

The University of Ottawa Retirement Pension Plan

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

November 2022

Financial Services Regulatory Authority and
Canada Revenue Agency Registration Number: 0310839

Note to reader regarding actuarial valuations:

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

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

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

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

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

Funding calculations reflect our understanding of the requirements of the Ontario Pension Benefits Act, 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

(in \$000s)	2022-07-01	2021-05-15
Going Concern Financial Status		
Smoothed value of assets	\$2,836,474	\$2,777,577
Going concern funding liabilities	\$2,378,296	\$2,354,765
Provision for adverse deviations in respect of the going concern liabilities	\$153,428	\$190,988
Funding excess (shortfall)	\$304,750	\$231,824
Hypothetical Wind-up Financial Position		
Wind-up assets	\$2,700,429	\$2,848,273
Wind-up liability	\$3,738,310	\$4,275,012
Wind-up excess (shortfall)	(\$1,037,881)	(\$1,426,739)
Wind-up ratio	72%	67%
Funding Requirements in the Year Following the Valuation ¹		
Total current service cost	\$77,840	\$83,362
Estimated members' required contributions	(\$39,679)	(\$38,053)
Estimated employer's current service cost	\$38,161	\$45,309
Provision for adverse deviations in respect of current service cost	\$5,476	\$6,898
Total	\$43,637	\$52,207
Employer's current service cost and provision for adverse deviations in respect of the current service cost expressed as a percentage of members' pensionable earnings	10.53% ²	13.17% ³
Minimum special payments	\$0	\$0
Estimated minimum employer contribution	\$43,637 ⁴	\$52,207
Estimated maximum eligible employer contribution	\$1,081,518	\$1,478,930
Next required valuation date	July 1, 2025	May 15, 2024

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

² Alternatively expressed as 7.85% of pensionable earnings up to the YMPE threshold, and 12.00% of the balance of pensionable earnings up to 120% of the maximum salary paid to a professor

³ Alternatively expressed as 9.80% of pensionable earnings up to the YMPE threshold, and 15.05% of the balance of pensionable earnings up to 120% of the maximum salary paid to a professor

⁴ Notwithstanding the available actuarial surplus in the Plan, if any, the terms of the Plan may require the University to make current service cost contributions.

Section 2

Introduction

To the University of Ottawa

At the request of the University of Ottawa (the “University”), we have conducted an actuarial valuation of the University of Ottawa Retirement 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 *Ontario Pension Benefits Act* (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 (“FSRA”) and with the Canada Revenue Agency (“CRA”), in connection with our actuarial valuation of the Plan. This report will be filed with FSRA and with CRA. 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 of Ottawa, our actuarial valuation of the Plan is based on the following material terms:

- It has been prepared in accordance with applicable pension legislation and actuarial standards of practice in Canada.
- As instructed by the University, we have not reflected a margin for adverse deviations in the going concern valuation in excess of the provision for adverse deviations prescribed by the Act.

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

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

- Certain excludable benefits were excluded from the solvency liabilities.
- The solvency financial position was determined on a market value basis.

See sections Valuation Results of the report for more information.

Events since the Last Valuation at May 15, 2021

Pension Plan

The Plan was amended to grant an additional pension increase of 0.21% on January 1, 2022 to deferred pensioners, pensioners and survivors on that date who retired or terminated prior to January 1, 2018, to account for an increase in inflation that was not provided as indexation on January 1, 2019 due to application of the Plan's indexation provisions (deferred pensioners, pensioners and survivors on January 1, 2022 who retired or terminated in 2018 are entitled to a partial pension increase corresponding to a fraction of 0.21% as a result of the amendment). This amendment has been reflected in the results of this valuation, and its impact on the Plan's financial position at January 1, 2022 was reported in the *Interim Cost Certificate for Funding Purposes as at January 1, 2022* dated August 2022.

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

This valuation reflects the provisions of the Plan as at July 1, 2022. 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:	7.00% per year	6.15% per year
Actuarial basis for benefits assumed to be settled through a lump sum:	Discount rate: 2.60% Mortality rates: CPM2014 with fully generational improvements using CPM-B	Discount rate: 1.80% Mortality rates: CPM2014 with fully generational improvements using CPM-B
Inflation:	6.8% in 2022, 3.5% in 2023, and 2.0% thereafter	2.00% per year
Post-retirement pension increases:	5.45% at January 1, 2023, 3.25% at January 1, 2024 and 1.70% per year thereafter	1.70% per year
Provision for future non-investment expenses:	Explicit provision of \$59,360,000 included in going concern funding target	Implicit provision through reduction of 0.13% of discount rate used for both going concern funding target and current service cost

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

On September 14, 2021, the Actuarial Standards Board published a revised version of Section 3500 of the Standards of Practice on Pension Commuted Values which were 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. Those changes have been taken into account in this valuation.

There have been no other changes to the Act and regulations that impact the funding of the Plan.

Subsequent Events

Following an asset liability modelling analysis completed in 2022, the Pension Fund Investment Committee (PFIC) recently approved changes to the strategic asset allocation of the Plan. As a result, the target allocation to absolute return assets will be modified, to shift 5% of plan assets from hedge funds to private debt. The Statement of Investment Policy and Procedures of the Plan will be updated to reflect this change. The impact of this change in strategic asset allocation on the going concern discount rate has been reflected in the current valuation.

After checking with representatives of the University, to the best of our knowledge there have been no other events subsequent to the valuation date 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, 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:

(in \$000s)	2022-07-01	2021-05-15
Assets		
Market value of assets	\$2,700,894	\$2,848,928
Present value of future buy-back contributions	\$535	\$345
Asset smoothing adjustment	\$135,045	(\$71,696)
Smoothed value of assets	\$2,836,474	\$2,777,577
Going concern funding target		
Going concern liabilities:		
• Active members	\$973,526	\$1,050,185
• Pensioners and survivors	\$1,280,596	\$1,234,869
• Deferred pensioners	\$64,599	\$69,359
• Additional voluntary contributions ⁵	\$215	\$352
• Provision for future non-investment expenses	\$59,360	N/A
• Subtotal	\$2,378,296	\$2,354,765
Provision for adverse deviations in respect of going concern liabilities as prescribed by the Act	\$153,428	\$190,988
Total	\$2,531,724	\$2,545,753
Funding excess (shortfall) ⁶	\$304,750	\$231,824

The going concern liabilities at July 1, 2022 do not include an additional margin for adverse deviations beyond the provision for adverse deviations prescribed by the Act

⁵ Additional voluntary contributions made by members as allowed under prior plan provisions.

⁶ Funding excess (shortfall) may or may not be equal to the going concern excess (unfunded liability) as described in the Act. Details of the going concern excess (unfunded liability) are provided in Appendix A.

Reconciliation of Financial Status (in \$000s)

Funding excess (shortfall) as at previous valuation	\$231,824
Interest on funding excess (shortfall) at 6.15% per year	\$16,039
Expected funding excess (shortfall)	\$247,863
Net experience gains (losses)	
• Investment return	(\$100,772)
• Increases in pensionable earnings, YMPE and maximum pension	(\$2,965)
• Indexation	(\$9,082)
• Mortality	(\$1,509)
• Retirement	(\$2,640)
• Termination	(\$2,741)
• Interest on employee contributions	(\$2,516)
Total experience gains (losses)	(\$122,225)
Impact of changes in assumptions	
• Discount rate	\$199,371
• Discount rate for lump sum settlements	\$14,783
• Post-retirement pension increases at January 1, 2023 and at January 1, 2024	(\$70,913)
• Provision for future administrative expenses	(\$22,571)
Total assumption changes impact	\$120,670
Impact of plan amendment (additional pension increase)	(\$2,917)
Change in Provision for Adverse Deviations (PfAD)	\$58,894
Net impact of other elements of gains and losses	\$2,465
Funding excess (shortfall) as at current valuation	\$304,750

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:

(in \$000s)	2022-07-01	2021-05-15
Total current service cost ⁷	\$77,840	\$83,362
Estimated members' required contributions	(\$39,679)	(\$38,053)
Total estimated employer's current service cost	\$38,161	\$45,309
Employer's current service cost expressed as a percentage of members' pensionable earnings ⁸	9.21%	11.43%
Provision for adverse deviations in respect of the current service cost (based on the percentage defined in Appendix A and on total current service cost net of estimated future costs for escalated adjustments)		
• As a dollar amount per year	\$5,476	\$6,898
• As a percentage of members' pensionable earnings ⁸	1.32%	1.74%
Employer's current service cost and provision for adverse deviations in respect of current service cost		
• As a dollar amount per year	\$43,637	\$52,207
• As a percentage of members' pensionable earnings ⁸	10.53%	13.17%

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

Employer's current service cost as at previous valuation	11.43%
Demographic changes	0.50%
Changes in assumptions	(2.72%)
Employer's current service cost as at current valuation	9.21%

⁷ Total current service cost includes estimated future costs for escalated adjustments as defined in the Act (\$6,070,000 and \$11,092,000 as of July 1, 2022 and May 15, 2021, respectively).

