

THE UNIVERSITY OF NEW BRUNSWICK
SHARED RISK PLAN FOR ACADEMIC EMPLOYEES OF
THE UNIVERSITY OF NEW BRUNSWICK

Actuarial Valuation as at July 1, 2019

February 7, 2020

Registration Number 0695478

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Introduction

Purpose

This report with respect to the Shared Risk Plan for Academic Employees of the University of New Brunswick (“AESRP”) has been prepared for the Board of Trustees of the Shared Risk Plan for Academic Employees of the University of New Brunswick (“Board of Trustees”), the plan administrator, and presents the results of the actuarial valuation of the plan as at July 1, 2019.

The principal purposes of the report are:

- to present information on the financial position of the plan on the funding policy and going concern bases;
- to review the hypothetical windup status of the plan;
- to present, based on information provided by the University of New Brunswick, a set of reasonable assumptions, and on the stochastic model to be approved by the Superintendent of Pension of New Brunswick, the primary and secondary risk management results;
- to present information on the application of the funding policy, including the basis to grant escalated adjustments to members and former members, make adjustments to the initial contribution rates or reduce base benefits, if applicable; and
- to provide certain additional information required for the administration of the plan.

This report outlines the changes in the plan’s financial situation since the previous actuarial valuation at July 1, 2018, provides the information and the actuarial opinion required by the *Pension Benefits Act (New Brunswick)* and Regulations thereto and provides the information required to maintain plan registration under the *Income Tax Act (Canada)* and Regulations thereto. The previous going concern valuation was performed as at July 1, 2016.

This report summarizes the results of the actuarial valuation and contains an actuarial opinion as an integral part of the report. Supporting detailed information on the significant terms of engagement, assets, actuarial basis, membership data and plan provisions is contained in the Appendices.

The information contained in this report was prepared for the Board of Trustees, for its internal use and for filing with the Financial and Consumer Services Commission of New Brunswick, in connection with the actuarial valuation of the plan prepared by Société Towers Watson Canada inc. (“Willis Towers Watson”). This report is not intended, nor necessarily suitable, for other parties or for other purposes. Further distribution of all or part of this report to other parties (except where such

distribution is required by applicable legislation) or other use of this report is expressly prohibited without Willis Towers Watson's prior written consent. Willis Towers Watson is available to provide additional information with respect to this report to the above-mentioned intended users upon request.

The numbers in this report are not rounded. The fact that numbers are not rounded does not imply a greater level of precision than if the numbers had been rounded.

Significant Events Since Previous Actuarial Valuation

Actuarial Basis

Since the previous actuarial valuation, there have been changes to the funding policy actuarial basis as outlined in Appendix C.

In addition, the capital market investment model and the assumptions used for the going concern and hypothetical windup valuations have been updated. Details regarding the actuarial basis can be found in Appendices C, D, E and F.

Plan Provisions

This actuarial valuation reflects the plan provisions as at July 1, 2019 and does not make any provision for the possibility that a change or action (retroactive or otherwise) may be imposed by order of a regulatory body or a court as we were not aware of any definitive events that would require such change or action at the time this actuarial valuation was completed.

The plan was amended, effective July 1, 2018, in order to reflect the COLA granted in the July 1, 2018 actuarial valuation. The impact of this change has been reflected in this report.

The plan was further amended effective July 1, 2018 to correct a technical drafting error in the revisions to the Plan made in relation to the Improvement Program implemented effective July 1, 2007. The amendment results in applying the ITA maximum defined benefit pension limit separately to each period of service. This amendment has no impact on the valuation results as we were already using that methodology for actuarial valuation purposes.

There have been no other changes to the plan provisions since the previous actuarial valuation that affect the actuarial valuation's results. Details regarding the plan provisions can be found in Appendix H.

Subsequent Events

We completed this actuarial valuation on February 7, 2020.

Effective November 29, 2019, the Investment Policy was amended to permit private equity investments. This amendment has no material financial impact on the results presented in this report.

Furthermore, it is our understanding that the Board of Trustees is currently reviewing historical practice with respect to the recognition of certain stipends in pensionable earnings. The financial impact of this review, if any, will be reflected in a subsequent actuarial valuation.

To the best of our knowledge and on the basis of our discussions with the Board of Trustees, no other events which would have a material financial effect on the actuarial valuation occurred between the actuarial valuation date and the date this actuarial valuation was completed.

Section 1: Funding Policy Financial Position

1.1 Statement of Financial Position

	July 1, 2019		July 1, 2018
	After application of funding policy	Before application of funding policy	After application of funding policy
Funding Policy Value of Assets			
Market value of assets	\$ 379,046,873	\$ 379,046,873	\$ 348,805,278
Present value of excess contributions	85,735,258	86,863,719	80,311,996
Total funding policy value of assets	\$ 464,782,131	\$ 465,910,592	\$ 429,117,274
Funding Policy Liability			
▪ Active and disabled members	\$ 188,581,752	\$ 184,910,220	\$ 186,240,296
▪ Retired members and beneficiaries	206,540,383	203,532,833	191,153,707
▪ Terminated vested members	10,787,136	10,680,811	10,656,596
▪ Terminated non-vested members	265,115	265,115	238,782
Total funding policy liability	\$ 406,174,386	\$ 399,388,979	\$ 388,289,381
Funding Policy Excess (Deficit)	\$ 58,607,745	\$ 66,521,613	\$ 40,827,893
Open Group Funded Ratio	114.4%	116.7%	110.5%
Termination Value Funded Ratio	93.3%	94.9%	89.8%

Comment:

- The financial position of the plan on a funding policy basis is determined by comparing the funding policy value of assets (market value of assets plus the present value of excess contributions as defined under subsection 1.2) over the funding policy liability. The funding policy liability is the actuarial present value of the past base benefits and past ancillary benefits, excluding escalated adjustments that do not form part of the base benefits. However, the funding policy liability does include the value of escalated adjustments in respect of future Progress-Through-the-Ranks ("PTR") adjustments, in accordance with the applicable plan provisions. Please refer to Appendix C for details on the assumptions used.

1.2 Determination of Present Value of Excess Contributions

The present value of excess contributions as defined under the Shared Risk Plans Regulation to the *Pension Benefits Act (New Brunswick)* is based on the following:

- For each year in the fifteen years following the actuarial valuation date, the excess of the contributions expected to be made less the funding policy normal cost;
- The discount rate used to calculate the funding policy liabilities and funding policy normal cost; and
- The projected aggregate level of earnings in respect of which contributions are expected to be made for each year in the fifteen years following the actuarial valuation date.

Present Value of Excess Contributions

	July 1, 2019		July 1, 2018
	After application of funding policy	Before application of funding policy	After application of funding policy
Present value over the next 15 years			
A: Expected Contributions	\$ 245,015,801	\$ 245,015,801	\$ 232,714,585
B: Funding Policy Normal Cost	159,280,543	158,152,082	152,402,589
Excess Contributions (A – B)	\$ 85,735,258	\$ 86,863,719	\$ 80,311,996

Comments:

- The present value of funding policy normal cost includes the present value of non-investment expenses.
- The aggregate level of earnings in respect of which contributions are to be made were projected using the projection assumptions detailed in Appendix C.

1.3 Cost of Living Adjustments

Under the shared risk plan framework, cost of living adjustments (“Base COLA”) may be granted annually, subject to the plan’s ability to pay and the priorities established under the funding policy. Base COLA is comprised of Base CPI COLA for members who are accruing benefits at the actuarial valuation date and Base Pension COLA for members who were receiving a pension or terminated employment prior to the actuarial valuation date. These terms are defined further in Appendix H.

The following table presents the eligible Base COLA as at the actuarial valuation date, prior to the application of the funding policy.

Eligible Base COLA

In respect of the twelve month period ending	Base CPI COLA	Base Pension COLA ¹	
		For benefits in respect of service prior to June 30, 2004	For benefits in respect of service on or after July 1, 2004
June 30, 2016	1.40%	1.40%	0.50%
June 30, 2017	1.46%	1.46%	0.50%
June 30, 2018	1.88%	1.88%	0.50%
June 30, 2019	2.12%	2.12%	0.50%

Note:

¹ Eligible Base COLA is determined by applying the plan’s target indexing formulas described in Appendix H for the relevant period, without regard to the conditional nature of such COLA.

Comment:

- The decrease in the funding policy excess as at July 1, 2019, which would result from granting the full eligible Base COLA at that date, is \$25,874,976.

1.4 Application of Funding Policy

The plan's funding policy lists the actions and priorities that will be triggered when the funding level either exceeds or falls below specified thresholds. As the open group funded ratio exceeds 105% as at July 1, 2019, the funding excess utilization plan is triggered at that date.

Funding Excess Utilization Plan

Required Actions	July 1, 2019
1. Reversal of any prior reductions in base benefits	Not applicable
2. Remove any prior increases in contribution rates	Not applicable
3. Grant conditional Base COLA	
▪ Funding excess available to grant Base COLA ¹	\$ 7,913,868
▪ Cost of granting full eligible Base COLA ²	\$ 25,874,976
▪ Percentage of eligible Base COLA to be granted ³	30.59%
4. Grant conditional PTR Recapture	
▪ Funding excess available to grant PTR Recapture ⁴	\$ 0
▪ Cost of granting full eligible PTR Recapture ⁵	\$ 1,608,868
▪ Percentage of eligible PTR Recapture to be granted ³	0%
5. Reduce contribution rates ⁶	Not applicable

Notes:

- ¹ Determined as 17% of the funding excess between 105% and 140% in accordance with the plan's funding policy.
- ² Determined as the increase in the plan's funding policy liability plus the decrease in the present value of excess contributions as at July 1, 2019, assuming the full eligible Base COLA increases, outlined in Section 1.3, are granted.
- ³ In accordance with the plan terms and administrative practice, the Base COLA and PTR Recapture granted based on the available funding excess as at July 1, 2019 shall be payable effective as of January 1, 2020.
- ⁴ Determined as 50% of the funding excess remaining after granting the full eligible Base COLA in accordance with the plan's funding policy.
- ⁵ Determined as the increase in the plan's funding policy liability plus the decrease in the present value of excess contributions as at July 1, 2019, assuming the full eligible PTR Recapture is granted. Granting full eligible PTR Recapture as at July 1, 2019 would increase the Indexed PTR Adjustment and the Indexed Professor Salary Ceiling to \$2,964 and \$175,636, respectively.
- ⁶ Only applies if the open group funded ratio is above 140% at the actuarial valuation date.

Comment:

- Details on the funding policy procedures are provided in Appendix H.

