

HEALTH WEALTH CAREER

THE CONTRIBUTORY PENSION PLAN FOR HOURLY-RATED EMPLOYEES OF MCMASTER UNIVERSITY INCLUDING MCMASTER DIVINITY COLLEGE

REPORT ON THE ACTUARIAL VALUATION FOR FUNDING PURPOSES AS AT JULY 1, 2019

MARCH 2020

Financial Services Regulatory Authority of Ontario Registration Number: 0215418

Canada Revenue Agency Registration Number: 0215418

Note to reader regarding actuarial valuations:

This valuation report may not be relied upon for any purpose other than those explicitly noted in the Introduction, nor may it be relied upon by any party other than the parties noted in the Introduction. Mercer is not responsible for the consequences of any other use. A valuation report is a snapshot of a plan's estimated financial condition at a particular point in time; it does not predict a pension plan's future financial condition or its ability to pay benefits in the future. If maintained indefinitely, a plan's total cost will depend on a number of factors, including the amount of benefits the plan pays, the number of people paid benefits, the amount of plan expenses, and the amount earned on any assets invested to pay the benefits. These amounts and other variables are uncertain and unknowable at the valuation date. The content of the report may not be modified, incorporated into or used in other material, sold or otherwise provided, in whole or in part, to any other person or entity, without Mercer's permission. All parts of this report, including any documents incorporated by reference, are integral to understanding and explaining its contents; no part may be taken out of context, used, or relied upon without reference to the report as a whole.

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, and the sensitivity to three adverse scenarios. 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 Pension Benefits Act of 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)	1
2. Introduction	3
3. Valuation Results – Going Concern	7
4. Valuation Results – Hypothetical Wind-Up	11
5. Valuation Results – Solvency	13
6. Minimum Funding Requirements	15
7. Maximum Eligible Contributions.....	18
8. Actuarial Opinion.....	20
Appendix A: Prescribed Disclosure.....	21
Appendix B: Plan Assets.....	30
Appendix C: Methods and Assumptions – Going Concern	33
Appendix D: Methods and Assumptions – Hypothetical Wind-up and Solvency	40
Appendix E: Membership Data	44
Appendix F: Summary of Plan Provisions	49
Appendix G: Plausible Adverse Scenarios.....	53
Appendix H: Employer Certification	57

1

SUMMARY OF RESULTS (\$000'S)

	01.07.2019	01.07.2016
Going Concern Financial Status		
Smoothed value of assets	\$60,925	\$53,452
Going concern funding liabilities	\$57,586	\$51,871
Provision for adverse deviations in respect of the going concern liabilities	\$6,324	N/A
Funding excess (shortfall)	(\$2,985)	\$1,581
Hypothetical Wind-up Financial Position		
Wind-up assets	\$61,361	\$52,761
Wind-up liability	\$77,925	\$73,210
Wind-up excess (shortfall)	(\$16,564)	(\$20,449)
Wind-up ratio	79%	72%
Funding Requirements in the Year Following the Valuation ¹		
Total current service cost	\$1,129	\$1,262
Estimated members' required contributions	(\$490)	(\$531)
Estimated employer's current service cost	\$639	\$731
Provision for adverse deviations in respect of current service cost	\$124	N/A
Total	\$763	\$731

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.

	01.07.2019	01.07.2016
Employer's current service cost and provision for adverse deviations in respect of the current service cost expressed as a percentage of members' required contributions	156%	138%
Minimum special payments ²		
Year 1	\$730	\$371
Year 2	\$1,121	\$1,184
Year 3	\$1,121	\$1,184
Estimated minimum employer contribution		
Year 1	\$1,493	\$1,102
Year 2	\$1,884	\$1,843
Year 3	\$1,884	\$1,777
Estimated maximum eligible employer contribution	\$17,327	\$21,180
Next required valuation date	July 1, 2020	July 1, 2019

² Each Plan Year following the respective valuation date.

2

INTRODUCTION

TO MCMASTER UNIVERSITY

At the request of McMaster University, we have conducted an actuarial valuation of The Contributory Pension Plan for Hourly-Rated Employees of McMaster University Including McMaster Divinity College (the “Plan”), sponsored by McMaster University (the “University”), as at the valuation date, July 1, 2019. 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, 2019 on going concern, hypothetical wind-up, and solvency bases;
- The minimum required funding contributions from July 1, 2019, in accordance with the *Pension Benefits Act of Ontario* (the “Act”); and
- The maximum permissible funding contributions from July 1, 2019, 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 Regulatory Authority 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 Regulatory Authority 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, 2020, or as at the date of an earlier amendment to the Plan.

TERMS OF ENGAGEMENT

In accordance with our terms of engagement with the 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.

- We have reflected the McMaster 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, 2016

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, 2019. The Plan has been amended since the date of the previous valuation to increase required contributions for various employee classes as a result of recent negotiations. 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 amendment coming into effect during the period covered by this report; however, it has no impact on this valuation. 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
Discount rate:	4.75%	5.00%
ITA limit / YMPE increases:	3.00%	2.50%
Post-retirement pension increases:	0.33% starting January 1, 2020, 0.00% per year thereafter	0.00%
Interest on employee contributions:	4.75%	5.00%

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 that 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 as 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. McMaster had elected to apply the broader public sector solvency funding relief measures in previous valuations of the Plan.

Effective March 1, 2019, the CIA made changes to its Standards that required additional disclosure items to be included in the valuation reports prepared on or after that date. In particular, the financial impact on the going concern results under plausible adverse scenarios is to be included in the report. These additional disclosure items are shown in Appendix G of the report.

