THE COLLEGES OF APPLIED ARTS AND TECHNOLOGY PENSION PLAN

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

MARCH 2018

Financial Services Commission of Ontario and
Canada Revenue Agency Registration Number: 0589895

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

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Introduction

To The Board of Trustees of the CAAT Pension Plan

At the request of the Board of Trustees of The Colleges of Applied Arts and Technology Pension Plan (the "Board"), we have conducted an actuarial valuation of The Colleges of Applied Arts and Technology Pension Plan (the "Plan") 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; and
- The required contributions from 2018, in accordance with the *Pension Benefits Act (Ontario)* ("the Act").

The information contained in this report was prepared for the internal use of the Board of Trustees, the Sponsors' Committee, and Plan staff, 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 Section 14 of the regulations to the *Pension Benefits Act (Ontario)*, 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 that would have a material impact on the valuation results.

Terms of Engagement

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

- We have not reflected a margin for adverse deviations in the going concern valuation.
- We have reflected the Board's decisions for determining the solvency funding requirements, summarized as follows:
  - The same Plan wind-up scenario was hypothesized for both hypothetical wind-up and solvency valuations.
  - Certain excludable benefits were excluded from the solvency liabilities.
  - The solvency financial position was determined on a market value basis.

– The solvency deficiency, as defined in the Regulations to the *Pension Benefits Act (Ontario),* has been specified to be zero in accordance with Section 1.3.1(3) of the Regulations.

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

Events since the Last Valuation at January 1, 2017

Pension Plan

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

The Plan is fully funded on a going-concern basis as of January 1, 2018. Since the Plan provides for indexation adjustments in respect of post-2007 service that are contingent upon the funded status of the Plan, we have made an allowance in the Plan's actuarial liability for those adjustments that may occur prior to the filing of the next expected actuarial valuation (January 1, 2021), i.e., at January 1, 2019, 2020 and 2021.

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**
Basis used to determine lump sums	Non-indexed interest rates 2.8% per year for 10 years, 3.3% per year thereafter Partially indexed interest rates 1.7% per year for 10 years, 1.9% per year thereafter	Non-indexed interest rates 2.3% per year for 10 years, 3.7% per year thereafter Partially indexed interest rates 1.5% per year for 10 years, 2.1% per year thereafter

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

The hypothetical wind-up and solvency assumptions have been updated to reflect market conditions at the valuation date, and to exclude grow-in benefits pursuant to the Board's election to opt out of providing grow-in benefits pursuant to Section 74.1 of the Act. A summary of the hypothetical wind-up and solvency methods and assumptions is provided in Appendix D.

Regulatory Environment and Actuarial Standards

As at January 1, 2018, an amendment to the Regulations to the *Pension Benefits Act (Ontario)* made permanent the temporary exemption for plans named in Section 47.7.1 of the Regulations from requiring scheduled contributions to meet minimum contribution requirements determined by the Reference Valuation. These plans are, however, still required to prepare a Reference Valuation for disclosure purposes.

There have been no other changes to the Act or the relevant regulations which impact the funding of the Plan.

Subsequent Events

In September 2017, the Plan entered into an agreement with the Youth Services Bureau of Ottawa (YSB) for the YSB to become a participating employer of the Plan. In January 2018, YSB plan members voted in favour of joining the Plan, and active YSB members began earning benefits in the Plan as of January 1, 2018. Upon regulatory approval from the Financial Services Commission of Ontario, assets and past service liabilities under the YSB pension plan will be merged into the Plan. Our valuation does not take in to account the impact of this plan merger, the benefits earned by YSB employees in the Plan on and after January 1, 2018, nor the contributions to be made by YSB and its employees to the Plan on and after January 1, 2018. The merger is not expected to materially impact the financial position of the Plan.

After checking with representatives of the Plan, 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.

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Valuation Results – Going Concern

Financial Status – Current Valuation

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

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

(000's)	01.01.2018	01.01.2017
Assets		
Market value of assets	$10,821,000	$9,363,800
Asset smoothing adjustment	($977,400)	($457,400)
Smoothed value of assets	$9,843,600	$8,906,400
Present value of future contributions		
– Basic contributions	$3,572,300	$3,397,700
– Supplemental contributions	$1,365,600	$1,318,300
Actuarial value of assets	$14,781,500	$13,622,400
Going concern funding target		
Present value of accrued benefits for:		
– Active members	$4,188,800	$4,128,300
– Pensioners	$4,656,100	$4,381,500
– Survivors	$226,700	$229,000
– Deferred pensioners	$109,300	$104,200
– Terminations in progress	$7,900	$5,000
– Refunds	$1,000	$0
Total liabilities for accrued benefits	$9,189,800	$8,848,000
Present value of future benefits for active members	$3,282,800	$3,139,800
Provision for indexation adjustments relating to post-2007 service to the year of the next required valuation	$40,400	$33,700
Total actuarial liability	$12,513,000	$12,021,500
Funding excess (shortfall)	$2,268,500	$1,600,900

The going concern funding target is based on best-estimate assumptions and does not include a provision for adverse deviations.

Reconciliation of Financial Status

Funding excess (shortfall) as at previous valuation		$1,600,900
Interest on funding excess (shortfall) at 5.60% per year		$89,700
Recognition of additional year of supplemental contributions		$76,000
Expected funding excess (shortfall)		$1,766,600
Net experience gains (losses)		
• Investment return	$945,500	
• Increases in pensionable earnings/YMPE	$56,500	
• Termination experience	$2,200	
• Inactive cash-outs	($9,300)	
• Inflation experience	$10,200	
• Mortality experience	($2,400)	
• Retirement experience	($26,500)	
• Present value of future contributions in excess of future benefits for new entrants	$30,900	
Total experience gains (losses)		$1,007,100
Impact of changes in assumptions		($9,300)
Impact of extension of indexing in respect of post-2007 service to Jan. 1, 2021		($14,700)
Data corrections and valuation refinements		$16,400
Impact of asset smoothing		($500,300)
Net impact of other elements of gains and losses		$2,700
Funding excess (shortfall) as at current valuation		$2,268,500

Reference Valuation

Prior to January 1, 2018, pursuant to Section 4(2.2) of the Regulations to the *Act,* a going-concern valuation of the Plan using an actuarial cost method that is not a benefit allocation method, must test the present value of minimum required contributions under the Current Valuation against a valuation prepared ("the Reference Valuation") using a benefit allocation method (projected unit credit in the case of this valuation).