1.5 Reconciliation of Funding Policy Financial Position

Funding policy excess (deficit) as at July 1, 2018		\$	40,827,893
Less: Present value of excess contributions as at July 1, 2018			<u>(80,311,996)</u>
Funding policy excess (deficit) as at July 1, 2018, excluding present value of excess contributions		\$	(39,484,103)
Contributions in excess of funding policy normal cost net of non-investment expenses			5,938,176
Expected interest on:			
▪ Funding policy excess (deficit), excluding present value of excess contributions	\$	(1,579,364)	
▪ Contributions in excess of funding policy normal cost net of non-investment expenses		<u>118,764</u>	(1,460,600)
Plan experience:			
▪ Investment gains (losses)	\$	13,776,803	
▪ Non-investment expenses gains (losses)		(727)	
▪ Liability and miscellaneous gains (losses)		<u>888,345</u>	14,664,421
Change in actuarial basis:			
▪ Economic assumptions			<u>0</u>
Funding policy excess (deficit) as at July 1, 2019, before application of funding policy and excluding present value of excess contributions		\$	(20,342,106)
Present value of excess contributions as at July 1, 2019, before application of funding policy			<u>86,863,719</u>
Funding policy excess (deficit) as at July 1, 2019, before application of funding policy		\$	66,521,613
Application of funding policy			<u>(7,913,868)</u>
Funding policy excess (deficit) as at July 1, 2019, after application of funding policy		\$	58,607,745

1.6 Reconciliation of Present Value of Excess Contributions

Present value of excess contributions as at July 1, 2018	\$ 80,311,996
Expected increase in present value of excess contributions due to rate of salary increase	2,634,465
Plan experience:	
▪ Liability and miscellaneous gains (losses)	2,851,972
Change in actuarial basis:	
▪ Provision for non-investment expenses	<u>1,065,286</u>
Present value of excess contributions as at July 1, 2019, before application of funding policy	\$ 86,863,719

Section 2: Risk Management Procedures

2.1 Risk Management Test Results

Risk management procedures for a shared risk plan require the use of a stochastic asset liability model to test the viability of a plan.

The primary and secondary risk management goals for the plan are set out in the funding policy in accordance with the requirements of the *Pension Benefits Act (New Brunswick)* and Regulations thereto. The primary and secondary risk management tests were conducted as at the valuation date based on 5,000 economic scenarios over a 20-year period. The results of those tests are indicated in the table below:

	July 1, 2019		July 1, 2018
	After application of funding policy	Before application of funding policy	After application of funding policy
Primary Risk Management Test			
Proportion of scenarios that do not result in a reduction of base benefits in any year over the 20-year period	96.4% <i>Passed</i>	96.7% <i>Passed</i>	96.7% <i>Passed</i>
Secondary Risk Management Test			
Total COLA provided, on average across all stochastic simulations, as a percentage of the total eligible Base COLA over the 20-year period	82.6% <i>Passed</i>	82.1% <i>Passed</i>	88.2% <i>Passed</i>

Comments:

- The primary risk management goal requires that at least 97.5% of the modeled outcomes will not result in the past base benefits being reduced in any year over a 20-year period starting on the actuarial valuation date.

- The primary risk management goal must be reviewed at each actuarial valuation, but shall only need to be met on:
 - the Conversion Date;
 - the date a Permanent Benefit Change is made;
 - the date a Benefit Improvement is made, except if the benefit improvement is made as a result of conditional Base COLA and at least 95% of the modeled outcomes will not result in the past base benefits being reduced in any year over a 20-year period starting on the actuarial valuation date and the asset mix has not been changed in a manner that increased investment risks for the plan in the six-month period before the contingent indexing occurred; and
 - the date cumulative increases or cumulative decreases in contribution rates exceed the adjustments permitted by the funding policy.
- The secondary risk management goal requires that, over a 20-year period, the total COLA expected to be provided, on average across all stochastic simulations, will exceed:
 - with respect to accrued benefits for active and disabled members, 75% of the cumulative increase in Consumer Price Index (CPI); and
 - with respect to immediate and deferred pensions, 75% of the cumulative increase that would have been provided in accordance with the indexing provisions of the Prior Plan that were in effect immediately before it was converted to a shared risk plan.
- The secondary risk management goal must be reviewed at each actuarial valuation, but shall only need to be met on:
 - the Conversion Date; and
 - the date a Permanent Benefit Change is made.
- Details on the risk management procedures are provided in Appendix D.

Section 3: Going Concern Financial Position

This section outlines the changes in the plan's going concern financial situation since the previous actuarial valuation at July 1, 2016 and provides the information required to maintain plan registration under the *Income Tax Act (Canada)* and Regulations thereto.

3.1 Statement of Financial Position

	July 1, 2019	July 1, 2016
Going Concern Value of Assets	\$ 379,046,873	\$ 300,779,537
Actuarial Liability		
▪ Active and disabled members	\$ 225,607,829	\$ 222,107,479
▪ Retired members and beneficiaries	222,726,744	183,019,873
▪ Terminated vested members	11,551,484	9,079,006
▪ Terminated non-vested members	265,115	220,292
Total actuarial liability	\$ 460,151,172	\$ 414,426,650
Actuarial Surplus (Unfunded Actuarial Liability)	\$ (81,104,299)	\$ (113,647,113)

Comment:

- The financial position of the plan on a going concern basis is determined by comparing the going concern value of assets to the actuarial liability and is a reflection of the assets available for the benefits accrued in respect of credited service prior to the actuarial valuation date assuming the plan continues indefinitely and that Base COLA and PTR Recapture are provided in full each year, without regard to the conditional nature of such COLA. Please refer to Appendix E for details on the assumptions used.

Section 4: Hypothetical Windup Financial Position

4.1 Statement of Hypothetical Windup Financial Position

	July 1, 2019	July 1, 2018
Hypothetical Windup Value of Assets		
Market value of assets	\$ 379,046,873	\$ 348,805,278
Provision for plan windup expenses	(600,000)	(400,000)
Total hypothetical windup value of assets	<u>\$ 378,446,873</u>	<u>\$ 348,405,278</u>
Hypothetical Windup Liability		
▪ Active and disabled members	\$ 355,539,530	\$ 340,816,886
▪ Retired members and beneficiaries	297,446,336	275,374,424
▪ Terminated vested members	19,600,879	18,630,692
▪ Terminated non-vested members	265,115	238,782
Total hypothetical windup liability	<u>\$ 672,851,860</u>	<u>\$ 635,060,784</u>
Hypothetical Windup Surplus (Unfunded Hypothetical Windup Liability)	\$ (294,404,987)	\$ (286,655,506)

Comments:

- The financial position of the plan on a hypothetical windup basis is determined by comparing the hypothetical windup value of assets to the hypothetical windup liability (the actuarial present value of benefits accrued in respect of credited service prior to the actuarial valuation date, calculated as if the plan were wound up on that date). Please refer to Appendix F for details on the assumptions used.
- Under the scenario of a plan windup within the first 10 years following conversion to a shared risk plan, the Superintendent may determine that the conversion is void that the Shared Risk Plan for Academic Employees of the University of New Brunswick be wound-up as a defined benefit plan under Part 1 of the *Pension Benefits Act (New Brunswick)*. Consequently, the hypothetical windup liability shown in this table assumes the Pension Plan for Academic Employees of the University of New Brunswick (the Prior Plan) provisions prior to conversion would apply.

- The hypothetical windup actuarial valuation results presented in this report are determined under a scenario where, following a plan windup, the employer continues its operations.

Section 5: Contribution Requirements

5.1 Funding Policy Contribution (Ensuing Year)

	July 1, 2019		July 1, 2018
	After application of funding policy	Before application of funding policy	After application of funding policy
Estimated University Contribution			
Estimated contribution	\$ 9,321,683	\$ 9,321,683	\$ 9,059,333
Estimated payroll	\$ 81,058,111	\$ 81,058,111	\$ 78,776,807
% of payroll (blended rate)	11.5%	11.5%	11.5%
Estimated Member Contributions			
Estimated contribution	\$ 9,321,683	\$ 9,321,683	\$ 9,059,333
Estimated payroll	\$ 81,058,111	\$ 81,058,111	\$ 78,776,807
% of payroll (blended rate)	11.5%	11.5%	11.5%

Comments:

- In accordance with the terms of the plan, the member blended contribution rate of 11.5% shall be payable as 10.55% of pensionable salary up to the YMPE and 12.25% of pensionable salary in excess of the YMPE for each Party. The pensionable salary used to calculate the portion in excess of the YMPE as at July 1, 2019 is limited to the post-conversion maximum pensionable salary in effect at that date.
- The University of New Brunswick is required to contribute an amount equal to the total of the members' contributions.

5.2 Funding Policy Normal Actuarial Cost (Ensuing Year)

	July 1, 2019		July 1, 2018
	After application of funding policy	Before application of funding policy	After application of funding policy
Funding policy normal actuarial cost	\$ 12,178,258	\$ 12,123,739	\$ 11,901,886
Estimated payroll ¹	\$ 81,058,111	\$ 81,058,111	\$ 78,776,807
% of payroll	15.02%	14.96%	15.11%
Provision for non-investment expenses	\$ 526,878	\$ 526,878	\$ 590,826
Estimated payroll ¹	\$ 81,058,111	\$ 81,058,111	\$ 78,776,807
% of payroll	0.65%	0.65%	0.75%

Note:

¹ Reflects expected adjustments for members retiring during the year.

Comment:

- The funding policy normal actuarial cost rate changed by (0.15)% of payroll due to plan experience since the previous actuarial valuation, prior to application of the funding policy.

5.3 Going Concern Normal Actuarial Cost (Ensuing Year)

	July 1, 2019	July 1, 2016
Going concern normal actuarial cost	\$ 14,660,677	\$ 14,383,010
Estimated payroll	\$ 81,058,111	\$ 77,282,994
% of payroll	18.09%	18.61%

5.4 Estimated Maximum Contribution (Ensuing Year)

	July 1, 2019	July 1, 2016
Going Concern Normal Actuarial Cost	\$ 14,660,677	\$ 14,383,010
Greater of the Unfunded Actuarial Liability and the Unfunded Hypothetical Windup Liability	<u>294,404,987</u>	<u>322,064,795</u>
Actuarial Surplus (Unfunded Actuarial Liability)	\$ 309,065,664	\$ 336,447,805

Comment:

- The *Income Tax Act (Canada)* permits the Parties to make contributions up to the above amount less the contributions made in respect of periods since July 1, 2019, provided that all assumptions made for the purpose of the hypothetical windup valuation remain reasonable at the time each contribution is made.

5.5 Timing of Contributions

To satisfy the requirements of New Brunswick pension legislation, the required employer contributions must be paid monthly and within 15 days of the month to which it pertains. Members' contributions must also be remitted to the fund monthly and within 15 days of the month to which they pertain.

5.6 Future Contribution and Benefit Levels

Future contribution levels and/or benefits provided may change as a result of future changes in the actuarial methods and assumptions, the membership data, the plan provisions and the legislative

rules, or as a result of future experience gains or losses, none of which has been anticipated at this time. The funding policy provides a framework for making adjustments to the contribution rate and/or benefits. The initial contribution rate may change by up to 2.25% of pensionable salary for each Party in future years (i.e. total maximum increase or decrease of 4.50% of payroll), as required by the funding policy. Future and/or past benefit may also change as required by the funding policy. Emerging experience, differing from the assumptions, will result in gains or losses that will be revealed in future actuarial valuations. Further details on how future contribution levels may vary are provided in Appendix H.

