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Brock University Pension Plan

Report on the Actuarial Valuation for Funding Purposes as at July 1, 2022

January 2023

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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 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.

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Section 1

Summary of results

	01.07.2022		01.01.2020	
	Excluding Money Purchase Component[1]	Including Money Purchase Component[1]	Excluding Money Purchase Component[1]	Including Money Purchase Component[1]
Going Concern Financial Status				
Market value of assets	$39,441,000	$594,111,000	$37,650,000	$578,826,000
Going concern funding liabilities	$44,111,000	$598,781,000	$50,092,000	$591,268,000
Provision for adverse deviations in respect of the going concern liabilities excluding post-retirement indexing and excluding money purchase component	$595,000	$595,000	$269,000	$269,000
Funding excess (shortfall)	($5,265,000)	($5,265,000)	($12,711,000)	($12,711,000)
Hypothetical Wind-up Financial Position				
Wind-up assets	$38,866,000	$593,536,000	$37,075,000	$578,251,000
Wind-up liability	$88,840,000	$643,510,000	$168,029,000	$709,205,000
Wind-up excess (shortfall)	($49,974,000)	($49,974,000)	($130,954,000)	($130,954,000)
Solvency Financial Position				
Solvency assets	$38,866,000	$593,536,000	$37,075,000	$578,251,000
Solvency liability[2]	$8,988,000	$563,658,000	$4,611,000	$545,787,000
Solvency excess (deficiency)	$29,878,000	$29,878,000	$32,464,000	$32,464,000
Transfer ratio	0.44	0.92	0.22	0.82
Solvency ratio	4.39	1.05	8.17	1.06

[1] Money Purchase Account, Short Term Account, Additional Voluntary Contribution Account, Special Transferred Contributions Fund and Variable Annuity Fund

[2] Excluding the value of the contractual indexing of pensions after retirement.

	01.07.2022	01.01.2020
Funding Requirements in the Year Following the Valuation[3]		
Total current service cost	$21,626,000	$21,899,000
Estimated members' required contributions	($ 7,972,000)	($7,773,000)
Estimated University's current service cost	$ 13,654,000	$14,126,000
Provision for adverse deviations in respect of current service cost excluding post-retirement indexing and excluding money purchase component	$3,000	$3,000
Total	$ 13,657,000	$14,129,000
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	171.3%	181.8%
Minimum special payments	$1,463,000[4]	$1,939,000[5]
Estimated minimum University contribution	$15,120,000[4]	$16,068,000[5]
Estimated maximum eligible University contribution	$63,631,000	$145,083,000
Next required valuation date	July 1, 2025	January 1, 2023

[3] 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.

[4] Reflects one-year deferral of newly established going concern special payments. Annual special payment requirement will reduce to $534,000 effective July 1, 2023.

[5] Reflects one-year deferral of newly established going concern special payments. Annual special payment requirement reduced to $1,463,000 effective January 1, 2021.

Section 2

Introduction

To the Board of Trustees

At the request of Brock University (the “University”), we have conducted an actuarial valuation of the Brock University Pension Plan (the “Plan”), sponsored by the University, as at the valuation date, July 1, 2022. 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, 2022 on going concern, hypothetical wind-up, and solvency bases;
- The minimum required funding contributions from July 1, 2022, in accordance with the *Pension Benefits Act (Ontario)* (the “Act”); and
- The maximum permissible funding contributions from July 1, 2022, 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, 2025 or as at the date of an earlier amendment to the Plan depending on any funding implications.

Terms of Engagement

In accordance with our terms of engagement with the 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 decision to apply the prescribed provision for adverse deviations in respect of going-concern liabilities and current service cost excluding the money purchase component.

- 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.
  - Certain excludable 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 January 1, 2020

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, 2022. The Plan has not been amended since the date of the previous valuation, and we are not aware of any pending definitive or virtually definitive amendments coming into effect during the period covered by this report. 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:	5.85%	5.30%
Inflation:	2.20%	2.00%
ITA limit / YMPE increases:	3.20%	3.00%
Post retirement money purchase pension increases	(0.15%)	(0.70%)
Interest on Money Purchase Account Balance	5.85%	5.30%

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 July 23, 2020, the CIA published the final version of Section 3500 of the Standards of Practice on Pension Commuted Values and confirmed that the effective date of the new standards is December 1, 2020. From the effective date, the revised standards affect the assumptions used to value the solvency and wind-up liabilities for benefits assumed to be settled through a lump sum transfer. They also affect the assumptions used to determine the commuted values payable upon termination for members assumed to elect a lump sum transfer under the going concern basis. The financial impact of those changes is reflected in this actuarial valuation on a going concern basis and on a solvency and hypothetical wind-up basis.

On September 14, 2021, the Actuarial Standards Board published a revised version of Section 3500 of the Standards of Practice on Pension Commuted Values effective February 1, 2022. The revised standards affect implied rates of inflation used in the Standard and affirmed that the select and ultimate non-indexed rate cannot be less than zero. From the effective date, the revised standards affect the assumptions used to value the solvency and wind-up liabilities for benefits assumed to be settled through a lump sum transfer. They also affect the assumptions used to determine the commuted values payable upon termination for members assumed to elect a lump sum transfer under the going concern basis. The financial impact of those changes is reflected in this actuarial valuation on a going concern basis and on a solvency and hypothetical wind-up basis.

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 as at July 1, 2022.

However, since the valuation date, there have been significant fluctuations in the financial markets including an increase in yields on fixed income and an increase in actual and expected short-term inflation, which may have led to a variation in the funded position of the Plan after the valuation date. Our valuation reflects the financial position of the Plan as of the valuation date and does not take into account any subsequent 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.

Section 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:

	01.07.2022		01.01.2020	
	Excluding Money Purchase Component	**Including Money Purchase Component**	**Excluding Money Purchase Component**	**Including Money Purchase Component**
Assets				
Money Purchase, Short Term Account, AVC, and Special Transferred Contribution Funds	n/a	$376,097,000	n/a	$389,214,000
Variable Annuity Fund	n/a	$178,573,000	n/a	$151,962,000
Minimum Guarantee Fund	$39,441,000	$39,441,000	$37,650,000	$37,650,000
Total market value of assets	$39,441,000	$594,111,000	$37,650,000	$578,826,000
Going concern funding target				
Money Purchase, Short Term Account, AVC, and Special Transferred Contribution Funds	n/a	$376,097,000	n/a	$389,214,000
Variable Annuity Fund	n/a	$178,573,000	n/a	$151,962,000
Accrued Active Members' Supplemental Benefits	$ 17,295,000	$17,295,000	$30,272,000	$30,272,000
Retired Members' Supplemental Benefits	$26,816,000	$26,816,000	$19,820,000	$19,820,000
Subtotal	$44,111,000	$598,781,000	$50,092,000	$591,268,000
Provision for adverse deviations in respect of going concern liabilities excluding post-retirement indexing and excluding money purchase component	$595,000	$595,000	$269,000	$269,000
Total	$44,706,000	$599,376,000	$50,361,000	$591,537,000
Funding excess (shortfall)	($5,265,000)	($5,265,000)	($12,711,000)	($12,711,000)