⁸ Based on projected payroll of \$414,365,000 for the year following July 1, 2022, and \$396,393,000 for the year following May 15, 2021, which includes individual earnings up to 120% of the maximum professor salary, excludes earnings for members on disability, and reflects earnings for part-timers.

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 (in \$000s)	Valuation Basis	Reduce Discount Rate by 1%
Going concern funding liabilities	\$2,378,296	\$2,691,088
Current service cost		
• Total current service cost	\$77,840	\$90,118
• Estimated members' required contributions	(\$39,679)	(\$39,679)
Estimated employer's current service cost	\$38,161	\$50,439

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.

Vested Unfunded Reserves

As part of the Plan's pension reform in 1999/2000, five notional accounts referred to as reserves were established and were to be used to provide for potential reduction in the University and members' contributions. In addition, there was a portion of the going concern surplus allocated to Plan members for refund of prior contributions. Certain amounts were allocated to each reserve and were to vest on specific dates, based on some conditions. Some amounts vested on January 1, 1999 and January 1, 2002. No additional amounts vested after January 1, 2002 and no amounts are scheduled to vest in the future.

The use of these reserves was however suspended on January 1, 2004, given that the plan had a going concern deficit on that date.

The vested reserves are accumulated each year with interest calculated at the net return on the smoothed value of assets, and they are reduced by the amount of contribution reduction, as applicable. The net return for the period from May 15, 2021 to December 31, 2021 and for the period from January 1, 2022 to July 1, 2022 are 7.1% and -3.5% respectively, based on the asset smoothing method used in the last filed actuarial valuation report, as per the plan text. Vested reserves as of July 1, 2022 are presented in the following table for disclosure purposes, and are based on the vested balances of the reserves as at January 1, 2007. The unfunded reserves do not reflect the contribution holidays taken in 2007 and 2008.

Reserves (in \$000s)	July 1, 2022
Surplus allocation (for unlocated members)	\$286
Employee contribution reduction reserve	\$37,815
Unallocated reserve	\$74,202
Excess reserve	\$13,096
Future Supplemental reserve	\$7,948
Total	\$133,347

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:

(in \$000s)	2022-07-01	2021-05-15
Assets		
Market value of assets	\$2,700,894	\$2,848,928
Present value of future buy-back contributions	\$535	\$345
Termination expense provision	(\$1,000)	(\$1,000)
Wind-up assets	(\$2,700,429)	\$2,848,273
Present value of accrued benefits for:		
• Active members	\$1,772,133	\$2,170,095
• Pensioners and survivors	\$1,827,376	\$1,929,711
• Deferred pensioners	\$138,586	\$174,854
• Additional voluntary contributions	\$215	\$352
Total wind-up liability	\$3,738,310	\$4,275,012
Wind-up excess (shortfall)	(\$1,037,881)	(\$1,426,739)
Transfer Ratio	0.72	0.67

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:

(in \$000s)	2022-07-01	2021-05-15
Number of years covered by report	3 years	3 years
Hypothetical wind-up incremental cost	\$353,411	\$525,691

The incremental cost is not an appropriate measure of the contributions that would be required to maintain the wind-up 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 (in \$000s)	Valuation Basis	Reduce Discount Rate by 1%
Total hypothetical wind-up liability	\$3,738,310	\$4,417,166

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.

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: <ul style="list-style-type: none"> (a) any escalated adjustment (e.g. indexing), (b) certain plant closure benefits, (c) certain permanent layoff benefits, (d) special allowances other than funded special allowances, (e) consent benefits other than funded consent benefits, (f) prospective benefit increases, (g) potential early retirement window benefit values, and (h) pension benefits and ancillary benefits payable under a qualifying annuity contract. 	The following benefits were excluded from the solvency liabilities shown in this valuation: <ul style="list-style-type: none"> - Future indexation of benefit
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:

(in \$000s)	2022-07-01	2021-05-15
Assets		
Market value of assets	\$2,700,894	\$2,848,928
Present value of future buy-back contributions	\$535	\$345
Termination expense provision	(\$1,000)	(\$1,000)
Net assets	\$2,700,429	\$2,848,273
Liabilities		
Total hypothetical wind-up liabilities	\$3,738,310	\$4,275,012
Difference in circumstances of assumed wind-up	\$0	\$0
Value of excluded benefits	(\$1,247,060)	(\$1,510,204)
Liabilities on a solvency basis	\$2,491,250	\$2,764,808
Surplus (shortfall) on a market value basis	\$209,179	\$83,465
Solvency Ratio	1.08	1.03

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 Plan has a funding excess on a going concern basis inclusive of the provision for adverse deviations, and the solvency ratio⁹ is greater than 105%. Under these circumstances, the Act does not require the employer to contribute to the Plan until the available actuarial surplus has been applied towards the employer's current service cost and the provision for adverse deviations in respect of the current service cost, provided that the required application has been made to regulator. Details on the determination of the provision for adverse deviations and on the available actuarial surplus are shown in Appendix A.

Once the available actuarial surplus has been so applied, monthly employer contributions must resume. On the basis of the assumptions and methods described in this report, the rule for determining the minimum required employer monthly contributions, as well as an estimate of the employee and employer contributions, from the valuation date until the next required valuation are as follows:

Period beginning	Employer's contribution rule ¹⁰			
	Monthly current service cost	Provision for adverse deviations	Total	Total – Below / above YMPE threshold ¹¹
July 1, 2022	9.21% ¹²	1.32% ¹³	10.53%	7.85% / 12.00%
July 1, 2023	9.21%	1.32%	10.53%	7.85% / 12.00%
July 1, 2024	9.21%	1.32%	10.53%	7.85% / 12.00%

⁹ Solvency liabilities are used for broader public sector organisations in accordance with the Act.

¹⁰ Expressed as a percentage of members' pensionable earnings.

¹¹ 1999 YMPE indexed at 55% of the percentage increase in the YMPE since 2003

¹² Alternatively expressed as 6.85% of pensionable earnings up to the YMPE threshold, and 10.50% of the balance of pensionable earnings up to 120% of the maximum salary paid to a professor

¹³ Alternatively expressed as 1.00% of pensionable earnings up to the YMPE threshold, and 1.50% of the balance of pensionable earnings up to 120% of the maximum salary paid to a professor

Period beginning	Monthly employee contributions	Estimated employer's contributions			
		Monthly provision for adverse deviations	Monthly current service cost and provision for adverse deviation	Available actuarial surplus applied ¹⁴	Minimum monthly contributions ¹³
July 1, 2022	\$3,306,600	\$456,300	\$3,636,400	\$0	\$3,636,400
July 1, 2023	\$3,372,700	\$465,300	\$3,707,500	\$0	\$3,707,500
July 1, 2024	\$3,480,200	\$479,200	\$3,818,600	\$0	\$3,818,600

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' pensionable earnings. Therefore, the actual employer's current service cost and provision for adverse deviations may be different from the above estimates and, as such, the contribution requirements should be monitored closely to ensure contributions are made in accordance with the Act.

