

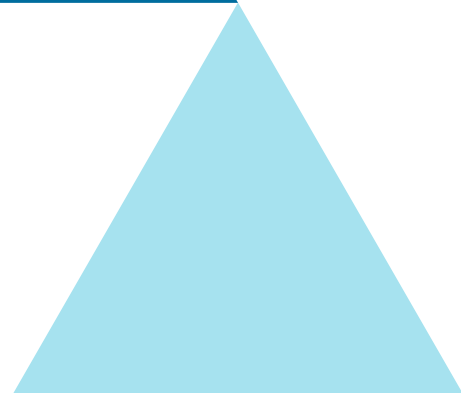
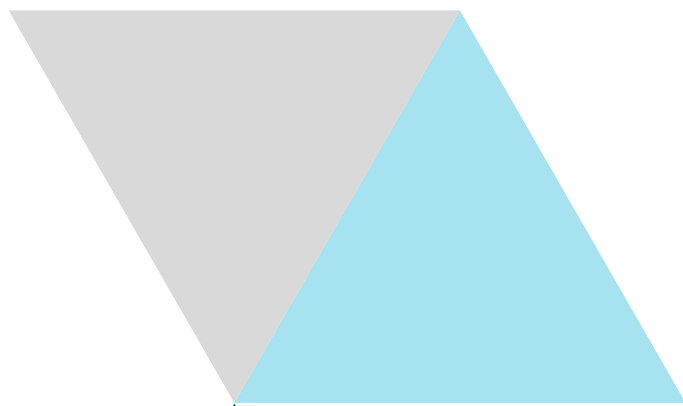
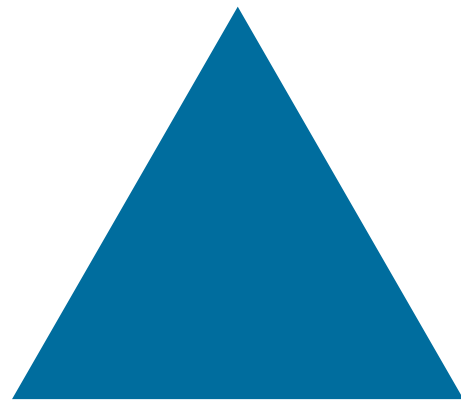
HEALTH WEALTH CAREER

THE UNIVERSITY OF OTTAWA RETIREMENT PENSION PLAN

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

NOVEMBER 2018

Financial Services Commission of Ontario 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. 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 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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SUMMARY OF RESULTS

(IN \$000S)	01.01.2018	01.01.2016
Going Concern Financial Status		
Smoothed value of assets	\$2,257,726	\$1,993,544
Going concern funding liabilities	\$1,983,454	\$1,803,879
Provision for adverse deviations in respect of the going concern liabilities	\$143,550	\$0
Funding excess (shortfall)	\$130,722	\$189,665
Hypothetical Wind-up Financial Position		
Wind-up assets	\$2,314,111	\$2,045,232
Wind-up liability	\$3,730,686	\$3,381,477
Wind-up excess (shortfall)	(\$1,416,575)	(\$1,336,245)
Wind-up ratio	62%	60%
Funding Requirements in the Year Following the Valuation ¹		
Total current service cost	\$71,801	\$67,802
Estimated members' required contributions	(\$31,855)	(\$25,619)
Estimated employer's current service cost	\$39,946	\$42,183
Provision for adverse deviations in respect of current service cost	\$5,292	\$0
Total	\$45,238	\$42,183
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	12.56% ²	12.09%
Minimum special payments	\$0	\$0 ³
Estimated minimum employer contribution	\$45,238	\$42,183
Estimated maximum eligible employer contribution	\$1,461,813	\$1,378,428
Next required valuation date	January 1, 2021	January 1, 2019

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 9.35% of pensionable earnings up to the YMPE threshold, and 14.35% of the balance of pensionable earnings up to 120% of the maximum salary paid to a professor

³ From January 1, 2017, annual minimum special payments of \$8,578,000.

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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, January 1, 2018. We are pleased to present the results of the valuation.

PURPOSE

The purpose of this valuation is to determine:

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

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

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

TERMS OF ENGAGEMENT

In accordance with our terms of engagement with 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 deviation prescribed by the Act.

- We have reflected the University decisions for determining the solvency funding requirements, summarized as follows:
 - The same plan wind-up scenario was hypothesized for both hypothetical wind-up and solvency valuations.
 - Certain excludable benefits were excluded from the solvency liabilities.
 - The solvency financial position was determined on a market value basis.

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

EVENTS SINCE THE LAST VALUATION AT JANUARY 1, 2016

Pension Plan

Since the date of the last valuation, the Plan was amended to reflect increases in members' contribution rates effective January 1, 2017 and January 1, 2018. Such increases were reflected in the last valuation as at January 1, 2016, and in a Supplementary Cost Certificate dated March 16, 2018, respectively. In addition, changes to the definitions of "spouse" and "employee" were adopted since the last valuation, but had no impact on the financial position or funding requirements of the Plan.

As a result of the above contribution rates increases, the contribution level for all active members of the Plan at January 1, 2018 is 6.60% of earnings up to 85% of the 1999 YMPE indexed at 55% of the percentage increase in the YMPE since 2003, and 10.15% of the excess earnings up to total contributory earnings of 120% of the maximum salary paid to a professor.

We are aware that members' contribution rates are scheduled to increase effective January 1, 2019, and that a plan amendment to that effect is being drafted. As a result, and as reflected in the current valuation, the contribution level for all active members of the Plan at January 1, 2019 will be 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.