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

Reconciliation of Financial Status

Funding excess (shortfall) as at previous valuation		($12,711,000)
Provision for Adverse Deviations (PfAD) at previous valuation		$269,000
Funding excess (shortfall) before PfAD at previous valuation		($12,442,000)
Interest on funding excess (shortfall) before PfAD at 5.30% per year		($1,715,000)
University's special payments, with interest		$4,428,000
Expected funding excess (shortfall)		($9,729,000)
Net experience gains (losses)		
• Net investment return	($1,396,000)	
• Increases in pensionable earnings, YMPE, ITA maximum pension and CRA contribution limits	$225,000	
• Mortality	($743,000)	
• Retirement	($3,914,000)	
• Termination	($905,000)	
• Money Purchase Account balance & Variable Annuity Fund Growth different than expected	($14,504,000)	
• Pensioner indexing	$37,000	
Total experience gains (losses)		($21,200,000)
Impact of changes in assumptions		
• YMPE and ITA maximum	$391,000	
• Actuarial basis for benefits assumed to be settled through a lump sum	$2,964,000	
• Discount rate	$23,153,000	
Total assumption changes gains (losses)		$26,508,000
Net impact of other elements of gains and losses		($249,000)
Funding excess (shortfall) before PfAD at current valuation		($4,670,000)
Provision for Adverse Deviations at current valuation		($595,000)
Funding excess (shortfall) as at current valuation		($5,265,000)

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:

University's Current Service Cost				
	2022/2023		2020	
	Amount	% of member contributions	Amount	% of member contributions
Matching money purchase component contribution	$7,972,000	100.0%	$7,773,000	100.0%
Additional University money purchase component contribution	$4,747,000	59.6%	$4,587,000	59.0%
Current service cost for supplemental benefits	$935,000	11.7%	$1,766,000	22.7%
Provision for adverse deviations in respect of the current service cost excluding post retirement indexing and excluding money purchase component	$3,000	0.0%	$3,000	0.0%
Total estimated University's current service cost	$13,657,000	171.3%	$14,129,000	181.8%
Estimated members' required contributions	$7,972,000		$7,773,000	
University's current service cost expressed as a percentage of members' required contributions	171.3%		181.8%	

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

University's current service cost as at previous valuation	181.8%
Demographic changes	4.1%
Changes in assumptions	(14.6%)
University's current service cost as at current valuation	171.3%

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 not changed the interest rate used to determine commuted values upon termination of employment. The effect of a change in the discount rate on the provision for adverse deviations is not reflected.

Scenario	Valuation Basis	Reduce Discount Rate by 1%
Going concern funding liabilities		
• Including Money Purchase Component	$598,781,000	$646,487,000
• Excluding Money Purchase Component	$44,111,000	$91,817,000
Current service cost		
• Total current service cost	$21,626,000	$23,686,000
• Estimated members' required contributions	($7,972,000)	($7,972,000)
Estimated University's current service cost	$13,654,000	$15,714,000

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.

Section 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:

	01.07.2022		01.01.2020	
	Excluding Money Purchase Component	Including Money Purchase Component	Excluding Money Purchase Component	Including Money Purchase Component
Assets				
Market value of assets	$39,441,000	$594,111,000	$37,650,000	$578,826,000
Termination expense provision	($575,000)	($575,000)	($575,000)	($575,000)
Wind-up assets	$38,866,000	$593,536,000	$37,075,000	$578,251,000
Present value of accrued benefits for:				
• Money Purchase, Short Term Account, AVC, and Special Transferred Contribution Funds	n/a	$376,097,000	n/a	$389,214,000
• Variable Annuity Fund	n/a	$178,573,000	n/a	$151,962,000
• Active Members' Supplemental Benefits	$42,445,000	$42,445,000	$113,677,000	$113,677,000
• Retired Members' Supplemental Benefits	$46,395,000	$46,395,000	$54,352,000	$54,352,000
Total wind-up liability	$88,840,000	$643,510,000	$168,029,000	$709,205,000
Wind-up excess (shortfall)	($49,974,000)	($49,974,000)	($130,954,000)	($130,954,000)

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:

	01.07.2022	01.01.2020
Number of years covered by report	3 years	3 years
Hypothetical wind-up incremental cost	$11,276,000[6]	$37,529,000

The incremental cost is not an appropriate measure of the contributions that would be required to maintain the windup position of the Plan even if actual experience is exactly in accordance with the going concern valuation assumptions. For example, 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	Valuation Basis	Reduce Discount Rate by 1%
Total hypothetical wind-up liability		
• Including Money Purchase Component	$643,510,000	$705,576,000
• Excluding Money Purchase Component	$88,840,000	$150,906,000

Plausible Adverse Scenarios

The financial impact on the hypothetical wind-up financial position of plausible adverse scenarios that would pose threats to the Plan’s future financial condition is presented in Appendix G.

[6] The hypothetical wind-up incremental cost for 2022/2023, 2023/2024 and 2024/2025 is $3,858,000, $3,642,000 and $3,776,000 respectively.

Section 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.	The following benefits were excluded from the solvency liabilities shown in this valuation: - Post-retirement indexing
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:

	01.07.2022		01.01.2020	
	Excluding Money Purchase Component	Including Money Purchase Component	Excluding Money Purchase Component	Including Money Purchase Component
Assets				
Market value of assets	$39,441,000	$594,111,000	$37,650,000	$578,826,000
Termination expense provision	($575,000)	($575,000)	($575,000)	($575,000)
Net assets	$38,866,000	$593,536,000	$37,075,000	$578,251,000
Liabilities				
Total hypothetical wind-up liabilities	$88,840,000	$643,510,000	$168,029,000	$709,205,000
Difference in circumstances of assumed wind-up	$0	$0	$0	$0
Value of excluded benefits	($79,852,000)	($79,852,000)	($163,418,000)	($163,418,000)
Liabilities on a solvency basis	$8,988,000	$563,658,000	$4,611,000	$545,787,000
Surplus (shortfall) on a solvency basis	$29,878,000	$29,878,000	$32,464,000	$32,464,000
Transfer ratio	0.44	0.92	0.22	0.82
Solvency ratio	4.39	1.05	8.17	1.06

Plausible Adverse Scenarios

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

Section 6

Minimum funding requirements

The Act prescribes the minimum contributions that the 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 set out under the Act.

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		Estimated University's contributions		
Period beginning	Monthly current service cost including money purchase component and provision for adverse deviation[7]	Minimum monthly special payments	Monthly current service cost including money purchase contributions[8]	Provision for adverse deviations[9]	Total minimum monthly contributions
July 1, 2022	171.3%	$121,917	$1,137,833	$250	$1,260,000
July 1, 2023	171.3%	$44,500	$1,172,250	$258	$1,217,008
July 1, 2024	171.3%	$44,500	$1,210,348	$266	$1,255,114

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

[8] University contributions to the Money Purchase Account are subject to the annual maximum contribution limits under the *Income Tax Act*.

[9] In respect of current service cost excluding money purchase component.

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 University'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; and
- 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. If the full payment of benefits does not occur, the residual amount plus interest must be paid within 5 years of the initial transfer.

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.