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.

¹⁴ Notwithstanding the available actuarial surplus in the Plan, if any, the terms of the Plan may require the University to make current service cost contributions.

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 five 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 employer contributions that can be remitted to the defined benefit component of a registered pension plan. For purposes of this section on maximum eligible contributions only, any reference to the current service cost includes the provision for adverse deviations in respect of the current service cost.

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

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

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

Schedule of Maximum Contributions

The University is permitted to fully fund the greater of the going concern and hypothetical wind-up shortfalls (\$1,037,881,000), as well as make current service cost contributions including the provision for adverse deviations in respect of the current service cost. The portion of this contribution representing the payment of the hypothetical wind-up shortfall can be increased with interest at 4.56% per year from the valuation date to the date the payment is made, and must be reduced by the amount of any deficit funding made from the valuation date to the date the payment is made.

Assuming the University contributes the greater of the going concern and the hypothetical wind-up shortfall of \$1,037,881,000 as of the valuation date, the rule for determining the estimated maximum eligible annual contributions, as well as an estimate of the maximum eligible contributions until the next valuation, are as follows:

Year beginning	Employer's contribution rule		Estimated employer's contributions
	Monthly current service cost including provision for adverse deviation - below / above YMPE threshold ¹⁵	Deficit Funding	Monthly current service cost including provision for adverse deviations
July 1, 2022	7.85% / 12.00%	n/a	\$3,636,400
July 1, 2023	7.85% / 12.00%	n/a	\$3,707,500
July 1, 2024	7.85% / 12.00%	n/a	\$3,818,600

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

¹⁵ Expressed as a percentage of members' pensionable earnings. The YMPE threshold in a year is equal to the 1999 YMPE indexed at 55% of the percentage increase in the YMPE since 2003.

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.
- 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 Ontario Pension Benefits Act.

Frédéric Gendron

Frédéric Gendron
Fellow of the Society of Actuaries
Fellow of the Canadian Institute of Actuaries

November 10, 2022

Date

Liza Musni

Liza Musni
Fellow of the Society of Actuaries
Fellow of the Canadian Institute of Actuaries

November 10, 2022

Date

Appendix A

Prescribed disclosure

Definitions

The Act defines a number of terms as follows:

Defined Term	Description	Result	
Going concern assets	Total smoothed value of assets plus the sum of the following:	\$2,836,474,000	
	(a) the present value of special payments in respect of any past service unfunded liability identified in a previously filed report	\$0	
	(b) the present value of special payments in respect of any plan amendment that increases going concern liabilities	\$0	
	(c) present value of special payments in respect of going concern unfunded liabilities identified in a previously filed report that are scheduled for payment within one year of the date of this report	\$0	
Going concern excess / (unfunded liability)	The Going Concern Assets minus the sum of the following:	\$304,750,000	
	a. the going concern liabilities		
	(i) liabilities excluding the value of escalated adjustments		\$2,010,853,000
	(ii) liabilities in respect of escalated adjustments		\$367,443,000
	a. the provision for adverse deviations in respect of the going concern liabilities excluding the value of escalated adjustments		\$153,428,000
	b. Prior Year Credit Balance		\$0

Defined Term	Description	Result
Going concern funded ratio	The ratio of: (a) Total smoothed value of assets (excluding letters of credit) less the Prior Year Credit Balance; to (b) going concern liabilities	1.19
Transfer Ratio	The ratio of: (a) Solvency Assets minus the lesser of the Prior Year Credit Balance and the minimum required employer contributions including the provision for adverse deviations until the next required valuation; to (b) The sum of the Solvency Liabilities and liabilities for benefits, other than benefits payable under qualifying annuity contracts that were excluded in calculating the Solvency Liabilities.	0.72
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	1.08
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.	\$2,701,429,000
Solvency Asset Adjustment	The sum of: (a) the difference between smoothed value of assets and the market value of assets (b) the present value of going concern special payments required to liquidate any past service unfunded liability (c) the present value of going concern special payments identified in the May 15, 2021 valuation and scheduled for the year following July 1, 2022 (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 (e) the present value of any previously scheduled solvency special payments (excluding those identified in this report) (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 \$0 \$0 \$0 \$0 \$0
		\$0

Defined Term	Description	Result
Solvency Liabilities	Liabilities determined as if the plan had been wound up on the valuation date, including liabilities for plant closure benefits or permanent layoff benefits that would be immediately payable if the employer's business were discontinued on the valuation date of the report, but, if elected by the plan sponsor, excluding liabilities for, <ul style="list-style-type: none"> (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. 	\$2,491,250,000
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: <ul style="list-style-type: none"> (a) the Solvency Liabilities (b) the Solvency Liability Adjustment (c) the Prior Year Credit Balance <p style="margin-left: 20px;">Exceeds the sum of</p> <ul style="list-style-type: none"> (d) the Solvency Assets net of estimated termination expenses¹⁶ (e) the Solvency Asset Adjustment 	<ul style="list-style-type: none"> \$2,491,250,000 \$0 \$0 <hr style="width: 100%;"/> <ul style="list-style-type: none"> \$2,491,250,000 <p style="margin-left: 20px;">Exceeds the sum of</p> <ul style="list-style-type: none"> \$2,700,429,000 \$0 <hr style="width: 100%;"/> <ul style="list-style-type: none"> \$2,700,429,000 <p style="margin-left: 20px;">Exceeds the sum of</p> <ul style="list-style-type: none"> \$0
Reduced Solvency Deficiency / (Solvency Excess)	The sum of: <ul style="list-style-type: none"> (a) 85% of the Solvency Liabilities (b) 85% of the Solvency Liability Adjustment (c) the Prior Year Credit Balance 	<ul style="list-style-type: none"> \$2,117,563,000 \$0 \$0 <hr style="width: 100%;"/> <ul style="list-style-type: none"> \$2,117,563,000

¹⁶ In accordance with accepted actuarial practice, for purposes of determining the financial position, the market value of plan assets was reduced by a provision for estimated termination expenses payable from the Plan's assets that may reasonably be expected to be incurred in terminating the Plan and to be charged to the Plan.

Defined Term	Description	Result
	minus the sum of:	
	(d) the Solvency Assets net of estimated termination expenses	\$2,700,429,000
	(e) the Solvency Asset Adjustment	\$0
		\$2,700,429,000
		(\$582,866,000)

Provision for Adverse Deviations

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

Defined Amount	Results										
Fixed Income Component (L) The sum of the Plan's target allocation of assets (excluding those allocated to annuity contracts and meeting the minimum rating requirement) as described in the regulations according to the investment policy applicable at the valuation date: <table border="1" style="margin-left: 40px; margin-top: 10px;"> <thead> <tr> <th style="text-align: center;">Investment</th> <th style="text-align: center;">Target</th> </tr> </thead> <tbody> <tr> <td>Canadian Bonds and debentures</td> <td style="text-align: center;">21.25%¹⁷</td> </tr> <tr> <td>Non-Canadian bonds and debentures</td> <td style="text-align: center;">0.0%</td> </tr> </tbody> </table>	Investment	Target	Canadian Bonds and debentures	21.25% ¹⁷	Non-Canadian bonds and debentures	0.0%	21.25%				
Investment	Target										
Canadian Bonds and debentures	21.25% ¹⁷										
Non-Canadian bonds and debentures	0.0%										
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: <table border="1" style="margin-left: 40px; margin-top: 10px;"> <thead> <tr> <th style="text-align: center;">Investment</th> <th style="text-align: center;">Target¹⁸</th> </tr> </thead> <tbody> <tr> <td>Real estate</td> <td style="text-align: center;">15.0%</td> </tr> <tr> <td>Infrastructure</td> <td style="text-align: center;">15.0%</td> </tr> <tr> <td>Hedge Funds</td> <td style="text-align: center;">10.0%</td> </tr> <tr> <td>Private Debt</td> <td style="text-align: center;">5.0%</td> </tr> </tbody> </table>	Investment	Target ¹⁸	Real estate	15.0%	Infrastructure	15.0%	Hedge Funds	10.0%	Private Debt	5.0%	45.0%
Investment	Target ¹⁸										
Real estate	15.0%										
Infrastructure	15.0%										
Hedge Funds	10.0%										
Private Debt	5.0%										
Investment Component (N) Plan's target asset allocation for mutual, pooled or segregated funds	0.0%										

¹⁷ Based on 22% target allocation to fixed income as per the Investment Policy, and reflecting that 30% of a 5% allocation of the plan assets to corporate bonds is non-investment grade, which is considered to be 50% fixed income for PfAD purposes.