In October 2018, the University approved an additional pension increase on January 1, 2019 to certain deferred pensioners, pensioners and survivors, to account for increases in inflation that were not provided as indexation in the past due to application of the Plan's indexation provisions. The additional pension increase rates will be as indicated in the table on the following page:

RETIREMENT / TERMINATION DATE	ADDITIONAL PENSION INCREASE RATE
Prior to January 1, 2003	2.3%
Between January 1, 2003 and December 31, 2003	1.0% (prorated) + 1.3%
Between January 1, 2004 and December 31, 2007	1.3%
Between January 1, 2008 and December 31, 2008	0.5% (prorated) + 0.8%
Between January 1, 2009 and December 31, 2010	0.8%
Between January 1, 2011 and December 31, 2011	0.8% (prorated)

A Plan amendment adopting this change is currently being drafted. The results presented in this report reflect the impact, as at January 1, 2018, of the additional pension increase as at January 1, 2019.

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

This valuation reflects the provisions of the Plan as at January 1, 2018 including the changes described above regarding members' contribution rates and additional pension increase. We are not aware of any other 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
Pensionable earnings increases:	3.00% + scale, adjusted for additional increase of 0.8% on 1.1.2019 and to account for known short-term negotiated or scheduled increases for various groups of employees	3.00% + scale
Actuarial basis for benefits assumed to be settled through a lump sum:	Discount rate: 2.10% Mortality rates: CPM2014 with fully generational improvements using CPM-B	Discount rate: 2.60% Mortality rates: CPM2014 with fully generational improvements using CPM-B

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

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

Regulatory Environment and Actuarial Standards

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

On July 20, 2017, the Canadian Institute of Actuaries released an Exposure Draft with proposed changes to the standards for pension commuted values ("CIA CV Standard"). The impact of any changes to the CIA CV Standard will be considered in a future actuarial valuation, once the amendments are finalized.

SUBSEQUENT EVENTS

As previously indicated, the University approved in October 2018 an additional pension increase on January 1, 2019 to certain deferred pensioners, pensioners and survivors, to account for increases to inflation that were not provided as indexation in the past due to application of the Plan's indexation provisions. The results presented in this report reflect the impact, as at January 1, 2018, of the additional pension increase as at January 1, 2019.

After checking with representatives of the University, to the best of our knowledge there have been no other events subsequent to the valuation date which, in our opinion, would have a material impact on the results of the valuation. Our valuation reflects the financial position of the Plan as of the valuation date and does not take into account any experience after the valuation date.

IMPACT OF CASE LAW

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

- The Ontario Court of Appeal's 2003 decision in *Aegon Canada Inc. and Transamerica Life Canada versus ING Canada Inc.* restricted the use of original plan surplus where two or more pension plans were merged.
- The Supreme Court of Canada's 2004 decision in *Monsanto Canada Inc. versus Superintendent of Financial Services* upheld the requirement, with retroactive effect, to distribute surplus on partial plan wind-up under the *Pension Benefits Act (Ontario)*.

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

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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)	01.01.2018	01.01.2016
Assets		
Market value of assets	\$2,314,658	\$2,045,560
Present value of future buy-back contributions	\$453	\$422
Asset smoothing adjustment	(\$57,385)	(\$52,438)
Smoothed value of assets	\$2,257,726	\$1,993,544
Going concern funding target		
Going concern liabilities:		
• Active members	\$915,047	\$878,702
• Pensioners and survivors	\$1,008,408	\$871,693
• Deferred pensioners	\$59,183	\$51,853
• Additional voluntary contributions ⁴	\$816	\$1,631
• Subtotal	\$1,983,454 ⁵	\$1,803,879
Provision for adverse deviations in respect of going concern liabilities as prescribed by the Act	\$143,550	n/a
Total	\$2,127,004	\$1,803,879
Funding excess (shortfall) ⁶	\$130,722	\$189,665

⁴ Additional voluntary contributions made by members as allowed under prior plan provisions.

⁵ Including impact of January 1, 2019 additional pension increase (\$8,539,000 at January 1, 2018)

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.

The going concern liabilities at January 1, 2018 do not include an additional margin for adverse deviations beyond the provision for adverse deviations prescribed by the Act. The going concern liabilities at January 1, 2016 include a margin for adverse deviations in the discount rate.

RECONCILIATION OF FINANCIAL STATUS (\$000S)

Funding excess (shortfall) as at previous valuation		\$189,665
Interest on funding excess (shortfall) at 6.25% per year		\$24,449
Employer's special payments, with interest		\$8,842
Expected funding excess (shortfall)		\$222,956
Net experience gains (losses)		
• Net investment return	\$45,710	
• Increases in pensionable earnings, YMPE and maximum pension	\$32,121	
• Indexation	\$4,633	
• Mortality	(\$5,006)	
• Retirement	(\$2,221)	
• Termination	(\$11,139)	
Total experience gains (losses)		\$64,098
Impact of changes in assumptions		
• Discount rate for lump sum settlements	(\$4,550)	
• Pensionable earnings increase	\$603	
Total assumption changes impact		(\$3,947)
Impact of additional pension increase at January 1, 2019		(\$8,539)
Introduction of provision for adverse deviations in respect of the going concern liabilities		(\$143,550)
Net impact of other elements of gains and losses		(\$296)
Funding excess (shortfall) as at current valuation		\$130,722

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 deviation 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)	2018	2016
Total current service cost ⁷	\$71,801	\$67,802
Estimated members' required contributions	(\$31,855)	(\$25,619)
Total estimated employer's current service cost	\$39,946	\$42,183
Employer's current service cost expressed as a percentage of members' pensionable earnings ⁸	11.09%	12.09%
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	\$5,292	N/A
• As a percentage of members' pensionable earnings	1.47%	N/A
Employer's current service cost and provision for adverse deviations in respect of current service cost		
• As a dollar amount per year	\$45,238	N/A
• As a percentage of members' pensionable earnings	12.56%	N/A

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	12.09%
Demographic changes	0.04%
Changes in members' contributions rates	(1.26%)
Changes in assumptions	0.22%
Employer's current service cost as at current valuation	11.09%

⁷ Total current service cost includes estimated future costs for escalated adjustments as defined in the Act (\$9,541,000 as of January 1, 2018).