SUBSEQUENT EVENTS

After checking with representatives of the University, to the best of our knowledge there have been no events subsequent to the valuation date that, 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 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)	01.07.2019	01.07.2016
Assets		
Market value of assets, adjusted for in-transits	\$61,541	\$52,911
Asset smoothing adjustment	(\$616)	\$541
Smoothed value of assets	\$60,925	\$53,452
Going concern funding target		
Going concern liabilities:		
• Active and suspended members	\$23,725	\$23,260
• Pensioners and survivors	\$32,702	\$27,155
• Deferred pensioners	\$1,159	\$1,426
• Pending members	\$0	\$30
• Subtotal	\$57,586	\$51,871
Provision for adverse deviations in respect of going concern liabilities as prescribed by the Act	\$6,324	N/A
Total	\$63,910	\$51,871
Funding excess (shortfall) ³	(\$2,985)	\$1,581

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, 2019 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		\$1,581
Interest on funding excess (shortfall) at 5.00% per year		\$250
Employer's special payments, with interest		\$2,985
Expected funding excess (shortfall)		\$4,816
Net experience gains (losses)		
• Net investment return ⁴	\$2,088	
• Increases in pensionable earnings	\$384	
• Indexation	(\$1,076)	
• Mortality	(\$194)	
• Retirement	(\$241)	
• Termination	\$59	
Total experience gains (losses)		\$1,020
Impact of changes in assumptions		
• Discount rate	(\$1,496)	
• YMPE increase	\$51	
• Post-retirement pension increases	(\$98)	
Total assumption changes impact		(\$1,543)
Impact of higher member contributions on excess cost sharing		(\$588)
Impact of plan amendments		(\$181)
Inclusion of provision for adverse deviations in respect of the going concern liabilities		(\$6,324)
Net impact of other elements of gains and losses		(\$185)
Funding excess (shortfall) as at current valuation		(\$2,985)

⁴ Based on smoothed asset values.

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)	2019/2020	2016/2017
Total current service cost ⁵	\$1,129	\$1,262
Estimated members' required contributions	(\$490)	(\$531)
Estimated employer's current service cost	\$639	\$731
Employer's current service cost expressed as a percentage of members' required contributions	131%	138%
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	\$124	N/A
• As a percentage of members' required contributions	25%	N/A
Employer's current service cost and provision for adverse deviations in respect of total current service cost		
• As a dollar amount per year	\$763	\$731
• As a percentage of members' required contributions	156%	138%

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

Employer's current service cost as at previous valuation	138%
Demographic changes	14%
Plan amendments	(29%)
Changes in assumptions	8%
Employer's current service cost as at current valuation	131%

⁵ The Total Current Service Costs includes no amount for escalated adjustments as defined in the Act.

DISCOUNT RATE SENSITIVITY

The following table summarizes the effect on the going concern liabilities and current service cost shown in this report of using a discount rate that is 1% lower than that used in the valuation. For the purposes of the illustration, we have reduced the interest rate used to determine commuted values upon termination of employment by 1%. The effect of a change in the discount rate on the provision for adverse deviations is not reflected.

SCENARIO (\$000'S)	VALUATION BASIS	REDUCE DISCOUNT RATE BY 1%
Going concern funding liabilities	\$57,586	\$64,676
Current service cost		
• Total current service cost	\$1,129	\$1,324
• Estimated members' required contributions	(\$490)	(\$490)
Estimated employer's current service cost	\$639	\$834

PLAUSIBLE ADVERSE SCENARIOS

The financial impact on the going concern results of plausible adverse scenarios that would pose threats to the Plan's future financial condition is presented in Appendix G.

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)	01.07.2019	01.07.2016
Assets		
Market value of assets, adjusted for in-transits	\$61,541	\$52,911
Termination expense provision	(\$180)	(\$150)
Wind-up assets	\$61,361	\$52,761
Present value of accrued benefits for:		
• Active and suspended members	\$35,127	\$36,289
• Pensioners and survivors	\$41,054	\$34,520
• Deferred pensioners	\$1,744	\$2,371
• Pending members	\$0	\$30
Total wind-up liability	\$77,925	\$73,210
Wind-up excess (shortfall)	(\$16,564)	(\$20,499)

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)	01.07.2019	01.07.2016
Number of years covered by report	3 years	3 years
Total hypothetical wind-up liabilities at the valuation date (A)	\$77,925	\$73,210
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)	\$82,064	\$79,064
Hypothetical wind-up incremental cost (B – A)	\$4,139	\$5,854

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, even 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

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

SCENARIO (\$000'S)	VALUATION BASIS	REDUCE DISCOUNT RATE BY 1%
Total hypothetical wind-up liability	\$77,925	\$88,880

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: <ul style="list-style-type: none"> (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.

EXCEPTIONS	REFLECTED IN VALUATION BASED ON THE TERMS OF ENGAGEMENT
<p>In accordance with actuarial standards, the termination expense provision used for the hypothetical wind-up valuation includes a reduction in the value of the Plan's assets resulting from their liquidation and a provision for the related transaction fees. Since the solvency valuation is based on the market value of assets and not the liquidated value of assets, these adjustments can be excluded from the solvency termination expense provision.</p>	<p>The termination expense provision used in the solvency valuation is \$180,000, which is the same as the provision used for the hypothetical wind-up valuation.</p>

FINANCIAL POSITION

The financial position on a solvency basis is the same as the financial position on the Hypothetical Wind-up basis shown in the previous section. The transfer ratio is 79%, compared to 72% at the previous valuation.

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, the rule for determining the minimum required employer monthly contributions, as well as an estimate of the employee and employer contributions, for a period of three years following the valuation date are as follows:

Period beginning	EMPLOYER'S CONTRIBUTION RULE		
	Monthly current service cost ⁶	Provision for adverse deviations ⁷	Minimum monthly special payments
July 1, 2019	131%	25%	\$60,813
July 1, 2020	131%	25%	\$93,445
July 1, 2021	131%	25%	\$93,445

⁶ Expressed as a percentage of members' required contributions.

