HEALTH WEALTH CAREER

THE CANADIAN BLOOD SERVICES DEFINED BENEFIT PENSION PLAN

REPORT ON THE ACTUARIAL VALUATION FOR FUNDING PURPOSES AS AT DECEMBER 31, 2017

OCTOBER 2018

Financial Services Commission of Ontario Registration Number: 1048800

Canada Revenue Agency Registration Number: 1048800

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

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SUMMARY OF RESULTS

	2017.12.31	2016.12.31
Going Concern Financial Status		
Smoothed value of assets	$379,058,000	$350,973,000
Going concern funding liabilities	$337,470,000	$328,692,000
Provision for adverse deviations in respect of the going concern liabilities	$24,871,000	N/A
Funding excess (shortfall)	$16,717,000	$22,281,000
Hypothetical Wind-up Financial Position		
Wind-up assets	$395,437,000	$347,731,000
Wind-up liability	$489,615,000	$463,525,000
Wind-up excess (shortfall)	($94,178,000)	($115,794,000)
Funding Requirements in the 2nd Year Following the Valuation [1,2]	**2019**	**2018**
Members' contribution rate as percentage of Pensionable earnings	6.35%	6.1%
Employer's contribution rate as percentage of Pensionable earnings	8.35%	8.1%
Total contribution rate	14.7%	14.2%
Next required valuation date	December 31, 2020	December 31, 2017

[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] Including provisions with respect to amortization of funding deficiencies and provisions for adverse deviations, as applicable.

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INTRODUCTION

TO THE CANADIAN BLOOD SERVICES DEFINED BENEFIT PENSION PLAN BOARD OF TRUSTEES (THE "TRUSTEES")

At your request, we have conducted an actuarial valuation of the Canadian Blood Services Defined Benefit Pension Plan (the "Plan"), jointly sponsored by Canadian Blood Services ("CBS") and participating unions, as at the valuation date, December 31, 2017. 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 December 31, 2017 on going concern, hypothetical wind-up, and solvency bases;
- The minimum required funding contributions from 2019, in accordance with the *Pension Benefits Act (Ontario)* (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 Canadian Blood Services Defined Benefit Pension Plan Board of Trustees and for filing with the Financial Services Commission of Ontario ("FSCO") and with the Canada Revenue Agency, in connection with our actuarial valuation of the Plan. This report will be filed with the FSCO 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 December 31, 2020, or as at the date of an earlier amendment to the Plan.

TERMS OF ENGAGEMENT

In accordance with our terms of engagement with the Trustees, 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 Trustees, 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 Trustee 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.
  - The value of pension indexation was 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 DECEMBER 31, 2016

Pension Plan

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

This valuation reflects the provisions of the Plan as at December 31, 2017 as well as an amendment to the Plan approved in September 2018 to clarify that the provision for adverse deviations is to be shared between members and CBS. The Plan provisions are summarized in Appendix F.

Assumptions

We have used the same going concern valuation assumptions and methods as were used for the previous valuation, except for the following:

	CURRENT VALUATION	PREVIOUS VALUATION
Discount rate [3]:	5.75%	5.50%
Retirement rates:	Revised age-related table	Age-related table
Termination rates:	Revised age-related table	Age-related table
Mortality rates:	110% of the rates of the 2014 Combined Canadian Pensioners Mortality Table (CPM2014)	100% of the rates of the 2014 Combined Canadian Pensioners Mortality Table (CPM2014)
Mortality improvements:	Fully generational using CPM Improvement Scale B (CPM-B)	Fully generational using CPM Improvement Scale B (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 a number of 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.

SUBSEQUENT EVENTS

After checking with the Trustees and representatives of CBS, to the best of our knowledge there have been no 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.

[3] The discount rate for the current valuation excludes a margin for adverse deviations, while that at the previous valuation includes an explicit margin.

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:

	2017.12.31	2016.12.31
Assets		
Market value of assets	$396,187,000	$348,481,000
Asset smoothing adjustment	($17,129,000)	$2,492,000
Smoothed value of assets	$379,058,000	$350,973,000
Going concern funding target		
Going concern liabilities:		
• Active members	$197,632,000	$198,717,000
• Money purchase feature	$2,337,000	$2,606,000
• Pensioners and survivors	$120,400,000	$111,133,000
• Deferred pensioners	$17,101,000	$16,236,000
• Subtotal	$337,470,000	$328,692,000
Provision for adverse deviations in respect of going concern liabilities as prescribed by the Act (based on the percentage defined in Appendix A)[4]	$24,871,000	N/A
Total	$362,341,000	$328,692,000
Funding excess (shortfall)[5]	$16,717,000	$22,281,000

[4] Calculated based on liabilities excluding the value of future post-retirement indexation and the Money Purchase Feature balances ($323,001,000 as at December 31, 2017).

[5] 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 December 31, 2017 do not include an additional margin for adverse deviations beyond the provision for adverse deviations prescribed by the Act.