Section 7

Maximum eligible contributions

The *Income Tax Act* (the “ITA”) limits the amount of University 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 University’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 University can remit a contribution equal to the University’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 University 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 ($49,974,000), 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 4.52% 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 $49,974,000 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
Period beginning	**Monthly current service cost including money purchase contributions and provision for adverse deviations[10]**	**Deficit Funding**	**Monthly current service cost including money purchase contributions and provision for adverse deviations[11]**
July 1, 2022	171.3%	n/a	$1,138,083
July 1, 2023	171.3%	n/a	$1,172,508
July 1, 2024	171.3%	n/a	$1,210,614

The University's current service cost in the above table was estimated based on projected members' required contributions. The actual University'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.

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

[11] University contributions to the Money Purchase Account are subject to the annual maximum contribution limits under the *Income Tax Act*.

Section 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; and
- 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).

Armand Abehsera
Fellow of the Society of Actuaries
Fellow of the Canadian Institute of Actuaries

January 31, 2023
Date

Bill Watson
Fellow of the Society of Actuaries
Fellow of the Canadian Institute of Actuaries

January 31, 2023
Date

Appendix A
Prescribed disclosure

Definitions

The Act defines a number of terms as follows:

<table>
<tr><th>Defined Term</th><th colspan="3">Description</th><th>Result</th></tr>
<tr><td rowspan="4">Going concern assets</td><td colspan="3">Total value of assets plus the sum of the following:</td><td rowspan="4">$40,860,000</td></tr>
<tr><td>(a)</td><td>the present value of special payments in respect of any past service unfunded liability identified in a previously filed report</td><td>$0</td></tr>
<tr><td>(b)</td><td>the present value of special payments in respect of any plan amendment that increases going concern liabilities</td><td>$0</td></tr>
<tr><td>(c)</td><td>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</td><td>$1,419,000</td></tr>
<tr><td rowspan="6">Going concern excess / (unfunded liability)</td><td colspan="3">The Going Concern Assets minus the sum of the following:</td><td rowspan="6">($3,846,000)</td></tr>
<tr><td>a.</td><td colspan="2">the going concern liabilities</td></tr>
<tr><td></td><td>(i) liabilities excluding the value of escalated adjustments</td><td>$7,439,000</td></tr>
<tr><td></td><td>(ii) liabilities in respect of escalated adjustments</td><td>$36,672,000</td></tr>
<tr><td>b.</td><td>the provision for adverse deviations in respect of the going concern liabilities excluding the value of escalated adjustments</td><td>$595,000</td></tr>
<tr><td>c.</td><td>Prior Year Credit Balance</td><td>$0</td></tr>
</table>

Defined Term	Description	Result
Going concern funded ratio	The ratio of: (a) Total value of assets (excluding letters of credit) less the Prior Year Credit Balance; to (b) going concern liabilities	0.89
Transfer Ratio	The ratio of: (a) Solvency Assets minus the lesser of the Prior Year Credit Balance and the minimum required University 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.	0.44 excluding the Money Purchase Component 0.92 including the Money Purchase Component
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	4.39 excluding the Money Purchase Component 1.05 including the Money Purchase Component
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.	$39,441,000

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 January 1, 2020 valuation and scheduled for 2022	$1,428,000
	(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	$2,289,000
	(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
		$3,717,000
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 University's business were discontinued on the valuation date of the report, but, if elected by the plan sponsor, excluding liabilities for, (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.	$8,988,000

Defined Term	Description	Result
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	$8,988,000
	(b) the Solvency Liability Adjustment	$0
	(c) the Prior Year Credit Balance	$0
		$8,988,000
	Exceeds the sum of	
	(d) the Solvency Assets net of estimated termination expenses[12]	$38,866,000
	(e) the Solvency Asset Adjustment	$3,717,000
		$42,583,000
		$0
Reduced Solvency Deficiency / (Solvency Excess)	The sum of:	
	(a) 85% of the Solvency Liabilities	$7,640,000
	(b) 85% of the Solvency Liability Adjustment	$0
	(c) the Prior Year Credit Balance	$0
		$7,640,000
	minus the sum of:	
	(d) the Solvency Assets net of estimated termination expenses[8]	$38,866,000
	(e) the Solvency Asset Adjustment	$3,717,000
		$42,583,000
		($34,943,000)

[12] 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.

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: **Investment** — **Target** Canadian Bonds and debentures — 30.0%	30.0%
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: **Investment** — **Target** Real estate — 10.0% Infrastructure — 10.0%	20.0%
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 company 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)	30.00%		
• 0.5 × Alternative Investment Component (0.5 × M)	10.00%		
• Investment Component × Investment Component Fixed Income % (N × P)	0.00%		
• 0.5 × Investment Component × Investment Component Alternative Investment % (0.5 x N × Q)	0.00%		
		40.00%	
Divided by			
• 100% - Annuity Contract Allocation (100% - R)		100.00%	
Combined Target Asset Allocation for Fixed Income Assets			**40.00%**

Combined Target Asset Allocation for Non-Fixed Income Assets (K)	
100% – Combined **Target** Asset Allocation for Fixed Income Assets (100% - J)	**60.00%**
Duration of going concern liabilities at valuation date	
= (F - G) / (G × 0.01) where,	**108.15**
G = going concern liabilities at valuation date established using the discount rate determined for this valuation	$44,111,000
F = going concern liabilities established using the discount rate minus 1%	$91,817,000

Benchmark Discount Rate (E)	
Base rate	0.50%
Effective yield from CANSIM Series V39056 (H)	3.14%
1.5% x Combined **Target** Asset Allocation for Fixed Income Assets (1.5% × J)	0.60%
5.0% x Combined **Target** Asset Allocation for Non-Fixed Income Assets (5.0% × K)	3.00%
Benchmark Discount Rate	7.24%

Provision for Adverse Deviations		
i. 5.0% for a closed plan and 4.0% for a Plan that is not a closed plan		4.00%
ii. Provision based on Combined Target Asset Allocation for Non-Fixed Income Assets		4.00%
iii. Greater of zero and the		
• Duration of going concern liabilities at valuation date	108.15	
Multiplied by:		
– Going concern valuation gross discount rate net of active investment management fees (D), less	6.06%	
– Benchmark Discount Rate (E)	7.24%	0.00%
Provision for Adverse Deviations (i. + ii. + iii.)		**8.00%**

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		$39,441,000	
Over			
• Going concern liabilities	$44,111,000		
• Provision for adverse deviations in respect of the going concern liabilities	$595,000		
• Prior Year Credit Balance	$0		
		$44,706,000	
		$0	(a)
Excess of			
• Solvency assets excluding the value of any letters of credits and lesser of Prior Year Credit Balance and minimum required University contributions, including the provision for adverse deviations until the next required valuation		$39,441,000	
Over			
• Wind-up liabilities × 105%		$93,282,000	
		$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, 2025.

Special Payments

The present values as at July 1, 2022 of the monthly special payments determined in the previous valuation are as follows:

**Present Value of Monthly Special Payments
Determined as at July 1, 2022**

Type of Deficit	Start Date	Monthly Special Payment	End date	Present Value of Remaining Payments as at July 1, 2022	
				Going Concern Basis[13]	Solvency Basis[14]
Going concern	January 1, 2021	$121,917	December 31, 2030	$9,838,000	$7,688,000
Total		$121,917		$9,838,000	$7,688,000

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

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

The valuation revealed a going concern unfunded liability of $5,265,000, 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, 2022. In addition, the special payment set out for the period from July 1, 2022 to June 30, 2023 as identified in the prior valuation report to fund any going concern unfunded liability or plan amendments, must continue to be made from July 1, 2022 to June 30, 2023.