Section 6: Actuarial Certification and Opinion

6.1 Actuarial Certification

Based on the results of these actuarial valuations, we hereby certify that, in our opinion, as at July 1, 2019:

- The funding policy excess (funding policy deficit), determined by comparing the funding policy liability, the measure of obligations of the plan on a funding policy basis, to the funding policy value of assets, is \$66,521,613, before application of the funding policy.
- In accordance with the funding policy, \$7,913,868 of the funding policy excess can be used to provide 30.59% of the eligible Base COLA.
- In accordance with the funding policy, \$0 of the funding policy excess can be used to provide 0% of the eligible PTR Recapture.
- The funding policy excess (funding policy deficit), determined by comparing the funding policy liability, the measure of obligations of the plan on a funding policy basis, to the funding policy value of assets, is \$58,607,745, after application of the funding policy.
- The results of the primary and secondary risk management tests conducted as at the actuarial valuation date based on 5,000 economic scenarios over a 20-year period are:

	After application of funding policy
Primary Risk Management Test	
Proportion of scenarios that do not result in a reduction of base benefits in any year over the 20-year period	96.4%
Secondary Risk Management Test	
Total COLA provided, on average across all stochastic simulations, as a percentage of the total eligible Base COLA over the 20-year period	82.6%

- The going concern surplus (unfunded actuarial liability), determined by comparing the going concern liability, the measure of the obligations of the plan on a going concern basis, to the actuarial value of assets, is \$(81,104,299).
- The hypothetical windup surplus (unfunded hypothetical windup liability), determined by comparing the hypothetical windup liability, the measure of the obligations of the plan on a hypothetical windup basis, to the hypothetical windup value of assets, is \$(294,404,987).
- The excess actuarial surplus, pursuant to section 147.2(2) of the *Income Tax Act (Canada)*, is \$0.
- In accordance with the plan provisions, the funding policy and paragraph 9 of the Shared Risk Plans Regulation to the *Pension Benefits Act (New Brunswick)*, the Parties are required to make the total contributions until the effective date of the next actuarial opinion as follows:

		After application of funding policy
Estimated University Contribution		
Estimated contribution	\$	9,321,683
Estimated payroll	\$	81,058,111
% of payroll (blended rate)		11.50%
Estimated Member Contributions		
Estimated contribution	\$	9,321,683
Estimated payroll	\$	81,058,111
% of payroll (blended rate)		11.50%

- The maximum total contributions permissible under the *Income Tax Act (Canada)* are described in Section 5.
- The open group funded ratio, defined as the ratio of the market value of assets plus the present value of contributions in excess of normal cost during the next 15 years to the funding policy liabilities, is 114.4%, after application of the funding policy.
- The termination value funded ratio, defined as the ratio of the market value of assets to the funding policy liabilities, is 93.3%, after application of the funding policy.
- The hypothetical windup ratio, defined as the ratio of the hypothetical windup value of assets to the hypothetical windup liabilities, is 56.2%.

- In accordance with the Shared Risk Plans Regulation to the *Pension Benefits Act (New Brunswick)*, the next funding policy actuarial valuation should be performed with an effective date not later than July 1, 2020. The basis for University contributions presented in this report is effective until the next actuarial opinion is filed.

- The pension benefits provided under the plan are not subject to the limitation imposed under Section 8504(6) of the Regulations to the *Income Tax Act (Canada)*.

6.2 Limitation of Analysis for Risk Management Tests

The analysis contained in this report involves actuarial calculations and stochastic modeling. This requires that we make assumptions about future events. We have used assumptions that we believe are reasonable and appropriate for the purpose for which they have been used. Other assumptions may also be reasonable and could result in substantially different results.

In addition, because it is not possible or practical to model all aspects of a situation, we use summary information, estimates, or simplifications of calculations to facilitate the modeling of future events. We may also exclude factors or data that are immaterial in our judgment. We believe that we have not oversimplified the situation being modeled and have not inappropriately included or excluded any items.

Naturally, future events and actual experience will vary from the assumptions we have employed and calculations prepared with actual data will vary from estimates or summaries used for modeling purposes. As these differences arise, contribution levels and benefits payable under the plan will be adjusted in accordance with the priorities set out under the funding policy.

Because of the nature of the primary and secondary risk management objectives set out in the applicable Shared Risk Plans Regulation to the *Pension Benefits Act (New Brunswick)*, the modeled results may be acutely sensitive to changes in the assumptions employed and the model used. While the Willis Towers Watson model and the assumptions employed will need to be approved for use by the New Brunswick Superintendent of Pensions, it is important to note that other acceptable models and assumptions could in theory produce different results. The results presented in this report are not intended nor should they be interpreted to represent a guarantee or warranty with respect to the future financial condition of the Shared Risk Plan for Academic Employees of the University of New Brunswick. Moreover, any determinations of probabilities based on the model represent simulated outcomes and should not be interpreted as being actual probabilities.

6.3 Actuarial Opinion

In our opinion:

- the membership data on which the actuarial valuations are based are sufficient and reliable for the purposes of the risk management procedures and funding policy, going concern and hypothetical windup valuations,
- the assumptions are appropriate for the purposes of the risk management procedures, funding policy, going concern and hypothetical windup valuations, and the funding policy valuation assumptions are consistent with the stochastic model inputs,
- the methods employed in the actuarial valuations are appropriate for the purposes of the risk management procedures, funding policy, going concern and hypothetical windup valuations, and
- the disclosures in this report have been prepared in compliance with Subsection 3270 of the Canadian Institute of Actuaries Standards of Practice, *Disclosure for Stochastic Models Used to Comply with Specific Regulatory Pension Plan Funding Requirements*.

This report has been prepared, and our opinions given, in accordance with accepted actuarial practice in Canada. The actuarial valuations have been conducted in accordance with our understanding of the funding and solvency standards prescribed by the *Pension Benefits Act (New Brunswick)* and Regulations thereto, and in accordance with our understanding of the requirements of the *Income Tax Act (Canada)* and Regulations thereto. This actuarial opinion forms an integral part of the report.

The results presented in this report have been developed using a particular set of actuarial assumptions and stochastic model inputs. While we believe that these assumptions and stochastic model inputs are reasonable at the actuarial valuation date, other reasonable actuarial assumptions and stochastic model inputs could have been used resulting in potentially very different results and distributions of forecasted outcomes. The results presented in this report are reasonable actuarial results based on actuarial assumptions reflecting our expectation of future events.

Société Towers Watson Canada inc.



Jonathan Morin
Fellow of the Canadian Institute of Actuaries



Nancy Chauvette
Associate of the Canadian Institute of Actuaries

Montréal, Québec
February 7, 2020

Appendix A: Significant Terms of Engagement

For purposes of preparing this actuarial valuation report, the Board of Trustees has directed that:

- The actuarial valuation is to be prepared as at July 1, 2019.
- For the purpose of the funding policy valuation, the terms of engagement require the use of the actuarial basis and actuarial cost method, as described in Appendix C.
- For the purpose of the risk management procedures, the terms of engagement require the use of the actuarial basis described in Appendix D.
- For the purpose of the going concern valuation, the terms of engagement require the use of the margins for adverse deviations described in Appendix E.
- For the purposes of determining the going concern liability discount rate, the funding policy liability discount rate and the risk management procedures, the target asset allocation should reflect the revised target asset allocation approved by the Board of Trustees in February 2018. There are no expectations that this target asset allocation will be further modified in the near future.
- This report is to be prepared on the basis that there will be no retroactive changes to previously filed partial windup reports, if any, and neither the applicable pension regulator nor the plan sponsor will order/declare any partial plan windup with an effective date prior to the actuarial valuation date.
- The hypothetical windup valuation results presented in this report are to be determined under a scenario where the employer continues to operate and certain expenses are paid from the pension fund (consistent with past practice) while the employer pays other plan expenses.
- This report is to be prepared on the basis that the employer is entitled to apply the actuarial surplus, if any, revealed in an actuarial valuation report to meet its contribution requirements under the plan while the plan remains a going concern, to the extent permitted by applicable pension legislation and the funding policy. This report does not address the disposition of any surplus assets remaining in the event of plan windup. If an applicable pension regulator or other entity with jurisdiction directs otherwise, certain financial measures contained in this report, including contribution requirements, may be affected.

Should these directions from the plan administrator be amended or withdrawn, Willis Towers Watson reserves the right to amend or withdraw this report.

Appendix B: Assets

Statement of Market Value

	July 1, 2019	July 1, 2018
Invested assets:		
▪ Canadian equities	\$ 0	\$ 49,226,969
▪ Global equities	35,343,362	66,302,232
▪ Global equities – low volatility	77,717,962	34,807,925
▪ Real estate	46,833,136	24,370,384
▪ Infrastructure	28,146,403	28,488,177
▪ Universe bonds	132,164,932	63,498,897
▪ Global bonds	0	78,416,946
▪ High yield bonds	56,357,462	0
▪ Cash and short-term investments	2,560,146	4,109,789
▪ Total invested assets	<u>\$ 379,123,403</u>	<u>\$ 349,221,319</u>
Net outstanding amounts:		
▪ Prepaid expenses / account receivable	\$ 138,624	\$ 111,093
▪ Contributions receivable	0	0
▪ Benefits payable	(227)	(216,367)
▪ Expenses and other payables	(214,927)	(310,767)
▪ Total net outstanding amounts	<u>\$ (76,530)</u>	<u>\$ (416,041)</u>
Total	<u>\$ 379,046,873</u>	<u>\$ 348,805,278</u>

Comments:

- The invested assets are held by Vestcor Investment Management Corporation.
- The data relating to the invested assets are based on the financial statements prepared by the University of New Brunswick and by Vestcor Investment Management Corporation. The data relating to net outstanding amounts were provided by the University of New Brunswick. All such data has been relied upon by Willis Towers Watson following tests of reasonableness with respect to contributions, benefit payments and investment income. However, Willis Towers Watson has not independently audited or verified this data.

Asset Class Distribution

The following table shows the target asset allocation stipulated by the plan's investment policy in respect of various major asset classes and the actual asset allocation as at July 1, 2019.

	Target Asset allocation ¹	Asset allocation as at July 1, 2019 ²
Equities:		
Canadian equities	0.0%	0.0%
Global equities	10.0%	9.3%
Global equities – low volatility	20.0%	20.5%
Alternatives:		
Real estate	12.5%	12.3%
Infrastructure	7.5%	7.4%
Fixed Income:		
Universe bonds	35.0%	34.9%
Global bonds	0.0%	0.0%
High yield bonds	15.0%	14.9%
Cash and short-term investments	0.0%	0.7%
Total	100.0%	100.0%

Notes:

¹ Target asset allocation approved by the Board of Trustees in February 2018.

² This information was obtained from Vestcor Investment Management Corporation. All such data has been relied upon by Willis Towers Watson and compared against the target asset allocation in effect at that time to assess reasonableness. However, Willis Towers Watson has not independently audited or verified this data.