⁸ Based on a projected payroll of \$360,175,000 for 2018 and \$349,048,000 for 2016, which include 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 funding target and current service cost shown in this report of using a discount rate which is 1% lower than that used in the valuation. 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	\$1,983,454	\$2,292,941
Current service cost		
• Total current service cost	\$ 71,801	\$88,398
• Estimated members' required contributions	(\$31,855)	(\$31,855)
Estimated employer's current service cost	\$39,946	\$56,543

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 2016 and 2017 are 6.8% and 7.9% respectively, based on the asset smoothing method used in the last filed actuarial valuation report, as per the plan text. Vested reserves as of January 1, 2018 are presented in the table on the following page and are based on the vested balances of the reserves as at January 1, 2007 and are presented below for disclosure purposes. The unfunded reserves do not reflect the contribution holidays taken in 2007 and 2008.

RESERVES (IN \$000S)	JANUARY 1, 2018
Surplus allocation (for unlocated members)	\$218
Employee contribution reduction reserve	\$28,748
Unallocated reserve	\$56,411
Excess reserve	\$9,956
Future Supplemental reserve	\$6,042
Total	\$101,375

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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)	01.01.2018	01.01.2016
Assets		
Market value of assets	\$2,314,658	\$2,045,560
Present value of future buy-back contributions	\$453	\$422
Termination expense provision	(\$1,000)	(\$750)
Wind-up assets	\$2,314,111	\$2,045,232
Present value of accrued benefits for:		
• Active members	\$1,972,671	\$1,857,218
• Pensioners and survivors	\$1,607,864	\$1,390,693
• Deferred pensioners	\$149,335	\$131,935
• Additional voluntary contributions	\$816	\$1,631
Total wind-up liability	\$3,730,686	\$3,381,477
Wind-up excess (shortfall)	(\$1,416,575)	(\$1,336,245)
Transfer Ratio	0.62	0.60

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)	01.01.2018	01.01.2016
Number of years covered by report	3 years	3 years
Total hypothetical wind-up liabilities at the valuation date (A)	\$3,730,686	\$3,381,477
Present value at the valuation date of projected hypothetical wind-up liability at the next required valuation (including expected new entrants) plus expected benefit payments until the next required valuation (B)	\$4,249,510	\$3,941,712
Hypothetical wind-up incremental cost (B – A)	\$518,824	\$560,235

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

DISCOUNT RATE SENSITIVITY

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

SCENARIO (IN \$000S)	VALUATION BASIS	REDUCE DISCOUNT RATE BY 1%
Total hypothetical wind-up liability	\$3,730,686	\$4,526,325

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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 (other than additional pension increase at January 1, 2019, which was included)
The financial position on the solvency basis needs to be adjusted for any Prior Year Credit Balance.	Not applicable.
The solvency financial position can be determined by smoothing assets and the solvency discount rate over a period of up to 5 years.	Smoothing was not used.
The benefit rate increases coming into effect after the valuation date can be reflected in the solvency valuation.	Not applicable.

FINANCIAL POSITION

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

(\$ 000 S)	01.01.2018	01.01.2016
Assets		
Market value of assets	\$2,314,658	\$2,045,560
Present value of future buy-back contributions	\$453	\$422
Termination expense provision	(\$1,000)	(\$750)
Net assets	\$2,314,111	\$2,045,232
Liabilities		
Total hypothetical wind-up liabilities	\$3,730,686	\$3,381,477
Difference in circumstances of assumed wind-up	\$0	\$0
Value of excluded benefits	(\$1,360,719)	(\$1,209,668)
Liabilities on a solvency basis	\$2,369,967	\$2,171,809
Surplus (shortfall) on a market value basis (1)	(\$55,856)	(\$126,577)
Impact of smoothing adjustment		
Liability decrease (increase) (2)	n/a	\$140,883
Asset increase (decrease) (3)	n/a	(\$52,438)
Surplus (shortfall) on a solvency basis ((1) + (2) + (3))	(\$55,856)	(\$38,132)
Solvency Ratio	0.98	0.98

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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 as set out under the Act.

On the basis of the assumptions and methods described in this report, no special payments are required. However, since the available actuarial surplus is zero, the Act requires the employer to contribute the difference between the total current service cost, including the provision for adverse deviations, and the members' required contributions. 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 ^{9, 10}			
	Monthly current service cost	Provision for adverse deviation	Total	Total – below / above YMPE threshold ¹¹
January 1, 2018	11.09%	1.47%	12.56%	9.35% / 14.35%
January 1, 2019	10.33%	1.47%	11.80%	8.70% / 13.50%
January 1, 2020	10.33%	1.47%	11.80%	8.70% / 13.50%

⁹ Expressed as a percentage of members' pensionable earnings

¹⁰ Taking into account increases in members' contributions effective January 1, 2019

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

Period beginning	Monthly employee contributions ¹²	ESTIMATED EMPLOYER'S CONTRIBUTIONS			
		Monthly provision for adverse deviations	Monthly current service cost and provision for adverse deviation	Available actuarial surplus applied ¹³	Minimum monthly contributions ¹²
January 1, 2018	\$2,654,600	\$441,400	\$3,769,800	\$0	\$3,769,800
January 1, 2019	\$2,967,500	\$454,200	\$3,646,000	\$0	\$3,646,000
January 1, 2020	\$3,038,400	\$465,400	\$3,733,000	\$0	\$3,733,000

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

¹² Taking into account increases in members' contributions effective January 1, 2019

¹³ 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.