However, as at January 1, 2018, an amendment to the Regulations to the *Pension Benefits Act (Ontario)* made permanent the temporary exemption for plans named in Section 47.7.1 of the Regulations from requiring scheduled contributions to meet minimum contribution requirements determined by the Reference Valuation. These plans are, however, still required to prepare a Reference Valuation for disclosure purposes. Consequently, the results below are for information purposes only.

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

(000's)	01.01.2018	01.01.2017
Assets		
Market value of assets	$10,821,000	$9,363,800
Asset smoothing adjustment	($977,400)	($457,400)
Smoothed value of assets	$9,843,600	$8,906,400
Going concern funding target		
Present value of accrued benefits for:		
– Active members	$4,188,800	$4,128,300
– Pensioners	$4,656,100	$4,381,500
– Survivors	$226,700	$229,000
– Deferred pensioners	$109,300	$104,200
– Terminations in progress	$7,900	$5,000
– Refunds	$1,000	$0
– Provision for indexation adjustments relating to post-2007 service to the year of the next required valuation	$39,500	$32,900
Total liabilities for accrued benefits	$9,229,300	$8,880,900
Funding excess (shortfall)	$614,300	$25,500

The actuarial assumptions used for the Reference Valuation are identical to those used under the going-concern valuation. The going concern funding target in the Reference Valuation is based on best estimate assumptions and does not include a provision for adverse deviations.

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.

The current service cost during the year following the valuation date, compared with the corresponding value determined in the previous valuation, is as follows:

(000's)	2018	2017
Total current service cost	$283,400	$273,400
Current service cost expressed as a percentage of members' pensionable earnings	15.35%	15.34%

Discount Rate Sensitivity

The following table summarizes the effect of using a discount rate which is 1% lower than that used in the valuation on the total liability for future benefits, total liability for accrued benefits (including the provision for conditional indexation until the next valuation report is filed), the current service cost and the present value of future contributions. For the purposes of the illustration, we have not changed the interest rate used to determine commuted values upon termination of employment.

Scenario (000's)	Valuation Basis	Reduce Discount Rate by 1%
Total liability for future benefits	$12,513,000	$14,790,000
Total liability for accrued benefits	$9,229,300	$10,507,800
Current Service Cost	$283,400	$348,200
Present value of future contributions		
– basic contributions	$3,572,300	$3,878,800
– supplemental contributions	$1,365,600	$1,461,400

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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 producing the maximum wind-up liabilities on the valuation date.

There are significant difficulties in establishing appropriate assumptions for purposes of conducting a wind-up valuation for this Plan due to the size of the liabilities expected to be settled through the purchase of annuities relative to the size of the Canadian group annuity market, and the contractual cost of living adjustments provided to these members on their benefits.

The estimated cost of purchasing annuities has been determined in accordance with the Canadian Institute of Actuaries Educational Note: *Assumptions for Hypothetical Wind-Up and Solvency Valuations with Effective Dates on or after December 31, 2017 (but no later than December 30, 2018)*. The estimated cost is based on the cost of purchasing annuities of significantly smaller size that would not be affected by the capacity constraints of the Canadian group annuity market. The actual cost of setting the Plan benefits could differ, perhaps significantly, from the costs estimated on this basis.

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

(000's)	01.01.2018	01.01.2017
Assets		
Market value of assets	$10,821,000	$9,363,800
Termination expense provision	($20,000)	($20,000)
Wind-up assets	$10,801,000	$9,343,800
Present value of accrued benefits for:		
– Active members	$6,189,800	$6,143,700
– Pensioners	$6,429,100	$5,997,400
– Survivors	$289,700	$293,400
– Deferred pensioners	$167,400	$157,600
– Terminations in progress	$7,900	$5,000
– Refunds	$1,000	$0
Total wind-up liability	$13,084,900	$12,597,100
Wind-up excess (shortfall)	($2,283,900)	($3,253,300)

The wind-up liabilities for active members as of January 1, 2018 reflect the Board's election to opt out of providing grow-in benefits pursuant to Section 74.1 of the Act.

Wind-up Incremental Cost

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

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

(000's)	01.01.2018	01.01.2017
Number of years covered by report	3 years	3 years
Total hypothetical wind-up liabilities at the valuation date (A)	$13,084,900	$12,597,100
Present value of projected hypothetical wind-up liability at the next required valuation (including expected new entrants) plus benefit payments until the next required valuation (B)	$14,471,100	$14,033,700
Hypothetical wind-up incremental cost (B – A)	$1,386,200	$1,436,600

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 (000's)	Valuation Basis	Reduce Discount Rate by 1%
Total hypothetical wind-up liability	$13,084,900	$15,012,300

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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: (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.	Indexing was excluded from the solvency liabilities shown in this valuation.
The financial position on the solvency basis needs to be adjusted for any Prior Year Credit Balance.	Not applicable.
The solvency financial position can be determined by smoothing assets and the solvency discount rate over a period of up to 5 years.	Smoothing was not used.
The benefit rate increases coming into effect after the valuation date can be reflected in the solvency valuation.	Not applicable.
Section 1.3.1(3) of the Regulations to the Act state that a valuation report prepared on certain pension plans, including the Plan with an effective date on or after December 31, 2010 may specify the solvency deficiency to be a stated amount (not to be less than zero)	The solvency deficiency has been specified to be zero.