Reconciliation of Total Assets (Market Value)

Assets as at July 1, 2018		\$	348,805,278
Receipts:			
▪ Contributions:			
– University contributions	\$	9,215,444	
– Members' contributions		<u>9,215,444</u>	\$ 18,430,888
▪ Investment return, net of investment expenses			<u>27,778,280</u>
▪ Total receipts			\$ 46,209,168
Disbursements:			
▪ Benefit payments:			
– Pension payments	\$	14,102,670	
– Lump sum settlements		<u>1,273,364</u>	\$ 15,376,034
▪ Non-investment expenses			<u>591,539</u>
▪ Total disbursements			\$ 15,967,573
Assets as at July 1, 2019		\$	379,046,873

Comments:

- This reconciliation is based on the financial statements issued by the University of New Brunswick and by Vestcor Investment Management Corporation. All such data has been relied upon by Willis Towers Watson following tests of reasonableness with respect to contributions, benefit payments and investment income. However, Willis Towers Watson has not independently audited or verified this data.
- The rate of return earned on the market value of assets, net of investment expenses, from July 1, 2018 to July 1, 2019 is approximately 7.9% p.a.

Appendix C: Actuarial Basis – Funding Policy

Methods

Asset Valuation Method

The funding policy value of assets was calculated as the sum of the market value of invested assets at the actuarial valuation date, adjusted for net outstanding amounts, and the present value of excess contributions.

Present Value of Excess Contributions

The present value of excess contributions as defined under the Shared Risk Plans Regulation to the *Pension Benefits Act (New Brunswick)* is based on the following:

- For each year, in the fifteen years following the valuation date, the excess of the contributions expected to be made in the year less the funding policy normal cost;
- The discount rate used to calculate the funding policy liabilities and funding policy normal cost; and
- The projected aggregate level of earnings in respect of which contributions are to be made in each year in the fifteen years following the actuarial valuation date.

Actuarial Cost Method

The funding policy liability and the funding policy normal actuarial cost in respect of base benefits were calculated using the projected unit credit cost method.

Prospective benefits were calculated for each active and disabled member according to the plan provisions and actuarial assumptions. The funding policy liability was calculated as the actuarial present value of the member's prospective base benefits and ancillary benefits accrued for credited service to date (the benefit accrual method), excluding any escalated adjustments that do not form part of the base benefits at the actuarial valuation date. However, the funding policy liability does include the value of any escalated adjustments attributable to future PTR Adjustments in respect of credited service prior to the actuarial valuation date, based on the Indexed PTR Adjustment in effect at the actuarial valuation date. The calculation of the actuarial present value of the member's prospective benefits is at least equal to the member's contributions with interest.

The funding policy liability for retired members and beneficiaries, terminated vested members and terminated non-vested members as calculated as the actuarial present value of their respective benefits.

The funding policy normal actuarial cost in respect of benefits for each active and disabled member was calculated as the actuarial present value of the member's prospective base benefits and ancillary benefits accruing in respect of credited service in the ensuing year, excluding any escalated adjustments that will not form part of the base benefits in the year following the actuarial valuation date. However, the funding policy normal actuarial cost does include the value of any escalated adjustments attributable to future PTR Adjustments in respect of credited service in the ensuing year, based on the Indexed PTR Adjustment in effect at the actuarial valuation date. The funding policy normal actuarial cost rate in respect of benefits determined by the projected unit credit cost method will be stable over time if the demographic characteristics of the active and disabled plan membership remain stable from actuarial valuation to actuarial valuation. All other things being equal, an active and disabled membership whose average age increases (decreases) between actuarial valuations will result in an increasing (decreasing) funding policy normal actuarial cost rate.

Actuarial Assumptions

	July 1, 2019	July 1, 2018
Economic Assumptions (per annum)		
Liability discount rate	4.00%	4.00%
Rate of inflation	2.00%	2.00%
Rate of salary increase	1.80% for 1 year, 3.00% thereafter plus annual PTR Adjustments	1.80% for 2 years, 3.00% thereafter plus annual PTR Adjustments
Escalation in PTR Adjustment and professor salary ceiling ¹	1.80% for 1 year, 3.00% thereafter	1.80% for 2 years, 3.00% thereafter
Escalation of <i>Income Tax Act (Canada)</i> maximum pension limitation ²	3.00%	3.00%
Base COLA		
▪ Base CPI COLA (active and disabled members)	Nil	Nil
▪ Base Pension COLA (other members)		
– Service before June 30, 2004	Nil	Nil
– Service from July 1, 2004 onward	Nil	Nil
PTR Recapture	Nil	Nil
Demographic Assumptions		
Mortality	2014 Public Sector Canadian Pensioners' Mortality Table, projected generationally using Scale B, adjusted for industry classification (86.6% Male and 94.2% Female)	2014 Public Sector Canadian Pensioners' Mortality Table, projected generationally using Scale B, adjusted for industry classification (86.6% Male and 94.2% Female)
Withdrawal	Service-related rates (refer to Table 1)	Service-related rates (refer to Table 1)
Disability incidence/recovery	Nil	Nil
Retirement/pension commencement		
▪ Active and disabled members	Age-related rates (refer to Table 2)	Age-related rates (refer to Table 2)
▪ Terminated vested members	Age 65	Age 65
New Entrant Assumptions ³		
Reduction in complement	-0.25% per annum	-0.25% per annum
New entrant membership profile	Refer to Table 3	Refer to Table 3

	July 1, 2019	July 1, 2018
Other		
Percentage of members with eligible spouses at pension commencement and electing joint and survivor pension form	90%	90%
Years male spouse older than female spouse	3	3
Percentage of members with eligible dependant other than spouse	0%	0%
Provision for non-investment expenses	0.65% of payroll	0.75% of payroll

Notes:

- ¹ The PTR Adjustment and professor salary ceiling figures of \$2,964 and \$175,636, respectively, as at July 1, 2019 were projected at 3.00% per annum starting in 2020. PTR Adjustment and professor salary ceiling figures of \$2,912 and \$172,516, respectively, were used as at July 1, 2018.
- ² The *Income Tax Act (Canada)* maximum pension limit of \$3,025.56 per year of service in 2019 is the starting value for maximum pension limit projection as at the current valuation and is indexed starting in 2020. The *Income Tax Act (Canada)* maximum pension at retirement is used to ensure that pension at retirement, including escalated adjustments in respect of future PTR Adjustments, does not exceed the limit.
- ³ Assumptions used for the purpose of determining the present value of excess contributions.

Table 1 — Withdrawal Rates

Service	%
0	14.0%
1	12.0%
2	10.0%
3	8.0%
4	6.0%
5	4.0%
6	3.5%
7	3.0%
8	2.5%
9	2.0%
10 – 14	1.5%
15 – 19	1.0%
20 – 24	1.0%
25 and over	Nil

Table 2 — Retirement Rates

Age	% If 85 points ¹	% Otherwise
55 – 57	5%	2%
58 – 61	10%	4%
62 – 64	15%	10%
65	50%	50%
66 – 70	20%	20%
71 and over	100%	100%

Note:

¹ Applicable only for retirement prior to July 1, 2030.

Table 3 — New Entrant Membership Profile

	July 1, 2019		July 1, 2018	
▪ Number ¹		24		24
▪ Average age		40		40
▪ Average credited service		0		0
▪ Average pensionable salary	\$	100,861	\$	96,184

Note:

¹ Number of distinct new entrant profiles. Actual number of new entrants in a given year will be determined in accordance with the expected decrements and the complement reduction assumption.

Rationale for Actuarial Assumptions

The rationale for the material actuarial assumptions used in the funding policy valuation is summarized below.

The assumptions do not include margins for adverse deviations, except as noted below.

Liability discount rate

The liability discount rate of 4.00% per annum has been determined in accordance with the funding policy in a manner consistent with the purposes of the Shared Risk Plan for Academic Employees of the University of New Brunswick, the funding policy, the investment policy and the risk management goals and procedures.

This assumption includes the margin for adverse deviations described below. The economic assumptions used for determining the margin for adverse deviations included in the liability discount rate have been developed based on the 25th percentile of the distribution of expected long-term nominal rate of return using the Willis Towers Watson stochastic capital market investment model, as detailed in Appendix D. The capital market model simulates economic variables (e.g. inflation and yields) and asset class returns, with the assumptions being developed through both the analysis of historical rates and returns, and the application of econometric theory. In modeling inflation and bond yields, current conditions and long-term expectations are used and the serial correlation inherent in these parameters is recognized.

Our long-term nominal rate of return assumption was determined using the expected long-term asset mix for the plan based on the revised target asset allocation approved by the Board of Trustees in February 2018.

Based on the stochastic capital market investment model, a best estimate long-term gross nominal rate of return as of July 1, 2019 of 5.13% is appropriate. The following adjustments were subsequently made before selecting the long-term nominal rate of return assumption:

▪ Best estimate long-term nominal rate of return before adjustments	5.13%
▪ Adjustment for investment expenses paid by the plan (excluding active management fees)	<u>(0.05)</u>
▪ Best estimate long-term nominal rate of return after adjustments	5.08%

In determining the best estimate long-term nominal rate of return after adjustments, we have assumed that additional returns associated with employing an active investment management strategy would equal the additional expenses associated with employing such strategy. Consequently, any potential additional returns have been ignored.

After allowing a 1.00% margin for adverse deviations and rounding to the nearest 0.25%, a liability discount rate of 4.00% was established. At the previous actuarial valuation, a 1.50% margin for adverse deviations was used. The resulting funding policy discount rate is in accordance with the Policy for Adjusting Funding Policy Discount Rate as described in Appendix H.

Rate of inflation

The assumption reflects an estimate of future rate of inflation considering economic and financial market conditions at the actuarial valuation date.

Rate of salary increase

The assumption reflects the most recent collective bargaining agreement for a select period of one year. After the select period, the assumption reflects an assumed rate of inflation of 2.00% per annum, plus an allowance of 1.00% per annum to reflect the effect of real economic growth and productivity gains in the economy. In addition, Pensionable Salary is also assumed to increase annually with future PTR Adjustments until the Pensionable Salary exceeds the salary ceiling of the rank of professor.

Escalation in PTR Adjustment and professor salary ceiling

The assumption reflects the most recent collective bargaining agreement for a select period of one year. After the select period, the assumption reflects an assumed rate of inflation of 2.00% per annum, plus an allowance of 1.00% per annum to reflect the effect of real economic growth and productivity gains in the economy.

Escalation of Income Tax Act (Canada) maximum pension limitation

The maximum pension limitation under the *Income Tax Act (Canada)* is scheduled to be indexed annually based on assumed increases in the Industrial Aggregate Wage index. The assumption reflects an assumed rate of inflation of 2.00% per annum, plus an allowance of 1.00% per annum for the effect of real economic growth and productivity gains in the economy.

Base COLA

No allowance for future Base COLA is included in the liability. This assumption is consistent with the requirements of the Shared Risk Plans Regulation to the *Pension Benefits Act (New Brunswick)*.

PTR Recapture

No allowance for future PTR Recapture is included. This assumption is consistent with the requirements of the Shared Risk Plans Regulation to the *Pension Benefits Act (New Brunswick)*.

Mortality

The 2014 Public Sector Canadian Pensioners' Mortality Table (CPM2014Publ) is based on a mortality experience study for calendar years 1999 to 2008 conducted by the Canadian Institute of Actuaries on a sample of Canadian registered pension plans. The CPM2014Publ table allows adjustments to the mortality rates based on pension size and/or industry classification. Base mortality rates were adjusted based on an educational institution adjustment factor. Improvement Scale B (CPM-B) is a two-dimensional scale developed by the Canadian Institute of Actuaries based primarily on the mortality experience of pensioners under the Canada Pension Plan (CPP) and the Québec Pension Plan (QPP) up to 2007 as well as the assumptions used in the 26th CPP Actuarial Report.