As such, special payments must be made as follows:

				Present Value	
Type of payment	**Start date**	**End date**	**Monthly Special Payment**	**Going Concern Basis[15]**	**Solvency Basis[16]**
Prior going concern over 1 year	July 1, 2022	June 30, 2023	$121,917	$1,419,000	$1,428,000
New going concern	July 1, 2023	June 30, 2033	$44,500	$3,846,000	$2,289,000
Total				$5,265,000	$3,717,000

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

[16] 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.

Pension Benefits Guarantee Fund (PBGF) Assessment

A PBGF assessment is required to be paid under Section 37 of the Act. The PBGF assessment base and additional information required under Section 3 of the Regulation 909 under the Act is as follows:

Solvency assets	$594,111,000	(a)
PBGF liabilities	$563,658,000	(b)
Solvency liabilities	$563,658,000	(c)
Ontario asset ratio	100%	(d) = (b) ÷ (c)
Ontario portion of the fund	$594,111,000	(e) = (a) × (d)
PBGF assessment base	$0	(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)
Modified PBGF liabilities	$276,796,000	
Number of Ontario Plan beneficiaries	2,651	
Number of Ontario Plan beneficiaries receiving monthly pensions (including bridge benefit) of $1,500 or less	251	
Number of Ontario Plan beneficiaries who have accrued monthly pensions (including bridge benefit) of $1,500 or less	1,284	
Amount of largest monthly pension or monthly pension benefit (including bridge benefit) that has accrued under the plan to an Ontario beneficiary	$14,897	

Percentiles of amounts payable under Plan to Ontario beneficiaries in reference to all accrued monthly pensions, including bridge benefits for actives, disabled, suspended, transfers and deferred pensioners	Accrued monthly pension (including bridge benefit)	PBGF liabilities
90th	$5,039	$252,084,000
80th	$3,230	$164,000,000
70th	$2,354	$103,673,000
60th	$1,448	$64,837,000
50th	$977	$40,144,000
40th	$643	$23,296,000
30th	$382	$12,959,000
20th	$214	$5,442,000
10th	$94	$1,423,000

Percentiles of amounts payable under Plan to Ontario beneficiaries in reference to all monthly pensions in pay, including bridge benefits for pensioners and beneficiaries	Accrued monthly pension (including bridge benefit)	PBGF liabilities
90th	$6,612	$139,346,000
80th	$4,654	$98,369,000
70th	$3,342	$68,976,000
60th	$2,360	$47,048,000
50th	$1,670	$30,140,000
40th	$1,226	$19,110,000
30th	$935	$10,880,000
20th	$630	$5,187,000
10th	$344	$1,524,000

Appendix B
Plan assets

The pension fund was held by RBC Investor Services until December 2020 and is now held by by CIBC Mellon since then. In preparing this report, we have relied upon fund statements prepared by RBC Investor Services and 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:

	2020	2020/2021	2021/2022
January 1	$578,906,273		
July 1		$594,445,146	$652,558,875
PLUS			
Members' contributions	$3,545,954	$7,659,035	$7,834,432
University's MPC contributions	$6,031,313	$12,542,470	$12,880,135
University's MGP contributions	$890,054	$1,784,640	$1,817,987
University's special funding payments	$969,500	$1,701,002	$1,463,004
Additional voluntary contributions	$57,998	$123,741	$127,642
Special transferred contributions	$222,882	$246,990	$146,200
Investment income	$13,459,921	$14,326,984	$37,393,312
Net capital gains (losses	$6,169,734	$63,668,252	($74,890,527)
	$31,347,356	$102,053,114	($13,227,815)
LESS			
Pensions paid	$7,245,005	$17,005,618	$19,155,378
Lump-sums paid	$6,469,349	$21,788,969	$19,104,243
Investment fees	$1,609,336	$3,966,411	$4,384,106
Professional fees	$227,293	$362,140	$205,123
Administration fees	$257,500	$816,247	$936,407
	$15,808,483	$43,939,385	$43,785,257
June 30	$594,445,146	$652,558,875	$595,545,803
Rate of return net of expenses[17]	3.0343%	12.4090%	(6.6644%)

[17] 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 invested assets	$595,546,000	$578,906,000
In-transit amounts		
• Members' and University's contributions	$1,999,000	$2,083,000
• Benefit payments	($3,434,000)	($2,163,000)
Market value of assets adjusted for in-transit amounts	$594,111,000	$578,826,000

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.

Money Purchase Component Account

This sub-fund consists of Members' required contributions and the University's matching contributions, together with interest allocated to these amounts. For employees who are on long-term disability, both the Member contributions and the University matching contributions are made by the University. Receipts and disbursements during the period January 1, 2020 to July 1, 2022 were as follows:

Money Purchase Account Balance as at January 1, 2020 (market value)		$366,946,540
Receipts		
• Member and University Contributions	$50,561,198	
• Transfer back from Short Term Account for terminating and retiring members	$11,136,922	
• Interest allocation[18]	$27,586,625	
		$89,284,745
Disbursements		
• Transfer to the Short Term Account	($3,565,013)	
• Transfer to the Variable Annuity Fund	($52,727,511)	
• Lump sum Payments	($38,258,842)	
• Pensioner payments	$0	
		($94,551,366)
Money Purchase Account Balance as at July 1, 2022 (market value)		$361,679,919

The Money Purchase Component Account balances cover all active members and deferred vested members.

[18] The interest allocation shown was provided by the University for each member with an account balance except members who received a lump sum settlement for whom the interest allocation is a balancing item.

Additional Voluntary Contribution Account

This sub-fund consists of Members' Additional Voluntary Contributions and Voluntary Lump Sum Transfer Payments, together with the interest allocated to these amounts. Receipts and disbursements during the period January 1, 2020 to July 1, 2022 were as follows:

Additional Voluntary Contribution Account Balance as at January 1, 2020 (market value)		$1,135,340
Receipts		
• Member Additional Voluntary Contributions	$301,398	
• Interest allocation[19]	$94,859	
		$396,257
Disbursements		
• Lump sum payments to members	($350,597)	
• Pensioners payments	$0	
• Transfer to the Variable Annuity Fund	($72,208)	
		($422,805)
Additional Voluntary Contribution Account Balance as at July 1, 2022 (market value)		$1,108,792

The Additional Voluntary Contribution Account balances cover all active members and deferred vested members.

[19] The interest allocation shown was provided by the University for each member with an account balance except members who received a lump sum settlement for whom the interest allocation is a balancing item.