RECONCILIATION OF FINANCIAL STATUS

Funding excess (shortfall) as at previous valuation		$22,281,000
Interest on funding excess (shortfall) at 5.50% per year		$1,225,000
Delayed increase in employer and employee contributions, with interest		($1,264,000)
Expected funding excess (shortfall)		$22,242,000
Net experience gains (losses)		
• Net Investment return	$5,726,000	
• Increases in pensionable earnings	$2,747,000	
• Increase in maximum pension	$54,000	
• Indexation	$388,000	
• Mortality	($751,000)	
• Retirement	$284,000	
• Termination	($1,504,000)	
• Expenses	($275,000)	
• Interest on employee contributions	$118,000	
Total experience gains (losses)		$6,787,000
Impact of change in discount rate[6]	($10,206,000)	
Change in provision for adverse deviations in respect of the going concern liabilities, net of removal of margin in discount rate[7]	($2,541,000)	
Impact of changes in demographic assumptions	$1,049,000	
		($11,698,000)
Net impact of other elements of gains and losses		($614,000)
Funding excess (shortfall) as at current valuation		$16,717,000

[6] Change from 5.50% to 5.30%. Under the rules under the Act in place before May 1, 2018, a margin of 0.45% would have been deducted from the best-estimate discount rate of 5.75%, for a net discount rate of 5.30%.

[7] As noted above, a margin of 0.45% would have been employed in the pre-May 1, 2018. The impact of removing this margin is offset by the addition of the new provision for adverse deviations.

SURPLUS ACCOUNTS

In accordance with Section 3.6 of the Plan, a notional Member Surplus Account and a notional Employer Surplus Account are established and retained in the Trust Fund. These Accounts are adjusted at a rate equal to the net rate of return on the actuarial value of Fund assets. These rates are calculated annually, net of all plan expenses.

The Member Surplus Account evolved over time until it was entirely depleted effective March 1, 2003 when plan improvements were made. Since then, the Member Surplus Account has remained $0 and still is $0 as at December 31, 2017. Also, no amount has yet been allocated to the Employer Surplus Account, which also remains $0 as at December 31, 2017.

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:

	2018	2017
Total current service cost, including administration expenses	$20,204,000	$21,291,000
Provision for adverse deviations in respect of the current service cost (based on the percentage defined in Appendix A[8])	$1,421,000	N/A
Total current service cost and provision for adverse deviations in respect of current service cost	$21,625,000	$21,291,000
Estimated members’ pensionable earnings	$146,752,000	$150,030,000
Current service cost expressed as a percentage of members’ pensionable earnings		
Total current service cost	14.7%	14.2%
- Employer current service cost	8.35%	8.1%
- Member current service cost	6.35%	6.1%

[8] Calculated considering the current service cost before addition of administration expenses and excluding the value of future post-retirement indexation ($18,452,000 for 2018).

The total current service cost rate of 14.7% includes an allowance of 0.7% to cover administrative expenses paid from the fund.

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	14.2%
Demographic changes	0.1%
Change in discount rate (from 5.50% to 5.30%)	0.5%
Impact of removal of margin (0.45%) in discount rate and addition of provision for adverse deviations	(0.1%)
Employer's current service cost as at current valuation	14.7%

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	VALUATION BASIS	REDUCE DISCOUNT RATE BY 1%
Going concern funding liabilities	$337,470,000	$386,249,000
Current service cost		
• Total current service cost, including administration expenses without provision for adverse deviations	$20,204,000	$23,812,000
Current service cost expressed as a percentage of pensionable earnings (including provision for adverse deviations consistent with the percentage developed under Appendix A)		
• Employer current service cost	8.35%	9.7%
• Member current service cost	6.35%	7.7%
• Total current service cost	14.7%	17.4%

4
VALUATION RESULTS – HYPOTHETICAL WIND-UP

FINANCIAL POSITION

When conducting a hypothetical wind-up valuation, we determine the relationship between the respective values of the Plan's assets and its liabilities assuming the Plan is wound up and settled on the valuation date, assuming benefits are settled in accordance with the Act and under circumstances consistent with the hypothesized scenario on the valuation date. More details on such scenario are provided in Appendix D.

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

	2017.12.31	2016.12.31
Assets		
Market value of assets	$396,187,000	$348,481,000
Termination expense provision	($750,000)	($750,000)
Wind-up assets	$395,437,000	$347,731,000
Present value of accrued benefits for:		
• Active members	$288,957,000	$284,846,000
• Money purchase feature	$2,337,000	$2,606,000
• Pensioners and survivors	$168,637,000	$149,140,000
• Deferred pensioners	$29,684,000	$26,933,000
Total wind-up liability	$489,615,000	$463,525,000
Wind-up excess (shortfall)	($94,178,000)	($115,794,000)

WIND-UP INCREMENTAL COST

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

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

	2017.12.31	2016.12.31
Number of years covered by report	3 years	1 year
Total hypothetical wind-up liabilities at the valuation date (A)	$489,615,000	$463,525,000
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)	$580,183,000	$494,587,000
Hypothetical wind-up incremental cost (B – A)	$90,568,000	$31,062,000

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	VALUATION BASIS	REDUCE DISCOUNT RATE BY 1%
Total hypothetical wind-up liability	$489,615,000	$582,661,000

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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.	The following benefits were excluded from the solvency liabilities shown in this valuation: • *Post-retirement indexation*
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:

	2017.12.31	2016.12.31
Assets		
Market value of assets	$396,187,000	$348,481,000
Termination expense provision	($750,000)	($750,000)
Net assets	$395,437,000	$347,731,000
Liabilities		
Total hypothetical wind-up liabilities	$489,615,000	$463,525,000
Value of excluded benefits	($36,930,000)	$0
Liabilities on a solvency basis	$452,685,000	$463,525,000
Surplus (shortfall) on a solvency basis	($57,248,000)	($115,794,000)
Transfer Ratio	0.809	0.750
Solvency Ratio	0.875	0.750

6
MINIMUM FUNDING REQUIREMENTS

The Act prescribes the minimum contributions that must be made 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.