⁷ Expressed as a percentage of members' required contributions. The determination of the provision for adverse deviations is shown in Appendix A.

Period beginning	Monthly Employee Contribution	ESTIMATED EMPLOYER'S CONTRIBUTIONS			
		Minimum monthly special payments	Provision for adverse deviations	Monthly current service cost	Total minimum monthly employer contributions
July 1, 2019	\$40,833	\$60,813	\$10,333	\$53,250	\$124,396
July 1, 2020	\$40,833	\$93,445	\$10,333	\$53,250	\$157,028
July 1, 2021	\$40,833	\$93,445	\$10,333	\$53,250	\$157,028

The estimated contribution amounts for current service cost and the provision for adverse deviations in respect of the current service cost shown above are based on projected members' required contributions. Therefore, the actual employer's current service cost and provision for adverse deviations may be different from the above estimates and, as such, the contribution requirements should be monitored closely to ensure contributions are made in accordance with the Act.

Appendix A includes details on:

- the development of the minimum special payments;
- 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 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.

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 solvency 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.

For purposes of this section on maximum eligible contributions only, any reference to the current service cost includes the provision for adverse deviations in respect of the current service cost.

In accordance with Section 147.2 of the ITA and *Income Tax Regulation* 8516, for a plan that 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 explicit expense allowance if applicable, plus the greater of the going concern funding shortfall and hypothetical wind-up shortfall.

For a plan that 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 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 that 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. The portion of this contribution representing the payment of the hypothetical wind-up shortfall can be increased with interest at 2.56% 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 \$16,564,000 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:

Year beginning	EMPLOYER'S CONTRIBUTION RULE			ESTIMATED EMPLOYER'S CONTRIBUTIONS
	Monthly current service cost including provision for adverse deviations ⁸	Monthly expense allowance	Deficit Funding	Monthly current service cost including provision for adverse deviations
July 1, 2019	156%	\$0	N/A	\$63,583

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

⁸ 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 of Ontario.



Chad Spence

Fellow of the Society of Actuaries

Fellow of the Canadian Institute of Actuaries

March 10, 2020

Date



Angelita Graham

Fellow of the Society of Actuaries

Fellow of the Canadian Institute of Actuaries

March 10, 2020

Date

APPENDIX A

PRESCRIBED DISCLOSURE

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:	\$60,925,000	
	(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		\$0
Going concern excess / (unfunded liability)	The Going concern assets minus the sum of the following:	(\$2,985,000)	
	a. the going concern liabilities		
	(i) liabilities excluding the value of escalated adjustments		\$57,586,000
	(ii) liabilities in respect of escalated adjustments		\$0
	b. the provision for adverse deviations in respect of the going concern liabilities excluding the value of escalated adjustments		\$6,324,000
	c. Prior Year Credit Balance		\$0

DEFINED TERM	DESCRIPTION	RESULT
Going concern funded ratio	The ratio of: (a) Total smoothed value of assets (excluding letters of credit) less the Prior Year Credit Balance; to (b) going concern liabilities	1.06
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.	0.79
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	0.79
Prior Year Credit Balance	Accumulated sum 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.	\$61,541,000
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 30, 2016 valuation and scheduled for 2016/2017	\$0
	(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	\$1,451,000
	(e) the present value of any previously scheduled solvency special payments (excluding those identified in this report)	\$5,557,000
	(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
		\$7,008,000

DEFINED TERM	DESCRIPTION	RESULT
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,	\$77,925,000
	(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
Solvency Deficiency	The amount, if any, by which the sum of:	
	(a) the Solvency Liabilities	\$77,925,000
	(b) the Solvency Liability Adjustment	\$0
	(c) the Prior Year Credit Balance	\$0
		\$77,925,000
	Exceeds the sum of	
	(d) the Solvency Assets net of estimated termination expenses ⁹	\$61,361,000
	(e) the Solvency Asset Adjustment	\$7,008,000
	\$68,369,000	
	\$9,556,000	

⁹ 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
Reduced Solvency Deficiency / (Solvency Excess)	The sum of:	
	(a) 85% of the Solvency Liabilities	\$66,236,000
	(b) 85% of the Solvency Liability Adjustment	\$0
	(c) the Prior Year Credit Balance	\$0
		\$66,236,000
	minus the sum of:	
	(d) the Solvency Assets net of estimated termination expenses ⁸	\$61,361,000
	(e) the Solvency Asset Adjustment	\$7,008,000
		\$68,369,000
	(\$2,133,000)	

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 contracts and meeting the minimum rating requirement) as described in the regulations, according to the investment policy applicable, at the valuation date:	45.0%				
	<table border="1"> <thead> <tr> <th>Investment</th> <th>Target</th> </tr> </thead> <tbody> <tr> <td>Canadian Bonds and debentures</td> <td>45.0%</td> </tr> </tbody> </table>	Investment	Target	Canadian Bonds and debentures	45.0%	
Investment	Target					
Canadian Bonds and debentures	45.0%					
Alternative Investment Component (M)	The sum of the Plan's target allocation of assets (excluding those allocated to annuity contracts) meeting requirements as described in the regulations, according to the investment policy, applicable at the valuation date	0.0%				
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)	N/A				

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

Combined Target Actual Asset Allocation for Fixed Income Assets (J)		
Sum of		
• Fixed Income Component (L)	45.0%	
• 0.5 x Alternative Investment Component (0.5 x M)	0.0%	
• 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%	
	45.0%	
Divided by		
• 100% - Annuity Contract Allocation (100% - R)	100%	
Combined Target Asset Allocation for Fixed Income Assets		45.0%

Combined Target Asset Allocation for Non-Fixed Income Assets (K)	
100% – Combined Target Asset Allocation for Fixed Income Assets (100% - J)	55.0%