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**	**01.01.2017**
Assets		
Market value of assets	$10,821,000	$9,363,800
Termination expense provision	($20,000)	($20,000)
Net assets	$10,801,000	$9,343,800
Total hypothetical wind-up liabilities	$13,084,900	$12,597,100
Value of excluded benefits	($1,600,100)	($1,569,900)
Liabilities on a solvency basis	$11,484,800	$11,027,200
Surplus (shortfall) on a market value basis	($683,800)	($1,683,400)
Solvency ratio	0.94	0.85
Transfer ratio	0.83	0.74

As permitted under Section 1.3.1(3) of the regulations to the *Pension Benefits Act (Ontario)*, the solvency deficiency may be specified to be a stated amount, not to be less than zero. Consequently, the solvency deficiency as at January 1, 2018 has been specified to be zero.

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Minimum Funding Requirements

Scheduled Contributions

Members must contribute an amount equal to the sum of the following in 2018:

- 11.20% of pensionable earnings up to the YMPE, plus
- 14.80% of pensionable earnings in excess of the YMPE.

Consistent with the Plan's Funding Policy, the total scheduled member contribution rate consists of a 8.20%/11.80% basic contribution rate and a supplemental contribution rate of 3% of pensionable earnings. Employers are required to match member scheduled contributions.

The table below summarizes the estimated total contributions (by members and employers) for the year, in comparison to the estimated total contributions as of the last valuation:

(000's)	2018	2017
Members' contributions[1]	$230,200	$221,600
Employers' contributions	$230,500	$222,300
Total contributions	$460,700	$443,900
Payroll for year (excludes LTD's)[2]	$1,845,800	$1,781,900
Total contributions as a % of payroll	24.96%	24.91%

[1] Member contributions are expected to be slightly lower than employer contributions due to scheduled phase-in of contributions for former ROM Plan members that ends in 2018.

[2] Annual member pensionable earnings capped at maximum allowable for accruing benefits in the Plan under the Income Tax Act.

As illustrated in Section 2, the Plan is fully funded on a going-concern basis under the Current Valuation. In addition, the solvency deficiency has been specified to be zero. Consequently, no additional special payments are required to be made in addition to the scheduled contributions.

The *Act* prescribes the minimum contributions that members and employers 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 and special payments to fund any going concern or solvency shortfalls. However, as at January 1, 2018, an amendment to the Regulations to the *Pension Benefits Act (Ontario)* made permanent the temporary exemption for plans named in Section 47.7.1 of the Regulations from requiring scheduled contributions to meet minimum contribution requirements determined by the Reference Valuation.

In our opinion, the contributions being made to the Plan are sufficient to meet the requirements of the *Act*.

Other Considerations

Differences Between Valuation Bases

There is no provision in the Plan's scheduled contributions to fund the hypothetical wind-up deficit. Consequently, the Plan is likely to remain under-funded on a wind-up basis unless there are strong investment returns and/or significant increases in long-term nominal and real interest rates.

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.

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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 *Pension Benefits Act (Ontario)* and Regulations.

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

March 27, 2018

Date

Manuel Monteiro
Fellow of the Society of Actuaries
Fellow of the Canadian Institute of Actuaries

March 27, 2018

Date

APPENDIX A

Prescribed Disclosure

Definitions

The Act defines a number of terms as follows:

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 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.	0.83
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 Company chooses to treat the excess contributions as a Prior Year Credit Balance).	$0
Solvency Assets (000's)	Market value of assets including accrued or receivable income and excluding the value of any qualifying annuity contracts.	$10,821,000
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 (including those identified in this report) within 6 years following the valuation date	$0
	(c) the present value of any previously scheduled solvency special payments (excluding those identified in this report)	$0
	(d) the face value of the letter of credit	$0
		$0

Defined Term	Description	Result
Solvency Liabilities (000's)	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, (a) any escalated adjustment, (b) excluded plant closure benefits, (c) excluded permanent layoff benefits, (d) special allowances other than funded special allowances, (e) consent benefits other than funded consent benefits, (f) prospective benefit increases, (g) potential early retirement window benefit values, and (h) pension benefits and ancillary benefits payable under a qualifying annuity contract.	$11,484,800
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 (000's)	The amount, if any, by which the sum of:	
	(a) the Solvency Liabilities	$11,484,800
	(b) the Solvency Liability Adjustment	$0
	(c) the Prior Year Credit Balance	$0
		$11,484,800
	Exceeds the sum of	
	(d) the Solvency Assets net of estimated termination expenses[3]	$10,801,000
	(e) the Solvency Asset Adjustment	$0
		$10,801,000
	(f)	$683,800
	In accordance with Section 1.3.1(3) of the Regulations, the Solvency Deficiency can be specified to be an amount less than (f) above, not to be less than zero	The solvency deficiency has been specified to be $0

[3] 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.

Timing of Next Required Valuation

In accordance with Section 14 of the regulations to the *Pension Benefits Act (Ontario),* the next valuation date of the Plan would be required as of no later than January 1, 2021, or as at the date of an earlier amendment to the Plan.

Special Payments – Current Valuation

Since there is no going-concern funding shortfall under the Current Valuation, no going-concern special payments are required. Also, since the solvency deficiency has been specified to be zero, no solvency special payments are required.

Pension Benefit Guarantee Fund (PBGF) Assessment

In accordance with Section 37(1.1) of the regulations to the *Pension Benefits Act (Ontario)*, the Plan is not subject to assessment by the Pension Benefits Guarantee Fund.

APPENDIX B

Plan Assets

The pension fund is held by the Plan. In preparing this report, we have relied upon the draft auditors' report for 2017 without further audit. Customarily, this information would not be verified by a plan's actuary. We have reviewed the information for internal consistency and we have no reason to doubt its substantial accuracy.

Reconciliation of Market Value of Plan Assets

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

(000's)	2017
January 1	$9,388,227[4]
PLUS	
Members' contributions	$207,272
Employers' contributions	$207,913
Service purchases	$9,232
Transfer from other pension plans	$19,806
Investment income	$1,466,149
	$1,910,372
LESS	
Pensions paid	$422,956
Lump-sums paid	$33,636
Transfer to other pension plans	$0
Administration and investment fees	$21,035
	$477,627
December 31	$10,820,972
Gross rate of return[5]	15.6%
Rate of return net of expenses[5]	15.4%

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.