Base mortality rates from the CPM2014Publ table, adjusted by the educational institution adjustment factor, are considered reasonable for the actuarial valuation of the plan given that the mortality experience of the plan membership is insufficient to assess plan-specific experience, and there is no reason to expect the mortality experience of the plan to differ significantly from that of other pension plans covering membership groups with similar characteristics. Applying improvement scale CPM-B generationally provides allowance for improvements in mortality after 2014 and is considered reasonable for projecting mortality experience into the future.

Withdrawal

The rates of withdrawal were developed based on a review of plan experience over the 5-year period ending July 1, 2015 and an assessment of future expectations.

Disability incidence/recovery

There are no disability benefits under the plan other than the accrual of retirement income (earnings remain constant) during disability. Consequently, the assumption of no incidence of disability or recovery therefrom makes an appropriate allowance, in combination with the other assumptions, for such continued accruals.

Retirement from active membership

The rates of retirement were developed based on a review of plan experience over the 5-year period ending July 1, 2015 and an assessment of future expectations. All members are assumed to commence their pension at retirement date.

Pension commencement after termination of employment

All terminated members are assumed to commence their pension at age 65, as the plan's termination benefit does not provide a significant early retirement subsidy. An assumption of pension commencement prior to the normal retirement age would not have a material impact on the actuarial valuation results.

Reduction in complement

As specified in the funding policy and based on discussions with the University of New Brunswick concerning their future expectations, retiring and terminating members are assumed to be partially replaced by new entrants such that the active membership will decrease by 5% over a 20-year period following the valuation date.

New entrant membership profile

The profile for new entrants used for purposes of the demographic projections was developed based on the age, earnings and gender of actual new entrants in the plan over the 8-year period ending July 1, 2019.

Percentage of members with eligible spouses at pension commencement and electing joint and survivor pension form

When provided, the actual data on the spouse and form of payment were used for retired members. For other members, the assumed percentage of members with a spouse is based on the percentages for the general population. All members with eligible spouses were assumed to elect a joint and survivor pension form.

Years male spouse older than female spouse

When provided, the actual data on the spouse were used for retired members. For other members, the assumption is based on surveys of the age difference in the general population and an assessment of future expectations for members of the plan.

Provision for non-investment expenses

The liability discount rate is net of investment expenses (with the exception of any fees associated with employing an active investment management strategy). An explicit provision has been made in the funding policy normal cost for non-investment related expenses expected to be paid from the pension fund. The assumed level of expenses is based on recent experience of the plan and an assessment of future expectations.

Appendix D: Actuarial Basis – Risk Management Procedures

Methods

Capital Market Investment Model

The risk management procedures were performed using the July 1, 2019 Willis Towers Watson Canadian stochastic Capital Market Investment Model for use in asset/liability modeling studies for Canadian plans.

The Capital Market Investment Model is based on the following set of principles:

- Willis Towers Watson's Investment Assumptions Committee provides the framework in which the economic and Capital Market Investment Model Assumptions are developed, including interest rates and other asset portfolio assumptions. The philosophy behind the development of the Capital Market Investment Model is based on a combination of theory, history and current market conditions using judgement.
- It is designed to simulate a wide range of plausible scenarios of future capital market performance (based on 5,000 stochastic simulations).
- Results should not be interpreted as a prediction of exact capital market performance for any period.
- Asset classes (equities, alternatives and bonds), the Government of Canada yield curve and inflation are included in the capital market model. Each is simulated from a Canadian Dollar perspective.
- It reflects the capital market conditions prevailing at the starting date of the simulation. The transition in key capital market measures (such as price inflation and bond yields) from these initial conditions to assumed long-term levels is a significant factor underlying the simulation results.

The Capital Market Investment Assumptions setting process considers the following areas:

- The behavior of asset classes over time and between series is based on historical evidence, which has been used to create the basic model structure and the ascertain the key parameters within the model.

- Base correlation structures are based on historical analysis of relationships between asset classes.
- The volatility of the returns of each asset class is closely tied to both the returns produced by that asset class and to the correlations with other asset classes. Future volatility expectations are based on historical evidence. Variation in volatility assumptions across regions is set to be consistent with the returns and correlations assumed. Current market conditions are considered for short-term volatility assumptions.
- The long-term average, or normative, levels incorporate a blend of historical capital market data and future expectations. Normative assumptions are established based on a blend of historical capital market data and future expectations and do not change frequently. In current capital market conditions, the normative assumptions reflect the expectation that bond yields will increase in the long-term. The sources consulted in the determination of normative levels include practitioners in our global actuarial and investment consulting practices, plan sponsors, investment managers, economists, and academicians. Since the previous actuarial valuation, normative levels were decreased to reflect a “lower for longer” environment.
- Return distributions for equity and some alternatives asset classes incorporate fat tails. Correlations between return-seeking asset classes increase when fat-tail events occur. The Capital Market Investment Model uses a regime-switching model that switches among different states for normal and stressed market conditions, creating more frequent and severe downside events and allowing for converging correlations.
- Bond yields are modeled based on current market conditions and the observable redemption yield in each market. This is reflective of the combined markets' views of the required return for both risk-free and risky fixed income and inflation linked bond investments held to maturity. Longer term projections of bond returns are based on both judgement and historical analysis around the future term premium and the future inflation risk premium.

Stochastic Asset/Liability Model

5,000 stochastic simulations have been performed over a 20-year projection period using ALPro, our proprietary comprehensive stochastic asset/liability modeling system. Our proprietary tools enable us to create detailed liability forecasts using plan membership data from the most recent actuarial valuation of the plan. The financial module of ALPro combines the results of the liability forecasts with asset portfolio simulations to generate integrated financial results on a stochastic basis using a variety of assumptions. The ALPro system also has the flexibility to analyze any of a plan's financial results, including all forms of plan cost, surplus measures, funded ratios and cash flows.

This tool captures the funding policy requirements and risk management framework applicable to shared risk plans. Specifically, the tool determines what funding policy actions would be triggered in each year over the 20-year projection period, based on the projected funding policy valuation results for each simulated economic scenario. For the purpose of the risk management tests, once COLA

has been granted in a given year, it forms part of the base benefits for the remaining years of that simulated economic scenario.

Additional details on the assumptions underlying this simulation are provided in the following tables.

Actuarial Assumptions for Projected Funding Policy Valuations

The actuarial basis used for the annual funding policy valuations in each subsequent projection year during the 20-year period is the same as the actuarial basis used for the funding policy valuation as at July 1, 2019, as described in Appendix C, regardless of the simulated experience in effect for a given economic scenario up to the subsequent actuarial valuation date.

Projection Assumptions for Annual Plan Experience

Economic Assumptions (per annum)

Funding policy discount rate	4.00% ¹
Fund rate of return on plan assets	Varies by stochastic scenario (net of investment expenses) ²
Rate of inflation	Varies by stochastic scenario
Rate of salary increase	1.80% for 1 year; Inflation + 1% thereafter plus annual PTR Adjustments
Escalation in PTR Adjustment and professor salary ceiling ³	1.80% for 1 year; Inflation + 1% thereafter
Escalation of YMPE under Canada/Québec Pension Plan ⁴	Inflation + 1%
Escalation of <i>Income Tax Act (Canada)</i> maximum pension limitation ⁵	Inflation + 1%
Eligible Base COLA	
▪ Base CPI COLA (active and disabled members)	100% of inflation ⁶
▪ Base Pension COLA (other members)	
– Service before June 30, 2004	100% of inflation ⁶
– Service from July 1, 2004 onward	33% of inflation ⁶
PTR Recapture	1.00%

Demographic Assumptions

Mortality	2014 Public Sector Canadian Pensioners' Mortality Table, projected generationally using Scale B, adjusted for industry classification (86.6% Male and 94.2% Female)
Withdrawal	Service-related rates (refer to Table 1 in Appendix C)
Disability incidence/recovery	Nil
Retirement/pension commencement	
▪ Active and disabled members	Age-related rates (refer to Table 2 in Appendix C)
▪ Terminated vested members	Age 65
Future credited service accruals for active and disabled members	Full service credited each year until decrement age

New Entrant Assumptions

Reduction in complement	-0.25% per annum
New entrant membership profile	Refer to Table 3 in Appendix C

Other

Frequency of actuarial valuations	Annual
Percentage of members with eligible spouses at pension commencement and electing joint and survivor pension form	90%
Years male spouse older than female spouse	3
Percentage of members with eligible dependant other than spouse	0%
Provision for non-investment expenses	0.65% of payroll

Notes:

- ¹ The funding policy discount rate is kept unchanged through the forecasting period.
- ² Based on the the target asset allocation approved by the Board of Trustees in February 2018 and the underlying economic scenario each year.
- ³ The PTR Adjustment and professor salary ceiling figures of \$2,964 and \$175,636, respectively, as at July 1, 2019 were projected to each subsequent valuation date during the 20-year projection period, based on the applicable rate of inflation for a given economic scenario.
- ⁴ The YMPE of \$57,400 for 2019 is the starting value for the YMPE projection and is indexed starting in 2020.
- ⁵ The *Income Tax Act (Canada)* maximum pension limit of \$3,025.56 per year of service in 2019 is the starting value for maximum pension limit projection and is indexed starting in 2020.
- ⁶ Subject to the funding excess utilization priorities described in Appendix H, eligible Base COLA will only be granted over the 20-year projected period when the necessary funding excess is projected to be available for a given economic scenario.