Duration of going concern liabilities at valuation date	
= $(F - G) / (G \times 0.01)$ where,	12.33
G = going concern liabilities at valuation date established using the discount rate determined for this valuation	\$57,586,000
F = going concern liabilities at valuation date established using the discount rate minus 1%	\$64,676,000

Benchmark Discount Rate (E)	
Base rate	0.50%
Effective yield from CANSIM Series V39056 (H)	1.68%
1.5% x Combined Target Asset Allocation for Fixed Income Assets (1.5% x J)	0.68%
5.0% x Combined Target Asset Allocation for Non-Fixed Income Assets (5.0% x K)	2.75%
Benchmark Discount Rate	5.61%

Provision for Adverse Deviations		
ii. 5.0% for a closed plan and 4.0% for a Plan that is not a closed plan		5.00%
iii. Provision based on Combined Target Asset Allocation for Non-Fixed Income Assets		6.00%
iv. Greater of zero and the		
• Duration of going concern liabilities at valuation date	12.33%	
Multiplied by:		
– Going concern valuation gross discount rate net of active investment management fees (D), less	5.08%	
– Benchmark Discount Rate (E)	5.61%	0.00%
Provision for Adverse Deviations (A + B + C)		11.00%

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

Available actuarial surplus			
Excess of			
• Assets determined on basis of going concern valuation including accrued and receivable income but excluding the value of any letters of credit		\$60,925,000	
Over			
• Going concern liabilities	\$57,586,000		
• Provision for adverse deviations in respect of the going concern liabilities	\$6,324,000		
• Prior Year Credit Balance	\$0		
		\$63,910,000	
		\$0	(a)

Excess of		
<ul style="list-style-type: none"> Solvency assets excluding the value of any letters of credits and lesser of Prior Year Credit Balance and minimum required employer contributions, including the provision for adverse deviations until the next required valuation 	\$61,541,000	
Over		
<ul style="list-style-type: none"> Wind-up liabilities x 105% 	\$81,821,250	
	\$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%; or
- The employer 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, 2020.

SPECIAL PAYMENTS

The present values as at July 1, 2019 of the monthly special payments determined in the previous valuation are as follows:

**Present Value of Monthly Special Payments
Determined at Previous Valuation**

TYPE OF DEFICIT	START DATE	SPECIAL PAYMENT	END DATE	PRESENT VALUE OF REMAINING PAYMENTS AS AT 01.07.2019	
				GOING CONCERN BASIS ¹⁰	SOLVENCY BASIS ¹¹
Solvency	July 1, 2017	\$98,692	June 30, 2024	N/A	\$5,557,000
Total		\$98,692			\$5,557,000

The valuation revealed a going concern unfunded liability of \$2,985,000, as outlined in the Definitions section of this appendix. 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, 2019.

Since there is a Solvency Excess of \$2,133,000, as outlined in the Definitions section of this appendix, but it is less than the present value of the special payments set out in the prior valuation report to fund any reduced solvency deficiency, either the monthly rate or the amortization period of the solvency special payments can be reduced so as to reduce the solvency excess to zero for any amortization period for which special payments end within six years after the valuation date. As a result, the prior solvency special payment has been reduced.

As such, special payments must be made as follows:

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

¹¹ Calculation considers both solvency and going concern special payments (six years only) and is based on the average solvency discount rate.

TYPE OF PAYMENT	START DATE	END DATE	MONTHLY SPECIAL PAYMENT	PRESENT VALUE	
				GOING CONCERN BASIS ¹²	SOLVENCY BASIS ¹³
New going concern	July 1, 2020	June 30, 2030	\$32,632	\$2,985,000	\$1,451,000
Solvency	July 1, 2017	June 30, 2024	\$60,813		\$3,424,000
Total			\$93,445	\$2,985,000	\$4,875,000

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 2019/2020, 2020/2021 and 2021/2022 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.

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	\$61,541,000	(a)
PBGF liabilities	\$77,925,000	(b)
Solvency liabilities	\$77,925,000	(c)
Ontario asset ratio	100%	(d) = (b) ÷ (c)
Ontario portion of the fund	\$61,541,000	(e) = (a) x (d)
PBGF assessment base	\$16,384,000	(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)

¹² Calculation only considers going concern special payments and is based on a going concern discount rate.

¹³ Calculation considers both solvency (all remaining scheduled payments) and going concern special payments (six years only) and is based on the average solvency discount rate.

APPENDIX B

PLAN ASSETS

The pension fund is held in trust by CIBC Mellon. In preparing this report, we have relied upon fund statements prepared by CIBC Mellon 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)	2016/2017	2017/2018	2018/2019
July 1	\$52,848	\$56,176	\$58,466
PLUS			
Members' contributions	\$487	\$446	\$563
University's contributions	\$1,128	\$1,637	\$1,711
Investment income	\$1,263	\$1,548	\$1,568
Net capital gains (losses)	\$3,750	\$1,805	\$2,580
	\$6,628	\$5,436	\$6,422
LESS			
Pensions paid	\$2,419	\$2,559	\$2,876
Lump-sums paid	\$561	\$227	\$34
Administration and investment fees	\$320	\$360	\$417
	\$3,300	\$3,146	\$3,327
June 30	\$56,176	\$58,466	\$61,561
Gross rate of return ¹⁴	9.6%	6.0%	7.2%

¹⁴ Assuming mid-period cash flows.

(\$000'S)	2016/2017	2017/2018	2018/2019
Rate of return, net of expenses ¹⁵	9.0%	5.4%	6.4%

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

(\$000'S)	CURRENT VALUATION	PREVIOUS VALUATION
Market value of invested assets	\$61,561	\$52,848
In-transit amounts		
• Members' contributions	\$34	\$38
• University's contributions	\$146	\$91
• Expenses	(\$1)	(\$1)
• Benefit payments	(\$199)	(\$65)
Market value of assets adjusted for in-transit amounts	\$61,541	\$52,911

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.

