed Income Assets (J)			
Sum of			
• Fixed Income Component (L)	35.0%		
• 0.5 x Alternative Investment Component (0.5 x M)	0.5%		
• Investment Component x Investment Component Fixed Income % (N x P)	0.0%		
• 0.5 x Investment Component x Investment Component Alternative Investment % (0.5 x N x Q)	0.0%		
		35.5%	
Divided by			
• 100% - Annuity Contract Allocation (100% - R)		100.0%	
Combined Target Asset Allocation for Fixed Income Assets			**35.5%**

Combined Target Asset Allocation for Non-Fixed Income Assets (K)	
100% – Combined Target Asset for Fixed Income Assets (100% - J)	**64.5%**

Duration of going concern liabilities at valuation date	
= (F - G) / (G x 0.01) where,	13.54
G = going concern liabilities at valuation date established using the discount rate determined for this valuation	$1,892,602,000
F = going concern liabilities established using the discount rate minus 1%	$2,148,800,000

Benchmark Discount Rate (E)	
Base rate	0.50%
Effective yield from CANSIM Series V39056 (H)	2.19%
1.5% x Combined Target Asset Allocation for Fixed Income Assets (1.5% x J)	0.53%
5.0% x Combined Target Asset Allocation for Non-Fixed Income Assets (5.0% x K)	3.22%
Benchmark Discount Rate	6.44%

Provision for Adverse Deviations			
(A)	5.0% for a closed plan and 4.0% for a Plan that is not a closed plan		5.0%
(B)	Provision based on Combined Target Asset Allocation for Non-Fixed Income Assets		8.8%
(C)	Greater of zero and the		
	• Duration of going concern liabilities at valuation date	13.54	
	Multiplied by the excess of:		
	– Going concern valuation gross discount rate net of active investment management fees (D), less	5.6%	
	– Benchmark Discount Rate (E)	6.5%	0.0%
Provision for Adverse Deviations (A + B + C)			13.8%

The available actuarial surplus that may be used according to the Act is established as follows:

Available actuarial surplus (000's)			
Excess of			
• Assets determined on basis of going concern valuation including accrued and receivable income but excluding the value of any letters of credit		$1,983,556	
Over			
• Going concern liabilities	$1,892,602		
• Provision for adverse deviations in respect of the going concern liabilities	$234,374		
• Prior Year Credit Balance	$0	$2,126,976	
		$0	(a)
Excess of			
• Solvency assets		$2,056,405	
Over			
• Solvency liabilities x 105%		$2,365,391	
		$0	(b)
The available actuarial surplus = the lesser of a) and b) above		$0	

TIMING OF NEXT REQUIRED VALUATION

In accordance with the Act the next valuation of the Plan would be required at an effective date within one year of the current valuation date if:

- The ratio of solvency assets to solvency liabilities is less than 85%.
- The University elected to exclude plant closure or permanent lay-off benefits under Section 5(18) of the regulations, and has not rescinded that election.

Otherwise, the next valuation of the Plan would be required at an effective date no later than three years after the current valuation date.

Accordingly, the next valuation of the Plan will be required as of July 1, 2021.

PENSION BENEFITS GUARANTEE FUND (PBGF) ASSESSMENT

A PBGF assessment is required to be paid under Section 37 of the Act. The PBGF assessment base is derived as follows:

Solvency assets	$2,056,405,000	(a)
PBGF liabilities	$2,252,753,000	(b)
Solvency liabilities	$2,252,753,000	(c)
Ontario asset ratio	100.00%	(d) = (b) ÷ (c)
Ontario portion of the fund	$2,056,405,000	(e) = (a) x (d)
PBGF assessment base	$196,348,000	(f) = max(0, (b) – (e))
Amount of additional liability for plant closure and/or permanent layoff benefits which is not funded and subject to the 2% (3% for years after 2018) assessment pursuant to s.37(4)	$0	(g)

APPENDIX B

PLAN ASSETS

The pension fund is held by CIBC Mellon Trust Company. In preparing this report, we have relied upon the auditors' report prepared by KPMG without further audit. Customarily, this information would not be verified by a plan's actuary. We have reviewed the information for internal consistency and we have no reason to doubt its substantial accuracy.

RECONCILIATION OF MARKET VALUE OF PLAN ASSETS

The pension fund transactions since the last valuation are summarized in the following table:

(000'S)	JULY 1,2017 TO JULY 1, 2018
July 1, 2017	$1,903,823
PLUS	
Members' contributions	$24,728
University's contributions	$59,090
Transfers to the Plan	$280
Investment earnings	$163,950
	$248,048
LESS	
Pensions paid	$73,106
Lump-sums paid	$9,382
Administration and investment fees	$6,052
	$88,540
July 1, 2018	$2,063,331
Gross rate of return[12]	8.62%
Rate of return net of expenses[11]	8.29%

[12] Assuming mid-period cash flows.

The market value of assets shown in the above table is adjusted to reflect in-transit amounts as follows:

	CURRENT VALUATION	PREVIOUS VALUATION
Market value of assets	$2,063,331	$1,903,823
In-transit amounts		
• Benefit payments	($6,926)	($87)
Market value of assets, adjusted for in-transit amounts	$2,056,405	$1,903,736

We have tested the pensions paid, the lump-sums paid, and the contributions for consistency with the membership data for the Plan members who have received benefits or made contributions. The results of these tests were satisfactory.

INVESTMENT POLICY

The plan administrator has adopted a statement of investment policy and procedures. This policy is intended to provide guidelines for the manager(s) as to the level of risk that is consistent with the Plan's investment objectives. A significant component of this investment policy is the asset mix.

The plan administrator is solely responsible for selecting the Plan's investment policies, asset allocations, and individual investments.

The constraints on the asset mix and the actual asset mix at the valuation date are provided for information purposes:

	INVESTMENT POLICY			ACTUAL ASSET MIX AS AT JULY 1, 2018
	Minimum	Target	Maximum	
Canadian equities	16%	20%	24%	19.9%
U.S. equities	17%	22%	27%	26.3%
International equities	17%	22%	27%	24.6%
Real estate and infrastructure	0%	1%	10%	1.0%
Bonds	20%	35%	50%	27.9%
Cash and cash equivalents	0%	0%	10%	0.3%
		100%		100.0%

Because of the mismatch between the Plan's assets (which are invested in accordance with the above investment policy) and the Plan's liabilities (which tend to behave like long bonds) the Plan's financial position will fluctuate over time. These fluctuations could be significant and could cause the Plan to become underfunded or overfunded even if the University contributes to the Plan based on the funding requirements presented in this report.