Additional restrictions are imposed when:

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

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

Letters of Credit

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

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MAXIMUM ELIGIBLE CONTRIBUTIONS

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

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

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

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

SCHEDULE OF MAXIMUM CONTRIBUTIONS

The University is permitted to fully fund the greater of the going concern and hypothetical wind-up shortfalls (\$1,416,575,000), 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 3.08% 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 \$1,416,575,000 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 ^{14, 15}	Deficit Funding	Monthly current service cost including provision for adverse deviations ¹⁵
01.01.2018	9.35% / 14.35%	n/a	\$3,769,800
01.01.2019	8.70% / 13.50%	n/a	\$3,646,000
01.01.2020	8.70% / 13.50%	n/a	\$3,733,000

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

¹⁴ 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

¹⁵ Taking into account increases in members' contributions effective January 1, 2019

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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.

ORIGINAL REPORT SIGNED BY:

Marc Bouchard

Frédéric Gendron

Marc Bouchard

Frédéric Gendron

Fellow of the Society of Actuaries

Fellow of the Society of Actuaries

Fellow of the Canadian Institute of Actuaries

Fellow of the Canadian Institute of Actuaries

November 26, 2018

November 26, 2018

Date

Date

APPENDIX A

PRESCRIBED DISCLOSURE

DEFINITIONS

The Act defines a number of terms as follows:

DEFINED TERM	DESCRIPTION	RESULT	
Going concern assets	Total value of assets plus the sum of the following:	\$2,257,726,000	
	(a) the present value of special payments in respect of any past service unfunded liability identified in a previously filed report		
	(b) the present value of special payments in respect of any plan amendment that increases going concern liabilities		
	(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		
Going concern excess / (unfunded liability)	The amount by which the Going Concern Assets exceed the sum of the following:	\$130,722,000	
	(a) the going concern liabilities		
	(i) liabilities excluding the value of escalated adjustments		\$1,688,818,000
	(ii) liabilities in respect of escalated adjustments		\$294,636,000
	(b) the provision for adverse deviations in respect of the going concern liabilities excluding the value of escalated adjustments		\$143,550,000
	(c) Prior Year Credit Balance		\$0
Going concern funded ratio	The ratio of:	1.14	
	(a) total value of assets (excluding letters of credit) less the Prior Year Credit Balance; to		
	(b) going concern liabilities		

DEFINED TERM	DESCRIPTION	RESULT
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.	0.62
Solvency Ratio	The ratio of: (a) solvency Assets related to defined benefits and ancillary benefits plus the total amount of any letters of credit minus the Prior Year Credit Balance (b) the sum of the Solvency Liabilities related to defined benefits and ancillary benefits	0.98
Prior Year Credit Balance	Accumulated excess of contributions made to the pension plan in excess of the minimum required contributions (note: only applies if the University chooses to treat the excess contributions as a Prior Year Credit Balance).	\$0
Solvency Assets	Market value of assets including accrued or receivable income and excluding the value of any qualifying annuity contracts.	\$2,315,111,000
Solvency Asset Adjustment	The sum of:	
	(a) the difference between smoothed value of assets and the market value of assets	\$0
	(b) the present value of going concern special payments required to liquidate any past service unfunded liability	\$0
	(c) the present value of going concern special payments identified in the January 1, 2016 valuation and scheduled for 2019	\$0
	(d) the present value of going concern special payments (identified in this report) that are scheduled for payment within 6 years following the valuation date	\$0
	(e) the present value of any previously scheduled solvency special payments (excluding those identified in this report)	\$32,270,000
	(f) the total value of all letters of credit in respect of the special payments due before the valuation date, subject to the limit of 15% of solvency liabilities	\$0
		\$32,270,000

DEFINED TERM	DESCRIPTION	RESULT
Solvency Liabilities	Liabilities determined as if the plan had been wound up on the valuation date, including liabilities for plant closure benefits or permanent layoff benefits that would be immediately payable if the employer's business were discontinued on the valuation date of the report, but, if elected by the plan sponsor, excluding liabilities for,	\$2,369,967,000
	(a) any escalated adjustment,	
	(b) excluded plant closure benefits,	
	(c) excluded permanent layoff benefits,	
	(d) special allowances other than funded special allowances,	
	(e) consent benefits other than funded consent benefits,	
	(f) prospective benefit increases ¹⁶	
	(g) potential early retirement window benefit values, and	
(h) pension benefits and ancillary benefits payable under a qualifying annuity contract.		
Solvency Liability Adjustment	The amount by which Solvency Liabilities are adjusted as a result of using a solvency valuation interest rate that is the average of market interest rates calculated over the period of time used in the determination of the smoothed value of assets.	\$0
Solvency Deficiency	The amount, if any, by which the sum of:	
	(a) the Solvency Liabilities	\$2,369,967,000
	(b) the Solvency Liability Adjustment	\$0
	(c) the Prior Year Credit Balance	\$0
		\$2,369,967,000
	Exceeds the sum of	
	(d) the Solvency Assets net of estimated termination expenses ¹⁷	\$2,314,111,000
	(e) the Solvency Asset Adjustment	\$32,270,000
	\$2,346,381,000	
	\$23,586,000	

¹⁶ Solvency liabilities at January 1, 2018 include the estimated impact of additional pension increase at January 1, 2019.

¹⁷ In accordance with accepted actuarial practice, for purposes of determining the financial position, the market value of plan assets was reduced by a provision for estimated termination expenses payable from the Plan's assets that may reasonably be expected to be incurred in terminating the Plan and to be charged to the Plan.