Special Transferred Contribution Account

This sub-fund consists of Members' transferred payments into the Fund which were not made under a Reciprocal Transfer Agreement, together with interest allocated on these amounts. Receipts and disbursements during the period January 1, 2020 to July 1, 2022 were as follows:

Special Transferred Contribution Account Balance as at January 1, 2020 (market value)		$7,711,759
Receipts		
• Lump sum transfers from other employers	$521,135	
• Interest allocation[20]	$681,943	
		$1,203,078
Disbursements		
• Lump sum payments to members	($1,038,705)	
• Pensioner payments	$0	
• Transfer to the Variable Annuity Fund	($522,896)	
		($1,561,601)
Special Transferred Contribution Account Balance as at July 1, 2022 (market value)		$7,353,236

The Special Transferred Contribution Account balances cover all active members and deferred vested members.

[20] The interest allocation shown was provided by the University for each member with an account balance except members who received a lump sum settlement for whom the interest allocation is a balancing item.

Short Term Account

This sub-fund consists of accumulated Members' required contributions and the University's matching contributions, transferred at the member's discretion from the Money Purchase Account, within prescribed limits. This fund was first introduced in November 1998. Receipts and disbursements during the period January 1, 2020 to July 1, 2022 were as follows:

Short Term Account Balance as at January 1, 2020 (market value)		$13,420,374
Receipts		
• Transfers from the Money Purchase Account	$3,565,013	
• Interest allocation[21]	$106,145	
		$3,671,158
Disbursements		
• Transfer to Money Purchase Account	($11,136,922)	
		($11,136,922)
Short Term Account Balance as at July 1, 2022 (market value)		$5,954,610

[21] This represents the actual returns credited to the Short Term Account balances between January 1, 2020 and July 1, 2022.

Minimum Guarantee Fund

This sub-fund was established to fund the Plan's minimum guarantees, including the minimum final earnings related guarantees based on service and linked to the cost of living. The value of this fund at July 1, 2022 is outlined below:

Minimum Guarantee Fund as at January 1, 2020 (market value)		$37,650,480
Receipts		
• University contributions not allocated to other funds	$8,576,766	
• Interest allocation[22]	$3,519,848	
		$12,096,614
Disbursements		
• Pensioner payments (Minimum Guarantee)	($648,944)	
• Lump-sum payments (Minimum Guarantee)	($8,272,788)	
• Adjustment for indexation timing	($1,384,673)	
		($10,306,405)
Minimum Guarantee Fund as at July 1, 2022 (market value)		$39,440,689

[22] The interest allocation shown is a balancing item. In order to confirm that the amount was reasonable, we projected the balances from January 1, 2020 to July 1, 2022 reflecting the actual cash flows (i.e. contributions, benefit payments, transfers between accounts, etc.) and the actual fund rate of return. The result was satisfactory.

Variable Annuity Fund

This fund provides variable annuities to members retiring after January 1, 1975. The investment and mortality experience of this fund is used to adjust retiree pensions each year. Receipts and disbursements during the period January 1, 2020 to July 1, 2022 were as follows:

Variable Annuity Fund as at January 1, 2020 (market value)		$151,961,544
Receipts		
• Transfers to Variable Annuity Fund	$53,322,615	
• Adjustment for indexation[23]	$1,384,673	
• Interest allocation[24]	$14,661,612	
		$69,368,900
Disbursements		
• Funds paid back to Variable Annuity Fund	$0	
• Interest paid to Mortality Reserve Fund	$0	
• Pensioner payments	($42,757,057)	
		($42,757,057)
Variable Annuity Fund as at July 1, 2022 (market value)		$178,573,387

[23] Attributable to experience in the 6 month prior to January 1, 2020 captured in the July 1, 2021 indexing adjustment

[24] This represents the actual returns credited to the Variable Annuity Fund between January 1, 2020 and July 1, 2022.

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, 2022
	Minimum	Target	Maximum	
Equities	40%	50%	60%	52.1%
Fixed Income	22.5%	30%	37.5%	28.4%
Infrastructure	0%	10%	26%	5.5%
Real Estate	0%	10%	26%	12.3%
Cash and cash equivalents	0%	0%	5%	1.7%
		100%		100%

Because the Plan's assets (which are invested in accordance with the above investment policy) are not matched to 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 the market value of assets.

The market value of assets, adjusted for in-transit amounts, determined as at July 1, 2022, is $594,111,000.

This value was derived as follows:

Market value of Assets as at 01.07.2022

Phillips, Hager & North (Fixed Income)	$112,699,000
Aviva (Fixed Income)	$56,188,000
Mawer (Global Equity)	$127,032,000
Walter Scott (Global Equity)	$120,232,000
Pier 21 (Global Equity)	$62,910,000
Morgan Stanley (Real Estate)	$35,381,000
Prisa (Real Estate)	$37,929,000
IFM (Infrastructure)	$32,805,000
Axium (Infrastructure)	$155,000
Short Term Fund (Money Market)	$5,955,000
Cash/Cash equivalents	$4,260,000
	$595,546,000
In-transit contributions (June contributions made in July 2022)	$1,999,000
In-transit lump sums (terminated members paid in July 2022)	($3,434,000)
Market value of assets (adjusted for in-transit amounts)	$594,111,000

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, if any, 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, including ancillary benefits as follows:

- We project the money purchase pension and the minimum guarantee pension that each active Member will receive during retirement based on projected service, earnings, and the money purchase account balance (including future contributions).
- We compare the money purchase pension with the minimum guarantee benefit at each year after retirement.
- The present value of any supplementary pension, representing the excess of the minimum guarantee over the money purchase pension, is allocated to accrued and future liabilities proportionately by service.
- The present value of the accrued supplementary pension benefit is compared to the value of the Minimum Guarantee Fund at the valuation date to determine any funding excess or funding shortfall under the Plan.
- The present value of any supplementary pension, representing the excess of the minimum guarantee over the money purchase pension, is allocated to the year following the valuation date proportionately by service to determine the current service cost rate.

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 (including the prior year credit balance) 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:	5.85%	5.30%
Inflation:	2.20%	2.00%
ITA limit / YMPE increases:	3.20%	3.00%
Pensionable earnings increases:	2.80% for 0.5 year and 3.25% thereafter	2.80% for 3 years and 3.25% thereafter
Post-retirement minimum guaranteed pension increases:	2.00%	2.00%
Post-retirement money purchase pension increases:	(0.15%)	(0.70%)
Interest on Money Purchase Account Balance:	5.85%	5.30%
Mortality rates:	95% of the rates of the 2014 Public Sector Canadian Pensioners Mortality Table (CPM2014Publ)	95% of the rates of the 2014 Public Sector Canadian Pensioners Mortality Table (CPM2014Publ)

Assumption	Current valuation	Previous valuation
Mortality improvements:	Fully generational using CPM Improvement Scale B (CPM-B)	Fully generational using CPM Improvement Scale B (CPM-B)
Retirement rates:	Unchanged Age-related table	Age-related table
Termination rates:	Unchanged Age-related table	Age-related table
Disability rates:	None	None
Form of benefit elected:	• Retirement: 60% of eligible members receive a pension from the plan and 40% elect a lump sum transfer • Termination: 40% of eligible members receive a pension from the plan and 60% elect a lump sum transfer	• Retirement: 60% of eligible members receive a pension from the plan and 40% elect a lump sum transfer • Termination: 40% of eligible members receive a pension from the plan and 60% elect a lump sum transfer
Actuarial basis for benefits assumed to be settled through a lump sum:	• Discount rate: 4.30% per annum for 10 years; 4.60% per annum thereafter • Mortality rates: CPM2014 with fully generational improvements using CPM-B	• Discount rate: 2.50% per annum for 10 years; 2.60% per annum thereafter • Mortality rates: CPM2014 with fully generational improvements using CPM-B
Eligible spouse before retirement:	85%	85%
Eligible spouse at retirement:	66%	66%
Spousal age difference:	Same age	Same age

The assumptions are best estimates and do not include a margin for adverse deviations.