¹⁸ Prior to change in target asset allocation adopted subsequent to the valuation date (5% shift from hedge funds to private debt).

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

Combined Target Asset Allocation for Fixed Income Assets (J)

Sum of		
• Fixed Income Component (L)	21.25%	
• 0.5 × Alternative Investment Component (0.5 × M)	22.50%	
• Investment Component × Investment Component Fixed Income % (N × P)	0.00%	
• 0.5 × Investment Component × Investment Component Alternative Investment % (0.5 × N × Q)	0.00%	
		43.75%
Divided by		
• 100% - Annuity Contract Allocation (100% - R)	0.00%	
Combined Target Asset Allocation for Fixed Income Assets		43.75%

Combined Target Asset Allocation for Non-Fixed Income Assets (K)

100% – Combined Target Asset Allocation for Fixed Income Assets (100% - J)	56.25%
--	---------------

Duration of going concern liabilities at valuation date

= $(F - G) / (G \times 0.01)$	9.5
where,	
G = going concern liabilities excluding liabilities in respect of escalated adjustments at valuation date established using the discount rate determined for this valuation	1,971,481,000
F = going concern liabilities excluding liabilities in respect of escalated adjustments, established using the discount rate minus 1%	2,158,373,000

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)	0.66%
5.0% x Combined Target Asset Allocation for Non-Fixed Income Assets (5.0% × K)	2.81%
Benchmark Discount Rate	7.11%

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	3.63%
iii.	Greater of zero and the	
	• Duration of going concern liabilities at valuation date	9.5
	Multiplied by:	
	– Going concern valuation gross discount rate net of active investment management fees (D), less	7.02%
	– Benchmark Discount Rate (E)	7.11% 0.00%
	Provision for Adverse Deviations (i. + ii. + iii.)	7.63%

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

Available actuarial surplus

Excess of			
<ul style="list-style-type: none"> Assets determined on basis of going concern valuation including accrued and receivable income but excluding the value of any letters of credit 		\$2,836,474,000	
Over			
<ul style="list-style-type: none"> Going concern liabilities 	\$2,378,296,000		
<ul style="list-style-type: none"> Provision for adverse deviations in respect of the going concern liabilities 	\$153,428,000		
<ul style="list-style-type: none"> Prior Year Credit Balance 	\$0		
		<u>\$2,531,724,000</u>	
		\$304,750,000	(a)
Excess of			
<ul style="list-style-type: none"> Solvency assets excluding the value of any letters of credits and lesser of Prior Year Credit Balance and minimum required employer contributions, including the provision for adverse deviations until the next required valuation 		<u>\$2,700,429,000</u>	
Over			
<ul style="list-style-type: none"> Solvency liabilities¹⁹ × 105% 		<u>\$2,615,813,000</u>	
		\$84,616,000	(b)
The available actuarial surplus = the lesser of a) and b) above		\$84,616,000	

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 employer elected to exclude plant closure or permanent lay-off benefits under Section 5(18) of the regulations, and has not rescinded that election.

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

Accordingly, the next valuation of the Plan will be required as of July 1, 2025.

¹⁹ Solvency liabilities are used for broader public sector organisations in accordance with the Act.

Special Payments

As the Plan does not have a funding shortfall and there is a solvency excess, no special payments are required.

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 ¹⁹	\$2,700,214,000	(a)
PBGF liabilities ²⁰	\$2,491,035,000	(b)
Solvency liabilities ¹⁹	\$2,491,035,000	(c)
Ontario asset ratio	100%	(d) = (b) ÷ (c)
Ontario portion of the fund	\$2,700,214,000	(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	\$1,110,052,000	
Number of Ontario Plan beneficiaries	6,901	
Number of Ontario Plan beneficiaries receiving monthly pensions (including bridge benefit) of \$1,500 or less	827	
Number of Ontario Plan beneficiaries who have accrued monthly pensions (including bridge benefit) of \$1,500 or less	2,504	
Amount of largest monthly pension or monthly pension benefit (including bridge benefit) that has accrued under the plan to an Ontario beneficiary	\$12,390	

²⁰ For purposes of the PBGF assessment, additional voluntary contributions are excluded from solvency assets and liabilities

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
90 th	\$4,464	\$736,322,000
80 th	\$3,071	\$491,277,000
70 th	\$2,138	\$323,490,000
60 th	\$1,475	\$212,830,000
50 th	\$1,060	\$134,205,000
40 th	\$751	\$78,773,000
30 th	\$487	\$41,332,000
20 th	\$293	\$17,935,000
10 th	\$143	\$4,017,000

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
90 th	\$7,193	\$936,181,000
80 th	\$5,629	\$708,459,000
70 th	\$4,203	\$520,195,000
60 th	\$3,391	\$372,096,000
50 th	\$2,684	\$247,040,000
40 th	\$2,044	\$152,120,000
30 th	\$1,438	\$82,457,000
20 th	\$909	\$36,713,000
10 th	\$456	\$10,018,000

Appendix B

Plan assets

The pension fund is held by the trustee/custodian RBC Investor & Treasury Services (“RBCIS”). In preparing this report, we have relied upon audited financial statements prepared by KPMG LLP for the period from January 1, 2021 to December 31, 2021, except that we have reflected interest on the outstanding surplus allocation payments to unlocated members and we have reflected in-transit benefit payments payable to terminated members. The differences in assets are additional outstanding payments of \$144,000 as of January 1, 2021 and \$156,000 as of January 1, 2022, reducing the respective asset values by the same amounts. The figures from May 15, 2021 to December 31, 2021 were determined by taking the figures in the auditors’ report at December 31, 2021 and subtracting the figures for the period January 1 to May 14, 2021 indicated in the previous funding report.

We have also relied on the monthly trust statements prepared by RBCIS for the period from January 1, 2022 to June 30, 2022, adjusted to reflect contributions remitted in July 2022 with respect to the month of June 2022, as provided by the University, to estimate the market value of Plan assets at June 30, 2022.

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:

(in \$000s)	2021-05-15 to 2021-12-31	2022-01-01 to 2022-06-30
Beginning of period	\$2,848,928	\$3,046,832
PLUS		
Members' contributions	\$27,490	\$17,153
University contributions	\$35,781	\$22,868
Investment earnings	\$60,122	\$50,318
Net capital gains (losses)	\$157,540	(\$369,912)
	\$280,933	(\$279,573)
LESS		
Pensions paid	\$67,198	\$52,586
Lump-sums paid	\$9,825	\$9,210
Administration and investment fees	\$6,006	\$4,569
	\$83,029	\$66,365
End of period	\$3,046,832	\$2,700,894
Gross rate of return ²¹	7.7%	(10.5%)
Rate of return net of expenses ²¹	7.4%	(10.7%)

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

Investment Policy

The plan administrator has adopted a statement of investment policy and procedures (SIP&P). 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 on the following page.

²¹ Assuming mid-period cash flows.

	Investment policy			Actual asset mix as at June 30, 2022
	Minimum	Target	Maximum	
Canadian Equities	0%	5%	10%	5.9%
Foreign Equities	15%	28%	40%	29.8%
Nominal Fixed Income	15%	22%	35%	16.8%
Absolute Return Assets ²²	5%	15%	30%	17.8%
Real Return Assets ²³	18%	30%	40%	27.7%
Cash and cash equivalents	0%	0%	10%	2.0%
		100%		100%

Following an asset liability modelling analysis completed in 2022, the Pension Fund Investment Committee (PFIC) recently approved changes to the strategic asset allocation of the Plan. As a result, the target allocation to absolute return assets will be modified, to shift 5% of plan assets from hedge funds to private debt. The Statement of Investment Policy and Procedures of the Plan will be updated to reflect this change. The impact of this change in strategic asset allocation on the going concern discount rate has been reflected in the current valuation.