DEFINED TERM	DESCRIPTION	RESULT
Reduced Solvency Deficiency / (Solvency Excess)	The amount by which the sum of:	
	(a) 85% of the Solvency Liabilities	\$2,014,472,000
	(b) 85% of the Solvency Liability Adjustment	\$0
	(c) the Prior Year Credit Balance	\$0
		\$2,014,472,000
	Exceeds the sum of:	
	(d) the Solvency Assets net of estimated termination expenses	\$2,314,111,000
	(e) the Solvency Asset Adjustment	\$32,270,000
		\$2,346,381,000
	(\$331,909,000)	

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:	
	Investment	Target
	Canadian Bonds and debentures	15.0%
	Non-Canadian bonds and debentures	5.0%
Alternative Investment Component (M)	The sum of the Plan's target allocation of assets (excluding those allocated to annuity contracts) meeting requirements as described in the regulations according to the investment policy applicable at the valuation date:	
	Investment	Target
	Real estate	12.5%
	Infrastructure	12.5%
	Hedge funds	10.0%
Investment Component (N)	Plan's target asset allocation for mutual, pooled or segregated funds	0.0%

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

Combined Target Asset Allocation for Fixed Income Assets (J)		
Sum of		
• Fixed Income Component (L)	20.00%	
• 0.5 x Alternative Investment Component (0.5 x M)	17.50%	
• Investment Component x Investment Component Fixed Income % (N x P)	0.00%	
• 0.5 x Investment Component x Investment Component Alternative Investment % (0.5 x N x Q)	0.00%	
		37.50%
Divided by		
• 100% - Annuity Contract Allocation (100% - R)		100.00%
Combined Target Asset Allocation for Fixed Income Assets		37.50%

Combined Target Asset Allocation for Non-Fixed Income Assets (K)	
100% – Combined Target Asset for Fixed Income Assets (100% - J)	62.50%

Duration of going-concern liabilities at valuation date	
= $(F - G) / (G \times 0.01)$ where,	13.9
G = going-concern liabilities at valuation date established using the discount rate determined for this valuation, excluding liabilities in respect of escalated adjustments	\$1,688,818,000
F = going-concern liabilities excluding liabilities in respect of escalated adjustments, established using the discount rate minus 1%	\$1,923,768,000

Benchmark Discount Rate (E)	
Base rate	0.50%
Effective yield from CANSIM Series V39056 (H)	2.26%
1.5% x Combined Target Asset Allocation for Fixed Income Assets (1.5% x J)	0.56%
5.0% x Combined Target Asset Allocation for Non-Fixed Income Assets (5.0% x K)	3.13%
Benchmark Discount Rate	6.45%

Provision for Adverse Deviations	
(A) 5.0% for a closed plan and 4.0% for a Plan that is not a closed plan	4.00%
(B) Provision based on Combined Target Asset Allocation for Non-Fixed Income Assets	4.50%
(C) Greater of zero and the	
• Duration of going concern liabilities at valuation date	13.9
Multiplied by the excess of:	
– Going concern valuation gross discount rate net of active investment management fees (D), less	6.39%
– Benchmark Discount Rate (E)	6.45%
	0.00%
Provision for Adverse Deviations (A + B + C)¹⁸	8.50%

AVAILABLE ACTUARIAL SURPLUS

The available actuarial surplus that may be used according to the Act for each year up to the next valuation date is nil. This is established, based on the amounts in this Appendix A, as the lesser of:

- The excess of the going concern assets over the sum of the going concern liabilities, the provision for adverse deviations in respect of the going concern liabilities and the Prior Year Credit Balance; and
- The excess of the solvency assets excluding the value of any letters of credits and the lesser of the Prior Year Credit Balance and minimum required employer contributions, including the provision for adverse deviations until the next required valuation, over 105% of the solvency liabilities.

¹⁸ Percentage applicable to going concern liabilities and current service cost excluding the value of escalated adjustments

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 January 1, 2021.

SPECIAL PAYMENTS

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

Present Value of Monthly Special Payments Determined as at 01.01.2016

TYPE OF DEFICIT	START DATE	SPECIAL PAYMENT	END DATE	PRESENT VALUE OF REMAINING PAYMENTS AS AT 01.01.2018	
				GOING CONCERN BASIS ¹⁹	SOLVENCY BASIS ²⁰
Solvency	01.01.2017	\$714,800	12.31.2021	n/a	\$32,270,000

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

¹⁹ Calculation only considers going concern special payments and is based on a going concern discount rate.

²⁰ Calculation considers both solvency and going concern special payments (six years only) and is based on the average solvency discount rate.

TRANSITIONAL RULES

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

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

PENSION BENEFITS GUARANTEE FUND (PBGF) ASSESSMENT

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

Solvency assets	\$2,315,111,000	(a)
PBGF liabilities	\$2,369,967,000	(b)
Solvency liabilities	\$2,369,967,000	(c)
Ontario asset ratio	100%	(d) = (b) ÷ (c)
Ontario portion of the fund	\$2,315,111,000	(e) = (a) x (d)
PBGF assessment base	\$54,856,000	(f) = max(0, (b) – (e))
Amount of additional liability for plant closure and/or permanent layoff benefits which is not funded and subject to the 2% (3% for years after 2018) assessment pursuant to s.37(4)	\$0	(g)

APPENDIX B

PLAN ASSETS

The pension fund is held by the trustee/custodian RBC Investor & Treasury Services. In preparing this report, we have relied upon audited financial statements prepared by KPMG LLP for the period from January 1, 2016 to December 31, 2017, 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 \$1,060,000 as of January 1, 2016, \$585,000 as of January 1, 2017 and \$703,000 as of January 1, 2018, reducing the respective asset values by the same amounts.

RECONCILIATION OF MARKET VALUE OF PLAN ASSETS

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

(IN \$000S)	2016	2017
January 1	\$2,045,560	\$2,078,417
PLUS		
Members' contributions	\$26,957	\$31,319
University's contributions	\$41,334	\$48,735
Investment income	\$61,239	\$62,348
Net capital gains (losses)	\$1,257	\$201,914
	\$130,787	\$344,316
LESS		
Pensions paid	\$71,798	\$76,535
Lump-sums paid	\$15,922	\$20,212
Administration and investment fees	\$10,210	\$11,328
	\$97,930	\$108,075
December 31	\$2,078,417	\$2,314,658
Gross rate of return ²¹	3.1%	12.8%
Rate of return net of expenses ²¹	2.6%	12.2%

²¹ Assuming mid-period cash flows.