In our previous valuation of the Plan for funding purposes, as at December 31, 2016, the contribution rates were set as follows from January 1, 2018 to December 31, 2018 based on the following schedule:

CONTRIBUTION RATE AS A PERCENTAGE OF PENSIONABLE EARNINGS, 2018

	MEMBERS	EMPLOYER	TOTAL
Current service cost	6.1%	8.1%	14.2%
Provision for amortization of funding shortfall	0.0%	0.0%	0.0%
Total contribution rate	6.1%	8.1%	14.2%

As at December 31, 2017, the total current service cost is 14.7%. No going concern or solvency special payments are required. This results in an increase to the total contribution rate for the Plan from the previous valuation, effective January 1, 2019.

As per the plan rules, we recommend that Canadian Blood Services and plan members make monthly contributions to the plan from January 1, 2019 to December 31, 2021 based on the following schedule:

	MEMBERS	EMPLOYER	TOTAL
Current service cost	6.35%	8.35%	14.7%
Provision for amortization of funding shortfall	0.0%	0.0%	0.0%
Total contribution rate	6.35%	8.35%	14.7%

On the basis of the members' estimated pensionable earnings, we have estimated the members' and employer contributions for the period from January 1, 2018 to December 31, 2021 to be as follows:

ESTIMATED CONTRIBUTIONS UNTIL DECEMBER 31, 2021

YEAR ENDING	MEMBER CONTRIBUTIONS	EMPLOYER CONTRIBUTIONS	TOTAL CONTRIBUTIONS
December 31, 2018	$8,952,000	$11,886,000	$20,838,000
December 31, 2019	$9,662,000	$12,705,000	$22,367,000
December 31, 2020	$10,017,000	$13,172,000	$23,189,000
December 31, 2021	$10,386,000	$13,657,000	$24,043,000

The estimated contribution amounts above are based on projected members' pensionable earnings. Therefore, the actual contributions will be different from the above estimates and, as such, the contribution requirements should be monitored closely to ensure contributions are made in accordance with the Act.

The development of the minimum special payments and determination of the provision for adverse deviations are summarized in Appendix A.

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 including the expense allowance 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.

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.

7
MAXIMUM ELIGIBLE CONTRIBUTIONS

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

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

CBS is permitted to fully fund the greater of the going concern and hypothetical wind-up shortfalls, $94,178,000, as well as make current service cost contributions. The portion of this contribution representing the payment of the hypothetical wind-up shortfall can be increased with interest at 2.92% 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 CBS contributes the greater of the going concern and the hypothetical wind-up shortfall of $94,178,000 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:

	CONTRIBUTION RULE			ESTIMATED CONTRIBUTIONS		
YEAR ENDING	EMPLOYER'S MONTHLY CURRENT SERVICE COST[9]	EMPLOYEES' MONTHLY CURRENT SERVICE COST[9]	DEFICIT FUNDING	EMPLOYER'S CURRENT SERVICE COST	EMPLOYEE'S CURRENT SERVICE COST	TOTAL CURRENT SERVICE COST
Dec. 31, 2018	8.1%	6.1%	n/a	$11,886,000	$8,952,000	$20,838,000
Dec. 31, 2019	8.35%	6.35%	n/a	$12,705,000	$9,662,000	$22,367,000
Dec. 31, 2020	8.35%	6.35%	n/a	$13,172,000	$10,017,000	$23,189,000
Dec. 31, 2021	8.35%	6.35%	n/a	$13,657,000	$10,386,000	$24,043,000

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

9 Expressed as a percentage of members' pensionable earnings.

8
ACTUARIAL OPINION

In our opinion, for the purposes of the valuations,

- The membership data on which the valuation is based are sufficient and reliable;
- The assumptions are appropriate; and
- The methods employed in the valuation are appropriate.

This report has been prepared, and our opinions given, in accordance with accepted actuarial practice in Canada. It has also been prepared in accordance with the funding and solvency standards set by the *Pension Benefits Act* (Ontario).

Pascal Berger	Stefan J. Ramonat
Fellow of the Canadian Institute of Actuaries	Fellow of the Canadian Institute of Actuaries
Fellow of the Society of Actuaries	Fellow of the Society of Actuaries
October 22, 2018	October 22, 2018
Date	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 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.	0.809
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	Market value of assets including accrued or receivable income and excluding the value of any qualifying annuity contracts.	$396,187,000
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	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,	$452,685,000
	(a) any escalated adjustment,	
	(b) excluded plant closure benefits,	
	(c) excluded permanent layoff benefits,	
	(d) special allowances other than funded special allowances,	
	(e) consent benefits other than funded consent benefits,	
	(f) prospective benefit increases,	
	(g) potential early retirement window benefit values, and	
	(h) pension benefits and ancillary benefits payable under a qualifying annuity contract.	
Solvency Liability Adjustment	The amount by which Solvency Liabilities are adjusted as a result of using a solvency valuation interest rate that is the average of market interest rates calculated over the period of time used in the determination of the smoothed value of assets.	$0
Solvency Deficiency	The amount, if any, by which the sum of:	
	(a) the Solvency Liabilities	$452,685,000
	(b) the Solvency Liability Adjustment	$0
	(c) the Prior Year Credit Balance	$0
		$452,685,000
	Exceeds the sum of	
	(d) the Solvency Assets net of estimated termination expenses[10]	$395,437,000
	(e) the Solvency Asset Adjustment	$0
		$395,437,000
	(f) Solvency deficiency	($57,248,000)