[4] The market value of Plan assets at January 1, 2017 was revised in the auditor's report following the filing of last year's actuarial valuation report. Therefore, the amount does not match the January 1, 2017 market value of assets in last year's actuarial valuation report nor Sections 2 - 4 of this report.

[5] Assuming mid-period cash flows.

Investment Policy

The plan administrator has adopted a statement of investment policy and procedures. This policy is intended to provide guidelines for the managers 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 December 31, 2017
	Minimum	Target	Maximum	
Canadian Equities	3.0%	5.0%	10.0%	4.9%
Global Equities	20.0%	22.0%	40.0%	34.5%
Emerging Market Equities	8.0%	10.0%	12.0%	10.0%
Private Equities	5.0%	15.0%	20.0%	6.2%
Commodities	3.0%	5.0%	7.0%	5.0%
Infrastructure Real Estate	10.0%	20.0%	25.0%	13.2%
Nominal Long Bonds	10.0%	13.0%	25.0%	16.0%
Nominal Universe Bonds	3.0%	5.0%	7.0%	4.8%
Real Return Bonds	3.0%	5.0%	7.0%	5.0%
Cash and Cash Equivalents	0.0%	0.0%	0.0%	0.4%
		100.0%		100.0%

APPENDIX C

Methods and Assumptions – Going Concern

Determining the January 1, 2018 Liabilities

The effective date of the data at this valuation is December 31, 2016 (one year prior to the valuation date). In determining the actuarial liabilities as at January 1, 2018, we first calculated the actuarial liabilities as at January 1, 2017, and then projected the liabilities to January 1, 2018. The one year projection reflected any known as well as anticipated experience during 2017 with respect to benefit payments, contributions, and YMPE growth and inflation. We assumed that salary growth would be consistent with the last valuation assumption. For active members on LTD we reflected the deemed salary increases. We also compared the actual termination and retirement experience with what was expected based on our decrement rates. However, the difference was not significant enough to require special adjustments in the projection. For purposes of this valuation, we believe that this projection process produces results that are within acceptable tolerances from the results that would have been determined using actual membership data (at December 31, 2017).

Valuation of Assets

For this valuation, we have continued to use an adjusted market value method for purposes of determining the actuarial value of the plan assets, whereby investment gains and losses relative to the discount rate are recognized on a linear basis over five years.

The table below shows the calculation of the gain/(loss) on assets under the smoothing approach:

($000)	**2014**	**2015**	**2016**	**2017**
Market value of assets at beginning of year	$7,127,136	$7,964,803	$8,592,301	$9,388,227[6]
Net cash flows in the year	$48,522	$25,757	$117,680	($12,369)
Expected return on assets	$414,781	$462,706	$493,115	$525,394
Expected value of assets at end of year	$7,590,439	$8,453,266	$9,203,096	$9,901,252
Actual value of assets at end of year	$7,964,803	$8,592,301	$9,388,227	$10,820,972
Gain/(loss)	$374,364	$139,035	$185,131	$919,720
Liability discount rate at the beginning of the year	5.8%	5.8%	5.7%	5.6%

[6] The market value of Plan assets at January 1, 2017 was revised in the auditor's report following the filing of last year's actuarial valuation report. Therefore, the amount does not match the January 1, 2017 market value of assets in last year's actuarial valuation report nor Sections 2 - 4 of this report.

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

(000's)		
Market value of assets		$10,820,972
LESS		
Total Investment Gain/(Loss)	2014: $374,364 x 20% =	$74,873
	2015: $139,035 x 40% =	$55,614
	2016: $185,131 x 60% =	$111,079
	2017: $919,720 x 80% =	$735,776
		$977,342
Smoothed value of assets		$9,843,630

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

Current Valuation

For purposes of the Current Valuation, we have continued to use the modified aggregate actuarial cost method. Under this method, the funding target is determined as the present value of benefit cash flows expected to be paid in respect of service accrued prior to the valuation date, plus service expected to accrue to currently active members in the future, based on projected earnings.

The funding excess or funding shortfall, as the case may be, is the difference between the market or smoothed value of assets plus the present value of contributions expected to be made by employers and members and the funding target. A funding excess indicates that the value of assets and expected contributions and investment earnings are expected to be sufficient to meet the cash flows in respect of benefits accrued to the valuation date and after 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 and expected contributions is not expected to be sufficient to meet the Plan's cash flow requirements in respect of accrued and future benefits, absent additional contributions.

As required under the Act, a funding shortfall must be amortized over no more than 15 years through special payments. A funding excess may, from an actuarial standpoint, be applied immediately to reduce required employer and member contributions unless precluded by the terms of the Plan or by legislation.

This method does not produce a normal cost in the usual sense. Rather, it determines whether or not the contributions expected to be made in the future by the members and the employers together with the assets of the Plan and investment income thereon are expected to be sufficient to meet the obligations of the Plan.

The present value of future basic contributions has been determined on a closed group basis. The present value of future supplemental contributions has been determined on an open group basis over a 15 year period.

The *funding excess* or *unfunded liability*, as the case may be, is the difference between the actuarial value of assets and the actuarial liability.

Reference Valuation

For purposes of the Reference Valuation, we have continued to use the projected unit credit actuarial cost method. Under this method, the funding target is determined as the present value of benefit cash flows expected to be paid in respect of service accrued prior to the valuation date, based on projected earnings. For each individual Plan member, accumulated contributions with interest are established as a minimum actuarial liability.

The projected unit credit actuarial cost method used for the purposes of the Reference 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.

Under the Reference Valuation, 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.

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 of the group remains constant.