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

INVESTMENT POLICY

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

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

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

	INVESTMENT POLICY			ACTUAL ASSET MIX AS AT JANUARY 1, 2018
	Minimum	Target	Maximum	
Canadian Equities	0%	5%	15%	6.5%
Foreign Equities	30%	40%	50%	41.8%
Nominal Fixed Income	15%	20%	35%	20.5%
Absolute Return Assets ²²	5%	10%	15%	8.8%
Real Return Assets ²³	15%	25%	35%	21.7%
Cash and cash equivalents	0%	0%	10%	0.7%
		100%		100%

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

²² Hedge funds

²³ Includes real estate and infrastructure.

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 January 1, 2018 recognizes the following portions of excess returns that arose during the past three years:

YEAR	PERCENTAGE OF GAINS (LOSSES) RECOGNIZED
2017:	1/3
2016:	2/3
before 2016:	3/3

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 January 1, 2018 was derived as follows:

Market value of assets		\$2,314,658,000
LESS		
Unrecognized investment gains	2017: \$123,555,000 x 2/3 =	\$82,370,000
(losses)	2016: (\$74,952,000) x 1/3 =	(\$24,985,000)
		\$57,385,000
PLUS		
Present value of future buy-back contributions		\$453,000
Smoothed value of assets		\$2,257,726,000

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 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, plus 50% of the present value of pensions, are established as a minimum actuarial liability.

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

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

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

Current Service Cost

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

The employer's 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 (economic rates in the table are annual rates).

ASSUMPTION	CURRENT VALUATION	PREVIOUS VALUATION
Discount rate:	6.25%	6.25%
Explicit expenses:	\$0	\$0
Inflation:	2.00%	2.00%
ITA limit / YMPE increases:	3.00%	3.00%
Pensionable earnings increases ²⁴ :	3.00% + scale	3.00% + scale
Post-retirement pension increases:	1.70%	1.70%
Interest on employee contributions:	6.25%	6.25%
Retirement rates:	Age-related table	Age-related table
Termination 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

²⁴ 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
Form of benefit elected:	Retirement: 100% of eligible members receive a pension from the plan Termination: 70% of eligible members receive a pension from the plan and 30% elect a lump sum transfer	Retirement: 100% of eligible members receive a pension from the plan Termination: 70% of eligible members receive a pension from the plan and 30% elect a lump sum transfer
Actuarial basis for benefits assumed to be settled through a lump sum:	Discount rate: 2.10% Mortality rates: CPM2014 with fully generational improvements using CPM-B	Discount rate: 2.60% Mortality rates: CPM2014 with fully generational improvements using CPM-B
Eligible spouse at retirement:	80%	80%
Spousal age difference:	Male 2 years older	Male 2 years older

The going concern assumptions at January 1, 2018 are best estimate and do not include a margin for adverse deviations. The going concern discount rate at January 1, 2016 includes a margin for adverse deviations.

AGE-RELATED TABLES

Based on the plan experience over the years 2008 to 2012, 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	TERMINATION		RETIREMENT*
	MALE	FEMALE	
25	10%	10%	0%
30	7%	8%	0%
35	6%	6%	0%
40	4%	5%	0%
45	3%	4%	0%
50	3%	3%	0%
55 to 60	0%	0%	20%
61 to 64	0%	0%	10%
65	0%	0%	35%
66 to 69	0%	0%	15%
70	0%	0%	100%

* 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.

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, 2018 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 2018, 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 as follows:

- APUO: 2.0% per year in 2019 and in 2020
- Non-Union and PIPSC: 1.25% in 2019

An additional salary increase of 0.8% was also reflected for all active members in 2019.

PTR and Promotional Increases

The PTR and promotional salary increases assumption is based on the Plan experience during the years 2008 to 2012.

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.

The annual rates are the same for male and female employees.

SERVICE AT VALUATION DATE	ASSUMED RATE OF INCREASE FOR THE FOLLOWING YEAR
1 year	3.5%
3 years	3.4%
5 years	3.2%
10 years	2.8%
15 years	2.4%
20 years	2.0%
25 years	1.6%
30 years	1.2%
35 years	0.8%

RATIONALE FOR ASSUMPTIONS

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

DISCOUNT RATE

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

The discount rate is comprised of the following:

- Estimated returns for each major asset class consistent with market conditions on the valuation date, the expected time horizon over which benefits are expected to be paid, and the target asset mix specified in the Plan's investment policy.
- Implicit provision for passive investment expenses (additional return due to active management, net of related fees, is assumed to be nil).
- Implicit provision for non-investment expenses determined as the average expenses paid from the fund over the recent years and taking into account input from the Plan administrator.

The discount was developed as follows:

Assumed investment return	6.39%
Passive management investment expense provision	(0.03%)
Implicit non-investment expense provision	(0.11%)
Margin for adverse deviation	n/a
Net discount rate	6.25%

INFLATION

The inflation assumption is based on market expectations of long-term inflation implied by the yields on nominal and real return bonds at the valuation date and is consistent with the Bank of Canada's inflation target.

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

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

PENSIONABLE EARNINGS

The long term economic increases are equal to the inflation assumption plus an expected 1% for productivity gains. The PTR and promotional increases scale is based on experience over the years 2008 to 2012.

POST-RETIREMENT PENSION INCREASES

The assumption is based on the Plan formula and inflation assumption above. The 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 target inflation of 2% per year.

RETIREMENT RATES

The assumption is based on experience over the years 2008 to 2012.

TERMINATION RATES

The assumption is based on experience from 2008 to 2012.