Capital Market Investment Model Assumptions

Summary Statistics for July 1, 2019 Willis Towers Watson Canadian Investment Model

Summary Assumptions for July 1, 2019 Willis Towers Watson Canadian Investment Model								
Asset Class	1st Year Returns		10th Year Returns		10 Year Returns		20 Year Returns	
	Arithmetic Mean	Standard Deviation	Arithmetic Mean	Standard Deviation	Geometric Mean	Average STD	Geometric Mean	Average STD
Inflation	2.0%	1.6%	2.0%	2.5%	2.0%	2.3%	2.0%	2.3%
Canadian Fixed Income								
Cash / T-Bills	1.8%	1.2%	2.7%	2.6%	2.3%	2.1%	2.7%	2.4%
Universe Govt Bonds	0.7%	6.3%	2.8%	5.4%	1.7%	5.7%	2.5%	5.6%
Universe Corporate Bonds	1.3%	5.2%	3.6%	6.0%	2.5%	5.9%	3.3%	5.9%
Universe Bonds	0.8%	5.8%	3.0%	5.2%	2.0%	5.4%	2.8%	5.3%
Other Fixed Income								
Global Bonds ex-Canada (h)	1.2%	3.2%	2.4%	3.2%	1.5%	3.2%	2.4%	3.2%
High Yield Bonds	3.5%	10.1%	5.1%	10.1%	3.6%	10.1%	4.5%	10.1%
Equity Investments								
Cdn Large Cap	6.8%	21.0%	8.0%	21.0%	5.4%	21.0%	5.7%	21.0%
Global (u)	7.0%	18.0%	8.0%	18.0%	5.8%	18.0%	6.2%	18.0%
Global Low Vol (u)	5.3%	13.0%	6.7%	13.0%	5.3%	13.0%	5.8%	13.0%
Alternatives								
Global Real Estate	4.7%	10.1%	5.8%	10.1%	4.8%	10.1%	5.2%	10.1%
Global REITs	6.1%	15.9%	7.1%	15.9%	5.3%	15.9%	5.7%	15.9%
Global Infrastructure	6.2%	17.7%	7.2%	17.7%	5.3%	17.7%	5.7%	17.7%
Global Listed Infrastructure	5.9%	15.5%	6.9%	15.5%	5.3%	15.5%	5.7%	15.5%

Note: for asset classes with foreign currency exposure, (u) indicates unhedged and (h) indicates hedged

Average Correlations of Annual Returns over 10 Years

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Inflation	1.0													
2 Cash / T-Bills	0.3	1.0												
3 Universe Govt Bonds	(0.2)	(0.1)	1.0											
4 Universe Corporate Bonds	(0.1)	0.0	0.7	1.0										
5 Universe Bonds	(0.2)	(0.1)	1.0	0.8	1.0									
6 Global Bonds ex-Canada (h)	(0.3)	(0.1)	0.5	0.4	0.5	1.0								
7 High Yield Bonds	0.0	0.0	0.0	0.1	0.0	0.0	1.0							
8 Cdn Large Cap	0.1	0.0	(0.1)	0.2	0.0	0.0	0.5	1.0						
9 Global (u)	0.1	0.0	(0.1)	0.1	0.0	0.0	0.6	0.8	1.0					
10 Global Low Vol (u)	0.0	0.0	0.0	0.3	0.1	0.1	0.6	0.8	1.0	1.0				
11 Global Real Estate	0.0	0.0	(0.1)	0.1	0.0	0.0	0.3	0.4	0.5	0.5	1.0			
12 Global REITs	0.0	0.0	(0.1)	0.1	0.0	0.0	0.5	0.5	0.7	0.7	0.4	1.0		
13 Global Infrastructure	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.3	0.3	0.3	0.2	0.3	1.0	
14 Global Listed Infrastructure	0.1	0.0	(0.1)	0.1	0.0	0.0	0.3	0.5	0.5	0.5	0.3	0.4	0.7	1.0

Comment:

- The table above shows the key correlations of nominal 1 year returns between asset classes. To help interpret these numbers, a figure below 0.3 (positive or negative) is indicative of low correlation, a figure between 0.3 and 0.5 indicates moderate correlation and a figure of above 0.5 indicates a high degree of correlation.

Key Bond Yields and Spreads

The Capital Market Investment Model is based on the following key bond yields and spreads inputs which are used as the starting point for constructing the yield curve through the projection period:

- For the federal bond yield curve, the initial yield at one-year, 10-year, and 30-year terms are 1.70%, 1.52% and 1.64%, respectively.
- The initial credit spreads for short, medium and long-term provincial bonds are 0.37%, 0.60% and 0.80%, respectively, prior to adjustments for downgrade/default.
- The initial credit spreads for short, medium and long-term investment-grade corporate bonds are 0.87%, 1.39% and 1.70%, respectively, prior to adjustments for downgrade/default.

Rationale for Projection Assumptions for Annual Plan Experience

The rationale for the material actuarial assumptions used to project the annual plan experience for the risk management procedures is summarized below.

The assumptions do not include margins for adverse deviations.

Fund rate of return on plan assets

The experience varies annually by economic scenario in accordance with the Capital Market Investment Model Assumptions and stochastic simulations described herein.

Rate of inflation

The experience varies annually by economic scenario in accordance with the Capital Market Investment Model Assumptions and stochastic simulations described herein.

Rate of salary increase

The assumption reflects the most recent collective bargaining agreement for a select period of one year. After the select period, the assumption reflects an allowance of 1.00% per annum to reflect the effect of real economic growth and productivity gains in the economy over the inflation experience for a given economic scenario. In addition, Pensionable Salary is also assumed to increase annually with future PTR Adjustments until the Pensionable Salary exceeds the salary ceiling of the rank of professor.

Escalation in PTR Adjustment and professor salary ceiling

The assumption reflects the most recent collective bargaining agreement for a select period of one year. After the select period, the assumption reflects an allowance of 1.00% per annum to reflect the effect of real economic growth and productivity gains in the economy over the inflation experience for a given economic scenario.

Escalation of YMPE under Canada/Québec Pension Plan

The YMPE is indexed annually based on increases in the Industrial Aggregate Wage index for Canada. The assumption reflects an allowance of 1.00% per annum for the effect of real economic growth and productivity gains in the economy over the inflation experience for a given economic scenario.

Escalation of Income Tax Act (Canada) maximum pension limitation

The maximum pension limitation under the *Income Tax Act (Canada)* is scheduled to be indexed annually based on assumed increases in the Industrial Aggregate Wage index. The assumption reflects an allowance of 1.00% per annum for the effect of real economic growth and productivity gains in the economy over the inflation experience for a given economic scenario.

Base CPI COLA

This assumption has been determined based on the underlying inflation experience for a given economic scenario.

Base Pension COLA

The assumption has been determined as an approximation of the annual indexing that would result, on average, from the application of the target indexing formulas specified in the plan provisions, based on the underlying inflation experience for a given economic scenario.

PTR Recapture

The assumption has been determined as the expected annual increase, in excess of the assumed Base CPI COLA, necessary to increase the Indexed PTR Adjustment and Indexed Professor Salary Ceiling, up to the actual PTR Adjustment and the actual professor salary ceiling, respectively, as permitted under the *Income Tax Act (Canada)* and Regulations thereto.

Demographic Assumptions

See rationale for funding policy assumptions in Appendix C for demographic assumptions.

Rationale for Capital Market Investment Model Assumptions

The rationale and set of principles for the Capital Market Investment Model is described on page D-1. The Capital Market Investment Model Assumptions do not include margins for adverse deviations.

Appendix E: Actuarial Basis – Going Concern

Methods

Asset Valuation Method

The going concern value of assets was calculated as the market value of invested assets at the valuation date, adjusted for net outstanding amounts.

Actuarial Cost Method

The actuarial liability and the current service actuarial cost in respect of benefits were calculated using the projected unit credit cost method.

Prospective benefits were calculated for each active and disabled member according to the plan provisions and actuarial assumptions. The actuarial liability was calculated as the actuarial present value of the member's prospective benefits multiplied by the ratio of the member's credited service prior to the actuarial valuation date to the member's total potential credited service (the service prorate method). The calculation assumes that eligible Base COLA and PTR Recapture are granted in full each year, without regard to the conditional nature of such increases. The calculation of the actuarial present value of the member's prospective benefits is at least equal to the member's contributions with interest.

The actuarial liability for retired members and beneficiaries, terminated vested members and terminated non-vested members was calculated as the actuarial present value of their respective benefits.

The current service actuarial cost in respect of benefits for each active and disabled member was calculated as the actuarial present value of the member's prospective benefits multiplied by the ratio of the member's expected credited service during the ensuing year to the member's total potential credited service. The calculation assumes that eligible Base COLA and PTR Recapture are granted in full each year, without regard to the conditional nature of such increases. The current service actuarial cost rate in respect of benefits determined by the projected unit credit cost method will be stable over time if the demographic characteristics of the active and disabled plan membership remain stable from actuarial valuation to actuarial valuation. All other things being equal, an active and disabled membership whose average age increases (decreases) between actuarial valuations will result in an increasing (decreasing) current service actuarial cost rate.

Actuarial Assumptions

	July 1, 2019	July 1, 2016
Economic Assumptions (per annum)		
Liability discount rate	4.75%	4.75%
Rate of inflation	2.00%	2.00%
Rate of salary increase	1.80% for 1 year, 3.00% thereafter plus annual PTR Adjustments	3.00% plus annual PTR Adjustments
Escalation in PTR Adjustment and professor salary ceiling ¹	1.80% for 1 year, 3.00% thereafter	3.00%
Escalation of YMPE under Canada/Québec Pension Plan ²	3.00%	3.00%
Escalation of <i>Income Tax Act (Canada)</i> maximum pension limitation ³	3.00%	3.00%
Interest on members' contributions	4.75%	4.75%
Base COLA		
▪ Base CPI COLA (active and disabled members)	2.00%	2.00%
▪ Base Pension COLA (other members)		
– Service before June 30, 2004	2.00%	2.00%
– Service from July 1, 2004 onward	0.67%	0.67%
PTR Recapture	1.00%	1.00%
Demographic Assumptions		
Mortality	2014 Public Sector Canadian Pensioners' Mortality Table, projected generationally using Scale B, adjusted for industry classification (86.6% Male and 94.2% Female)	2014 Public Sector Canadian Pensioners' Mortality Table, projected generationally using Scale B, adjusted for industry classification (86.6% Male and 94.2% Female)
Withdrawal	Service-related rates (refer to Table 1)	Service-related rates (refer to Table 1)
Disability incidence/recovery	Nil	Nil
Retirement/pension commencement		
▪ Active and disabled members	Age-related rates (refer to Table 2)	Age-related rates (refer to Table 2)
▪ Terminated vested members	Age 65	Age 65

	July 1, 2019	July 1, 2016
Other		
Percentage of members with eligible spouses at pension commencement and electing joint and survivor pension form	90%	90%
Years male spouse older than female spouse	3	3
Percentage of members with eligible dependant other than spouse	0%	0%
Provision for non-investment expenses	0.65% of payroll	0.75% of payroll

Notes:

- ¹ The PTR Adjustment and professor salary ceiling figures of \$2,964 and \$175,636, respectively, as at July 1, 2019 were projected at 3.00% per annum starting in 2020. PTR Adjustment and professor salary ceiling figures of \$2,810 and \$166,443, respectively, were used as at July 1, 2016.
- ² The YMPE of \$57,400 for 2019 is the starting value for the YMPE projection as at the current valuation and is indexed starting in 2020.
- ³ The *Income Tax Act (Canada)* maximum pension limit of \$3,025.56 per year of service in 2019 is the starting value for maximum pension limit projection and is indexed starting in 2020.

Table 1 — Withdrawal Rates

Service	%
0	14.0%
1	12.0%
2	10.0%
3	8.0%
4	6.0%
5	4.0%
6	3.5%
7	3.0%
8	2.5%
9	2.0%
10 – 14	1.5%
15 – 19	1.0%
20 – 24	1.0%
25 and over	Nil

Table 2 — Retirement Rates

Age	% If 85 points ¹	% Otherwise
55 – 57	5%	2%
58 – 61	10%	4%
62 – 64	15%	10%
65	50%	50%
66 – 70	20%	20%
71 and over	100%	100%

Note:

¹ Applicable only for retirement prior to July 1, 2030.

Rationale for Actuarial Assumptions

The rationale for the material actuarial assumptions used in the going concern valuation is summarized below.

The going concern assumptions do not include margins for adverse deviations, except as noted below.