The Plan's assets are invested in accordance with the above investment policy, whereas the Plan liabilities tend to behave like long bonds. Accordingly, sensitivity of assets and liabilities to changes in market conditions will be quite different, resulting in the Plan's financial position fluctuating over time. These fluctuations could be significant and could cause the Plan to become underfunded or overfunded even if CPC contributes to the Plan based on the funding requirements presented in this report.

²² Hedge funds (10%) and private debt (5%), prior to changes to the strategic asset allocation

²³ Real estate (15%) and infrastructure (15%)

Appendix C

Methods and assumptions – Going concern

Valuation of Assets

For this valuation, we have used an adjusted market-value method to determine the smoothed value of assets. Under this method, total fund returns (net of expenses paid by the plan) in excess or below the expected return will be smoothed over three years, with the smoothed value of assets to be between 90% and 105% of the market value of assets. As a result, the smoothed value produced as at July 1, 2022 recognizes the following portions of excess returns that arose during the past three years:

Year	Percentage of Gains (Losses) Recognized
2022:	33 1/3%
2021:	50.00% ²⁴
2020:	83.33% ²⁵
before 2020:	100%

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

The smoothed value of the assets at July 1, 2022 was derived as follows:

Market value of assets		\$2,700,894,000
LESS		
Unrecognized investment gains (losses)	2022: (\$417,519,000) × 66.67% =	(\$278,346,000)
	2021: \$79,665,000 × 50.00% =	\$39,833,000
	2020: \$78,838,00 × 16.67% =	\$13,140,000
		(\$225,373,000)
Smoothed value of assets (A)		\$2,926,267,000
Market value of assets x 1.05 (B)		\$2,835,939,000
Lesser of (A) and (B)		\$2,835,939,000

²⁴ 18 months over 36 of gains are recognized

²⁵ 30 months over 36 of gains are recognized

PLUS	
Present value of future buy-back contributions	\$535,000
Smoothed value of assets	\$2,836,474,000

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, based on projected final average earnings. This is referred to as the funding target. For each individual plan member, accumulated contributions with interest are established as a minimum actuarial liability.

The valuation of the Plan as at July 1, 2022 is based on membership data as at January 1, 2022. The valuation results as at July 1, 2022 were determined by extrapolating actuarial liabilities calculated as of January 1, 2022 (using assumptions applicable as at July 1, 2022) to July 1, 2022 allowing for interest on the liabilities, the accrual of further benefits by active members, and the actual benefits paid out. We have assumed that all experience during the projection period, apart from inflation, investment returns, contributions, benefit payments and administration expenses, has been in line with the assumptions used to determine the actuarial liabilities as of January 1, 2022.

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 employer's contribution in respect of current service cost is the difference between the total current service cost, including the provision for adverse deviations, and the members' required contributions.

The employer's contribution in respect of current service cost has been expressed as a percentage of the members' pensionable earnings 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' pensionable earnings, 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:	7.00%	6.15%
Provision for future non-investment expenses:	Explicit provision of \$59,360,000 included in going concern funding target	Implicit provision through reduction of 0.13% of discount rate used for both going concern funding target and current service cost
Inflation:	6.8% in 2022, 3.5% in 2023 and 2.0% per year thereafter	2.00%
ITA limit / YMPE increases:	3.00%	3.00%
Pensionable earnings increases ²⁶ :	3.00% + PTR scale	3.00% + PTR scale
Post-retirement pension increases:	5.45% at January 1, 2023, 3.25% at January 1, 2024, and 1.70% per year thereafter	1.70%
Interest on employee contributions:	7.00%	6.15%
Termination rates:	Age-related table	Age-related table

²⁶ See section *Pensionable Earnings* below for details of short-term economic increases adjustments, and progress through the ranks (PTR) and promotional increases scale.

Assumption	Current valuation	Previous valuation
Retirement rates:	Age-related table	Age-related table
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)
Mortality improvements:	Fully generational using CPM Improvement Scale B (CPM-B)	Fully generational using CPM Improvement Scale B (CPM-B)
Disability rates:	None	None
Form of benefit elected:	Retirement: 100% of eligible members receive a pension from the plan Termination: 55% of eligible members receive a pension from the plan and 45% elect a lump sum transfer	Retirement: 100% of eligible members receive a pension from the plan Termination: 55% of eligible members receive a pension from the plan and 45% elect a lump sum transfer
Actuarial basis for benefits assumed to be settled through a lump sum:	Discount rate: 2.60% Mortality rates: CPM2014 with fully generational improvements using CPM-B	Discount rate: 1.80% Mortality rates: CPM2014 with fully generational improvements using CPM-B
Eligible spouse at retirement:	80%	80%
Spousal age difference:	Male 3 years older	Male 3 years older

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

Age-Related Tables

Based on the plan experience over the years 2014 to 2018, we have assumed that members will terminate or retire based on the following annual rates. The rates represent the probability of terminating or retiring in the following year.

Age (samples)	Termination
25	9.7%
30	6.5%
35	5.4%
40	4.7%
45	4.2%
50	3.9%

Age	Retirement ²⁷	Age	Retirement ²⁷
55 to 59	25%	66 to 67	15%
60	15%	68	20%
61 to 63	10%	69	25%
64	20%	70	50%
65	25%	71	100%

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 salary rates as of January 1, 2022 and assumed that such pensionable earnings will increase at the assumed rate.

We have considered that salary increases consist of two elements. The first represents that part of the increase which corresponds to the increase in the general level of salaries. This is usually called "economic salary increase". The second represents increases resulting from progress through the ranks (PTR) and promotion, which would presumably occur regardless of the economic trend.

Economic Salary Increases

Long-term economic salary increases are assumed equal to 3.0% per year from 2022, based on assumed inflation of 2.0% plus an expected 1.0% for productivity gains. Short-term economic increases are adjusted to reflect known negotiated or scheduled salary increases for the different groups of employees, including the effect of Ontario Bill 124 – An Act to implement moderation measures in respect of compensation in Ontario's public sector, which limits annual increases in wages and salaries to 1% per year (excluding increases related to PTR and promotions) during a three-year "moderation period".

The resulting economic salary increases are as follows:

- APUO: 1.0% per year in 2022 and 2023, and 3.0% per year from 2024
- SSUO: 3.0% per year from 2022
- 772A and 772B: 2.0% in 2022, and 3.0% per year from 2023
- Non-Union and PIPSC: 1.0% per year in 2022, and 3.0% per year from 2023

²⁷ Rates are only applied from unreduced retirement age. Experience shows that retirement rates at reduced retirement ages are small. Because pension amounts are reduced by actuarial equivalence, the impact of early retirement prior to eligibility to an unreduced pension is minimal.

Progress through the ranks (PTR) and Promotional Increases

The PTR and promotional salary increases assumption is based on the Plan experience during the years 2014 to 2018.

The following table shows examples of the rates of PTR or promotional increases for the following year for specimen years of service. As is common, these rates are relatively high as a percentage of salary at the lower years of service and reduce as the service increases.

Service at Valuation Date	Assumed Rate of increase for the following year	Service at Valuation Date	Assumed Rate of increase for the following year
1 year	3.3%	20 years	2.0%
3 years	3.2%	25 years	1.6%
5 years	3.0%	30 years	1.3%
10 years	2.7%	35 years	0.9%
15 years	2.3%		

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 investment management 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, except for alternative investments, for which it is net of any investment management expense. The assumed investment return includes the diversification and rebalancing effect.
- 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 (additional return due to active management, net of related fees, is assumed to be nil). The assumed passive investment management expense provision excludes any fees for alternative investments, since the assumed investment returns for those types of investments are already net of investment expenses.