APPENDIX C

METHODS AND ASSUMPTIONS – GOING CONCERN

VALUATION OF ASSETS

For this valuation, we have used an adjusted market-value method to determine the smoothed value of assets. Under this method, investment experience gains (losses) (actual versus the expected investment return on assets, net of expenses) arising during a given year are spread on a straight-line basis over 5 years in accordance with the schedule shown in the following table:

YEAR	PERCENTAGE OF GAINS (LOSSES) UNRECOGNIZED
2017/2018:	80%
2016/2017:	60%
2015/2016:	40%
2014/2015:	20%
before 2014:	0%

The asset values produced by this method are related to the market value of the assets, with the advantage that, over time, the market-related asset values will tend to be more stable than market values. To the extent that more investment experience gains than losses will arise over the long term, the smoothed value will tend to be lower than the market value.

The smoothed value of the assets at July 1, 2018 was derived as follows:

(000'S)		
Market value of assets		$2,063,331
LESS		
Unrecognized investment gains/(losses)	2017/2018: $51,239 x 80% =	$40,991
	2016/2017: $88,253 x 60% =	$52,952
	2015/2016: ($71,987) x 40% =	($28,795)
	2014/2015: $38,504 x 20% =	$7,701
		$72,849
Smoothed value of assets		$1,990,482

The smoothed value of assets shown in the above table is adjusted to reflect in-transit amounts as follows:

(000'S)	CURRENT VALUATION	PREVIOUS VALUATION
Smoothed value of assets	$1,990,482	$1,828,671
In-transit amounts		
• Benefit payments	($6,926)	($87)
Smoothed value of assets, adjusted for in-transit amounts	$1,983,556	$1,828,584

GOING CONCERN FUNDING TARGET

Over time, the real cost to the employer of a pension plan is the excess of benefits and expenses over member contributions and investment earnings. The actuarial cost method allocates this cost to annual time periods.

For purposes of the going concern valuation, we have continued to use the projected unit credit actuarial cost method. Under this method, we determine the present value of benefit cash flows expected to be paid in respect of service accrued prior to the valuation date, based on projected final average earnings. This is referred to as the funding target.

The funding excess or funding shortfall, as the case may be, is the difference between the market or smoothed value of assets and the funding target. A funding excess on a market value basis indicates that the current market value of assets and expected investment earnings are expected to be sufficient to meet the cash flows in respect of benefits accrued to the valuation date as well as expected expenses – assuming the plan is maintained indefinitely. A funding shortfall on a market value basis indicates the opposite – that the current market value of the assets is not expected to be sufficient to meet the plan's cash flow requirements in respect of accrued benefits, absent additional contributions.

As required under the Act, a funding shortfall and the provision for adverse deviations must be amortized over no more than 10 years through special payments beginning one year after the valuation date. A funding excess may, from an actuarial standpoint, be applied immediately to reduce required employer current service contributions unless precluded by the terms of the plan or by legislation.

The actuarial cost method used for the purposes of this valuation produces a reasonable matching of contributions with accruing benefits. Because benefits are recognized as they accrue, the actuarial cost method provides an effective funding target for a plan that is maintained indefinitely.

Current Service Cost

The current service cost is the present value of projected benefits to be paid under the plan with respect to service expected to accrue during the period until the next valuation.

The University's current service cost is the total current service cost reduced by the members' required contributions.

The University's current service cost has been expressed as a percentage of the members' required contributions to provide an automatic adjustment in the event of fluctuations in membership and/or pensionable earnings.

Under the projected unit credit actuarial cost method, the current service cost for an individual member will increase each year as the member approaches retirement. However, the current service cost of the entire group, expressed as a percentage of the members' required contributions, can be expected to remain stable as long as the average age distribution of the group remains constant.

ACTUARIAL ASSUMPTIONS – GOING CONCERN BASIS

The present value of future benefit payment cash flows is based on economic and demographic assumptions. At each valuation we determine whether, in our opinion, the actuarial assumptions are still appropriate for the purposes of the valuation, and we revise them, if necessary. Emerging experience will result in gains or losses that will be revealed and considered in future actuarial valuations.

The table below shows the various assumptions used in the current valuation in comparison with those used in the previous valuation.

ASSUMPTION	CURRENT VALUATION	PREVIOUS VALUATION
Discount rate:	5.60%	5.60%
Margin for adverse deviations:	0.00%	0.10%
Explicit expenses:	$0	$0
Inflation:	2.00%	2.00%

<table>
<tr><th>ASSUMPTION</th><th>CURRENT VALUATION</th><th>PREVIOUS VALUATION</th></tr>
<tr><td>ITA limit / YMPE increases:</td><td>3.00%</td><td>3.00%</td></tr>
<tr><td>Pensionable earnings increases:</td><td><u>Unifor members</u>
3.0% per year
<u>TMG members</u>
3.0% per year
<u>MUFA members</u>
4.0% per year
<u>Clinical Faculty members</u>
4.0% per year</td><td><u>Unifor members</u>
3.65% in 2018; 3.0% per year thereafter
<u>TMG members</u>
4.0% in 2018; 3.0% per year thereafter
<u>MUFA members</u>
4.6% in 2018; 4.0% per year thereafter
<u>Clinical Faculty members</u>
4.0% per year</td></tr>
<tr><td>Post-retirement pension increases:</td><td>Unifor Hired on or After May 1, 2010
<table><tr><th>Year</th><th>Rate</th></tr><tr><td>2019</td><td>1.89%</td></tr><tr><td>2020</td><td>2.00%</td></tr><tr><td>2021</td><td>1.47%</td></tr><tr><td>2022</td><td>2.24%</td></tr><tr><td>2023</td><td>1.14%</td></tr><tr><td>2024 onwards</td><td>0.60%</td></tr></table>Other
<table><tr><th>Year</th><th>Rate</th></tr><tr><td>2019</td><td>1.89%</td></tr><tr><td>2020</td><td>2.00%</td></tr><tr><td>2021</td><td>1.97%</td></tr><tr><td>2022</td><td>2.03%</td></tr><tr><td>2023</td><td>1.64%</td></tr><tr><td>2024 onwards</td><td>1.10%</td></tr></table></td><td>Unifor Hired on or After May 1, 2010
<table><tr><th>Year</th><th>Rate</th></tr><tr><td>2018</td><td>1.46%</td></tr><tr><td>2019</td><td>2.00%</td></tr><tr><td>2020</td><td>1.52%</td></tr><tr><td>2021</td><td>0.99%</td></tr><tr><td>2022</td><td>1.79%</td></tr><tr><td>2023 onwards</td><td>0.70%</td></tr></table>Other
<table><tr><th>Year</th><th>Rate</th></tr><tr><td>2018</td><td>1.46%</td></tr><tr><td>2019</td><td>2.00%</td></tr><tr><td>2020</td><td>2.00%</td></tr><tr><td>2021</td><td>1.49%</td></tr><tr><td>2022</td><td>2.29%</td></tr><tr><td>2023 onwards</td><td>1.20%</td></tr></table></td></tr>
<tr><td>Interest on employee contributions:</td><td>5.60%</td><td>5.60%</td></tr>
</table>