[10] 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	$384,782,000
	(b) 85% of the Solvency Liability Adjustment	$0
	(c) the Prior Year Credit Balance	$0
		$384,782,000
	Exceeds the sum of:	
	(d) the Solvency Assets net of estimated termination expenses	$395,437,000
	(e) the Solvency Asset Adjustment	$0
		$395,437,000
	(f) Reduced solvency deficiency/(excess)	($10,655,000)

PROVISION FOR ADVERSE DEVIATIONS

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

<table>
<tr><th colspan="2">DEFINED AMOUNT</th><th>RESULTS</th></tr>
<tr><td>Fixed Income Component
(L)</td><td>The sum of the Plan’s target allocation of assets (excluding those allocated to annuity contacts and meeting the minimum rating requirement) as described in the regulations according to the investment policy applicable at the valuation date:<table><tr><th>Investment</th><th>Target</th></tr><tr><td>Demand deposits and cash on hand</td><td>0.0%</td></tr><tr><td>Short term notes and treasury bills</td><td>0.0%</td></tr><tr><td>Canadian Bonds and debentures</td><td>40.0%</td></tr><tr><td>Non-Canadian bonds and debentures</td><td>0.0%</td></tr></table></td><td>40.0%</td></tr>
<tr><td>Alternative Investment Component
(M)</td><td>The sum of the Plan’s target allocation of assets (excluding those allocated to annuity contacts) meeting requirements as described in the regulations according to the investment policy applicable at the valuation date:<table><tr><th>Investment</th><th>Target</th></tr><tr><td>Real estate</td><td>6.0%</td></tr><tr><td>Other</td><td>0.0%</td></tr></table></td><td>6.0%</td></tr>
<tr><td>Investment Component
(N)</td><td>Plan’s target asset allocation for mutual, pooled or segregated funds</td><td>0.0%</td></tr>
<tr><td>Investment Component Fixed Income %
(P)</td><td>Portion of Investment Component (N) that is allocated to investment categories accounted for in Fixed Income Component (L)</td><td>N/A</td></tr>
<tr><td>Investment Component Alternative Investment %
(Q)</td><td>Portion of Investment Component (N) that is allocated to investment categories accounted for in Alternative Income Component (M)</td><td>N/A</td></tr>
<tr><td>Annuity Contract Allocation
(R)</td><td>Annuity contracts that have been purchased from an insurance company and excluded from the Fixed Income Component (L) and Alternative Investment Component (M)</td><td>0.0%</td></tr>
</table>

DEFINED AMOUNT			RESULTS
Combined Target Asset Allocation for Fixed Income Assets (J)			
Sum of			
• Fixed Income Component (L)	40.0%		
• 0.5 x Alternative Investment Component (0.5 x M)	3.0%		
• Investment Component x Investment Component Fixed Income % (N x P)	0.0%		
• 0.5 x Investment Component x Investment Component Alternative Investment % (0.5 x N x Q)	0.0%		
		43.0%	
Divided by			
• 100% - Annuity Contract Allocation (100% - R)		100.0%	
Combined Target Asset Allocation for Fixed Income Assets			**43.0%**

Combined Target Asset Allocation for Non-Fixed Income Assets (K)	
100% – Combined Target Asset for Fixed Income Assets (100% - J)	**57.0%**

Duration of going-concern liabilities at valuation date	
= (F - G) / (G x 0.01) where,	**14.3 years**
G = going-concern liabilities excluding liabilities in respect of escalated adjustments and Money Purchase Feature balances at valuation date established using the discount rate determined for this valuation	$323,001,000
F = going-concern liabilities excluding liabilities in respect of escalated adjustments and Money Purchase Feature balances established using the discount rate minus 1%	$369,150,000

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)	0.65%
5.0% x Combined Target Asset Allocation for Non-Fixed Income Assets (5.0% x K)	2.85%
Benchmark Discount Rate	6.26%

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			3.70%
(C)	Greater of zero and the			
	• Duration of going concern liabilities at valuation date	14.3 years		
	Multiplied by the excess of:			
	– Going concern valuation gross discount rate net of active investment management fees (D), less	5.80%		
	– Benchmark Discount Rate (E)	6.26%	0.00%	
Provision for Adverse Deviations (A + B + C)			7.70%	

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 December 31, 2020.

SPECIAL PAYMENTS

Based on the results of this valuation, the Plan does not have a funding shortfall and thus no going concern special payments are required. In addition, no solvency special payments are required.

PENSION BENEFITS GUARANTEE FUND (PBGF) ASSESSMENT

Under the regulations to the *Pension Benefit Act*, the Plan is exempt from the annual assessment to the Pension Benefits Guarantee Fund due to its status as a jointly sponsored pension plan.