Actuarial Assumptions – Going Concern Basis

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

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

Assumption	Current valuation	Previous valuation
Discount rate:	5.60%	5.60%
Inflation:	2.00%	2.00%
ITA limit / YMPE increases:	3.00%	3.00%
Pensionable earnings increases:	3.75%	3.75%
Indexing:	1.50%	1.50%
Interest on member contributions:	2.30%	2.30%
Retirement rates (active members):	4.9% per year prior to unreduced age, 14.8% per year on or after unreduced age, revised age-related table at ages 65 to 71 (see below)	4.9% per year prior to unreduced age, 14.8% per year on or after unreduced age, revised age-related table at ages 65 to 71 (see below)
Retirement rates (deferred members)	Age 55	Age 55
Retirement rates (LTD members)	Age 65	Age 65
Termination rates:	Service-based table (see below)	Service-based table (see below)
Proportion of terminating members electing a lump sum	80%	80%
Basis used to determine lump sums	<u>Mortality rates</u> CPM2014 mortality table with projection scale CPM-B <u>Non-indexed interest rates</u> 2.8% per year for 10 years, 3.3% per year thereafter <u>Partially indexed interest rates</u> 1.7% per year for 10 years, 1.9% per year thereafter	<u>Mortality rates</u> CPM2014 mortality table with projection scale CPM-B <u>Non-indexed interest rates</u> 2.3% per year for 10 years, 3.7% per year thereafter <u>Partially indexed interest rates</u> 1.5% per year for 10 years, 2.1% per year thereafter

Mortality rates at valuation date:	Pre-Retirement 55% of the rates of the 2014 Public Sector Canadian Pensioners Mortality Table (CPM2014Publ) Post-Retirement 105% of the rates of the 2014 Public Sector Canadian Pensioners Mortality Table (CPM2014Publ)	Pre-Retirement 55% of the rates of the 2014 Public Sector Canadian Pensioners Mortality Table (CPM2014Publ) Post-Retirement 105% of the rates of the 2014 Public Sector Canadian Pensioners Mortality Table (CPM2014Publ)
Future mortality improvements:	Fully generational using Scale CPM-B	Fully generational using Scale CPM-B
Disability rates:	None	None
Eligible spouse at retirement:	85% of male members and 65% of female members	85% of male members and 65% of female members
Spousal age difference:	Male 3 years older	Male 3 years older
Rate of part-time service accrual	Assume same rate of service accrual as previous year	Assume same rate of service accrual as previous year

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

Retirement Rates

Retirement rates on or after age 65 are summarized in the following table:

Age	Rate
65	35%
66	17%
67	17%
68	17%
69	30%
70	50%
71	100%

Termination Rates

Sample rates from the termination assumption are as follows:

Service	Rate
< 1	5.90%
1	5.15%
2	4.30%
3	3.70%
4	3.20%
5	2.70%
6	2.30%
7	2.00%
8	1.80%
9	1.65%
10	1.55%
11	1.50%
12	1.40%
13	1.30%
14	1.20%
15	1.10%
16	1.05%
17-29	1.00%
30+	0.00%

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 2016 earnings and assumed that such pensionable earnings will increase at the assumed rate.

Rationale for Assumptions

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

Discount Rate

We have discounted the expected benefit payment cash flows using the expected investment return on Plan assets. 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:

– A long-term expected return on Plan assets reduced by:
– An implicit provision for expenses determined as the average rate of investment and administrative expenses paid from the fund over the last three years.

The discount rate was developed as follows:

Gross expected return on Plan assets	6.00%
Implicit provision for expenses	(0.40%)
Margin for adverse deviation	0.00%
Net discount rate	5.60%

The long-term expected return on Plan assets was derived based on expected returns for each of the major asset classes based on market conditions at the valuation date and the target asset mix specified in the Plan's investment policy.

The Board has established a detailed funding policy that describes how contributions and benefits (including post-retirement indexation) should be adjusted, depending on the financial position of the Plan. The funding policy also describes the size of the margin to be used in the going-concern valuations of the Plan, again depending on the financial position of the Plan.

Under the funding policy, the margin is used as (1) a mechanism to reduce the frequency and magnitude of adjustments to contribution and benefit levels and (2) to further the goal of equity between different generations of plan members and equity between the employers whose employment size and patterns will evolve differently over time. Although benefit security is a goal of the Sponsors of the Plan, it is less critical than the above factors in determining the size of the margin given the nature of the employers and the very low probability that the Plan would be wound up in the foreseeable future.

Based on the current financial position of the Plan, the funding policy indicates that no margins should be used in the valuation. The rationale for no margins in the current situation is as follows. Current members and employers are already making significant contributions to the Plan. If the going-concern basis is too conservative, it will likely result in the current generation of plan members and employers paying too much for their generation's benefits, with the excess funds generated being at least partly used to subsidize the benefits of subsequent generations. Conversely, if the going-concern basis is too aggressive, it will likely result in the current generation being subsidized by the subsequent generation. This suggests that the most appropriate way to fund the Plan in the current circumstance is to use best estimate assumptions (i.e. no margins for adverse deviations).

In accordance with the funding policy, should the financial position of the Plan improve in the future beyond certain thresholds, a part of the experience gains would be used to reduce contribution levels and to grant any past indexation increases that had been missed. The remaining portion of the gains would be used to create margins for adverse deviations and explicit reserves in the going-concern valuation. In the event of subsequent experience losses, the margins for adverse deviations and explicit reserves would be drawn down and therefore reduce the magnitude of required contribution increases and/or benefit reductions. While the use of margins and reserves in this fashion will likely result in some transfer of wealth between generations when the Plan is well funded, this is considered less important than the goal of reducing the magnitude of contribution and benefit adjustments. The inter-generational equity goal is considered less important in circumstances when the Plan is well funded because such transfers are being borne by members and employers who are benefiting through lower future contributions and/or higher benefits.

Inflation

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

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

The assumption is based on the historical average productivity over the last 40 years of 1% per year and the underlying inflation assumption.

Pensionable Earnings

The assumption is based on general wage growth assumptions increased by our best estimate of future merit and promotional increases over general wage growth considering industry averages.