ASSUMPTION	CURRENT VALUATION	PREVIOUS VALUATION
Retirement rates:	15% retire when first eligible for an unreduced pension, 10% retire at each age thereafter up to age 64, 20% retire at age 65, 50% retire at each of the ages 66-69, remainder retire at age 70	15% retire when first eligible for an unreduced pension, 10% retire at each age thereafter up to age 64, 20% retire at age 65, 50% retire at each of the ages 66-69, remainder retire at age 70
Termination rates:	**Age** / **Rate** Under 25: 15.0% 25: 13.0% 30: 8.0% 35: 5.5% 40: 3.5% 45: 3.0% 50: 3.0% 55 and older: 0.0% 15% of terminations are assumed to be involuntary without cause	**Age** / **Rate** Under 25: 15.0% 25: 13.0% 30: 8.0% 35: 5.5% 40: 3.5% 45: 3.0% 50: 3.0% 55 and older: 0.0% 15% of terminations are assumed to be involuntary without cause
Mortality rates:	85% of the rates of the 2014 Public Sector Canadian Pensioners Mortality Table (CPM2014Publ)	85% of the rates of the 2014 Public Sector Canadian Pensioners Mortality Table (CPM2014Publ)
Mortality improvements:	Fully generational using CPM Improvement Scale B (CPM-B)	Fully generational using CPM Improvement Scale B (CPM-B)
Disability rates:	None	None
Eligible spouse at retirement:	85%	85%
Spousal age difference:	Male 3 years older	Male 3 years older

ASSUMPTION	CURRENT VALUATION	PREVIOUS VALUATION
Portability	95% of terminations prior to age 55 and 5% of terminations on or after 55 are assumed to receive a lump sum transfer. The commuted value basis in effect at their date of transfer is assumed to be the commuted value basis in effect for July 2018, which is as follows: Interest rates: 2.9% per year for 10 years; 3.2% per year thereafter Mortality table: 100% of the rates of the 2014 Canadian Pensioners Mortality Table (CPM2014) with fully generational improvements using CPM Scale B	95% of terminations prior to age 55 and 5% of terminations on or after 55 are assumed to receive a lump sum transfer. The commuted value basis in effect at their date of transfer is assumed to be the commuted value basis in effect for July 2017, which is as follows: Interest rates: 2.3% per year for 10 years; 3.3% per year thereafter Mortality table: 100% of the rates of the 2014 Canadian Pensioners Mortality Table (CPM2014) with fully generational improvements using CPM Scale B

The assumptions are best estimates and do not include a margin for adverse deviations, except for the discount rate in the previous valuation.

Pensionable Earnings

The benefits ultimately paid will depend on each member's final average earnings. To calculate the pension benefits payable upon retirement, death, or termination of employment, we have taken rate of pay on July 1, 2018 and assumed that such pensionable earnings will increase at the assumed rate.

RATIONALE FOR ASSUMPTIONS

A rationale for each of the assumptions used in the current valuation is provided below.

DISCOUNT RATE

We have discounted the expected benefit payment cash flows using the expected investment return on the smoothed value of the fund net of fees and less a margin for adverse deviations. Other bases for discounting the expected benefit payment cash flows may be appropriate, particularly for purposes other than those specifically identified in this valuation report.

The discount rate is comprised of the following:

- Estimated returns for each major asset class consistent with market conditions on the valuation date, the expected time horizon over which benefits are expected to be paid, and the target asset mix specified in the Plan's investment policy.
- Additional returns assumed to be achievable due to active investment management strategy, equal to the fees related to such active investment management strategy. Such fees were determined by the difference between the provision for total investment expenses and the hypothetical fees that would be incurred for passive management of all assets.
- Implicit provision for non-investment and passive investment expenses.

The discount rate was developed as follows:

Assumed investment return	5.82%
Allowance for administrative, actuarial and passive investment management fees	(0.20%)
Rounding	(0.02%)
Net discount rate	5.60%

EXPENSES

The assumption is based on the average amount of investment and administrative expenses over the last 3 years.

INFLATION

The inflation assumption of 2% is based on the mid-point of the Bank of Canada's inflation target range of between 1% and 3%.

INCOME TAX ACT PENSION LIMIT AND YEAR'S MAXIMUM PENSIONABLE EARNINGS

The assumption is based on historical real economic growth and the underlying inflation assumption.

PENSIONABLE EARNINGS

The assumption is based on general wage growth assumptions increased by our best estimate of future merit and promotional increases over general wage growth considering the University's expectations.

POST-RETIREMENT PENSION INCREASES

The assumption is based on the Plan formula, as well as the future investment return and inflation assumption above.

RETIREMENT RATES

The assumption is based on experience over the years 2002 to 2008. Subsequent experience has been consistent with these rates.

TERMINATION RATES

Use of a different assumption would not have a material impact on the valuation.

MORTALITY RATES

The assumption for the mortality rates is based on the Canadian Pensioners' Mortality (CPM) study published by the Canadian Institute of Actuaries in February 2014.

Due to the size of the Plan, specific data on plan mortality experience is insufficient to determine the mortality rates. The CPM mortality rates from the public sector have been adjusted after considering plan-specific characteristics, such as the type of employment, the industry experience, the pension and employment income for the plan members, and data in the CPM study.