APPENDIX B
PLAN ASSETS

The pension fund is held by Northern Trust. In preparing this report, we have relied upon the auditors' report prepared by KPMG, 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:

	2017
January 1	$348,481,476
PLUS	
Members' contributions	$8,180,928
CBS contributions	$11,727,786
Transfers, net of refunds of over-contributions[11]	($198,224)
Investment income (all sources)	$45,539,984
	$65,250,474
LESS	
Pensions paid	$9,497,755
Lump-sums paid	$5,961,251
Administration and investment fees	$2,085,982
	$17,544,988
December 31	$396,186,962
Gross rate of return[12]	13.0%
Rate of return net of expenses[12]	12.4%

[11] The refunds are with respect to a correction of over-contributions by certain Plan members and, consequentially, CBS.

[12] 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 DECEMBER 31, 2017[13]
	Minimum	Target	Maximum	
Canadian Equities	10%	13%	15%	20.9%
Foreign Equity				
- U.S.	12%	17%	22%	19.1%
- Non-North American	14%	20%	25%	18.9%
- Emerging Markets	0%	4%	6%	4.4%
Fixed income	30%	40%	50%	36.3%
Real Estate Assets	0%	6%	8%	0.0%
Short term	0%	0%	12%	0.4%
		100%		100%

[13] The funds required to meet the target real estate mandate are in the process of being reallocated.

APPENDIX C

METHODS AND ASSUMPTIONS – GOING CONCERN

VALUATION OF ASSETS

For this valuation, we have used a new adjusted market-value method to determine the smoothed value of assets. Under this method, the actual investment returns in excess of the expected returns on assets arising during a given year are spread on a straight-line basis over three years in accordance with the schedule shown in the following table:

YEAR	PERCENTAGE OF GAINS (LOSSES) RECOGNIZED
2017:	33 1/3%
2016:	66 2/3%
before 2016:	100%

At last valuation, another adjusted market-value method was used. Under that method, realized and unrealized capital gains (losses) arising during a given year were spread on a straight-line basis over three years.

The smoothed value is constrained to a minimum value of 90% of the market value, and a maximum value of 105% of the market value.

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 December 31, 2017 was derived as follows:

Market value of assets		$396,186,962
LESS		
Unrecognized capital gains	2017 :	$15,938,977
(losses) realized or unrealized	2016 :	$1,189,809
		$17,128,787
Smoothed value of assets		$379,058,175

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.

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

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

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

Current Service Cost

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

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

The members' and employer's current service cost has been expressed as a percentage of the members' pensionable earnings to provide an automatic adjustment in the event of fluctuations in membership and/or pensionable earnings.

Under the projected unit credit actuarial cost method, the current service cost for an individual member will increase each year as the member approaches retirement. However, the current service cost of the entire group, expressed as a percentage of the members' pensionable earnings, can be expected to remain stable as long as the average age distribution of the group remains constant.

ACTUARIAL ASSUMPTIONS – GOING CONCERN BASIS

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

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

ASSUMPTION	CURRENT VALUATION	PREVIOUS VALUATION
Discount rate:	5.75%	5.50%
Administration expenses:	0.7% of pay	0.7% of pay
Inflation:	2.0%	2.0%
ITA limit / YMPE increases:	3.0%	3.0%
Pensionable earnings increases:	Service related table	Service related table
Post-retirement pension increases:	0.4%	0.4%
Interest on employee contributions:	3.0%	3.0%
Retirement rates:	Revised age-related table	Age related table
Termination rates:	Revised age-related table	Age related table
Mortality rates:	110% of Combined (Private and Public) CPM 2014 Table	100% of Combined (Private and Public) CPM 2014 Table
Mortality improvements:	Fully generational using improvement scale CPM-B	Fully generational using improvement scale CPM-B
Commuted value election:	70% below age 55	70% below age 55
Commuted value basis:	4.0% with CPM2014, with projection scale CPM-B	4.0% with CPM2014, with projection scale CPM-B
Disability rates:	None	None

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

AGE AND SERVICE RELATED TABLES

Sample rates from the age related tables are summarized in the following table. Rates used for the previous valuation are presented in brackets if they were different.

AGE	TERMINATION	RETIREMENT
20	21.93% (12.22%)	0.00%
25	15.14% (10.27%)	0.00%
30	11.03% (8.71%)	0.00%
35	8.55% (7.29%)	0.00%
40	7.05% (6.03%)	0.00%
45	6.14% (4.91%)	0.00%
50	5.59% (3.95%)	0.00%
55	0.00%	7.50% (4.00%)
56	0.00%	7.50% (4.00%)
57	0.00%	7.50% (4.00%)
58	0.00%	7.50% (4.00%)
59	0.00%	12.50% (4.00%)
60	0.00%	12.50% (8.00%)
61	0.00%	12.50% (8.00%)
62	0.00%	12.50% (8.00%)
63	0.00%	12.50% (8.00%)
64	0.00%	30.00% (25.00%)
65	0.00%	35.00% (25.00%)
66	0.00%	35.00% (25.00%)
67	0.00%	35.00% (25.00%)
68	0.00%	35.00% (25.00%)
69	0.00%	35.00% (25.00%)
70	0.00%	100.00%

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

SERVICE*	RATE OF SALARY INCREASE
0	5.70%
5	4.10%
10	3.50%
15	3.10%
20	2.80%
25	2.60%
30	2.40%
35	2.30%

*Completed years of continuous service at the valuation date

Pensionable Earnings

The benefits ultimately paid will depend on each member's final average earnings. To calculate the pension benefits payable upon retirement, death, or termination of employment, we have taken the annualized pensionable earnings during 2017 and assumed that such pensionable earnings will increase at the assumed rates shown above.