The discount rate was developed as follows:

Assumed investment return	7.02%
Assumed passive investment management expense provision	(0.02%)
Implicit non-investment management expense provision	n/a
Margin for adverse deviations	n/a
Net discount rate	7.00%

Provision for future non-investment management expenses

The provision for future non-investment expenses was established as the $PVFB_{net} - PVFB_{gross}$ where:

- $PVFB_{net}$ represents the present value of future benefits for past and future service for the current group of members valued with the same assumptions as for the going concern funding target except for a modified discount rate equal to the discount rate referred to above reduced by 0.15% (6.85%); and
- $PVFB_{gross}$ represents the present value of future benefits for past and future service for the current group of members valued with the same assumptions as for the going concern funding target including the discount rate referred to above (7.00%)

The approach implicitly assumes that future expenses are equivalent to the value of a reduction of 0.15% in the discount rate for both past and future accruals. This assumed level of future expenses is based on the average amount of non-investment expenses over the recent years and expectations regarding future level.

Inflation

The short-term inflation assumption for 2022 and 2023 is based on available Consumer Price Index data through June 2022, and on forecasts of Canadian inflation from financial and economic forecasters. The long-term inflation assumption from 2024 is based on the mid-point of the Bank of Canada's inflation target range of 1% to 3%.

Income Tax Act Pension Limit and Year's Maximum Pensionable Earnings

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

Pensionable Earnings

The long-term economic increases are equal to the long-term inflation assumption plus an expected 1% for productivity gains. The PTR and promotional increases scale is based on experience over the years 2014 to 2018.

Post-Retirement Pension Increases

The assumption is based on the Plan formula and inflation assumption above. The projected pension increases at January 1, 2023 and at January 1, 2024 are based on available Consumer Price Index data through June 2022, on the short-term inflation assumption and on the plan's indexation provisions. The long-term assumed rate of indexation was determined after analyzing the average level of indexation expected in the future based on a stochastic model that reflects volatility of inflation rates, with a long-term target inflation of 2% per year.

Termination Rates

The assumption is based on experience over the years 2014 to 2018.

Retirement Rates

The assumption is based on experience from 2014 to 2018.

Mortality Rates

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

Due to the size of the Plan, specific data on plan mortality experience is insufficient to determine the mortality rates. The CPM mortality rates from the public sector have been adjusted after considering plan-specific characteristics, such as the type of employment, the industry experience, the pension and employment income for the plan members, and data in the CPM study. Specifically, we have applied the adjustment for Educational institutions proposed in the Canadian Institute of Actuaries Final Report on Canadian Pensioners' Mortality published in February 2014.

There is broad consensus among actuaries and other longevity experts that mortality improvement will continue in the future. For the current valuation, we have continued to use the CPM Improvement Scale B (CPM-B), which is a reasonable outlook for future mortality improvements.

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 January 1, 2022. We have not adjusted the expected mortality rates for Plan members after that 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.

Based on the assumption used, the life expectancy of a member age 60 at the valuation date is 28.1 years for males and 30.1 years for females.

Interest on Employee Contributions

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

Disability Rates

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

Form of benefit elected and cost of future lump sums

The assumption for the percentage of eligible plan participants that will elect to receive their benefit as a lump sum transfer from the plan is based on experience from 2014 to 2018.

The cost of future lump sums will depend on the level of market interest rates at the time the lump sum is paid and any changes in the applicable actuarial standards for the determination of pension plan commuted values. The assumed cost of future lump sums is based on the average expected level of market interest rates over the period during which lump sums are expected to be paid, taking into account market conditions on the valuation date. We have also assumed that future lump sums elected by eligible plan participants will be calculated using the mortality basis applicable under the actuarial standards as of the valuation date. We have reflected no change in the applicable actuarial standards.

Eligible Spouse

The assumption for non-retired members is based on experience from 2014 to 2018 (actual spousal information is used for retirees).

Spousal Age Difference

The assumption for non-retired members is based on experience from 2014 to 2018 (actual spouse age is used for retirees).

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 valuation of the Plan as at July 1, 2022 is based on membership data as at January 1, 2022. The valuation results as at July 1, 2022 were determined by extrapolating actuarial liabilities calculated as of January 1, 2022 (using assumptions applicable as at July 1, 2022) to July 1, 2022 allowing for interest on the liabilities, the accrual of further benefits by active members, and the actual benefits paid out. We have assumed that all experience during the projection period, apart from inflation, investment returns, contributions, benefit payments and administration expenses has been in line with the assumptions used to determine the actuarial liabilities as of January 1, 2022.

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

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

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

We have estimated the cost of settlement through purchase of annuities in accordance with the *Canadian Institute of Actuaries Educational Note Supplement: Guidance for Assumptions*

for Hypothetical Wind-up and Solvency Valuations Update - Effective June 30, 2022, and applicable to Valuations with Effective Dates on or after June 30, 2022 and no later than December 30, 2022 (the “Educational Note Supplement”).

For solvency purposes, indexation after the valuation date was excluded. It may not be possible to settle the liabilities through the purchase of annuities due to the size of the Plan and the limited annuity market in Canada. In accordance with the Educational Note Supplement, we have assumed that the settlement of such liabilities would be priced on the same basis as the smaller group annuities that are available in the market.

For wind-up purposes, no benefits were excluded. There is limited data available to provide credible guidance on the cost of a purchase of indexed annuities in Canada. In accordance with the Educational Note Supplement, we have assumed that an appropriate proxy for estimating the cost of such purchase is to use an assumed interest rate net of inflation based on the indexed rates derived from yields on the real return bonds of the Government of Canada, reduced by 0.60%. In practice, it may be difficult to purchase indexed annuity liabilities exceeding \$300 million. The assumed indexation rate was determined after analyzing the average level of indexation expected in the future based on the implicit inflation rate²⁸, historical distribution of inflation rates, and the indexation rate formula under the Plan.

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, and we have applied the adjustment for Educational institutions proposed in the Canadian Institute of Actuaries Final Report on Canadian Pensioners’ Mortality published in February 2014.

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

²⁸ Derived from the difference in long-term Government of Canada nominal bond and real return bond yields.

The assumptions are as follows:

Form of Benefit Settlement Elected by Member	
Lump sum:	45% of active members 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
Pre-and post-retirement indexation rate:	1.56% per year for 10 years, 1.55% per year thereafter (for wind-up valuation)
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 5% to reflect super-standard mortality rates:
Interest rate:	4.63% per year
Pre-and post-retirement indexation rate:	3.57% per year (for wind-up valuation) ²⁹
Retirement Age	
Benefits assumed to be settled 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 plan rules and applicable legislation, and based on the eligibility requirements that have been met at the valuation date
Benefits assumed to be settled through an annuity purchase:	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 members whose age plus service equals at least 55 at the valuation date reflect their entitlement to grow into early retirement subsidies
Other Assumptions	
Weighted-average interest rate:	4.56%
Final average earnings:	Based on actual pensionable earnings over the averaging period
Family composition:	Same as for going concern valuation
Maximum pension limit:	\$3,420.00 increasing at 3.00% per year from 2023 (determined on the member's assumed pension commencement date)
Termination expenses:	\$1,000,000

²⁹ Reflects inflation and additional premium related to investments charged by insurers to guarantee inflation protection.

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

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

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

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

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

Incremental Cost

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

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

- Members terminate, retire, and die consistent with the termination, retirement, and mortality rates used for the going concern valuation.
- Pensionable earnings, the Income Tax Act pension limit, and the Year's Maximum Pensionable Earnings increase in accordance with the related going concern assumptions.
- Active members accrue pensionable service in accordance with the terms of the Plan.
- To accommodate for new entrants to the Plan, we have added to the projected liability an amount equal to the liability of new entrants that have joined the Plan since the previous valuation.
- 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, except that in accordance with the Act, we have excluded the future indexation of benefits. As such, the pre and post-retirement indexation rate was assumed to be 0%

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 January 1, 2022, provided by the University of Ottawa.

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.