There is broad consensus among actuaries and other longevity experts that mortality improvement will continue in the future, but the degree of future mortality improvement is uncertain. Two mortality improvement scales were recently published by the Canadian Institute of Actuaries (CIA) and may apply to Canadian pension valuations:

- The Canadian Pensioners Mortality (CPM) study published in February 2014 included CPM Improvement Scale B (CPM-B) which is also used for commuted value calculations.
- A report released by the Task Force on Mortality Improvement on September 20, 2017 includes an analysis of the rate of mortality improvement for the Canadian population and provides for mortality improvement scale MI-2017 to be considered for the purpose of reflecting future mortality improvement in Canadian actuarial work, while acknowledging that it might be appropriate to use alternative mortality improvement assumptions to reflect the nature of the work.

The CIA Committee on Pension Plan Financial Reporting published a revised version of the Educational Note on the Selection of Mortality Assumptions for Pension Plan Valuations on December 21, 2017. The Educational Note indicates that given the recent publication of the CPM-B and MI-2017 improvement scales and the similar data sets used in their development, it may be appropriate to use either scale in the absence of credible information to the contrary, such as the publication of a successor scale by the CIA.

For the present valuation, we have continued to use the CPM-B scale, which is a reasonable outlook for future mortality improvement.

Based on the assumption used, the life expectancy of a member age 65 at the valuation date is 24.1 years for males and 25.9 years for females.

INTEREST ON EMPLOYEE CONTRIBUTIONS

The assumption is based on Plan terms and the underlying investment return assumption.

DISABILITY RATES

Use of a different assumption would not have a material impact on the valuation.

ELIGIBLE SPOUSE

The assumption is based on an industry standard for non-retired members (actual status used for retirees).

SPOUSAL AGE DIFFERENCE

The assumption is based on an industry standard showing males are typically 3 years older than their spouse.

APPENDIX D

METHODS AND ASSUMPTIONS – HYPOTHETICAL WIND-UP AND SOLVENCY

HYPOTHETICAL WIND-UP BASIS

The Canadian Institute of Actuaries requires actuaries to report the financial position of a pension plan on the assumption that the plan is wound up on the effective date of the valuation, with benefits determined on the assumption that the pension plan has neither a surplus nor a deficit.

To determine the actuarial liability on the hypothetical wind-up basis, we have valued those benefits that would have been paid had the Plan been wound up on the valuation date, with all members fully vested in their accrued benefits including, however, the impact of plan amendments with an effective date before the next scheduled valuation which have been reflected in the going concern valuation results.

The Standards of Practice of the Canadian Institute of Actuaries require that the scenario upon which the hypothetical wind-up valuation is based be postulated. However, there are no benefits under the Plan contingent upon the circumstances of the plan wind-up or contingent upon other factors. Therefore, it was not necessary to postulate a scenario upon which the hypothetical wind-up valuation is made. No benefits payable on plan wind-up were excluded from our calculations. The plan wind-up is assumed to occur in circumstances that maximize the actuarial liability.

Upon plan wind-up, members are given options for the method of settling their benefit entitlements. The options vary by eligibility and by province of employment, but in general, involve either a lump sum transfer or an immediate or deferred pension.

The value of benefits assumed to be settled through a lump sum transfer is based on the assumptions described in Section 3500 – *Pension Commuted Values* of the Canadian Institute of Actuaries' Standards of Practice applicable for July 1, 2018.

Benefits provided as an immediate or deferred pension are assumed to be settled through the purchase of annuities based on an estimate of the cost of purchasing annuities.

We have estimated the cost of settlement through purchase of annuities in accordance with the *Canadian Institute of Actuaries Educational Note: Assumptions for Hypothetical Wind-up and Solvency Valuations with Effective Dates Between June 30, 2018 and December 30, 2018 (the "Educational Note").*

The Educational Note provides guidance on estimating the cost of annuity purchases assuming a typical group of annuitants. That is, no adjustments for sub- or super-standard mortality are considered. However, it is expected that insurers will consider plan experience and certain plan-specific characteristics when determining the mortality basis for a particular group. The Educational Note states that the actuary would be expected to make an adjustment to the regular annuity purchase assumptions where there is demonstrated substandard or super-standard mortality or where an insurer might be expected to assume so. In such cases, the actuary would be expected to make an adjustment to the mortality assumption in a manner consistent with the underlying annuity purchase basis. Given the uncertainty surrounding the actual mortality basis that would be typical of a group annuity purchase, it is reasonable to assume that there is a range of bases that can be expected not to be materially different from the actual mortality basis. Therefore, an adjustment to the regular annuity purchase assumptions would be warranted when the plan's assumed basis falls outside that range. In this context, we have determined that an adjustment to the mortality rates used in the regular annuity purchase assumptions is required.

We have not included a margin for adverse deviation in the solvency and hypothetical wind-up valuations.

The assumptions are as follows:

Form of Benefit Settlement Elected by Member	
Lump sum:	70% of active members and deferred vested members under age 55, and 50% of active members and deferred vested members over age 55, elect to receive their benefit entitlement in a lump sum
Annuity purchase:	All remaining members are assumed to elect to receive their benefit entitlement in the form of a deferred or immediate pension. These benefits are assumed to be settled through the purchase of deferred or immediate annuities from a life insurance University.
Basis for Benefits Assumed to be Settled through a Lump Sum	
Mortality rates:	100% of the rates of the 2014 Canadian Pensioners Mortality Table (CPM2014) with fully generational improvements using CPM Scale B
Interest rate:	2.90% per year for 10 years, 3.20% per year thereafter
Basis for Benefits Assumed to be Settled through the Purchase of an Annuity	
Mortality rates:	100% of the rates of the 2014 Canadian Pensioners Public Sector Mortality Table (CPM2014) with fully generational improvements using CPM Scale B
Adjustment to mortality rates:	Above mortality rates reduced by 15% to reflect super-standard mortality
Interest rate:	3.10% per year based on a duration of 14.06 years determined for the liabilities assumed to be settled through the purchase of an annuity.