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, but the degree of future mortality improvement is uncertain. Two mortality improvement scales were recently published by the Canadian Institute of Actuaries (CIA) and may apply to Canadian pension valuations:

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

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

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

Based on the assumption used, the life expectancy of a member age 65 at the valuation date is 27.8 years for males and 29.8 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 2008 to 2012.

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. 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.

ELIGIBLE SPOUSE

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

SPOUSAL AGE DIFFERENCE

We have used a typical assumption for the spousal age difference.

APPENDIX D

METHODS AND ASSUMPTIONS – HYPOTHETICAL WIND-UP AND SOLVENCY

HYPOTHETICAL WIND-UP BASIS

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

To determine the actuarial liability on the hypothetical wind-up basis, we have valued those benefits that would have been paid had the Plan been wound up on the valuation date, with all members fully vested in their accrued benefits.

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

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

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

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

We have estimated the cost of settlement through purchase of annuities in accordance with the *Canadian Institute of Actuaries Educational Note: Assumptions for Hypothetical Wind-up and Solvency Valuations with Effective Dates Between December 31, 2017 and December 30, 2018* (the "Educational Note").

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, 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, 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 0.70%. In practice, it may be difficult to purchase indexed annuity liabilities exceeding \$200 million. The assumed indexation rate was determined after analyzing the average level of indexation expected in the future based on the implicit inflation rate²⁵, 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 deviation in the solvency and hypothetical wind-up valuations.

The assumptions are summarized in the table on the next page.

²⁵ Derived from the difference in long-term Government of Canada nominal bond and real return bond yields.

Form of Benefit Settlement Elected by Member	
Lump sum:	30% 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:	2.80% per year for 10 years, 3.30% per year thereafter
Pre-and post-retirement indexation rate:	1.28% per year for 10 years, 1.57% 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
Interest rate:	3.12% per year
Pre-and post-retirement indexation rate:	3.07% per year (for wind-up valuation) ²⁶
Retirement Age	
Maximum value:	Members are assumed to retire at the age which maximizes the value of their entitlement from the Plan, based on the eligibility requirements which have been met at the valuation date
Grow-in:	The benefit entitlement and assumed retirement age of Ontario members whose age plus service equals at least 55 at the valuation date reflect their entitlement to grow into early retirement subsidies
Other Assumptions	
Special payments:	Discounted at the average interest rate of 3.08% per year
Final average earnings:	Based on actual pensionable earnings over the averaging period
Family composition:	Same as for going concern valuation
Maximum pension limit:	\$2,944.44 increasing at 3.00% per year from 2019 (determined on the member's assumed pension commencement date)
Termination expenses:	\$1,000,000

²⁶ Reflects inflation and risk premium 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 in the year preceding the current 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, 2018, 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.

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

	01.01.2018	01.01.2016
Active Members - Academic		
Number	1,258	1,258
Total annualized pensionable earnings for the following year	\$195,873,000	\$188,512,000
Average annualized pensionable earnings for the following year	\$155,700	\$149,900
Average years of pensionable service	13.1	13.1
Average age	50.2	50.1
Accumulated contributions with interest	\$188,579,000	\$167,014,000
% of female	41%	40%
Active Members - Administrative		
Number	2,188	2,242
Total pensionable earnings for the following year	\$175,795,000	\$171,512,000
Average pensionable earnings for the following year	\$80,300	\$76,500
Average years of pensionable service	10.8	10.8
Average age	44.4	44.4
Accumulated contributions with interest	\$130,675,000	\$115,979,000
% of female	64%	63%
Deferred Pensioners		
Number	652	793
Total annual pension	\$4,738,000	\$4,223,000
Average annual pension	\$7,300	\$5,300
Average age	50.6	49.3
Pensioners and Survivors		
Number ²⁷	2,311	2,110
Total annual lifetime pension ²⁸	\$81,234,000	\$70,463,000
Average annual lifetime pension	\$35,200	\$33,400
Average age	73.2	73.1

²⁷ 1,094 Academics, 1,208 Support, and 9 identified as "Religious" as of January 1, 2018 and 1,028 Academics, 1,071 Administrative, and 11 individuals identified as "religious" as of January 1, 2016

²⁸ Statistics include indexation as of January 1, 2018 and January 1, 2016, respectively, but do not include additional pension increase as of January 1, 2019

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

	ACTIVES	DEFERRED PENSIONERS	PENSIONERS AND SURVIVORS	TOTAL
Total at 01.01.2016	3,500	793	2,110	6,403
New entrants	491			491
Terminations:				
• Transfers/lump sums	(118)	(266)		(384)
• Deferred pensions	(185)	185		0
• Pending	(4)	(5)		(9)
Deaths				
• Without survivors	(9)		(75)	(84)
• With survivors			(34)	(34)
• Pending	(1)			(1)
New survivors			34	34
Retirements	(230)	(47)	277	0
Rehire	2	(2)		0
Adjustments		(6)	(1)	(7)
Total at 01.01.2018	3,446	652	2,311	6,409

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

Age	YEARS OF PENSIONABLE SERVICE									Total
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-40	40 +	
Under 20										
20 to 24	19 \$59,052									19 \$59,052
25 to 29	162 \$65,542	32 \$65,582								194 \$65,548
30 to 34	186 \$79,039	147 \$71,439	16 \$74,246	1 *						350 \$75,590
35 to 39	200 \$93,148	183 \$91,456	84 \$82,356	4 \$90,799						471 \$90,546
40 to 44	136 \$101,115	156 \$108,908	163 \$120,905	47 \$92,313	9 \$84,658	1 *				512 \$108,667
45 to 49	83 \$106,097	116 \$105,104	175 \$131,897	101 \$125,656	25 \$111,494	13 \$85,248	1 *			514 \$118,164
50 to 54	68 \$110,296	115 \$106,928	125 \$130,253	95 \$131,675	61 \$131,085	66 \$94,635	29 \$85,752	2 *		561 \$116,665
55 to 59	35 \$124,017	64 \$112,350	88 \$123,969	65 \$126,050	47 \$138,516	144 \$111,034	27 \$103,713	9 \$91,282		479 \$118,485
60 to 64	27 \$125,874	25 \$109,555	44 \$133,746	23 \$130,332	25 \$131,360	47 \$145,836	36 \$140,136	5 \$158,320	2 *	234 \$133,114
65 +	4 \$138,548	11 \$157,479	13 \$149,140	14 \$158,997	9 \$166,993	18 \$170,161	17 \$180,065	22 \$188,853	4 \$191,769	112 \$169,643
Total	920 \$90,676	849 \$97,145	708 \$121,342	350 \$123,957	176 \$129,788	289 \$115,392	110 \$122,386	38 \$155,266	6 \$153,521	3,446 \$107,855

* Pensionable earnings with two members or less are not shown for confidentiality reason.