Indexing

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

Retirement Rates

The assumption is based on experience over the years 2008 to 2013. LTD members are assumed to retire at age 65.

Termination Rates

The assumption is based on experience over the years 2008 to 2013.

Mortality Rates

The assumption is based on experience over the years 2008 to 2013.

Based on the assumption used, the life expectancy of a retired member age 65 at the valuation date is 22.5 years for males and 24.4 years for females.

Future Mortality Improvements

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.

Interest on Member Contributions

The assumption is based on Plan terms and the Government of Canada long bond yields.

Disability Rates

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

Eligible Spouse

The assumption is based on an industry standard for non-retired members. For retired members, the actual marital status is used.

Spousal Age Difference

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

Proportion of Terminating Members Electing a Lump Sum and Basis Used to Determine Lump Sums

The percentage of terminating active members assumed to elect a lump sum is based on experience over the years 2007 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 date.

APPENDIX D

Methods and Assumptions – Hypothetical Wind-up and Solvency

The hypothetical wind-up and solvency liabilities at January 1, 2018 were determined based on a projection of a valuation performed using membership data as of December 31, 2016. Please refer to Appendix C for a description of the methodology.

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. For the purposes of the hypothetical wind-up valuation, the plan wind-up is assumed to occur in circumstances that maximize the actuarial liability.

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.

No benefits payable on plan wind-up were excluded from our calculations.

Upon Plan wind-up, members are given options for the method of settling their benefit entitlements. The options vary by eligibility, 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.

However, there is virtually no data available to provide credible guidance on the cost of a purchase of indexed annuities or annuities for a plan of this size in Canada. The estimated cost of purchasing annuities has been determined in accordance with the Canadian Institute of Actuaries Educational Note: *Guidance for Assumptions for Hypothetical Wind-Up and Solvency Valuations Update – Effective December 31, 2017, and applicable to Valuations with Effective Dates on or after December 31, 2017 (but no later than December 30, 2018)*. The estimated cost is based on the cost of purchasing annuities of significantly smaller size that would not be affected by the capacity constraints of the Canadian group annuity market. The actual cost of setting the Plan benefits could differ, perhaps significantly, from the costs estimated on this basis.

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

The assumptions are as follows:

Form of Benefit Settlement Elected by Member	
Lump sum	70% of active members under age 55, and 40% of active members over age 55, elect to receive their benefit entitlement in a lump sum
Annuity purchase	All remaining members are assumed to elect to receive their benefit entitlement in the form of a deferred or immediate pension. These benefits are assumed to be settled through the purchase of deferred or immediate annuities from a life insurance company.
Basis for Benefits Assumed to be Settled through a Lump Sum	
Mortality rates:	100% of the rates of the 2014 Canadian Pensioners Mortality Table (CPM2014) with fully generational improvements using CPM Scale B
Interest rate:	2.8% per year for 10 years, 3.3% per year thereafter
Partially indexed interest rates:	1.7% per year for 10 years, 1.9% per year thereafter
Basis for Benefits Assumed to be Settled through the Purchase of an Annuity	
Mortality rates:	100% of the rates of the 2014 Canadian Pensioners Mortality Table (CPM2014) with fully generational improvements using CPM Scale B
Adjustment to mortality rates:	No adjustment
Interest rate:	3.02% per year based on a duration of 11.1 years determined for the liabilities assumed to be settled through the purchase of an annuity.
Partially indexed interest rate:	0.66% per year based on a duration of 11.1 years determined for the liabilities assumed to be settled through the purchase of an annuity
Retirement Age	
Maximum value:	Members are assumed to retire at the age which maximizes the value of their entitlement from the Plan based on the eligibility requirements which have been met at the valuation date
Grow-in:	Grow-in benefits have not been valued, as an election has been made to exclude grow-in benefits for members of the Plan, as permitted for jointly sponsored pension plans per Section 74.1 of the Act
Other Assumptions	
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 per year
Termination expenses:	$20,000,000

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

Because the settlement of all benefits on wind-up is assumed to occur on the valuation date and is assumed to be uncontested, the provision for termination expenses does not include custodial, investment management, auditing, consulting and legal expenses that would be incurred between the wind-up date and the settlement date or due to the terms of a wind-up being contested. Expenses associated with the distribution of any surplus assets that might arise on an actual wind-up are also not included in the estimated termination expense provisions.

In determining the provision for termination expenses payable from the Plan's assets, we have assumed that the Plan sponsors 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.

Actual fees incurred on an actual Plan wind-up may differ materially from the estimates disclosed in this report.

Incremental Cost

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

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

- Members terminate, retire and die consistent with the termination, retirement and mortality rates used for the going concern valuation.
- Pensionable earnings, the Income Tax Act pension limit and the Year's Maximum Pensionable Earnings increase in accordance with the related going concern assumptions.
- Active members accrue pensionable service in accordance with the terms of the Plan.
- To accommodate for new entrants to the Plan, we have added to the projected liability an amount equal to the liability of new entrants that have joined the Plan since the previous valuation. For each active member whose membership is assumed to terminate, we have assumed a new active member joins the Plan. The demographics and earnings of the new entrants are consistent with the new entrants hired over the past year.
- 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 excluded the value of escalated adjustments from the solvency liabilities.

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 December 31, 2016 (one year prior to the valuation date), provided by The Colleges of Applied Arts and Technology Pension Plan.

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.

	31.12.2016	31.12.2015
Active Members (including LTD)		
Number	26,379	25,822
Number of members on LTD	493	521
Percentage male	40%	40%
Average age	47.7	47.9
Average pensionable service (with buyback service)	8.7 years	8.8 years
Total pensionable service (with buyback service)	229,185 years	228,207 years
Number with buyback service	4,344	4,419
Total buyback service	11,673 years	11,793 years
Total buyback contributions	$73,243,900	$73,009,600
Average annual salary	$78,174	$76,810
Total regular contributions with interest	$1,725,877,800	$1,637,761,800
Deferred Pensioners		
Number	3,073	2,616
Percentage male	40%	39%
Average age	46.6	47.6
Average annual pension	$3,900	$4,200
Average bridge pension	$1,200	$1,300
Terminations in progress[1]		
Number	386	228
Percentage male	42%	39%
Average age	56.7	55.3
Average annual lifetime pension	$3,200	$4,300
Average bridge pension	$1,000	$1,200
Total contributions with interest	$3,700,700	$2,814,100

(1) ”Termination in progress” refers to members who have ceased employment, received a statement of benefit, but have not yet made an election.