Liability discount rate

Economic assumptions used for establishing the liability discount rate have been developed based on a custom stochastic capital market investment model, as detailed in Appendix D. The capital market model simulates economic variables (e.g. inflation and yields) and asset class returns, with the assumptions being developed through both the analysis of historical rates and returns, and the application of econometric theory. In modeling inflation and bond yields, current conditions and long-term expectations are used and the serial correlation inherent in these parameters is recognized.

Our long-term nominal rate of return assumption was determined using the expected long-term asset mix for the plan based on the target asset allocation approved by the Board of Trustees in February 2018.

Based on the custom stochastic capital market model, a best estimate long-term gross nominal rate of return as of July 1, 2019 of 5.13% is appropriate. The following adjustments were subsequently made before selecting the long-term nominal rate of return assumption:

▪ Best estimate long-term nominal rate of return before adjustments	5.13%
▪ Adjustment for investment expenses paid by the plan (excluding active management fees)	<u>(0.05)</u>
▪ Best estimate long-term nominal rate of return after adjustments	5.08%

In determining the best estimate long-term nominal rate of return after adjustments, we have assumed that additional returns associated with employing an active investment management strategy would equal the additional expenses associated with employing such strategy. Consequently, any potential additional returns have been ignored.

After allowing a 0.40% margin for adverse deviations and rounding to the nearest 0.25% we established 4.75% as the nominal rate of return assumption for the plan.

Rate of inflation

See rationale for funding policy assumptions in Appendix C.

Rate of salary increase

See rationale for funding policy assumptions in Appendix C.

Escalation in PTR Adjustment and professor salary ceiling

See rationale for funding policy assumptions in Appendix C.

Escalation of YMPE under Canada/Québec Pension Plan

The YMPE is indexed annually based on increases in the Industrial Aggregate Wage index for Canada. The assumption reflects an allowance of 1.00% per annum for the effect of real economic growth and productivity gains in the economy over the inflation experience for a given economic scenario.

Escalation of Income Tax Act (Canada) maximum pension limitation

See rationale for funding policy assumptions in Appendix C.

Base CPI COLA

This assumption has been determined based on the underlying inflation assumption without regard to the conditional nature of such increases, as permitted under the *Income Tax Act (Canada)* and Regulations thereto.

Base Pension COLA

The assumption has been determined as an approximation of the annual indexing that would result, on average, from the application of the target indexing formulas specified in the plan provisions, based on the underlying inflation assumption, without regard to the conditional nature of such increases, as permitted under the *Income Tax Act (Canada)* and Regulations thereto.

PTR Recapture

The assumption has been determined as the expected annual increase, in excess of the assumed Base CPI COLA, necessary to increase the Indexed PTR Adjustment and Indexed Professor Salary Ceiling, up to the actual PTR Adjustment and the actual professor salary ceiling, respectively, without regard to the conditional nature of such increases, as permitted under the *Income Tax Act (Canada)* and Regulations thereto.

Mortality

See rationale for funding policy assumptions in Appendix C.

Withdrawal

See rationale for funding policy assumptions in Appendix C.

Disability incidence/recovery

See rationale for funding policy assumptions in Appendix C.

Retirement from active membership

See rationale for funding policy assumptions in Appendix C.

Pension commencement after termination of employment

See rationale for funding policy assumptions in Appendix C.

Percentage of members with eligible spouses at pension commencement and electing joint and survivor pension form

See rationale for funding policy assumptions in Appendix C.

Years male spouse older than female spouse

See rationale for funding policy assumptions in Appendix C.

Provision for non-investment expenses

See rationale for funding policy assumptions in Appendix C.

Appendix F: Actuarial Basis – Hypothetical Windup Valuation

Methods

Asset Valuation Method

The market value of assets, adjusted for net outstanding amounts, has been used for the hypothetical windup valuation. The resulting value has been reduced by a provision for plan windup expenses.

Liability Calculation Method

In the event that the plan was wound-up by the Parties between 5 years and 10 years following the conversion to a shared risk pension plan, the Superintendent may determine that the conversion is void and may require that the plan be wound-up as a defined benefit plan under Part 1 of the *Pension Benefits Act (New Brunswick)*. This hypothetical wind-up valuation was performed under this scenario. Consequently, the hypothetical wind-up liability was calculated based on the prior plan provisions in effect on July 1, 2013 for service prior to July 1, 2013 and based on the AESRP provisions for service on or after July 1, 2013.

The hypothetical windup liability for active and disabled members was calculated as the actuarial present value of all benefits accrued up to the valuation date (treating all members as if vested). This calculation is at least equal to the member's contributions with interest.

The hypothetical windup liability for retired members and beneficiaries, terminated vested members and terminated non-vested members was calculated as the actuarial present value of their respective benefits.

Other Considerations

The hypothetical windup actuarial valuation has been prepared on a hypothetical basis. In the event of an actual plan windup, the plan assets may have to be allocated between various classes of plan members or beneficiaries in the manner determined by the Board of Trustees in accordance with the plan provisions, the funding policy, or as required by applicable pension legislation. Such potential allocation has not been performed as part of this hypothetical windup valuation.

Hypothetical Windup Incremental Cost Actuarial Method

The hypothetical windup incremental cost for a given year represents the present value, at the actuarial valuation date, of the expected aggregate change in the hypothetical windup liability during the year, increased for expected benefit payments during the year.

The hypothetical windup incremental cost reflects accrual of service, any expected changes in benefits, entitlements, members' contributions, pension formula or increases in the maximum pension limits, and projected pensionable earnings during the year.

The hypothetical windup incremental cost has been calculated for the year following the actuarial valuation date as the projected hypothetical windup liability at the end of the year, minus the hypothetical windup liability at the beginning of the year, increased for expected benefit payments during the year. Each of these amounts is discounted to the actuarial valuation date using the projected hypothetical windup liability discount rate.

The method used to calculate the projected hypothetical windup liability at the end of the year is the same as used in the hypothetical windup valuation.

Actuarial Assumptions

	July 1, 2019	July 1, 2018
Economic Assumptions (per annum)		
Liability discount rate		
▪ Annuity purchase	2.70%	3.00%
▪ Commuted value	N/A	N/A
Pension increases	See notes below ¹	See notes below ¹
Escalation of <i>Income Tax Act (Canada)</i> maximum pension limitation	Nil	Nil
Rate of inflation		
▪ Annuity purchase	3.10%	3.30%
▪ Commuted value	N/A	N/A
Demographic Assumptions		
Mortality	2014 Public Sector Canadian Pensioners' Mortality Table, projected generationally using Scale B, adjusted for industry classification (86.6% Male and 94.2% Female)	2014 Public Sector Canadian Pensioners' Mortality Table, projected generationally using Scale B, adjusted for industry classification (86.6% Male and 94.2% Female)
Disability incidence/recovery	Nil	Nil
Retirement/pension commencement	Described in detail on page F-5	Described in detail on page F-5
Other		
Percentage of members with eligible spouses at pension commencement and electing joint and survivor pension form	90%	90%
Years male spouse older than female spouse	3	3
Percentage of members receiving settlement by commuted value	0%	0%
Provision for expenses	\$600,000	\$400,000

Notes:

¹ For annuity purchase: 3.10% per annum for pension accrued up to June 30, 2004, 0.75% for pension accrued from July 1, 2004 onward.

² For annuity purchase: 3.30% per annum for pension accrued up to June 30, 2004, 0.75% for pension accrued from July 1, 2004 onward.

Rationale for Actuarial Assumptions

The rationale for the material actuarial assumptions used in the hypothetical windup valuation is summarized below.

The actuarial assumptions used in the hypothetical windup valuation do not include margins for adverse deviations.

Liability discount rate

In the event of a plan windup, it is expected that all liabilities will be settled by a group annuity purchase.

The liability discount rate corresponds to an approximation of the annuity purchase rates as at the actuarial valuation date following application of the relevant guidance on assumptions for solvency and hypothetical windup valuations issued by the Canadian Institute of Actuaries' committee on Pension Plan Financial Reporting.

The guidance provides that the approximation of the annuity purchase rate varies in accordance with the duration of the liabilities for non-indexed benefits assumed to be settled by group annuity purchase. The duration of the liabilities assumed to be settled through the purchase of non-indexed annuities is 14.4. As this duration is outside the range of durations covered in the guidance, we have used the annuity purchase rate approximation for a high duration block of annuities.

The discount rate determined in accordance with the guidance is applicable in conjunction with the CPM-2014 mortality table. As outlined below, base mortality rates from the CPM2014Publ table, adjusted by the educational institution adjustment factor, are considered more appropriate than the base mortality rates from the CPM-2014 mortality table. The annuity purchase rate has therefore been adjusted to reflect the use of the CPM-2014Publ mortality table rather than the CPM-2014 mortality table.

Rate of inflation

For the benefits that are expected to be settled by a group annuity purchase, the assumption has been set following application of the relevant guidance on assumptions for solvency and hypothetical windup valuations issued by the Canadian Institute of Actuaries' committee on Pension Plan Financial Reporting.

Escalation of Income Tax Act (Canada) maximum pension limitation

The *Income Tax Act (Canada)* maximum pension limitation specified in the Act as at the actuarial valuation date is applied without consideration for future scheduled increases, as pension entitlements are determined as at the actuarial valuation date.

Pension increases

The assumption has been determined by applying the post-retirement increase specified in plan provisions in effect on July 1, 2013 to the inflation assumption.

Mortality

The assumption has been set following application of the relevant guidance on assumptions for solvency and hypothetical windup valuations issued by the Canadian Institute of Actuaries' committee on Pension Plan Financial Reporting. No pre-retirement mortality has been assumed in order to approximate the value of pre-retirement death benefits.

Base mortality rates from the CPM2014Publ table, adjusted by the educational institution adjustment factor, are considered reasonable for the actuarial valuation of the plan given that the mortality experience of the plan membership is insufficient to assess plan-specific experience, and there is no reason to expect the mortality experience of the plan to differ significantly from that of other pension plans covering membership groups with similar characteristics. Applying improvement scale CPM-B generationally provides allowance for improvements in mortality after 2014 and is considered reasonable for projecting mortality experience into the future.

Retirement/pension commencement

- Active and disabled members: pension commences at the age that produces the highest actuarial value.
- Terminated vested members: pension commences at the age that produces the highest actuarial value.

This is consistent with the expected assumption that would have been used by insurers to price the group annuity.

Percentage of members with eligible spouses at pension commencement and electing joint and survivor pension form

See rationale for funding policy assumptions in Appendix C.

Years male spouse older than female spouse

See rationale for funding policy assumptions in Appendix C.

Percentage of members receiving settlement by commuted value

This assumption has been determined by considering the plan provisions in effect on July 1, 2013, legislative requirements to offer specific settlement options to various classes of members, and, in particular, the options to be provided to members upon plan windup.

Provision for expenses

Allowance was made for normal administrative, actuarial, legal and other costs which would be incurred if the plan were to be wound up (excluding costs relating to the resolution of surplus or deficit issues). The actuarial valuation is premised on a scenario in which the employer continues to operate after the windup date. In establishing the allowance for plan windup costs, certain administrative costs were assumed to be paid from the pension fund (consistent with past practice) while other costs were assumed to be borne directly by the University of New Brunswick.