¹⁵ Assuming mid-period cash flows.

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, 2019
	Minimum	Target	Maximum	
Canadian equities	10%	20%	30%	20.7%
US equities	8%	18%	28%	20.8%
Non-North American equities	7%	17%	27%	20.1%
Bonds	25%	45%	65%	38.0%
Cash and cash equivalents	0%	0%	10%	0.4%
		100%		100%

APPENDIX C

METHODS AND ASSUMPTIONS – GOING CONCERN

VALUATION OF ASSETS

For this valuation, we have continued to use an adjusted market-value method to determine the smoothed value of assets. Under this method, realized and unrealized capital gains (losses) arising during a given year are spread on a straight-line basis over 3 years.

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 capital 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, 2019 was derived as follows:

(\$000'S)	2017/2018	2018/2019
Market value of assets at July 1	\$56,176	\$58,466
Payments into Plan	\$2,083	\$2,274
Payments out of Plan ¹⁶	\$2,786	\$2,910
Expected interest	\$2,792	\$2,907
Investment experience gains (losses)	\$201	\$824
Market value of assets at June 30	\$58,466	\$61,561

¹⁶ Other than administration fees.

Market value of assets		\$61,561
LESS		
Investment experience gains (losses)	2018/2019: \$824 x 66.67% =	\$549
	2017/2018: \$201 x 33.33% =	\$67
		\$616
Smoothed value of assets		\$60,945

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	\$60,945	\$53,389
In-transit amounts		
• Members' contributions	\$34	\$38
• University's contributions	\$146	\$91
• Expenses	(\$1)	(\$1)
• Benefit payments	(\$199)	(\$65)
Smoothed value of assets, adjusted for in-transit amounts	\$60,925	\$53,452

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. For each individual plan member, accumulated contributions with interest are established as a minimum actuarial liability.

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

The employer'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:	4.75%	5.00%
Inflation:	2.00%	2.00%
ITA limit / YMPE increases:	3.00%	2.50%
Pensionable earnings increases:	3.25%	3.25%
Post-retirement pension increases:	0.33% on January 1, 2020, 0.00% per year thereafter	0.00%
Interest on employee contributions:	4.75%	5.00%
Retirement rates:	20% where first eligible for an unreduced pension, remainder at age 64	20% where first eligible for an unreduced pension, remainder at age 64
Termination rates:	None	None
Mortality rates:	115% of the rates of the 2014 Public Sector Canadian Pensioners Mortality Table (CPM2014Publ)	115% 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

The assumptions are best-estimate with the exception that the discount rate includes a margin for adverse deviations, as shown below.

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, 2019 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 market 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:

- An **assumed investment return** based on estimated return for each major asset class that are consistent with market conditions on the valuation date modified to include a provision for increases in market interest rates to a level higher than current historically low levels, on the expected time horizon over which benefits are expected to be paid, and on the target asset mix specified in the Plan's investment policy. Consistent with market observable and available data, the assumed investment return is a gross return for all asset classes.
- An **assumed passive investment management expense provision** which represents the hypothetical fees for passive investment management of assets based on estimated fees charged by index managers for balanced mandates.
- An **implicit non-investment management expense provision** determined as the average rate of non-investment expenses paid from the fund over the last 3 years. These would include all fees payable from the fund (administration, custodial, audit, consulting, etc.) except those payable to investment managers, to the extent that these fees are not covered in an explicit provision for expenses added to the current service cost

The discount rate was developed as follows:

Assumed investment return	5.08%
Assumed passive investment management expense provision	(0.08%)
Implicit non-investment management expense provision	(0.23%)
Rounding to nearest 5 basis points	(0.02%)
Net discount rate	4.75%

INFLATION

The inflation assumption 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 University's expectations.

POST-RETIREMENT PENSION INCREASES

The assumption is based on the Plan formula and inflation assumption above. The 0.33% increase on January 1, 2020 represents the actual indexation that was granted.

RETIREMENT RATES

The assumption is based on the Plan provisions and our experience with similar plans and employee groups.

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 22.0 years for males and 23.8 years for females.

INTEREST ON EMPLOYEE CONTRIBUTIONS

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

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.

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, 2019.

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.

However, it may not be possible to settle the liabilities through the purchase of annuities due to the size of the Plan and the limited annuity market in Canada. In accordance with the *Canadian Institute of Actuaries Educational Note: Assumptions for Hypothetical Wind-up and Solvency Valuations with Effective Dates Between December 31, 2018 and December 30, 2019* (the "Educational Note"), we

have assumed that the settlement of such liabilities would be priced on the same basis as the smaller group annuities that are available in the market.

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 no adjustment to the mortality rates used in the regular annuity purchase assumptions is required.

We have not included a margin for adverse deviations 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 under age 55, and 50% of active 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 company.
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 blending 50% male mortality and 50% female mortality
Interest rate:	2.30% per year for 10 years, 2.80% 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 Mortality Table (CPM2014) with fully generational improvements using CPM Scale B
Adjustment to mortality rates:	No adjustment
Interest rate:	2.66% per year
Retirement Age	
Maximum value:	Members are assumed to retire at the age that maximizes the value of their entitlement from the Plan, based on the eligibility requirements that 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 2.56% 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:	\$3,025.56
Termination expenses:	\$180,000

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 not be solvent on the wind-up date and therefore would not be able to reimburse the Plan for the termination expenses. 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.
- Active members accrue pensionable service in accordance with the terms of the Plan.
- Cost of living adjustments are consistent with the inflation assumption used for the going concern valuation.

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, 2019, 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.