Membership Data (continued)

	31.12.2016	31.12.2015
Retired Members		
Number	13,278	12,714
Percentage male	46%	47%
Average age	72.0	71.8
Average annual lifetime pension payable	$27,800	$27,300
Average bridge pension	$8,000	$7,900
Number with bridge pension	2,387	2,349
Total pensions paid	$388,624,540	$365,272,010
Survivors		
Number	1,771	1,763
Percentage male	20%	19%
Average age	78.8	78.6
Average annual lifetime pension payable	$13,500	$13,300
Total pensions paid	$23,922,965	$23,404,783
Non-vested Refunds		
Number	153	159
Percentage male	53%	52%
Average age	57.1	55.8
Total contributions with interest	$912,635	$937,368

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

	Actives	**Deferred Vested**	**Retired Members**	**Survivors**	**Terminations in Progress**	**Refunds**	**Total**
Total at 31.12.2015	25,822	2,616	12,714	1,763	228	159	43,302
New entrants	2,674						2,674
Return to active	35	(27)	(2)		(5)	(1)	-
Terminations:							
– deferred pensions	(932)	934			(2)		-
– in progress	(251)	(19)			271	(1)	-
– paid out	(136)	(365)			(113)	(4)	(618)
Benefit Expired			(10)				(10)
Retirements	(798)	(51)	851		(2)		-
Deaths, no survivor	(28)	(6)	(151)	(99)	9		(275)
Deaths with survivor	(6)		(118)	124			-
Data Corrections	(1)	(9)	(6)	(17)			(33)
Total at 31.12.2016	26,379	3,073	13,278	1,771	386	153	45,040

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

	Years of Pensionable Service								
Age	**0-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35+**	**Total**
< 25	211								211
	$40,281								$40,281
25-29	1,126	70							1,196
	$54,216	$61,518							$54,643
30-34	1,865	553	79						2,497
	$61,695	$67,028	$68,073						$63,078
35-39	1,746	818	433	49					3,046
	$66,397	$74,014	$72,914	$75,253					$69,511
40-44	1,650	788	661	306	25				3,430
	$70,650	$80,024	$82,231	$83,244	$78,204				$76,214
45-49	1,738	740	683	412	162	84			3,819
	$72,362	$87,405	$90,762	$90,666	$86,426	$78,084			$81,265
50-54	1,619	798	772	525	277	424	137	1	4,553
	$75,577	$85,291	$91,057	$91,485	$89,749	$83,452	$81,193	*	$83,505
55-59	1,270	600	652	561	281	479	245	59	4,147
	$75,258	$87,274	$93,615	$93,446	$95,093	$91,544	$90,087	$72,192	$86,401
60-64	761	392	417	361	164	283	183	104	2,665
	$78,968	$88,686	$92,616	$93,079	$91,487	$90,046	$95,976	$86,851	$87,867
65-69	230	103	116	87	34	75	56	58	759
	$77,017	$96,416	$99,959	$94,695	$101,803	$93,705	$99,760	$108,066	$91,992
70 +	17	7	8	8	3	8		5	56
	$69,410	$86,197	$103,685	$88,214	$105,436	$86,689		$95,597	$85,828
Total	12,233	4,869	3,821	2,309	946	1,353	621	227	26,379
	$68,650	$81,204	$87,850	$90,738	$91,247	$87,950	$90,732	$88,637	$78,174

* Salary is not displayed to preserve confidentiality

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

	Deferred Pensioners		Retired Members		Survivors	
Age	**Number**	**Average Pension**	**Number**	**Average Pension**	**Number**	**Average Pension**
< 30	237	$565			2	$1,785
30 – 34	315	$1,404				
35 – 39	371	$2,494				
40 – 44	404	$3,298			7	$13,101
45 – 49	464	$4,425			1	*
50 – 54	567	$5,482	60	$32,997	10	$14,156
55 – 59	375	$4,950	656	$30,750	34	$19,401
60 – 64	255	$6,272	1,922	$32,907	84	$18,272
65 – 69	60	$4,768	3,286	$30,931	156	$18,626
70 – 74	21	$3,948	3,002	$29,551	284	$16,626
75 – 79	3	$27,756	2,066	$24,162	331	$13,604
80 – 84			1,261	$21,336	367	$12,901
85 – 89			711	$17,504	291	$10,511
90 – 94	1	*	261	$14,685	171	$8,691
95 – 99			52	$13,643	32	$6,942
100+			1	*	1	*
Total	**3,073**	**$3,874**	**13,278**	**$27,833**	**1,771**	**$13,508**

* Pension amounts are not displayed to preserve confidentiality

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 Colleges of Applied Arts and Technology Pension Plan. 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. Since the previous valuation, the Plan has not been amended.

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

Background	The Plan became effective July 1, 1967. Benefits are based on a set formula and are paid for by the members and participating employers. The Plan is named in Section 47 of the Regulations to the *Pension Benefits Act (Ontario)* as a jointly sponsored pension plan.
Eligibility for Membership	A full-time employee must join the Plan upon employment. A part-time employee may join the Plan immediately on hire.
Member Contributions	Members who contribute to the Canada Pension Plan are required to contribute an amount equal to the sum of the following: – 11.2% of pensionable earnings up to the YMPE; plus – 14.8% of pensionable earnings in excess of the YMPE. Contributions in respect of earnings above the earnings limit ($166,787 in 2018) are directed to the RCA. The earnings limit is the earnings level at which the pension accrued in the year (calculated based on current year earnings and YMPE only) is equal to the maximum pension limit ($2,944.44 in 2018). Members who are receiving benefits under a long term disability plan or are disabled under the Worker’s Compensation Act are not required to contribute to the Plan.
Employer Contributions	The employers are required to match the member contributions.