RATIONALE FOR ASSUMPTIONS

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

DISCOUNT RATE

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

The discount rate is comprised of the following:

- 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 investment expenses determined as the hypothetical fees that would be incurred for passive management of all assets.
- A margin for adverse deviations of 0.00%

The discount rate was developed as follows:

Assumed investment return	5.80%
Passive management investment expense provision	(0.05%)
Margin for adverse deviation	(0.00%)
Net discount rate	**5.75%**

EXPENSES

The assumed investment return reflects an implicit provision for investment expenses. We have also included an allowance of 0.7% of pensionable earnings in the current service cost to meet administrative expenses charged to the fund. This is established to provide approximately $1,025,000 of administration expenses for 2018 and increase with pensionable earnings thereafter. This amount is in accordance with the budget for expenses prepared by the Trustees for 2018.

INFLATION

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

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

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

PENSIONABLE EARNINGS

The assumption is based on an experience study that was conducted in 2017, considering actual increases over the years 2014 to 2016, inclusive, and adjusted based on the general experience revealed by this valuation.

POST-RETIREMENT PENSION INCREASES

The assumption is based on the Plan formula and inflation assumption above. Pensions in payment are assumed to increase annually at a rate of 0.4%. This assumption reflects the Plan's indexation formula, as well as expected fluctuations in inflation around the assumed mean of 2.0% per year.

RETIREMENT RATES

The assumption is based on experience over the years 2014 to 2017, inclusive.

TERMINATION RATES

The assumption is based on experience over the years 2014 to 2017, inclusive.

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 Combined – Private and Public sector have been adjusted after considering plan-specific characteristics, such as the type of employment, lifestyle factors derived from postal codes, the pension income of plan members, and analysis of data from 2007–2016 aggregated across a diverse group of large and medium sized pension plans across Canada.

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. The mortality improvement scale published in the CPM study represents one reasonable outlook for future improvement. We have used the CPM mortality improvement scale B without adjustment.

Based on the assumption used, the life expectancy of a member age 65 at the valuation date is 21.7 years for males and 24.0 years for females.

INTEREST ON EMPLOYEE CONTRIBUTIONS

The assumption is based on Plan terms, market expectations of returns on Federal long-term bonds and historical spreads.

DISABILITY RATES

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

COMMUTED VALUE ELECTION AND CALCULATION BASIS

The assumption is based on our experience with similar plans and employee groups, and the proportion of terminated employees electing a commuted value was validated with Plan experience from 2014 to 2016.

The cost of future lump sums will depend on the level of market interest rates at the time the lump sum is paid and any changes in the applicable actuarial standards for the determination of pension plan commuted values. The assumed cost of future lump sums is based on the average expected level of market interest rates over the period during which lump sums are expected to be paid, taking into account market conditions on the valuation date. We have also assumed that future lump sums elected by eligible plan participants will be calculated using new mortality basis currently applicable under the actuarial standards since October 2015.

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.

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 December 31, 2017.

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

However, there is limited data available to provide credible guidance on the cost of a purchase of indexed annuities in Canada. In accordance with the *Canadian Institute of Actuaries Educational Note: Assumptions for Hypothetical Wind-up and Solvency Valuations with Effective Dates Between December 31, 2017 and December 30, 2018 (the "Educational Note")*, we have assumed that an appropriate proxy for estimating the cost of such purchase is using the yield on the long-term Government of Canada Real Return bonds, reduced by 0.7%.

The Educational Note provides guidance on estimating the cost of annuity purchases assuming a typical group of annuitants. That is, no adjustments for sub- or super-standard mortality are considered. However, it is expected that insurers will consider plan experience and certain plan-specific characteristics when determining the mortality basis for a particular group. The Educational Note states that the actuary would be expected to make an adjustment to the regular annuity purchase assumptions where there is demonstrated substandard or super-standard mortality or where an insurer might be expected to assume so. In such cases, the actuary would be expected to make an adjustment to the mortality assumption in a manner consistent with the underlying annuity purchase basis. Given the uncertainty surrounding the actual mortality basis that would be typical of a group annuity purchase, it is reasonable to assume that there is a range of bases that can be expected not to be materially different from the actual mortality basis. Therefore, an adjustment to the regular annuity purchase assumptions would be warranted when the plan's assumed basis falls outside that range.

In this context, we have determined that no adjustment to the mortality rates used in the regular annuity purchase assumptions is required.