Age-Related Tables

Sample rates from the age-related tables are summarized in the following table:

Age	Termination	Retirement
20	17.0%	0.0%
25	12.8%	0.0%
30	9.7%	0.0%
35	7.3%	0.0%
40	4.7%	0.0%
45	3.0%	0.0%
50	3.0%	0.0%
55	0.0%	2.5%
56	0.0%	2.5%
57	0.0%	3.5%
58	0.0%	4.5%
59	0.0%	4.5%
60	0.0%	8.0%
61	0.0%	5.0%
62	0.0%	5.0%
63	0.0%	5.0%
64	0.0%	10.0%
65	0.0%	20.0%
66	0.0%	20.0%
67	0.0%	15.0%
68	0.0%	15.0%
69	0.0%	15.0%
70	0.0%	25.0%
71	0.0%	100.0%

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 the rate of pay on July 1, 2022 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. 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 returns for each major asset class that are consistent with market conditions on the valuation date, 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. The assumed investment return includes the diversification and rebalancing effect.
- An **active investment management expense provision.** We have assumed that these fees would be offset by an equivalent additional return resulting from active investment management.
- 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 6 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	6.06%
Additional returns for active investment management	0.60%
Active investment management expense provision	(0.60%)
Assumed passive investment management expense provision	(0.04%)
Implicit non-investment management expense provision	(0.16%)
Rounding	(0.01%)
Net discount rate	5.85%

Inflation

The inflation assumption is based on market expectations of long-term inflation implied by the yields on nominal and real return bonds at the valuation date of 2.20%.

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 current economic and financial market conditions and University expectations.

Post-Retirement Pension Increases

The assumption is based on the Plan formula and inflation assumption above.

Post-Retirement Money Purchase Pension Increases

The assumption is based on the difference between the discount rate and annuity conversion basis interest rate.

Retirement Rates

The assumption is based on experience over the years 2011-2019. Subsequent experience has been consistent with these rates.

Termination Rates

The assumption is based on experience from the years 2011-2019. Subsequent experience has been consistent with these rates.

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. Considering the characteristics of the group, it was considered appropriate to use the CPM mortality rates from the public sector as a reference table.

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 published by the Canadian Institute of Actuaries (CIA) are generally adopted for Canadian pension valuations:

- The Canadian Pensioners Mortality (CPM) study published in February 2014 included CPM Improvement Scale B (CPM-B).
- A report released by the Task Force on Mortality Improvement on September 20, 2017 included 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 indicated 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.

COVID-19 has impacted mortality rates globally. Statistics Canada reported excess mortality in 2020 and 2021 for the general Canadian population and other peer countries globally have also seen excess mortality over the course of the pandemic. Mortality experience for the plan has been reflected up to the date of the valuation. We have not adjusted the expected mortality rates for Plan members after the valuation date. The long-term implications of the pandemic on mortality rates is unclear as at the date of this report. Credible plan specific experience and relevant broader observed mortality trends after the report date will be reflected in future valuations.

For the current 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 23.5 years for males and 25.3 years for females.

Money Purchase Accounting Conversion

Based on the current administrative practice, all members who participate in the Variable Annuity Fund receive pensions from their Money Purchase Account balances determined using an interest rate of 6% per annum and mortality rates are 95% of the rates of the public sector mortality table (CPM-RPP2014Publ) and CPM-B mortality improvement scale.

Interest on Money Purchase Account Balance
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.

Form of benefit elected and cost of future lump sums
The assumption is based on experience from the years 2011-2019. Subsequent experience has been consistent with these rates.

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

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

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 circumstances in which the plan wind-up is assumed to have taken place are as follows:

- The University's is discontinued on the valuation date

No benefits payable on plan wind-up under the above postulated scenario were excluded from our calculations.

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, 2022.

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, there is limited data available to provide credible guidance on the cost of a purchase of indexed annuities in Canada. In accordance with the *Canadian Institute of Actuaries Educational Note: Assumptions for Hypothetical Wind-up and Solvency Valuations with Effective Dates on and after December 31, 2021 and no later than December 30, 2022 (the "Educational Note")*, we have used an annuity proxy to estimate the cost of purchasing annuities.

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 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 and deferred pensioners under age 55, and 50% of active members and deferred pensioners 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
Interest rate:	4.30% per year for 10 years, 4.60% 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:	Above mortality rates reduced by 95% to reflect super-standard mortality
Interest rate:	4.59% per year based on a duration of 8.9 years determined for the liabilities assumed to be settled through the purchase of an annuity.

Retirement Age	
Benefits assumed to be payable through a lump sum:	Members are assumed to retire with a 50% probability at the age that maximizes the value of their entitlement from the Plan and a 50% probability at the member's earliest unreduced age in accordance with applicable legislation and based on the eligibility requirements that have been met at the valuation date
Benefits assumed to be settled through the purchase of an annuity:	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
Post retirement pension increases	
Minimum guarantee pension[25]	2.00% per year
Money purchase pension[25]	(1.70%) per year for 10 years, (1.40%) per year thereafter for lump sum transfers (1.41%) per year for annuity purchases
Other Assumptions	
Special payments:	Discounted at the average interest rate of 4.52% 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:	$3,420 per year
Termination expenses:	$575,000

For solvency and wind-up valuation purposes, we have assumed that, for active members, the annuity conversion basis used at the time of their ultimate pension commencement will be the conversion basis used to value the supplementary benefits for funding purposes.

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

[25] Excluded from solvency liabilities

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, money purchase account, 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 with the exception that we have excluded post-retirement indexing.

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, 2022, provided by the 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.

	01.07.2022	01.01.2020
Active Members		
Number	1,714	1,692
Total pensionable earnings for the following year	$170,064,946	$162,793,906
Average pensionable earnings for the following year	$99,221	$96,214
Average years of pensionable service	10.4 years	10.6 years
Average age	48.0 years	48.2 years
Accumulated contributions with interest		
• Money Purchase Component	$329,464,967	$336,123,281
• Short Term Account	$5,930,705	$13,420,374
• Additional Voluntary Contributions	$1,108,792	$1,135,340
• Special Transferred Contributions	$7,353,236	$7,711,759
Total Contributions	$343,857,700	$358,390,754
Deferred Pensioners		
Number	401	339
Average age	48.1 years	49.1 years
Accumulated contributions with interest		
• Money Purchase Component	$32,214,952	$30,823,259
• Short Term Account	$23,905	$0
• Additional Voluntary Contributions	$0	$0
• Special Transferred Contributions	$0	$0
Total Contributions	$32,238,857	$30,823,259
Pensioners and Survivors		
Number	536	465
Total annual lifetime pension	$17,349,560	$14,363,336
Average annual lifetime pension	$32,369	$30,889
Average age	74.5 years	74.0 years