Retirement Age	
Maximum value:	Members are assumed to retire at the age which maximizes the value of their entitlement from the Plan, based on the eligibility requirements which have been met at the valuation date
Grow-in:	The benefit entitlement and assumed retirement age of Ontario members whose age plus service equals at least 55 at the valuation date reflect their entitlement to grow into early retirement subsidies
Other Assumptions	
Special payments:	Discounted at the average interest rate of 3.00% per year
Final average earnings:	Based on actual pensionable earnings over the averaging period
Family composition:	Same as for going concern valuation
Maximum pension limit:	$2,944.44 increasing at 2.58% per year for 10 years, 2.79% per year thereafter
Termination expenses:	$900,000

To determine the hypothetical wind-up position of the Plan, a provision has been made for estimated termination expenses payable from the Plan's assets in respect of actuarial and administration expenses that may reasonably be expected to be incurred in terminating the Plan and to be charged to the Plan.

Because the settlement of all benefits on wind-up is assumed to occur on the valuation date and is assumed to be uncontested, the provision for termination expenses does not include custodial, investment management, auditing, consulting, and legal expenses that would be incurred between the wind-up date and the settlement date or due to the terms of a wind-up being contested.

Expenses associated with the distribution of any surplus assets that might arise on an actual wind-up are also not included in the estimated termination expense provisions.

In determining the provision for termination expenses payable from the Plan's assets, we have assumed that the plan sponsor would be solvent on the wind-up date. We have also assumed, without analysis, that the Plan's terms as well as applicable legislation and court decisions would permit the relevant expenses to be paid from the Plan.

Although the termination expense assumption is a best estimate, actual fees incurred on an actual plan wind-up may differ materially from the estimates disclosed in this report.

INCREMENTAL COST

In order to determine the incremental cost, we estimate the hypothetical wind-up liabilities at the next valuation date. We have assumed that the cost of settling benefits by way of a lump sum or purchasing annuities remains consistent with the assumptions described above. Since the projected hypothetical wind-up liabilities will depend on the membership in the Plan at the next valuation date, we must make assumptions about how the Plan membership will evolve over the period until the next valuation.

We have assumed that the Plan membership will evolve in a manner consistent with the going concern assumptions as follows:

- Members terminate, retire, and die consistent with the termination, retirement, and mortality rates used for the going concern valuation.
- Pensionable earnings, the Income Tax Act pension limit, and the Year's Maximum Pensionable Earnings increase in accordance with the related going concern assumptions.
- To accommodate for new entrants to the Plan, we have added to the projected liability an amount equal to three times the liability of new entrants that have joined the Plan since the previous valuation. The demographics and earnings of the new entrants are consistent with the new entrants hired over the past year.
- Active members accrue pensionable service in accordance with the terms of the Plan.

SOLVENCY BASIS

In determining the financial position of the Plan on the solvency basis, we have used the same assumptions and methodology as were used for determining the financial position of the Plan on the hypothetical wind-up basis.

The solvency position is determined in accordance with the requirements of the Act.

APPENDIX E
MEMBERSHIP DATA

ANALYSIS OF MEMBERSHIP DATA

The actuarial valuation is based on membership data as at July 1, 2018, provided by McMaster University.

We have applied tests for internal consistency, as well as for consistency with the data used for the previous valuation. These tests were applied to membership reconciliation, basic information (date of birth, date of hire, date of membership, gender, etc.), pensionable earnings, credited service, contributions accumulated with interest, and pensions to retirees and other members entitled to a deferred pension. Contributions, lump sum payments, and pensions to retirees were compared with corresponding amounts reported in financial statements. The results of these tests were satisfactory.

If the data supplied are not sufficient and reliable for its intended purpose, the results of our calculation may differ significantly from the results that would be obtained with such data. Although Mercer has reviewed the suitability of the data for its intended use in accordance with accepted actuarial practice in Canada, Mercer has not verified or audited any of the data or information provided.

Plan membership data are summarized below. For comparison, we have also summarized corresponding data from the previous valuation.

	01.07.18	01.07.17
Active Members		
Full-time		
Number	3,301	3,119
Average pensionable earnings for the following year	$94,578	$93,850
Average years of pensionable service	12.2	12.3
Average age	47.2	47.4
Accumulated contributions with interest	$343,817,997	$302,331,519
Part-time		
Number	311	510
Average pensionable earnings for the following year	$64,978	$68,507
Average years of pensionable service	7.5	9.1
Average age	46.4	46.0
Accumulated contributions with interest	$14,074,902	$24,191,872
Deferred Pensioners		
Number	916	913
Average annual lifetime pension	$4,786	$4,223
Average age	51.0	50.2
Pensioners and Survivors		
Number	2,245	2,157
Total annual lifetime pension	$75,025,172	$70,960,003
Total annual temporary pension	$462,018	$462,018
Average annual lifetime pension	$33,419	$32,898
Average age	73.9	73.7

The membership movement for all categories of membership since the previous actuarial valuation is as follows:

	ACTIVES	DEFERRED PENSIONERS	PENSIONERS AND SURVIVORS	TOTAL
Total at 01.07.17	3,629	913	2,157	6,699
New entrants	261			261
Rehires	9	(9)		0
Terminations:				
• Transfers/lump sums	(89)	(58)	(1)	(148)
• Deferred pensions	(85)	85		0
Deaths	(6)	(2)	(59)	(67)
Retirements	(107)	(10)	117	0
Beneficiaries			27	27
Data adjustments		(3)	4	1
Total at 01.07.18	3,612	916	2,245	6,773

The distribution of the active members by age and pensionable service as at the valuation date is summarized as follows:

	YEARS OF PENSIONABLE SERVICE									
Age	**0-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40+**	**Total**
Under 25	26 $49,545									26 $49,545
25 to 29	212 $53,652	8 $63,357								220 $54,005
30 to 34	244 $65,414	112 $63,206	10 $65,958							366 $64,820
35 to 39	209 $75,613	141 $81,326	80 $72,942	4 $93,218						434 $77,139
40 to 44	151 $74,935	145 $100,227	124 $102,112	60 $80,914	2 *					482 $90,197
45 to 49	99 $78,793	106 $91,488	147 $102,797	126 $119,455	39 $83,443	10 $91,235				527 $98,344
50 to 54	58 $67,666	92 $81,005	149 $95,585	147 $127,018	55 $126,401	56 $76,866	18 $80,722	1 *	1 *	577 $99,012
55 to 59	42 $74,569	75 $82,170	111 $90,975	107 $110,688	52 $121,120	69 $122,681	53 $99,739	15 $64,238	2 *	526 $99,580
60 to 64	21 $92,473	36 $100,055	50 $88,938	52 $121,868	32 $99,051	55 $130,960	51 $157,462	19 $103,017	6 $91,488	322 $115,644
65 to 70	6 $155,908	6 $101,643	13 $113,582	15 $116,792	6 $162,090	21 $150,889	24 $180,179	20 $163,220	2 *	113 $147,639
70+		1 *	3 $182,250	3 $112,611			5 $170,963	3 $186,962	4 $199,380	19 $174,029
Total	1,068 $68,821	722 $84,930	687 $94,729	514 $115,216	186 $111,595	211 $113,997	151 $132,112	58 $117,381	15 $114,875	3,612 $92,029

** For individual cells with information on two members or less, the average earnings are not disclosed for confidentiality reasons*

The distribution of the inactive members by age as at the valuation date is summarized as follows:

	DEFERRED PENSIONERS			PENSIONERS AND SURVIVORS	
Age	Number	Average Pension		Number	Average Pension
Under 25					
25 - 29	20	$495			
30 - 34	38	$1,526			
35 - 39	100	$3,037			
40 - 44	104	$4,077			
45 – 49	130	$4,478		1	*
50 – 54	189	$5,869		7	$24,615
55 – 59	150	$7,247		92	$31,330
60 – 64	126	$5,493		264	$31,478
65 – 69	43	$1,992		454	$32,072
70 – 74	11	$1,756		506	$37,113
75 – 79	4	$2,458		347	$37,871
80 – 84	1	*		264	$33,272
85 – 89				178	$29,181
90 – 94				90	$27,512
95 – 99				40	$15,527
100 +					
Total	916	$4,786		2,245	$33,419

** For individual cells with information on two members or less, the average pension is not disclosed for confidentiality reasons*

APPENDIX F

SUMMARY OF PLAN PROVISIONS

Mercer has used and relied on the Plan documents, including amendments and interpretations of Plan provisions, supplied by McMaster University. If any Plan provisions supplied are not accurate and complete, the results of any calculation may differ significantly from the results that would be obtained with accurate and complete information. Moreover, plan documents may be susceptible to different interpretations, each of which could be reasonable, and the results of estimates under each of the different interpretations could vary.

This valuation is based on the plan provisions in effect on July 1, 2018. Since the previous valuation, the Plan was amended to provide special adjustments to required contributions for certain employee classes in situations where the University's contributions for any month are below certain thresholds. The Plan was also amended to increase required contributions for various employee classes as a result of recent negotiations and other decisions.

The following is a summary of the main provisions of the Plan in effect on July 1, 2018. This summary is not intended as a complete description of the Plan.

Eligibility for Membership	Full-time employees may elect to join the Plan immediately but are required to join on the July 1st following completion of six month's employment. Part-time employees who either earn at least 35% of the YMPE or work for at least seven hundred hours in each of the two preceding consecutive calendar years for the University are eligible and are required to join under the same criteria as above. All members of the Plan (active and inactive) as of July 1, 2000 and new employees who joined the Original Plan between July 1, 2000 and December 31, 2000 have been transferred to this Plan if they voted in favour of the Surplus Sharing Agreement. In addition, members who joined the Original Plan between January 1, 2001 and January 14, 2003 have been transferred to this Plan following the approval of the asset transfer by the Financial Services Commission of Ontario. The Plan was completely closed to new SAAO employees or TMG employees who were hired after June 16, 2009 and to MUALA (Librarians) hired after March 16, 2010.

Employee Contributions

Effective at the dates and for the periods shown in the table below member required contribution rates for specific member groups as follows:

Class of Member	Period	Contribution Rate below/above YMPE
A.1 Faculty Members	July 1, 2013 to June 30, 2018 July 1, 2018 onwards	7.0% / 10.0% 8.0% / 11.0%
A.2 TMG Members	July 7, 2013 to July 28, 2018 July 29, 2018 onwards	7.0% / 10.0% 8.0% / 11.0%
SAAO Members	July 7, 2013 to July 28, 2018 July 29, 2018 onwards	7.0% / 10.0% 8.0% / 11.0%
B. Librarians	July 1, 2013 to June 30, 2018 July 1, 2018 onwards	7.0% / 10.0% 8.0% / 11.0%
C.1 Unifor Local 5555 Members hired prior to May 1, 2010	Jan. 14, 2018 to Apr. 30, 2018 May 1, 2018 to Dec. 31, 2022 Jan. 1, 2023 onwards	7.646% / 10.646% 8.646% / 11.646% 8.59% / 11.59%
C.2 Unifor Local 5555 Members hired after to May 1, 2010	Sept. 14, 2014 to Jan. 13, 2018 Jan. 14, 2018 to Dec. 31, 2022 Jan. 1, 2023 onwards	7.56% / 10.56% 7.646% / 10.646% 7.59% / 10.59%
D1. Members who are employees of: • McMaster Association of Part Time Students • McMaster University Faculty Association • Divinity College • Members who are non-union employees of Regional Medical Associates of Hamilton	July 27, 2014 onwards	7.00% / 10.00%
D2. Members who are employees of: • McMaster Children's Centre Inc. • Divinity College • Members who are non-union employees of Regional Medical Associates of Hamilton	July 28, 2018 onwards	8.0% / 11.0%

Employee Contributions (continued)

Class of Member	Period	Contribution Rate below/above YMPE
E. Members who are union employees of Regional Medical Associates of Hamilton	Sept. 14, 2014 to Jan. 13, 2018 Jan. 14, 2014 to Apr. 30, 2018 Jan. 1, 2023 onwards	7.56% / 10.56% 7.646% / 10.646% 8.59% / 11.59%
F. Full-time clinical faculty members of the Faculty of Health Sciences who must maintain membership in the Regional Medical Associate of Hamilton	Feb. 2, 2014 to July 28, 2018 July 29, 2018 onwards	7.0% / 10.0% 8.0% / 11.0%
G. Other Members (not included above)	July 27, 2014 to July 28, 2018 July 29, 2018 onwards	7.0% / 10.0% 8.0% / 11.0%
H. MUALA Members	July 1, 2016 to July 31, 2019 Aug. 1, 2019 onwards	7.00% / 10.00% 8.0% / 11.0%

Member required contributions are limited to the contribution arising when the applicable employee contribution rate is applied to the Maximum Annual Salary under the Plan. The Maximum Annual Salary is the salary rate that produces an annual pension amount equal to the maximum pension limit under the *Income Tax Act* for that year.