Ideally, membership data on the valuation date would be used to prepare our actuarial report. However, for our engagement with the University, ideal data were not available at July 1, 2022 and could not be made available without the Plan incurring unnecessary additional fees. Therefore, we considered the appropriateness of readily available membership data as at January 1, 2022.

We considered if the data as at January 1, 2022 are sufficient and reliable for the purposes of the valuation. The data are sufficient to determine the Plan's obligations at July 1, 2022 using the methods described in this report. The data are reliable to the extent that changes in Plan membership between January 1, 2022 and July 1, 2022 that are not reflected in the valuation do not materially impact the valuation results. We have assessed the materiality of changes in membership data by reviewing the Plan's demographic experience in recent actuarial reports and the level of experience gains/losses. Experience has been relatively stable and consistent with expectations, and we note that most demographic assumptions were reviewed in 2019 and, if appropriate, updated at January 1, 2020 to reflect membership experience observed over the period 2014 through 2018. We have also reviewed the level of contributions to the Plan from January 1, 2022 to July 1, 2022, and consulted with the University on any special events. We have concluded that using ideal data would not materially impact the valuation results and that the data used are sufficient and reliable for the purpose of this report.

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

	2022-01-01	2021-01-01
Active Members - Academic		
Number	1,241	1,226
Total annualized pensionable earnings for the following year	\$211,382,000	\$205,978,000
Average annualized pensionable earnings for the following year	\$170,300	\$168,000
Average years of pensionable service	13.7	13.5
Average age	51.0	50.7
Accumulated contributions with interest	\$276,631,000	\$248,767,000
% of female	44%	43%
Active Members – Administrative		
Number	2,332	2,263
Total pensionable earnings for the following year	\$208,671,000	\$197,168,000
Average pensionable earnings for the following year	\$89,500	\$87,100
Average years of pensionable service	9.9	10.3
Average age	44.0	44.3
Accumulated contributions with interest	\$187,824,000	\$171,774,000
% of female	63%	62%
Deferred Pensioners³⁰		
Number	570	578
Total annual pension	\$5,470,000	\$5,489,000
Average annual pension	\$9,600	\$9,500
Average age	50.6	50.2
Pensioners and Survivors		
Number ³¹	2,681	2,587
Total annual lifetime pension ³²	\$105,436,000	\$98,995,000
Average annual lifetime pension	\$39,300	\$38,300
Average age	73.6	73.5

³⁰ Excluding 77 pending members entitled to a commuted value at January 1, 2022 and 56 pending members at January 1, 2021

³¹ 1,209 Academics, 1,467 Support, and 5 identified as "Religious" as of January 1, 2022, and 1,193 Academics, 1,389 Support, and 5 identified as "Religious" as of January 1, 2021

³² Statistics include indexation as of January 1, 2022 (including the additional 0.21% pension increase following amendment on that date) and January 1, 2021, respectively

The membership movement for all categories of membership between the previous actuarial valuation at January 1, 2021 and the membership date of January 1, 2022 is as follows:

	Actives	Deferred Pensioners and pending members	Pensioners and survivors	Total
Total at 01.01.2021	3,489	634	2,587	6,710
New entrants	335			335
Terminations:				
• Transfers/lump sums	(53)	(49)		(102)
• Deferred pensions	(53)	53		0
• Pending	(33)	33		0
Deaths				
• Without survivors	(1)		(40)	(41)
• With survivors			(27)	(27)
• Pending	(3)	3		0
New survivors			27	27
Retirements	(108)	(25)	133	0
Rehires	1	(1)		0
Benefits expired				
Adjustments	(1)	(1)	1	(1)
Total at 01.01.2022	3,573	647	2,681	6,901

The distribution of the active members as at January 1, 2022, by age and pensionable service, as well as the average pensionable earnings for the following year for each subgroup, is summarized as follows:

Age	Years of Pensionable Service								Total
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35 +	
Under 20									
20 to 24	41								41
	\$62,372								\$62,372
25 to 29	145	18							163
	\$69,920	\$77,972							\$70,809
30 to 34	211	109	26						346
	\$82,545	\$83,250	\$79,436						\$82,533
35 to 39	214	157	105	15					491
	\$94,258	\$99,999	\$86,489	\$86,745					\$94,203
40 to 44	198	161	153	68	9				589
	\$106,329	\$118,655	\$115,576	\$101,826	\$100,081				\$111,485
45 to 49	122	85	165	135	37	10			554
	\$119,473	\$126,231	\$138,766	\$138,552	\$101,947	\$106,754			\$129,505
50 to 54	73	67	119	149	91	16	19		534
	\$123,375	\$121,377	\$129,258	\$159,779	\$137,512	\$130,694	\$94,044		\$136,178
55 to 59	54	60	88	100	84	54	45	7	492
	\$124,469	\$123,908	\$123,694	\$149,610	\$144,561	\$139,978	\$106,803	\$74,445	\$132,177
60 to 64	15	26	43	61	36	36	49	6	272
	\$108,963	\$137,956	\$127,671	\$148,580	\$162,249	\$168,441	\$154,786	\$137,649	\$147,389
65 +	6	10	13	18	9	11	12	12	91
	\$106,558	\$159,869	\$166,280	\$170,452	\$179,509	\$189,907	\$190,739	\$202,671	\$174,651
Total	1,079	693	712	546	266	127	125	25	3,573
	\$96,306	\$110,769	\$120,287	\$142,545	\$138,293	\$148,585	\$131,730	\$151,163	\$117,563

The distribution of the inactive members as at January 1, 2022, by age, is summarized as follows:

Age	Deferred Pensioners ³³		Pensioners and Survivors	
	Number	Average Pension	Number	Average Pension
< 45	178	\$6,866	2	*
45 – 49	95	\$10,273	4	\$31,694
50 – 54	102	\$12,161	2	*
55 – 59	113	\$12,639	97	\$34,490
60 – 64	48	\$8,000	367	\$33,221
65 – 69	20	\$8,508	557	\$36,618
70 – 74	6	\$2,449	542	\$46,239
75 – 79	3	\$7,331	455	\$42,268
80 – 84	-	-	335	\$40,909
85 – 89	1	*	180	\$35,541
90 – 94	2	*	116	\$34,749
95 +	2	*	24	\$29,585
Total	570	\$9,596	2,681	\$39,327

* Pensions in cells with less than three members are not shown for confidentiality reason.

³³ Excluding 77 pending members.

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 of Ottawa. 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.

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 September 1, 1963. Benefits are based on a set formula and are entirely paid for by the University.
Eligibility for Membership	An employee hired after age 30 must join the plan on the effective date of employment. An employee hired before age 30 is eligible to join the plan on the first day of any month and must join the plan after two years of service, or attainment of age thirty, whichever is the earliest. Part-time employees are eligible to join the plan after they have, in two consecutive calendar years, worked for 24 continuous months and either earned 35% of the YMPE or worked at least 700 hours in each of these two consecutive calendar years.
Employee Contributions	Members are required to contribute 7.15% of earnings up to 85% of the 1999 YMPE indexed at 55% of the percentage increase in the YMPE since 2003, and 10.95% of the excess earnings up to total contributory earnings of 120% of the maximum salary paid to a professor. For members in receipt of the University's long-term disability income plan, contributions are not required.
Retirement Dates	Normal Retirement Date <ul style="list-style-type: none">• Academic Staff – The first day of July coincident with or next following the member's 65th birthday.• Support Staff – The first day of the month coincident with or next following the member's 65th birthday. Early Retirement Date <ul style="list-style-type: none">• The member may choose to retire as early as age 55.

**Normal
Retirement
Pension**

For service before January 1, 2004, the maximum between:

- 1.3% of the average of the 60 highest monthly pensionable earnings up to 85% of the 1999 YMPE and 2% of the excess for each year of credited service; and
- 1.5 % of the average of the 60 highest monthly pensionable earnings for each year of credited service.