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 01.01.2020	**1,692**	**339**	**465**	**2,496**
New entrants	396			396
Terminations:				
• Transfers/lump sums	(175)	(40)		(215)
• Deferred pensions	(117)	117		-
Deaths	(6)	(3)	(31)	(40)
Retirements	(76)	(12)	88	-
Beneficiaries			14	14
Total at 01.07.2022	**1,714**	**401**	**536**	**2,651**

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							
	0-4	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30 +**	**Total**
Under 25	9							9
25 to 29	106	1						107
30 to 34	112	31	3					146
35 to 39	129	43	26	3				201
40 to 44	104	54	42	19	2			221
45 to 49	66	51	46	64	11	1		239
50 to 54	47	39	35	77	50	2	1	251
55 to 59	42	40	39	65	34	17	10	247
60 to 64	26	18	32	49	42	17	27	211
65 +	12	5	10	15	11	10	19	82
Total	**653**	**282**	**233**	**292**	**150**	**47**	**57**	**1,714**

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

Age	Deferred Pensioners		
	Number	Average Annual Minimum Guarantee Pension at Age 65	Average Money Purchase Account Balance at 01.07.2022
To 30	26	$907	$13,178
30 to 34	34	$1,938	$28,561
35 to 39	42	$1,768	$30,845
40 to 44	66	$3,537	$65,593
45 to 49	44	$4,432	$84,378
50 to 54	59	$3,693	$74,831
55 to 59	56	$5,480	$126,656
60 to 64	49	$6,221	$138,390
65 +	25	$5,223	$131,961
Total	**401**	**$3,871**	**$80,396**

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

Age	Pensioners and Survivors			
	Number	Average Annual Minimum Guarantee Pension (A)	Average Annual Money Purchase Pension (B)	Maximum of (A) and (B)
To 54	1	$7,058	$0	$7,058
55 to 59	13	$16,238	$25,491	$25,491
60 to 64	43	$16,699	$22,508	$22,588
65 to 69	95	$27,681	$32,339	$33,159
70 to 74	153	$32,359	$36,573	$38,124
75 to 79	103	$31,002	$32,791	$34,545
80 to 84	80	$27,019	$30,175	$30,841
85 to 89	31	$24,280	$22,926	$25,108
90 to 94	14	$13,575	$11,446	$14,031
95 +	3	$18,866	$14,518	$18,866
Total	**536**	**$27,744**	**$31,107**	**$32,369**

Appendix F

Summary of plan provisions

Mercer has used and relied on the plan documents, including amendments and interpretations of plan provisions, supplied by the 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, 2022. Since the previous valuation, the Plan has not been amended.

The following is a summary of the main provisions of the Plan in effect on July 1, 2022. This summary is not intended as a complete description of the Plan.

Background	The Plan became effective July 1, 1964. The Plan was restated, incorporating all amendments effective January 1, 1979. The Plan was further amended and restated effective January 1, 1988 to incorporate amendments and changes required under the Pension Benefits Act, 1987 (Ontario). Effective January 1, 1992, the Plan was amended and restated to incorporate the changes required under the *Income Tax Act*. Effective July 1, 2009 the Plan was amended and restated to incorporate all amendments to the Plan to date and to clarify Plan language. The Plan is a hybrid pension plan that incorporates the characteristics of both defined benefit and defined contribution pension plans. In particular, the Plan provides benefits based on accumulated University and employee contributions while guaranteeing a minimum level of post retirement income based on member's earnings.
Eligibility for Membership	Each full-time employee may elect to become a participant as of the date of hire, or as of the first day of the month coincident with or next following the completion of one year of continuous service but not later than age 30. An employee who has attained age 30 on the date of appointment may elect to become a participant as of the date of appointment and must participate following completion of one year of continuous service. Each part-time employee may elect to become a Member on the first day of the month coincident with or next following the completion of 24 months of continuous service, provided that he has earned at least 35% of the YMPE or worked at least 700 hours in each of the 2 immediately preceding consecutive calendar years.

Pensionable Service	The pensionable service is contributory service under the Plan since July 1, 1964. Pensionable Service includes periods while in receipt of income continuance benefits and during leave of absence if discretionary contributions are approved and made by the member.
Contributions	Effective July 1, 1988, each employee is required to contribute 4.4% of earnings up to the Canada Pension Plan's Year's Maximum Pensionable Earnings ("YMPE") plus 6% of any excess earnings. No contributions are required if the member is disabled and in receipt of income continuance benefits. Additional Voluntary Contributions may be made up to the maximum allowable under the *Income Tax Act*. Before January 1, 1991, the University matched the employee contributions and credited both the University and employee contributions to the Money Purchase Component Account taking into account transfers from the Minimum Guarantee Fund to the Money Purchase Component Account. Effective January 1, 1991, the University contributes 7.4% of members' earnings up to the Canada Pension Plan's YMPE plus 9% of any excess earnings into the Money Purchase Component Account. The employee contribution rates remain the same as before. The University will pay the whole of the balance required to provide the supplemental benefits under the Plan.
Retirement Dates	**Normal Retirement Date** • The normal retirement date is the first day of the month coincident with or next following the member's 65th birthday. **Early Retirement Date** • If a member has been in the Plan for at least two years, the member may choose to retire as early as age 55. **Postponed Retirement Date** • A member may postpone retirement beyond age 65.

Retirement Benefits

Variable Annuity

The basic pension will be a Variable Annuity according to a unisex basis which can be provided by the member's Money Purchase Component account at retirement (i.e., the University's and members' total required contributions with interest credited at a rate based on the experience of the fund taking into account not only interest and dividends but also realised and unrealised capital gains or losses).

This pension will remain constant during the pension year but will vary from one year to the next depending upon the experience of the fund during the preceding year.

Supplementary Pension

In addition, each member who retires on his or her normal retirement date will receive such amount of Supplementary Pension from the Minimum Guarantee Fund as may be required in any year to provide a total pension during such pension year equal to the minimum guaranteed benefit to which such member is entitled during that year. This guarantee will be equal to 1.7% of the member's Best Five Year's Average Earnings, multiplied by years of Pensionable Service, reduced by 1/35th of the member's annual Canada Pension Plan benefit for each year of Pensionable Service after January 1, 1966. The maximum pensionable service is 35 years.

The minimum final earnings guarantee will be adjusted for changes in the cost of living index up to a maximum increase of 2% per year accumulating from date of retirement.

Maximum Pension

The Minimum Guarantee Pension payable in the normal form from the Plan upon retirement, death, termination of employment or termination of the Plan 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
- $3,420 or such other maximum permitted under the *Income Tax Act*, multiplied by the member’s total credited service.

Notwithstanding the foregoing, there is no limit on the amount of the pension that the member can purchase from the funds accumulated in the Money Purchase Account.