Retirement Dates

Normal retirement is the first day of the month coincident with, or prior to the member's 65th birthday. However, a member may normally elect to retire immediately on attaining age 65.

Effective February 1, 2014 the number of points required to retire early and receive an unreduced pension and a bridge benefit is amended for members who are not Faculty Members. The number of points required is as follows:

Class	Retirement Date	Points Required
SAAO Members and TMG Members who are employees on June 30, 2006 and who retire on or after July 1, 2006	July 1, 2006 to December 31, 2011	80
	January 1, 2012 to December 31, 2012	81
	January 1, 2013 to December 31, 2013	82
	January 1, 2014 to December 31, 2014	83
	January 1, 2015 to December 31, 2015	84
	January 1, 2016 onwards	85
MUALA Members who are employees on March 15, 2010 and who retire on or after March 16, 2010	April 1, 2010 to December 31, 2011	80
	January 1, 2012 to December 31, 2012	81
	January 1, 2013 to December 31, 2013	82
	January 1, 2014 to December 31, 2014	83
	January 1, 2015 to December 31, 2015	84
	January 1, 2016 onwards	85

Retirement Dates (continued)

Class	Retirement Date	Points Required
Faculty Members who are employees on June 30, 2006 and who retire on or after July 1, 2006 And Librarians who are employees on June 15, 2006 and who retire on or after June 16, 2006	July 1, 2006 to December 31, 2011	80
	January 1, 2012 to December 31, 2012	81
	January 1, 2013 to December 31, 2013	82
	January 1, 2014 to December 31, 2014	83
	January 1, 2015 to December 31, 2015	84
	January 1, 2016 to December 31, 2018	85
	January 1, 2019 to December 31, 2019	86
	January 1, 2020 to December 31, 2020	87
	January 1, 2021 to December 31, 2021	88
	January 1, 2022 to December 31, 2022	89
	January 1, 2023 onwards	90
SAAO and TMG Members who become Employees on or after July 1, 2006		85
Faculty Members who become Employees on or after July 1, 2006 and Librarians who become Employees on or after June 16, 2006	July 1, 2006 to December 31, 2018	85
	January 1, 2019 to December 31, 2019	86
	January 1, 2020 to December 31, 2020	87
	January 1, 2021 to December 31, 2021	88
	January 1, 2022 to December 31, 2022	89
	January 1, 2023 onwards	90

Retirement Dates (continued)

Class	Retirement Date	Points Required
Members who are employees of: • McMaster Association of Part Time Students • McMaster Children's Centre Inc. • McMaster University Faculty Association • Divinity College and Members who are non-union employees of Regional Medical Associates of Hamilton	July 1, 2006 to December 31, 2011	80
	January 1, 2012 to December 31, 2012	81
	January 1, 2013 to December 31, 2013	82
	January 1, 2014 to December 31, 2014	83
	January 1, 2015 to December 31, 2015	84
	January 1, 2016 onwards	85
Unifor Local 5555 member and Members who are union employers or Regional Medical Association of Hamilton	Age + plan participation equals at least 80. Members who are newly hired by the University on or after May 1, 2010 and in respect of service as a Unifor Local 5555 Member only, the unreduced early retirement date is the first day of any month coincident with or following the date on which the Member, has (1) attained age 60, and (2) the sum of the Member's age and years and participation in the Plan equals at least 80.	
Full-time clinical faculty members of the Faculty of Health Sciences who must maintain membership in the Regional Medical Associates of Hamilton	Prior to February 1, 2014	80
	February 1, 2014 to December 31, 2014	81
	January 1, 2015 to December 31, 2015	82
	January 1, 2016 to December 31, 2016	83
	January 1, 2017 to December 31, 2017	84
	January 1, 2018 onwards	85

Retirement Dates (continued)

Class	Retirement Date	Points Required
Other Members (not included above) who are employees on June 30, 2007 and who retired on or after July 1, 2007	July 1, 2006 to December 31, 2011	80
	January 1, 2012 to December 31, 2012	81
	January 1, 2013 to December 31, 2013	82
	January 1, 2014 to December 31, 2014	83
	January 1, 2015 to December 31, 2015	84
	January 1, 2016 onwards	85
Other Members (not included above) who become Employees on or after July 1, 2007		85

Pension Benefits	**Members other than Unifor Local 5555 Members hired on or after May 1, 2010** The amount of annual payable to a member at his unreduced retirement age will be: a) 1.4% of Best Average Salary up to the Average Year's Maximum Pensionable Earnings times years of pensionable service, plus b) 2.0% of Best Average Salary in excess of the Average Year's Maximum Pensionable Earnings times years of pensionable service. Best Average Salary means the annualized average of the 48 highest months of earnings while a Plan participant. Average Year's Maximum Pensionable Earnings means the pro-rated average Yearly Maximum Pensionable Earnings, in the same 48 months as are used to calculate Best Average Salary. Pensions in payment will be increased from January 1st each year on a pro-rated basis (using the number of months the pensioner has been retired in the twelve months) by the excess over 4.5% of the average annual rate of return earned on the assets of the Plan over the previous five Plan Years, subject to a maximum of that year's rate of increase in the Consumer Price Index. Effectively July 1, 1997, if there is any year where the percentage calculated under the excess interest formula exceeds the rate of increase in the Consumer Price Index, the excess will be used to provide a supplementary increase to the pensions in pay for which the annual pension increase in any of the three previous years was based on the excess interest formula, provided that the supplementary increase will be limited to 100% of CPI increases in each of the three preceding years. In addition, members on LTD will have their salary adjusted each July 1st by the percentage increase applied to pensions in payment. This increase will be applied from the later of July 1, 1990 or the July 1st following disability. A member may retire early with a reduced pension at any time during the 10-year period preceding his normal retirement date. The reduction will be 0.5% for each month by which actual retirement precedes age 65. A member may retire early with an unreduced pension once they have attained the criteria set out in the table above. A member may postpone his actual retirement and commencement of pension (with University consent prior to December 12, 2006), but in any event his pension shall commence no later than the 1st of December of the year of attainment of age 71. The member will continue to make contributions and their benefits under the Plan will continue to accrue until such postponed retirement date.