We have not included a margin for adverse 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 50% of active members over age 55, elect to receive their benefit entitlement in a lump sum
Annuity purchase:	All remaining members are assumed to elect to receive their benefit entitlement in the form of a deferred or immediate pension. These benefits are assumed to be settled through the purchase of deferred or immediate annuities from a life insurance company.
Basis for Benefits Assumed to be Settled through a Lump Sum	
Mortality rates:	100% of the rates of the 2014 Canadian Pensioners Mortality Table (CPM2014) with fully generational improvements using scale CPM-B
Interest rate:	2.60% per year for 10 years, 3.40% per year thereafter
Pension increases:	0.19% per year for 10 years, 0.32% 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 scale CPM -B
Interest rate:	3.12% per year
Pension increases:	0.95% per year

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 and Nova Scotia members whose age plus service equals at least 55 at the valuation date reflect their entitlement to grow into early retirement subsidies
Other Assumptions	
Weighted average interest rate:	2.92% 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 2.30% per year for 10 years, 2.80% per year thereafter
Termination expenses:	$750,000

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

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

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

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

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

INCREMENTAL COST

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

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

- Members terminate, retire, and die consistent with the termination, retirement, and mortality rates used for the going concern valuation.
- Pensionable earnings, the Income Tax Act pension limit, and the Year's Maximum Pensionable Earnings increase in accordance with the related going concern assumptions.
- Active members accrue pensionable service in accordance with the terms of the Plan.
- To accommodate for new entrants to the Plan, we have added to the projected liability an amount equal to the liability of new entrants that have joined the Plan since the previous valuation, increased to reflect 3 years of inflation and productivity.
- Cost of living adjustments are consistent with the inflation assumption used for the going concern valuation.

SOLVENCY BASIS

In determining the financial position of the Plan on the solvency basis, we have used the same assumptions and methodology as were used for determining the financial position of the Plan on the hypothetical wind-up basis.

The solvency position is determined in accordance with the requirements of the Act.

APPENDIX E
MEMBERSHIP DATA

ANALYSIS OF MEMBERSHIP DATA

The actuarial valuation is based on membership data as at December 31, 2017, provided by Morneau Shepell Inc., the plan's third-party administrator.

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.

	2017.12.31	2016.12.31
Active Members		
Number	2,520	2,630
Total pensionable earnings for the following year	$146,751,500	$150,030,400
Average pensionable earnings for the following year	$58,200	$57,000
Average annualized pensionable earnings for the following year	$67,000	$66,100
Average years of pensionable service	8.5	8.1
Average age	48.7	48.3
Proportion female	76%	77%
Accumulated contributions with interest	$71,058,100	$68,744,900
Money Purchase Feature contribution balance	$2,337,000	$2,606,000
Deferred Pensioners		
Number	416	389
Total annual pension	$2,293,500	$2,061,000
Average annual pension	$5,513	$5,298
Average age	49.4	48.4
Proportion female	75%	74%
Pensioners and Survivors		
Number	923	832
Total annual lifetime pension	$9,764,900	$8,628,400
Average annual lifetime pension	$10,580	$10,371
Average age	68.0	67.6
Proportion female	86%	87%

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 December 31, 2016	2,630	38	832	3,851
New entrants	172			172
Terminations:				
• Transfers/lump sums	(79)	(44)		(123)
• Deferred pensions	(84)	84		0
• Benefits not settled	(39)			(39)
Deaths	(1)		(4)	(5)
Retirements	(79)	(13)	92	0
Survivors			4	4
Data adjustments			(1)	(1)
Total at December 31, 2017	2,520	416	923	3,859

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**
Under 25	20 $38,399								20 $38,399
25 to 29	103 $43,344	8 $56,756							111 $44,310
30 to 34	126 $49,392	56 $58,793	4 $50,898						186 $52,255
35 to 39	127 $53,269	94 $57,373	33 $54,642	3 $74,972					257 $55,200
40 to 44	121 $56,281	109 $59,693	49 $71,027	25 $71,996					304 $61,173
45 to 49	84 $54,862	142 $59,806	89 $68,704	59 $72,792	5 $61,797	1 *			380 $62,856
50 to 54	118 $52,842	135 $56,244	110 $66,704	56 $75,474	16 $68,458	19 $58,221	3 $66,040		457 $60,814
55 to 59	95 $58,355	130 $53,952	103 $67,235	67 $64,110	20 $61,219	20 $63,935	5 $65,409	4 $40,860	444 $60,296
60 to 64	53 $43,816	92 $51,319	63 $57,575	47 $67,531	5 $49,463	11 $95,422	8 $57,152	4 $57,942	283 $55,939
65 +	11 $39,696	26 $44,384	21 $61,980	9 $55,905	6 $88,878	2 *	1 *	2 *	78 $54,910
Total	858 $51,489	792 $56,339	472 $65,240	266 $69,619	52 $65,563	53 $70,075	17 $60,188	10 $49,542	2,520 $58,235

*Not shown for confidentiality reasons.

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

	DEFERRED PENSIONERS			PENSIONERS AND SURVIVORS	
Age	Number	Average Pension		Number	Average Pension
Under 25					
25 – 29	15	$894			
30 – 34	37	$2,335			
35 – 39	32	$2,692			
40 – 44	57	$4,589			
45 – 49	58	$6,424			
50 – 54	75	$5,414			
55 – 59	71	$7,633		57	$8,176
60 – 64	59	$7,941		227	$9,519
65 – 69	4	$7,374		318	$11,010
70 – 74	6	$3,421		215	$11,275
75 – 79	2	*		88	$11,266
80 +				18	$12,288
Total	416	$5,513		923	$10,580

*Not shown for confidentiality reasons.

APPENDIX F

SUMMARY OF PLAN PROVISIONS

Mercer has used and relied on the plan documents, including amendments and interpretations of plan provisions, supplied by CBS. 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.

The following is a summary of the main provisions of the Plan in effect on December 31, 2017 including an amendment approved in September 2018 that clarifies that the provision for adverse deviations in the total contribution rate is shared between the employees and CBS. This summary is not intended as a complete description of the Plan.