	01.07.2019	01.07.2016
Active Members		
Number	145	178
Total pensionable earnings for the following year	\$7,137,650	\$8,381,396
Average pensionable earnings for the following year	\$49,225	\$47,086
Average years of pensionable service	18.6	16.5
Average age	55.8	53.4
Suspended Members¹⁷		
Number	4	N/A
Total pensionable earnings for the following year	\$172,043	N/A
Average pensionable earnings for the following year	\$43,011	N/A
Average years of pensionable service	8.4	N/A
Average age	49.2	N/A
Deferred Pensioners		
Number	51	58
Total annual pension	\$122,293	\$183,384
Average annual pension	\$2,398	\$3,162
Average age	55.4	52.9
Pensioners and Survivors		
Number	292	290
Total annual lifetime pension	\$2,775,504	\$2,386,871
Average annual lifetime pension	\$9,505	\$8,231
Average age	74.7	73.9

¹⁷ Refers to members that have moved to salaried positions at McMaster but retain frozen pensions in the Plan.

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

	ACTIVES	SUSPENDED	DEFERRED	PENSIONERS AND SURVIVORS	PENDING	TOTAL
Total at 01.07.2016	178	0	58	290	1	527
Terminations:						
• Transfers/ refunds	(5)	-	(1)	-	(1)	(7)
• Deferred pensions	(4)	-	4	-	-	-
Suspended	(1)	4	(3)	-	-	-
Deaths	(2)	-	-	(33)	-	(35)
Retirements	(22)	-	(2)	24	-	-
Beneficiaries	-	-	(1)	11	-	10
Data corrections	-	-	(3)	-	-	(3)
Rehire	1	-	(1)	-	-	-
Total at 01.07.2019	145	4	51	292	0	492

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

Age	YEARS OF PENSIONABLE SERVICE							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30 +	
Under 30								
30 to 34			1 *					1 *
35 to 39		2 38,508		2 54,276				4 46,392
40 to 44			1 *	2 57,229				3 *
45 to 49		1 *	7 57,772	7 46,263	3 45,256			18 *
50 to 54	1 *	2 38,508	8 55,638	11 45,963	2 58,043	5 49,094	1 *	30 49,237
55 to 59		4 38,508	9 49,416	19 44,235		10 46,274	6 53,121	48 46,265
60 to 64		5 38,508	2 62,844	9 49,961	3 42,591	5 54,395	6 63,828	30 51,687
65 +			3 52,860	3 50,731	1 *	1 *	3 43,983	11 50,653
Total	1 *	14 *	31 55,098	53 47,071	9 *	21 *	16 *	145 49,225

* Not shown to protect member confidentiality.

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

Age	DEFERRED PENSIONERS		PENSIONERS AND SURVIVORS	
	Number	Average Pension	Number	Average Pension
34 and under				
35 – 39	2	2,973		
40 – 44	3	5,197		
45 – 49	11	2,765		
50 – 54	13	2,704	2	10,233
55 – 59	8	2,117	16	12,497
60 – 64	6	1,983	26	11,229
65 – 69	3	1,111	56	12,958
70 – 74	3	172	59	10,369
75 – 79	2	1,254	48	9,168
80 – 84			37	6,830
85 – 89			29	5,313
90 – 94			17	4,197
95 +			2	3,769
Total	51	2,398	292	9,505

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, 2019. Since the previous valuation, the Plan has been amended to update employee contribution rates and define service and benefit accruals for suspended members.

The following is a summary of the main provisions of the Plan in effect on July 1, 2019. This summary is not intended as a complete description of the Plan.

Background	The Plan became effective July 1, 1962. Benefits are based on a set formula and are partially paid for by the University.
Eligibility for Membership	The Plan was completely closed to new entrants on March 15, 2010.

Employee Contributions	Employee Contribution Rate on Annual Earnings				
	Class of Member	Period Beginning	Up to YMPE	In Excess of YMPE	
	Operations and Maintenance	July 15, 2018	7.00%	10.00%	
		November 29, 2020	8.00%	11.00%	
	Hospitality Services	July 15, 2018	7.00%	10.00%	
		April 7, 2019	8.00%	11.00%	
	Parking and Transit Services	July 15, 2018	7.00%	10.00%	
		July 14, 2019	8.00%	11.00%	
	Machinists and Operating Engineers	July 15, 2018	7.00%	10.00%	
	Special Constables	July 15, 2018	7.00%	10.00%	
		October 2, 2022	8.00%	11.00%	
	Retirement Dates	<p>Normal Retirement Date</p> <ul style="list-style-type: none"> The normal retirement date is the first day of the month coincident with or next following the member's 65th birthday. <p>Special Early Retirement Date</p> <ul style="list-style-type: none"> A member whose age plus Credited Service equals or exceeds 80 points may retire early without any reduction for early retirement. <p>Early Retirement Date</p> <ul style="list-style-type: none"> A member may retire early with a reduced pension at any time during the 10-year period preceding the member's normal retirement date. The pension payable will be reduced by 0.25% for each month between age 60 and 65 and 0.50% for each month prior to age. <p>Postponed Retirement Date</p> <ul style="list-style-type: none"> A member may postpone the actual retirement and commencement of pension (with University consent prior to December 12, 2006), but in any event the member's 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 benefits under the Plan and will continue to accrue benefits until such postponed retirement date. 			