Retirement Dates	Normal Retirement Date – The normal retirement date is the last day of the month coincident with or next following the member's 65th birthday. Early Retirement Date – A member may choose to retire early on the last day of the month coincident with or next following the earliest of – Age 55 with 2 years of Plan membership; – Age 50 with 20 years of credited service; or – Age plus years of credited service totalling 85 years.
Normal Retirement Pension	<u>Basic Benefit</u> 1.3% of the annualized average pensionable earnings for the 60 consecutive months for which they are the highest, up to the average of the YMPE during the last 5 calendar years PLUS 2.0% of the excess, if any, of the member's annualized average pensionable earnings for the 60 consecutive months for which they are the highest, in excess of the average of the YMPE during the last 5 calendar years MULTIPLIED BY The member's total years of credited service. <u>Supplemental Benefit (payable to age 65)</u> 0.7% of the annualized average pensionable earnings for the 60 consecutive months for which they are the highest, up to the average of the YMPE during the last 5 calendar years MULTIPLIED BY The member's total years of credited service.
Early Retirement Pension	If a member retires early, the member will be entitled to a pension that is calculated the same way as for a normal retirement. The basic pension and supplemental benefit payable, however, will be reduced by ¼% per month for each month that the member's early retirement precedes the earliest date on which the member would have attained the following if the member had continued employment to such date: – Age 65; – Age 60 with 20 years of credited service; or – Age plus years of credited service totalling 85 years.
Maximum Pension	The total annual pension payable from the Plan upon retirement, death or termination of employment cannot exceed the lesser of: – 2% of the average of the best three consecutive years of total compensation paid to the member by the employer, multiplied by years of credited service; and – The defined benefit limit under the *Income Tax Act*, multiplied by the member's years of credited service. The limit in respect of pre-1990 service credited after June 7, 1990 is 2/3rds of the defined benefit limit. The maximum pension is subject to minimum early retirement reductions as required under the *Income Tax Act.* The maximum pension is determined at the date of pension commencement.

Death Benefits	Pre-retirement: – If a member dies before the normal retirement date and before any pension payments have begun, the member's spouse, or beneficiary if there is no spouse, will receive a lump sum settlement equal to the value of the benefits to which the member would have been entitled had employment terminated on the date of death. If the deceased member has children under the age of 18 and does not have a spouse, 50% of the member's accrued pension shall be divided equally among the children under 18. The beneficiary or estate will then 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, less the value of the children's benefits. Post retirement: – The normal form of payment is a lifetime pension. For a member with a qualifying spouse at death, the normal form is a joint and survivor 60% pension.
Termination Benefits	A deferred lifetime pension, based on the member's earnings and years of credited service up to the date of termination. Deferred pensions are payable commencing at age 65, subject to a 5% per annum reduction for commencement prior to age 65.
Pre-retirement and post-retirement indexation	Pensions in payment and deferred pensions in respect of service on or after January 1, 1992 but before January 1, 2008 are increased every January 1 at 75% of the increase in the Consumer Price Index, up to a maximum annual increase of 8%. Increases in excess of 8%, as well as decreases, are carried forward to future years. Pensions in payment and deferred pensions in respect of service prior to January 1, 1992 were increased in the same manner, with the last approved increase occurring on January 1, 2014. Pensions in payment and deferred pensions in respect of service on or after January 1, 2008 are contingent on the funded status of the Plan at the last filed valuation.

The plan provisions for the former ROM Plan members are the same as above, except for the following:

Member Contributions	Contributions for former ROM Plan members are phased-in in accordance with the following table:

Year	Pensionable Earnings up to YMPE	Pensionable Earnings in excess of YMPE
2016	7.3%	10.5%
2017	8.6%	12.2%
2018	9.9%	13.5%
2019 onwards	11.2%	14.8%

Employer Contributions	Employer contributions in respect of former ROM Plan members are equal to 11.2% of pensionable earnings up to the YMPE, plus 14.8% of pensionable earnings in excess of the YMPE for all years.
Normal Retirement Pension	The normal retirement benefit for former ROM Plan members in respect of service before December 31, 2015 shall be equal to 1% for each year of credited service up to December 31, 1989, plus 1.3% for each year of credited service between January 1, 1990 and December 31, 2015, of the best average earnings up to, and 2.0% for each year of credited service of the best average earnings in excess of, the final average YMPE. Best average earnings is defined as the greater of the frozen best 3-year average earnings prior to January 1, 2010 and the best 5-year average earnings at the date of a determination.
Early Retirement Pension	Benefits for former ROM Plan members earned prior to January 1, 2010 are subject to a reduction of 2% for each of the first 5 years that early retirement precedes age 65 and 5% for each of the next 5 years. Benefits for former ROM Plan members earned after January 1, 2010 but before December 31, 2015 are subject to a 5% per year reduction from age 65.
Pre-retirement and post-retirement indexation	Pensions in payment and deferred pensions in respect of service prior to December 31, 2015 while a member of the ROM Plan are contingent on the funded status of the Plan at the last filed valuation.

APPENDIX G

Plan Administrator Certification

With respect to the Report on the Actuarial Valuation for Funding Purposes as at January 1, 2018 of The Colleges of Applied Arts and Technology Pension Plan, I hereby certify that, to the best of my knowledge and belief:

- The valuation reflects the terms of the Board's engagement with the actuary described in Section 1 of this report, particularly the requirement to not reflect a margin for adverse deviations in the going concern valuation.

- A copy of the official plan documents and of all amendments made up to 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 December 31, 2016.

- All events subsequent to January 1, 2018 that may have an impact on the Plan have been communicated to the actuary.

March 27, 2018

Date

Signed

Derek Dobson

Name

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