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

Age	DEFERRED PENSIONERS		PENSIONERS AND SURVIVORS	
	Number	Average Pension	Number	Average Pension
< 45	188	\$5,246		
45 – 49	106	\$7,209	3	*
50 – 54	133	\$10,146	2	*
55 – 59	139	\$8,850	97	\$33,175
60 – 64	50	\$5,878	375	\$30,099
65 – 69	22	\$3,135	454	\$36,517
70 – 74	7	\$4,377	467	\$42,162
75 – 79	1	*	367	\$37,201
80 – 84	1	*	259	\$33,052
85 – 89	2	*	187	\$30,965
90 – 94	3	*	79	\$24,806
95 +			21	\$18,974
Total	652	\$7,266	2,311	\$35,151

* Pensions in cells with four or less are not shown for confidentiality reason.

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 January 1, 2018.

We are aware that members' contribution rates are scheduled to increase effective January 1, 2019, and that a plan amendment to that effect is being drafted. As a result, and as reflected in the current valuation, the contribution level for all active members of the Plan at January 1, 2019 will be 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.

In addition, in October 2018, the University approved an additional pension increase on January 1, 2019 to certain deferred pensioners, pensioners and survivors, to account for increases to inflation that were not provided as indexation in the past due to application of the Plan's indexation provisions. The additional pension increase rates will be as follows:

RETIREMENT / TERMINATION DATE	ADDITIONAL PENSION INCREASE RATE
Prior to January 1, 2003	2.3%
Between January 1, 2003 and December 31, 2003	1.0% (prorated) + 1.3%
Between January 1, 2004 and December 31, 2007	1.3%
Between January 1, 2008 and December 31, 2008	0.5% (prorated) + 0.8%
Between January 1, 2009 and December 31, 2010	0.8%
Between January 1, 2011 and December 31, 2011	0.8% (prorated)

A summary of the main provisions of the Plan in effect on January 1, 2018 is presented below. This summary is not intended as a complete description of the Plan.

Background	<p>The Plan became effective September 1, 1963.</p> <p>Benefits are based on a set formula and are entirely paid for by the University.</p>
Eligibility for Membership	<p>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.</p>
Employee Contributions	<ul style="list-style-type: none"> • Effective January 1, 2018, members are required to contribute 6.60% of earnings up to 85% of the 1999 YMPE indexed at 55% of the percentage increase in the YMPE since 2003, and 10.15% of the excess earnings up to total contributory earnings of 120% of the maximum salary paid to a professor. • Effective January 1, 2019, 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. <p>For members in receipt of the University's long-term disability income plan, contributions are not required.</p>
Retirement Dates	<p>Normal Retirement Date</p> <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. <p>Early Retirement Date</p> <ul style="list-style-type: none"> • If a member has been in the Plan for at least two years, the member may choose to retire as early as age 55.
Normal Retirement Pension	<p>For service before January 1, 2004, the maximum between:</p> <ul style="list-style-type: none"> • 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. <p>For service on or after January 1, 2004, the maximum between:</p> <ul style="list-style-type: none"> • 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	<p>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).</p> <p>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).</p>

<p>Maximum Pension</p>	<p>The total annual pension payable from the Plan upon retirement, death or termination of employment cannot exceed the lesser of:</p> <ul style="list-style-type: none"> • 2% of the average of the best three consecutive years of total compensation paid to the member by the University, multiplied by total credited service; and • the maximum permitted under the Income Tax Act (\$2,944.44 per year of service in 2018), multiplied by the member's total credited service, reduced for early retirement as per the Income Tax Act, as applicable. <p>The maximum pension is determined at the date of pension commencement.</p>
<p>Death Benefits</p>	<p>Pre-retirement:</p> <ul style="list-style-type: none"> • 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. <p>Post retirement:</p> <ul style="list-style-type: none"> • 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.
<p>Termination Benefits</p>	<p>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.</p> <p>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.</p>
<p>Pension Indexation</p>	<p>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.</p> <p>Additional increases to reflect full CPI increases to the date of adjustment may be granted, provided the plan's financial position meets specific conditions.</p>

APPENDIX G

EMPLOYER CERTIFICATION

With respect to the Report on the Actuarial Valuation for Funding Purposes as at January 1, 2018 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 January 1, 2018 was provided to the actuary and is reflected appropriately in the summary of plan provisions contained herein.
- The asset information summarized in Appendix B is reflective of the Plan's assets.
- The membership data provided to the actuary included a complete and accurate description of every person who is entitled to benefits under the terms of the Plan for service up to January 1, 2018.
- All events subsequent to January 1, 2018 that may have an impact on the Plan have been communicated to the actuary.

ORIGINAL REPORT SIGNED BY:

P. Marc Joyal

Jacques Frémont

Signed

Signed

P. Marc Joyal

Jacques Frémont

Name

Name

Vice-President, Resources

Recteur et Vice-Chancelier / President and
Vice-Chancellor

Title

Title

November 22, 2018

November 22, 2018

Date

Date

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