For service on or after January 1, 2004, the maximum between:

- 1.3% of the average of the 60 highest monthly pensionable earnings up to 85% of the 1999 YMPE indexed at 55% of the percentage increase in the YMPE since 2003 and 2% of the excess for each year of credited service; and
- 1.5 % of the average of the 60 highest monthly pensionable earnings for each year of credited service.

**Early
Retirement
Pension**

If a member retires early, the member will be entitled to a pension that is calculated the same way as for a normal retirement. An unreduced pension will be payable if the member has attained age 60 or has satisfied the rule of 90 (age + credited service = 90).

The pension will be actuarially reduced for the period that the early retirement date precedes the earlier of attainment of age 60 or the rule of 90 (based on credited service assuming that the member would have remained in employment).

**Maximum
Pension**

The total annual pension payable from the Plan upon retirement, death or termination of employment cannot exceed the lesser of:

- 2% of the average of the best three consecutive years of total compensation paid to the member by the University, multiplied by total credited service; and
- the maximum permitted under the Income Tax Act (\$3,420.00 per year of service in 2022), multiplied by the member's total credited service, reduced for early retirement as per the Income Tax Act, as applicable.

The maximum pension is determined at the date of pension commencement.

Death Benefits

Pre-retirement:

- If a member dies before the normal retirement date and before any pension payments have begun, the member's spouse, or beneficiary if there is no spouse, will receive a lump sum settlement equal to the value of the benefits to which the member would have been entitled had employment terminated on the date of death.

Post retirement:

- The normal form of payment is a lifetime pension guaranteed for five years if there is no eligible spouse at retirement. If there is an eligible spouse at retirement, the normal form is a lifetime pension guaranteed for five years with a survivor pension of 60% of the original pension amount payable to the surviving spouse after the member's death. However, the member may elect to receive an optional form of pension on an actuarial equivalent basis.

**Termination
Benefits**

If a member's employment terminates for reasons other than death or retirement, the member is entitled to receive a deferred pension equal to the benefit accrued to the date of termination of service, commencing at age 60 or upon attainment of 90 points (based on actual credited service), but not earlier than age 55. A member may elect to receive an actuarially reduced pension as early as age 55. Instead of receiving a pension, a member may, before age 55, transfer the greater of the commuted value of that pension and twice his required contributions with interest into another retirement vehicle in accordance with the pension legislation.

**Pension
Indexation**

Pensions, including deferred pensions, are increased annually from January 1st following the earliest of the date of retirement or termination of service in accordance with changes in the cost of living as measured by the Consumer Price Index (CPI). Pensions are indexed annually by the increase in the CPI minus 1%, up to a maximum increase of 8% per annum. However, if the increase in CPI is 3% or less, then indexation is provided up to the lesser of 2% or the actual rate of increase in the CPI.

Additional increases to reflect full CPI increases to the date of adjustment may be granted, provided the plan's financial position meets specific conditions set out in the plan provisions.

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 illustrated for the following risks:

- Interest rate risk - an immediate parallel decrease in market interest rates of 150 basis points;
- Deterioration of asset values - an immediate decrease of 8.0% in the market value of non-fixed income assets; and
- Longevity risk - Longevity risk, 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.

(in \$000s)	Going Concern Valuation Results as at 2022-07-01	Plausible Adverse Scenario Results as at 2022-07-01		
		Interest Rate Risk	Deterioration of Asset Values	Longevity Risk
Market value of assets	\$2,701,429	\$2,760,344	\$2,533,974	\$2,701,429
Going Concern Financial Status				
Smoothed value of assets	\$2,836,474	\$2,898,334	\$2,660,646	\$2,836,474
Going concern funding target	\$2,378,296	\$2,461,630	\$2,378,283	\$2,441,193
Provision for Adverse Deviation	\$153,428	\$411,886	\$153,427	\$156,197
Funding excess (shortfall)	\$304,750	\$24,818	\$128,936	\$239,084
Estimated Employer's Current Service Cost including Provision for Adverse Deviation				
July 1, 2022	\$43,637	\$55,709	\$43,637	\$45,399
July 1, 2023	\$44,490	\$57,033	\$44,490	\$46,352
July 1, 2024	\$45,823	\$58,744	\$45,823	\$47,743

(in \$000s)	Hypothetical Wind-up and Solvency Results as at 2022-07-01	Plausible Adverse Scenario Results as at 2022-07-01		
		Interest Rate Risk	Deterioration of Asset Values	Longevity Risk
Hypothetical Wind-up Financial Position				
Market value of assets	\$2,701,429	\$2,760,344	\$2,533,974	\$2,701,429
Termination expense provision	(\$1,000)	(\$1,000)	(\$1,000)	(\$1,000)
Wind-up assets	\$2,700,429	\$2,759,344	\$2,532,974	\$2,700,429
Wind-up liabilities	\$3,738,310	\$4,834,622	\$3,738,310	\$3,905,232
Wind-up excess (shortfall)	(\$1,037,881)	(\$2,075,278)	(\$1,205,336)	(\$1,204,803)
Solvency Financial Position				
Reduction in wind-up liabilities due to value of excluded benefits	(\$1,247,060)	(\$1,874,974)	(\$1,247,060)	(\$1,362,379)
Surplus excess (shortfall)	\$209,179	(\$200,304)	\$41,724	\$157,576
Solvency ratio	1.08	0.93	1.02	1.06
Transfer ratio	0.72	0.57	0.68	0.69

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

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 include the categories 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 1.5% 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 impact on the value of assets and going concern assumptions described on the next page.

Defined Term	Description
Market value of assets	The decrease in market interest rates has been assumed to affect only the market value of the fixed income investments. The decrease is assumed to have occurred immediately on the valuation date.
Smoothed value of assets	Going concern: For purposes of determining the smoothed value of assets, 1/3 of the change in the market value of asset has been recognized in the smoothed value of assets, subject to the smoothed value of assets being between 90% and 105% of the market value of assets.
Discount rate assumption	<p>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 was therefore decreased from 7.00% to 6.70%. The discount rate used to value benefits assumed to be settled through a lump sum was not changed.</p> <p>Hypothetical wind-up and solvency: The interest rates used in the valuation were reduced by 1.50% for both benefits assumed to be purchased from an insurer and benefits assumed to be settled through a lump sum.</p>
Other assumptions	Except as mentioned above, all assumptions used were the same as those used for this valuation.
Provision for Adverse Deviations	It was assumed that the long-term benchmark bond yields would decrease by 1.5%, causing a reduction in the benchmark discount rate from 7.11% to 5.61%. This reduction, combined with a reduction in the best-estimate long-term expected return of 0.30%, results in a net increase in the level of the PfAD from 7.63% to 19.95%.

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 include the categories 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 8% 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 impact on the value of assets and valuation assumptions as described on the following page.

Defined Term	Description
Market value of assets	The decrease in the market value of the non-fixed income portion of assets is assumed to have occurred immediately on the valuation date.
Smoothed value of assets	For purposes of determining the smoothed value of assets, 1/3 of the change in the market value of assets has been recognized in the smoothed value of assets, subject to the smoothed value of assets being between 90% and 105% of the market value of assets
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 improvements³⁴ will be in line with the average improvements experienced by the Canadian population over the most recent 15-year period available, with uniform improvement rates for all future years but varying by age³⁵ and gender.

³⁴ i.e. starting one year after the valuation in this context

³⁵ Improvement rates below age 45 are set to those at age 45

Appendix H

Employer certification

With respect to the Report on the Actuarial Valuation for Funding Purposes as at July 1, 2022 of The University of Ottawa Retirement 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 not to reflect a margin for adverse deviations in the going concern valuation.
- A copy of the official plan documents and of all amendments made up to July 1, 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 January 1, 2022, and there were no special events affecting the Plan membership between January 1, 2022 and July 1, 2022.
- All events subsequent to July 1, 2022 that may have an impact on the Plan have been communicated to the actuary.

Tom Valks

Signed

Tom Valks

Name

Chief Investment Officer

Title

November 10, 2022

Date

Jennifer Doyle

Signed

Jennifer Doyle

Name

Vice-President, Finance and Administration

Title

November 10, 2022

Date



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