<p>Normal Retirement Pension</p>	<p>a) Service prior to July 1, 1979, the greater of: I. 1.0% of 1978 earnings multiplied by years of Plan membership, or II. the benefit accrued to June 30, 1979 PLUS</p> <p>b) Service from July 1, 1979 to December 31, 1985, 40% of member contributions in each year PLUS</p> <p>c) One-third of the benefits accrued under (a) and (b) above PLUS</p> <p>d) 20% of the benefits accrued under (a), (b) and (c) above PLUS</p> <p>e) 8% of the benefits accrued under (a), (b), (c) and (d) above PLUS</p> <p>f) 20% of the benefits accrued under (a), (b), (c), (d) and (e) above PLUS</p> <p>g) 1.5% of the benefits accrued under (a), (b), (c), (d), (e) and (f) above PLUS</p> <p>h) Service after December 31, 1985, 1.4% of Final Five Year Average Earnings up to the Average Year's Maximum Pensionable Earnings and 2.0% of Final Five Year Average Earnings in excess of the Average Year's Maximum Pensionable Earnings multiplied by years of Credited Service earned after December 31, 1985.</p> <p>Average Year's Maximum Pensionable Earnings is calculated using the average YMPE for the final three-year period of a member's participation in the Plan.</p> <p>The amount by which the member's required contributions with interest exceed 50% of the commuted value of the member's benefit shall be paid to the member.</p>
<p>Bridge Benefits</p>	<p>A member who retires early on or after July 1, 2001 is eligible to receive a bridge benefit equal to \$12.00 per month per year of credited service accrued to July 1, 2001. Such bridge benefit will be payable commencing on the member's early retirement date or age 60, if later. The bridge benefit ceases at age 65 or death, if earlier. Such bridge will be reduced by 0.25% per month for each month commencement occurs prior to 65. If the member has attained 80 points at the early retirement date, the bridge benefit will be unreduced.</p> <p>All pensioners who retired prior to July 1, 2001 and who had not yet attained age 65 at July 1, 2001, will receive a bridge benefit of \$12.00 per month per year of credited service accrued to July 1, 1999. The bridge benefit ceases at age 65 or death, if earlier.</p>
<p>Annual Pension Increase</p>	<p>Pensions in payment are 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 6% of the 5-year average rate of return earned on the market value of the fund, subject to a maximum of the previous calendar year's rate of increase in the Consumer Price Index.</p>

Maximum Pension	<p>The total annual pension payable from the Plan upon retirement, death or termination of employment cannot exceed the lesser of:</p> <ul style="list-style-type: none"> • 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 • \$3,025.56 or such other maximum permitted under the Income Tax Act, multiplied by the member's total credited service.
Death Benefits	<p>Pre-retirement:</p> <ul style="list-style-type: none"> • The death benefit payable is equal to the commuted value of benefits accrued under the Plan. • The amount by which twice the member's required contributions with interest exceeds the commuted value shall be paid to the member's spouse or if no spouse exists, to the member's designated beneficiary. <p>Post retirement:</p> <ul style="list-style-type: none"> • The normal form of payment is a lifetime pension guaranteed for ten years. However, the member may elect to receive an optional form of pension on an actuarial equivalent basis.
Disability Benefits	<p>If a member becomes totally and permanently disabled, the member shall continue to accrue benefits on the basis of their earnings in the twelve-month period preceding the onset of disability.</p> <p>A disabled member shall not be required to contribute to the Plan.</p>
Termination Benefits	<p>If a member terminates employment prior to retirement, the member may elect to receive one of the following:</p> <ol style="list-style-type: none"> a) A refund of the member's required contributions, with Net Interest on the Fund if the member has not participated in the Plan for at least 2 years. b) A transfer of the commuted value of the member's pension. c) A deferred pension, payable at Normal Retirement Date, equal to the pension earned to the date of termination. <p>In addition to the benefit payable above, the amount by which twice the member's required contributions with interest exceeds the commuted value of the member's benefit shall be paid to the member.</p> <p>With respect to (b) and (c) above, the transfer must be made to another retirement arrangement or pension plan in the form and manner prescribed by the Canada Revenue Agency and the amounts so transferred must be locked-in to provide retirement benefits commencing no earlier than the member's early retirement date under the Plan.</p>

APPENDIX G

PLAUSIBLE ADVERSE SCENARIOS

In this Appendix, the financial impact on the Plan's going concern results (i.e., going concern financial position at the valuation date and current service cost from the valuation date to the next valuation date) of plausible adverse scenarios that would pose threats to the Plan's future financial condition is illustrated for the following risks:

- Interest rate risk, the potential that interest rates will be lower than expected;
- Deterioration of asset values; and
- Longevity risk, the potential that pension plan members will live longer than expected.

The following table summarizes the going concern results, where we assumed for:

- Interest rate risk, an immediate parallel decrease in market interest rates of 100 basis points
- Deterioration of asset values, an immediate decrease of 15% in the market value of non-fixed income assets; and
- Longevity risk, that life expectancy from the valuation date at age 65 for a male and a female would increase by 1.46 years and 1.33 years, respectively.

000'S SCENARIO	GOING CONCERN VALUATION RESULTS AS 01.07.19	PLAUSIBLE ADVERSE SCENARIO RESULTS AS AT 01.07.19		
		INTEREST RATE RISK	DETERIO- RATION OF ASSET VALUES	LONGEVITY RISK
Market value of assets	\$61,541	\$63,779	\$56,464	\$61,541
Going Concern Financial Status				
Smoothed value of assets	\$60,925	\$61,671	\$59,232	\$60,925
Going concern funding target	\$57,586	\$60,777	\$57,586	\$59,127
Provision for Adverse Deviation	\$6,324	\$6,674	\$6,324	\$6,493
Funding excess (shortfall)	(\$2,985)	(\$5,780)	(\$4,678)	(\$4,695)
Estimated Employer's Current Service Cost including Provision for Adverse Deviation				
Plan Year 2019/2020	\$763	\$861	\$763	\$805
Plan Year 2020/2021	\$763	\$861	\$763	\$805
Plan Year 2021/2022	\$763	\$861	\$763	\$805

The balance of this Appendix provides details of the plausible adverse scenarios selected and the determination of the impact on the going concern results.