Death benefits	**Pre-retirement:** In the event of the death of a member of the Plan while in the employ of the University, the value of the benefit entitlement shall be payable to the member's beneficiary. This benefit is paid in the form of a variable annuity. If the member is survived by a spouse the surviving spouse can, in lieu of the above benefit, receive a spouse's benefit in an amount equal to 50% of the pension accrued to the deceased member based on his/her Best Year's Earnings and pensionable service prior to death, but ignoring any actuarial reduction based on the member's age at death. This pension is subject to a minimum of the lesser of the YMPE in the year of death and 10% of the deceased member's Best Year's Earnings. If the spouse was more than 10 years younger than the deceased member, the spouse's benefit will be adjusted to the Actuarial Equivalent of the above benefit as if only 10 years had separated their lives. The excess, if any, of the lump sum amount which would have been payable to the designated beneficiary over the total payments paid to the spouse, is payable as a residual payment after termination of payment of the spouse's benefit. For benefits earned after 1986, the value of the death benefits shall be at least equal to the commuted value of the Minimum Guaranteed Benefit accrued on and after January 1, 1987. **Post retirement:** The normal form of payment is a lifetime pension guaranteed for five years. If the member has a spouse, an actuarially equivalent retirement option, such that the death benefit is a spousal pension of at least 60% of the retirement income which was payable during the member's lifetime, must be provided unless the member's spouse waives his or her right to such spousal pension. In that case, or if the member does not have a spouse, other optional retirement income forms are available.

Termination Benefits

A member who terminates employment with the University prior to his retirement may:

- Leave his or her Money Purchase Component Account balance on deposit in the Brock University Pension Fund and receive the pension which can be provided by such amount in the form of a variable annuity at retirement and receive in addition the formula supplementary pension from the Minimum Guarantee Fund which is based on the member's earnings and service at termination; or
- Have the value of the benefit entitlement transferred to the registered pension fund of a subsequent employer provided such employer enters into an agreement with the University that such contributions be retained for the provision of pension benefits at retirement; or
- Have the value of the benefit entitlement transferred to a locked-in Registered Retirement Savings Plan; or,

Receive the value of the benefit entitlement as a cash refund or non-locked-in transfer if not locked-in.

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), on the Plan's hypothetical wind-up and solvency financial positions at the valuation date and on the special payments of plausible adverse scenarios that would pose threats to the Plan's future financial condition is summarized in the following tables for the following risks:

- Interest rate risk - an immediate parallel decrease in market interest rates of 125 basis points;
- Deterioration of asset values - an immediate decrease of 12% in the market value of non-fixed income assets; and
- Longevity risk - the potential that pension plan members will live longer than expected such that life expectancy from the valuation date at age 65 for a male and a female would increase by 1.6 years and 1.5 years, respectively.

Excluding Money Purchase Component (All figures in $000's)	Going Concern Valuation Results as at 01.07.2022	Plausible Adverse Scenario Results as at 01.07.2022		
		Interest Rate Risk	Deterioration of Asset Values	Longevity Risk
Going Concern Financial Status				
Market value of assets	$39,441	$40,545	$36,128	$39,441
Going concern funding target	$44,111	$53,455	$62,937	$48,358
Provision for Adverse Deviation	$595	$482	$1,221	$609
Funding excess (shortfall)	($5,265)	($13,392)	($28,030)	($9,526)
Estimated University's Current Service Cost for supplemental benefits, including Provision for Adverse Deviation				
July 1, 2022	$938	$1,379	$1,440	$1,089
July 1, 2023	$966	$1,421	$1,484	$1,122
July 1, 2024	$998	$1,467	$1,532	$1,158

Excluding Money Purchase Component (All figures in $000's)	Hypothetical Wind-Up and Solvency Position as at 01.07.2022	Plausible Adverse Scenario Results as at 01.07.2022		
		Interest Rate Risk	Deterioration of Asset Values	Longevity Risk
Hypothetical Wind-up Financial Position				
Market value of assets	$39,441	$40,545	$36,128	$39,441
Termination expense provision	($575)	($575)	($575)	($575)
Wind-up assets	$38,866	$39,970	$35,553	$38,866
Wind-up liabilities	$88,840	$162,569	$110,512	$95,797
Wind-up excess (shortfall)	($49,974)	($122,599)	($74,959)	($56,931)
Solvency Financial Position				
Reduction in wind-up liabilities due to difference in circumstances of assumed wind-up and excluded benefits	($79,852)	($154,479)	($91,582)	($86,575)
Surplus excess (shortfall)	$29,878	$31,880	$16,623	$29,644
Solvency ratio	439%	501%	191%	428%
Transfer ratio	44%	25%	33%	41%

Excluding Money Purchase Component (All figures in $000's)	Minimum Annual Special Payments as at 01.07.2022[26]	Plausible Adverse Scenario Results as at 01.07.2022		
		Interest Rate Risk	Deterioration of Asset Values	Longevity Risk
July 1, 2022	$1,463	$1,463	$1,463	$1,463
July 1, 2023	$534	$1,632	$3,702	$1,128
July 1, 2024	$534	$1,632	$3,702	$1,128

If the University sponsoring the Plan became insolvent and unable to continue making contributions to meet the minimum funding requirements described in the report, the Plan would likely be wound up. The impact of this adverse scenario, as measured at July 1, 2022, would be a shortfall in the Plan of $49,974,000.

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

[26] A new special payment is assumed to start 1 year have the valuation date.

Interest Rate Risk

The purpose of this scenario is to illustrate the sensitivity of the Plan's valuation 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 are 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 125 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 valuation assumptions:

Defined Term	Description
Market value of assets & Money Purchase Component	The decrease in market interest rates has been assumed to affect only the market value of the fixed income investments. The decrease to assets and Money Purchase Component benefits is assumed to have occurred immediately on the valuation date.
Discount rate assumption	**Going concern**: 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 (including interest on Money Purchase Account balance) was therefore decreased from 5.85% to 5.47%. **Hypothetical wind-up and Solvency**: The interest rates used in the valuation were reduced by 125 basis points
Post retirement money purchase pension increases	**Going concern:** The post retirement money purchase pension increases assumption decreased by 38 basis points. **Hypothetical wind-up and Solvency:** The post retirement money purchase pension increases assumption decreased by 125 basis points.
Other assumptions	Except as mentioned above, 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 valuation 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 are 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 12% 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 valuation assumptions:

Defined Term	Description
Market value of assets & Money Purchase Component	The decrease in the market value of the non-fixed income portion of assets, together with Money Purchase Component benefits, is assumed to have occurred immediately on the valuation date.
Going concern assumptions	This scenario is assumed to have no impact on the assumptions used for this valuation.
Wind-up & solvency 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 valuation 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 improvements[27] will be in line with the average improvements experienced by the Canadian population[28] over the most recent 15-year period available, with uniform improvement rates for all future years but varying by age[29] and gender.

[27] i.e. starting one year after the valuation in this context

[28] Based on Canadian population experience from the Hum Mortality Database from 2002 to 2016

[29] Improvement rates below age 45 are set to those at age 45

Appendix H
University certification

With respect to the Report on the Actuarial Valuation for Funding Purposes as at July 1, 2022 of the Brock University Pension Plan, 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 in excess of the provision for adverse deviation prescribed by the Act and 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, 2022 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, 2022.
- All events subsequent to July 1, 2022 that may have an impact on the Plan have been communicated to the actuary.

January 30, 2023	
Date	Signed
	Jennifer Guarasci, Associate Vice-President, Human Resources, Brock University
	Name

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