<table>
<tr><td>Pension Benefits (continued)</td><td>Unifor Local 5555 Members hired on or after May 1, 2010
The amount of annual pension payable to a member at his unreduced retirement age will be:
a) 1.0% of Best Average Salary up to the Average Year’s Maximum Pensionable Earnings times years of pensionable service, plus
b) 1.6% of Best Average Salary in excess of the Average Year’s Maximum Pensionable Earnings times years of pensionable service.
Best Average Salary means the annualized average of the 60 highest months of earnings while a Plan participant. Average Year’s Maximum Pensionable Earnings means the pro-rated average Yearly Maximum Pensionable Earnings, in the same 60 months as are used to calculate Best Average Salary.
Pensions in payment will be increased from January 1st each year on a pro-rated basis (using the number of months the pensioner has been retired in the twelve months) by the excess over 5.0% of the average annual rate of return earned on the assets of the Plan over the previous five Plan Years, subject to a maximum of that year’s rate of increase in the Consumer Price Index. If there is any year where the percentage calculated under the excess interest formula exceeds the rate of increase in the Consumer Price Index, the excess will be used to provide a supplementary increase to the pensions in pay for which the annual pension increase in any of the three previous years was based on the excess interest formula, provided that the supplementary increase will be limited to 100% of CPI increases in each of the three preceding years.
A member may retire early with a reduced pension at any time during the 10-year period preceding his normal retirement date. The reduction will be 0.5% for each month by which actual retirement precedes age 65.
A member may retire early with an unreduced pension once they have attained the criteria set out in the table above.
A member may postpone his actual retirement and commencement of pension, but in any event his pension shall commence no later than the 1st of December of the year of attainment of age 71. The member will continue to make contributions and their benefits under the Plan will continue to accrue until such postponed retirement date.</td></tr>
<tr><td>Bridge Benefits</td><td>Effective July 1, 1997, members who retire early and have attained the requisite number of points to receive an unreduced pension will receive a bridge benefit equal to $19.00 per month per year of credited service accrued to June 30, 1996 to a maximum of 20 years of service. The bridge benefit is payable from the later of the member’s early retirement date and age 60 and ceases payment on attainment of age 65 or death, if earlier.</td></tr>
<tr><td>Minimum Benefits</td><td>If the member’s total Required Contributions plus net interest are greater than 50% of the commuted value of a member’s retirement and bridge pensions, the excess amount will be refunded to the member as a lump sum payment. In addition, the member will receive a refund of his voluntary contributions with interest, if any.</td></tr>
<tr><td>Maximum Benefits</td><td>The total annual pension payable from the Plan upon retirement, death or termination of employment cannot exceed the lesser of:
• 2% of the average of the best three consecutive years of total compensation paid to the member by the University, multiplied by total credited service; and
• $2,944.44 or such other maximum permitted under the Income Tax Act, multiplied by the member’s total credited service.
The maximum pension is determined at the date of pension commencement.</td></tr>
</table>

Death Benefits	**Pre-retirement:** On the death of a member prior to retirement, his beneficiary or estate is entitled to receive a death benefit equal to his required contributions accrued to December 31, 1986 accumulated with net interest on the fund, and his beneficiary or estate shall receive the commuted value of the member's pension accrued after December 31, 1986, plus any required contributions made after December 31, 1986, accumulated with net interest on the fund, in excess of 50% of the commuted value. In addition, his beneficiary or estate will receive a refund of his voluntary contributions with interest, if any. **Post retirement:** The benefit is payable for life, but guaranteed for seven years in any event. In the case of a member with a spouse, 50% of the benefit is continued to the spouse for life and at least the remainder of the guaranteed seven years' payments will be made. There is no required adjustment in respect of this surviving spouse's benefit. Prior to July 1, 1997, the normal form of benefit was as described above with a five-year guarantee in place of the seven-year guarantee. Alternative forms of pension are available in actuarial equivalent amounts and for members who have a spouse and who retire after December 31, 1987, the automatic form of pension will be an actuarially reduced benefit which continues 60% of the pension to a surviving spouse for life.
Termination Benefits	If a Member terminates employment prior to retirement, he may elect to receive one of the following: 1) A refund of his required contributions, with Net Interest on the Fund. 2) A transfer of the greater of twice his Required Contributions plus Net Interest and the commuted value of his deferred pension to another locked-in registered pension vehicle. 3) A deferred pension, payable at Normal Retirement Date, equal to the pension earned to the date of termination. * Unifor Local 5555 members hired on or after May 1, 2010 and Faculty members or Librarians hired after July 1, 2013 will not be entitled to option b). However such member will be entitled to transfer the commuted value of his deferred pension to another locked-in registered pension vehicle. In addition, a member is entitled to a refund of the excess of his Required Contributions plus Net Interest over 50% of the commuted value of the deferred pension described in 3) above. The excess is measured separately for required contributions with interest and pension benefits accrued before and after January 1, 1987. In addition, a member is entitled to a refund of his voluntary contributions with Net Interest, if any.

APPENDIX G

UNIVERSITY CERTIFICATION

With respect to the Report on the Actuarial Valuation for Funding Purposes as at July 1, 2018 of The Contributory Pension Plan for Salaried Employees of McMaster University Including McMaster Divinity College, I hereby certify that, to the best of my knowledge and belief:

- The valuation reflects the terms of the University's engagement with the actuary described in Section 2 of this report, particularly the requirement to not reflect a margin for adverse deviations in the going concern valuation.
- A copy of the official Plan documents and of all amendments made up to July 1, 2018 was provided to the actuary and is reflected appropriately in the summary of plan provisions contained herein.
- The asset information summarized in Appendix B is reflective of the Plan's assets.
- The membership data provided to the actuary included a complete and accurate description of every person who is entitled to benefits under the terms of the Plan for service up to July 1, 2018.
- All events subsequent to July 1, 2018 that may have an impact on the Plan have been communicated to the actuary.

March 15, 2019	Original signed by Assistant VP Admin & CFO
Date	Signed
	Deirdre Henne Assistant Vice-President (Administration) & CFO
	Name

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