INTEREST RATE RISK

The purpose of this scenario is to illustrate the sensitivity of the Plan's going concern results to the potential that interest rates will be lower than expected. For this purpose, we have assumed an immediate parallel decrease in market interest rates underlying fixed income investments, where fixed income investments include the categories as shown in the investment policy summarized in Appendix B.

Using a methodology consistent with the one used to determine the going concern discount rate, we have determined that a parallel decrease in market interest rates of 100 basis points would have a non-trivial probability (between 1 in 10 and 1 in 20) of occurring within the year following the valuation date. For purpose of this scenario, we have assumed that such a decrease in market interest rates would occur immediately on the valuation date and would have the following impact on the value of assets and going concern assumptions:

DEFINED TERM	DESCRIPTION
Market value of assets	The decrease in market interest rates has been assumed to affect only the market value of the fixed income investments. The decrease is assumed to have occurred immediately on the valuation date.
Smoothed value of assets	For purposes of determining the smoothed value of assets, 33% of the change in the market value of asset has been recognized in the smoothed value of assets.
Discount rate assumption	It was assumed that the decrease in market interest rates affects only the expected return on assets for the fixed income portion of assets. The discount rate assumption was therefore decreased from 4.75% to 4.30%.
Other assumptions	Except for the interest rate on member's contributions, all assumptions used were the same as those used for this valuation. In particular, the discount rate used to value benefits assumed to be settled through a lump sum was not changed.
Provision for Adverse Deviations	The above changes would not affect the calculation of the Provision for Adverse Deviations

DETERIORATION OF ASSET VALUES

The purpose of this scenario is to illustrate the sensitivity of the Plan's going concern results to a deterioration of asset values. For this purpose, we assumed an immediate reduction in the market value of the Plan's non-fixed income assets, where non-fixed income investments include the following categories as shown in the investment policy summarized in Appendix B.

Using a methodology consistent with the one used to determine the going concern discount rate, we have determined that a decrease of 15% in the market value of value of non-fixed income assets would have a non-trivial probability (between 1 in 10 and 1 in 20) of occurring within the year following the valuation date. For purpose of this scenario, we have assumed that such a decrease would occur immediately on the valuation date and would have the following impact on the value of assets and going concern assumptions:

Market value of assets	The decrease in the market value of the non-fixed income portion of assets is assumed to have occurred immediately on the valuation date.
Smoothed value of assets	For purposes of determining the smoothed value of assets, 33% of the change in the market value of assets has been recognized in the smoothed value of assets.
Going concern assumptions	This scenario is assumed to have no impact on the assumptions used for this valuation.

LONGEVITY RISK

The purpose of this scenario is to illustrate the sensitivity of the Plan's going concern results to the potential that pension plan members will live longer than expected. For this purpose, we have determined that a plausible adverse scenario would be to assume that future mortality

improvements¹⁸ will be in line with the average improvements experienced by the Canadian population over the most recent 15-year period available, with uniform improvement rates for all future years but varying by age¹⁹ and gender.

The table below summarizes the improvement rates under the plausible adverse scenario compared to those currently assumed under the CPM-B scale and is based on Canadian population experience from the Human Mortality Database (HMD) from 2002 to 2016.

Age	MALES				FEMALES			
	CPM-B			Adverse Scenario	CPM-B			Adverse Scenario
	2020	2025	2030+		2020	2025	2030+	
20	1.59%	1.20%	0.80%	1.68%	0.98%	0.89%	0.80%	1.47%
30	1.88%	1.34%	0.80%	1.68%	0.98%	0.89%	0.80%	1.47%
40	1.80%	1.30%	0.80%	1.68%	1.17%	0.98%	0.80%	1.47%
50	1.17%	0.98%	0.80%	1.76%	0.98%	0.89%	0.80%	1.34%
55	1.47%	1.13%	0.80%	1.67%	1.11%	0.96%	0.80%	1.14%
60	1.77%	1.28%	0.80%	1.75%	1.24%	1.02%	0.80%	1.34%
65	2.06%	1.43%	0.80%	2.11%	1.36%	1.08%	0.80%	1.65%
70	2.06%	1.43%	0.80%	2.48%	1.36%	1.08%	0.80%	1.77%
75	2.01%	1.41%	0.80%	2.66%	1.36%	1.08%	0.80%	1.93%
80	1.96%	1.38%	0.80%	2.63%	1.36%	1.08%	0.80%	2.03%
85	1.38%	1.03%	0.68%	2.32%	1.31%	0.99%	0.68%	1.98%
90	0.75%	0.62%	0.48%	1.68%	0.75%	0.62%	0.48%	1.60%
95	0.16%	0.25%	0.34%	1.04%	0.16%	0.25%	0.34%	1.12%
100	0.14%	0.22%	0.30%	0.64%	0.14%	0.22%	0.30%	0.80%
105	0.14%	0.22%	0.30%	0.38%	0.14%	0.22%	0.30%	0.55%

¹⁸ i.e. starting one year after the valuation in this context

¹⁹ improvement rates below age 45 are set to those at age 45

APPENDIX H

EMPLOYER CERTIFICATION

With respect to the Report on the Actuarial Valuation for Funding Purposes as at July 1, 2019 of the Contributory Pension Plan for Hourly-Rated 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 University's decisions in regards to determining the going concern and solvency funding requirements.
- A copy of the official plan documents and of all amendments made up to July 1, 2019 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, 2019.
- All events subsequent to July 1, 2019 that may have an impact on the Plan have been communicated to the actuary.

***Original valuation has been signed by
the VP Admin on March 9, 2020***

Date

Signed

Name

MERCER (CANADA) LIMITED

120 Bremner Boulevard, Suite 800

Toronto, ON M5J 0A8

+1 416 868 2000

www.mercer.ca

Mercer (Canada) Limited