Background	The Canadian Blood Services Defined Benefit Pension Plan became effective September 28, 1998 further to the transfer of responsibilities with respect to the collection and delivery of blood supplies in Canada, outside the province of Quebec, from the Canadian Red Cross Society to Canadian Blood Services. The Plan is a jointly-sponsored pension plan, as defined by the *Pension Benefits Act* (Ontario), and as certified upon filing the report on the actuarial valuation for funding purposes as at December 31, 2010.
Eligibility for Membership	Members of the Canadian Red Cross Pension Plan (defined benefit part) were automatically enrolled in the Plan as of the effective date. New regular full-time employees who are members of a Participating Union may join after 3 months of continuous service and must join after 2 years. Other regular full-time employees may join after 3 months continuous service and must join either this plan or the Canadian Blood Services Defined Contribution Pension Plan after 2 years. Employees who are not regular full-time employees may join the Plan, or the Canadian Blood Services Defined Contribution Pension Plan if they are not members of a Participating Union, after 3 months of continuous service.

Employee Contributions	If the total contribution rate (current service cost, special payments, and provision for adverse deviations), as determined by the funding actuarial valuation, falls between 9.5% and 11.5% of pensionable earnings, members pay 4.75% and the employer pays the balance of the cost. If the total contribution rate, as determined by the funding actuarial valuation, falls outside the range of 9.5% to 11.5%, the reduction or additional cost will be shared equally between the employer and plan members. Grandfathered additional optional contributions (the money purchase feature) were permitted under the Plan until November 30, 2004. These contributions accumulate on a money purchase basis with the fund rate of return, minus applicable expenses, until payment upon retirement, death or termination of employment.
Retirement Dates	Normal Retirement Date • The normal retirement date is the first day of the month coincident with or next following the member's 65th birthday. Early Retirement Date • If a member has been in the Plan for at least two years, the member may choose to retire as early as age 55. Postponed Retirement Date • Retirement may be postponed beyond the normal retirement date. The pension must commence by the end of the year in which the member reaches age 71.
Normal Retirement Pension	If a member retires on the Normal Retirement Date, the member will be entitled to a pension equal to: • 2.0% times the average of the member's best five consecutive years of annualized earnings times years of credited service prior to November 1, 1997; plus • 1.6% times the average of the member's best five consecutive years of annualized earnings times years of credited service after October 31, 1997.
Pensionable Earnings	Base pay
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 payable, however, will be reduced by a given percentage for each month before the normal retirement date, as follows: • For the first 60 months: 0.3% per month • For the next 60 months: 0.4% per month
Postponed Retirement Pension	Benefits will continue to accrue as normal.
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 Company, multiplied by total credited service; and • $2,944.44 in 2018 or such other maximum permitted under the Income Tax Act, multiplied by the member's total credited service. 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 (or had the member retired, if he is age 55 or more), including the 50% rule, plus the value of optional contributions, including employer matching contributions. Post retirement: • The normal form of payment is a lifetime pension guaranteed for ten years. However, the member may elect to receive an optional form of pension on an actuarial equivalent basis. If a member has an eligible spouse, the member must choose a two-thirds or 100% joint & survivor pension, paid on an actuarially equivalent basis, unless waived by the member and spouse.
Termination Benefits	Upon termination of employment, a member is entitled to a deferred pension. The member may also transfer the commuted value of that pension into another retirement vehicle in accordance with the applicable Federal and provincial legislation. Deferred pensions are payable commencing at age 65. However, a member may elect to receive an actuarially reduced early retirement pension as early as age 55. If the member has 1 or more years of credited service, he is entitled to the greater of commuted value of pension including the 50% rule or the return of member contributions times a factor (locked-in). The factor equals 110% for those with 1 year credited service increasing by 10% for each year to reach 200% for those with 10 or more years credited service. This report reflects that the Plan is excluded from the operation of Section 74 of the Ontario *Pension Benefits Act* (grow-in benefits).
Disability Benefits	If a member becomes totally disabled, the employer will pay the member's required contributions during the period of disability. The member's earnings rate in effect at the onset of disability is used to determine contributions and benefits during the disability period.
Indexation during retirement	Pensions in pay are indexed annually to 75% of the increase in CPI in excess of 2%, subject to a maximum annual increase of 5.5%. From time to time, at their discretion, the Plan Trustees may increase pensions in pay further on an ad hoc basis. The last ad hoc increase was granted effective January 1, 2008.

APPENDIX G

EMPLOYER AND TRUSTEES CERTIFICATION

With respect to the Report on the Actuarial Valuation for Funding Purposes as at December 31, 2017 of the Canadian Blood Services Defined Benefit Pension Plan, I hereby certify that, to the best of my knowledge and belief:

- The valuation reflects the terms of the Canadian Blood Services Defined Benefit Pension Plan Board of Trustees engagement with the actuary described in Section 2 of this report, particularly the requirement to not reflect a margin for adverse deviations in the going concern valuation.
- A copy of the official plan documents and of all amendments made up to December 31, 2017 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, 2017.
- All events subsequent to December 31, 2017 that may have an impact on the Plan have been communicated to the actuary.

Sept 11/2018	2018-09-11
Date	Date
Signed	Signed
BRENDAN DICK	Pauline Port
Name	Name
CO-CHAIR	Co- CHAIR
Title	Title

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