Hypothetical Windup Incremental Cost Actuarial Assumptions

Demographic and Benefit Projection Actuarial Assumptions

No allowance has been made for mortality, withdrawal, retirement, disability incidence/recovery and new entrants between the current actuarial valuation date and next actuarial valuation date in the demographic projections on the basis that such assumptions would not have a material impact on the incremental cost.

Hypothetical Windup Liability Projection Actuarial Assumptions

The assumptions for the hypothetical windup liability projections for purposes of calculating the hypothetical windup incremental cost are the same assumptions as those used in the hypothetical windup valuation described previously.

Appendix G: Membership Data

Summary of Membership Data

Active and Disabled Members

	July 1, 2019		July 1, 2018	
▪ Number		592		583
▪ Average age		50.8		51.1
▪ Average credited service ¹		12.9		13.2
▪ Total pensionable salary ²	\$	81,058,111	\$	78,776,807
▪ Average pensionable salary ²	\$	136,922	\$	135,123
▪ Accrued pension ¹	\$	13,899,837	\$	13,889,770
▪ Marriage breakdown offset	\$	92,855	\$	109,224
▪ Net accrued pension ¹	\$	13,806,982	\$	13,780,546

Notes:

¹ Excluding credited service and pension payable under the Public Service Shared Risk Plan (the "PSSRP").

² Pensionable salary is capped at \$190,409 in 2019 and \$185,319 in 2018.

Comment:

The following distribution relates to active and disabled members. The following meanings have been assigned to age and credited service:

Age	Age as at July 1, 2019
Service	Credited service as at July 1, 2019
Pensionable salary	Annual pensionable salary as at July 1, 2019

Active and Disabled Members

Age		Service								Total
		0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 +	
< 25	Number	1								1
	Average Salary	*								*
25 - 29	Number	3								3
	Average Salary	89,636								89,636
30 - 34	Number	27	2							29
	Average Salary	94,440	94,390							94,436
35 - 39	Number	55	19	1						75
	Average Salary	103,645	111,853	*						*
40 - 44	Number	26	24	17	3					70
	Average Salary	108,061	114,854	122,375	138,048					115,151
45 - 49	Number	19	17	31	20	3				90
	Average Salary	110,032	122,100	131,183	148,756	155,273				129,710
50 - 54	Number	12	10	23	37	14	1			97
	Average Salary	136,804	133,352	141,778	154,156	161,737	*			*
55 - 59	Number	6	4	19	33	23	23			108
	Average Salary	120,808	123,365	138,685	157,477	164,315	173,249			155,686
60 - 64	Number	6	4	6	20	15	28			79
	Average Salary	140,201	141,704	134,247	157,975	158,755	173,543			159,665
65 - 69	Number	1	5	2	10	2	19			39
	Average Salary	*	132,122	166,736	151,630	170,716	174,402			*
70 +	Number						1			1
	Average Salary						*			*
Total	Number	156	85	99	123	57	72			592
	Average Salary	107,926	120,007	*	154,192	161,967	173,939			136,922

Average Age = 50.8

Average Service = 12.9

Retired Members and Beneficiaries

	July 1, 2019	July 1, 2018
▪ Number	572	549
▪ Average age	74.8	74.4
▪ Total lifetime annual pension	\$ 15,151,747	\$ 13,892,011
▪ Average lifetime annual pension	\$ 26,489	\$ 25,304
▪ Number of temporary annual pension payable from 55 to 60	5	4
▪ Total temporary annual pension payable from age 55 to 60	\$ 60,724	\$ 49,846
▪ Number of temporary annual pension payable from 60 to 65	21	32
▪ Total temporary annual pension payable from 60 to 65	\$ (47,613)	\$ (67,582)

Terminated Vested and Non-Vested Members

	July 1, 2019	July 1, 2018
Terminated vested members:		
▪ Number	96	95
▪ Average age	53.3	53.3
▪ Total annual pension	\$ 943,286	\$ 914,943
▪ Average annual pension	\$ 9,826	\$ 9,631
Terminated non-vested members:		
▪ Number	27	27
▪ Average age	46.5	47.8

Review of Membership Data

The membership data were supplied by the University of New Brunswick's third-party administrator, Moreau Shepell, as at July 1, 2019.

The membership data have been relied upon by Willis Towers Watson following tests for reasonableness and found to be sufficient and reliable for the purposes of the actuarial valuations. Elements of the data review included the following:

- ensuring that the data were intelligible (i.e., that an appropriate number of records was obtained, that the appropriate data fields were provided and that the data fields contained valid information);
- preparation and review of membership reconciliations to ascertain that the complete membership of the pension plan was accounted for;
- review of consistency of individual data items and statistical summaries between the current actuarial valuation and the previous actuarial valuation;
- review of reasonableness of individual data items, statistical summaries and changes in such information since the previous actuarial valuation date; and
- comparison of the membership data and the plan's financial statements for consistency.

However, the tests conducted as part of the membership data review may not have captured certain deficiencies in the data. We have also relied on the certification of the plan administrator as to the quality of the data.

Membership Reconciliation

Active and disabled members

▪ As at July 1, 2018	583
▪ New entrants	45
▪ Re-employed	0
▪ Retirements	(24)
▪ Terminations:	
– Without vested benefit	(3)
– With lump sum settlement	(2)
– With deferred pension entitlement	(6)
▪ Deaths:	
– Without vested benefit	0
– With lump sum settlement	0
– With survivor's pension	(3)
▪ Data corrections	2
▪ As at July 1, 2019	592

Retired members and beneficiaries

▪ As at July 1, 2018	549
▪ New retirements	27
▪ New beneficiaries	8
▪ Deaths:	
– Without survivor's pension	(4)
– With survivor's pension	(8)
▪ Data corrections	0
▪ As at July 1, 2019	572

Terminated Vested Members

▪ As at July 1, 2018	95
▪ New vested terminations (including from non-vested group)	6
▪ Lump sum settlements	(1)
▪ Retirements	(3)
▪ Deaths:	
– With lump sum settlement	0
– With survivor's pension	0
▪ Re-employed	0
▪ Data corrections	(1)
▪ As at July 1, 2019	<u>96</u>

Terminated Non-Vested Members

▪ As at July 1, 2018	27
▪ New non-vested terminations	3
▪ New deaths with lump sum settlement outstanding	0
With deferred pension entitlement	0
▪ Re-employed	0
▪ Lump sum settlements	(3)
▪ Data corrections	0
▪ As at July 1, 2019	<u>27</u>

Appendix H: Summary of Plan Provisions

The following is an outline of the principal features of the plan which are of financial significance to valuing the plan benefits. This summary is based on the most recently restated plan document and does not make any provisions for the possibility that a change or action (retroactive or otherwise) could be imposed by order of a regulatory body or a court. It is not a complete description of the plan terms and should not be relied upon for administration or interpretation of benefits. For a detailed description of the benefits, please refer to the plan text.

Plan Effective Date

July 1, 2013

Date of Last Amendment

December 2019

Definitions

Conversion Date

July 1, 2013

Plan Membership

Means the period of continuous service on and after January 1, 1993 while a member of the plan or the Pension Plan for Academic Employees of the University of New Brunswick prior to the Conversion Date.

Pensionable Salary

The normal salary (including administrative stipends) received by a member from the University of New Brunswick.

Indexed Pensionable Salary

Pensionable Salary adjusted to reflect any Base CPI COLA granted by the Board of Trustees and Indexed PTR Adjustments credited between the date the Pensionable Salary was received and the relevant date of determination. Indexed PTR Adjustments are credited in years that the member's

Indexed Pensionable Salary does not exceed the Indexed Professor Salary Ceiling and the member actually receives a PTR Adjustment.

Maximum Pensionable Salary

For service before July 1, 2013:

for a given calendar year shall be equal to (a) divided by (b), where:

- a) is the sum of (i) the maximum pension limit set forth in the Income Tax Act (Canada) and Regulations in respect of one year of service, and (ii) 0.7% of the YMPE for that calendar year; and
- b) is 2.0%.

For service on or after July 1, 2013:

for a given calendar year shall be equal to (a) divided by (b), where:

- a) is the sum of (i) the maximum pension limit set forth in the Income Tax Act (Canada) and Regulations in respect of one year of service, and (ii) 0.7% of the YMPE for that calendar year; and
- b) is 1.8%.

Best Average Pensionable Salary at Conversion

The average annual Pensionable Salary of the member during the 60 consecutive months in which Pensionable Salary were highest determined at the Conversion Date.

Indexed Best Average Pensionable Salary at Conversion

The Best Average Pensionable Salary at Conversion, adjusted to reflect any Base CPI COLA that has been granted by the Board of Trustees and Indexed PTR Adjustments credited between the Conversion Date and the relevant date of determination. Indexed PTR Adjustments are credited for any year that the member's Indexed Best Average Pensionable Salary at Conversion does not exceed the Indexed Professor Salary Ceiling and the Member actually receives a PTR Adjustment.

YMPE

The Year's Maximum Pensionable Earnings as defined under the Canada Pension Plan.

Indexed YMPE

YMPE adjusted to reflect any Base CPI COLA that has been granted by the Board of Trustees.

Average Year's Maximum Pensionable Earnings (YMPE) at Conversion

Average of the YMPE in 2013 and the immediately preceding two years.

Indexed Average YMPE at Conversion

Average YMPE at Conversion adjusted to reflect Base CPI COLA that has been granted by the Board of Trustees.

PTR Adjustment

Annualized amount of PTR related salary increase determined in accordance with the collective agreement in effect on the date of determination.

Indexed PTR Adjustment

The lesser of:

- a) PTR Adjustment in effect immediately prior to the Conversion Date, adjusted to reflect any Base CPI COLA and PTR Recapture that has been granted by the Board of Trustees; and
- b) PTR Adjustment in effect on the date of determination.

Indexed Professor Salary Ceiling

The lesser of:

- a) The salary ceiling of the rank of professor in effect immediately prior to the Conversion Date, adjusted to reflect Base CPI COLA and PTR Recapture granted by the Board of Trustees; and
- b) The salary ceiling of the rank of professor in effect on the date of determination, in accordance with the collective agreement in effect at that date.

Base COLA

A type of COLA that may be granted by the Board of Trustees in accordance with the funding policy. Base COLA is comprised of Base Pension COLA and Base CPI COLA.

Base Pension COLA

The Base COLA that may be granted by the Board of Trustees in accordance with the funding policy for members who are receiving a pension or have terminated employment at the relevant date.

The amount of eligible Base Pension COLA for a given year is determined based on the target indexing formula, which varies by period of Pensionable Service, as follows:

Pensionable Service	Target Indexing Formula
prior to July 1, 2003	Increase in CPI in latest year, to a maximum of 6.0%
between July 1, 2003 and June 30, 2004	Increase in CPI in latest year, to a maximum of 4.5%
from July 1, 2004	(i) Increase in CPI in latest year, to a maximum of 0.5%; plus (ii) the lesser of: a) excess average investment return over 7.75%; and b) excess of the 3 years average percentage increase in the CPI over the increase in (i)

Increase in CPI is determined as the rate of increase in the average Consumer Price Index (CPI) for the 12-months ending June 30th of the current year over the average CPI for the 12-months ending June 30th of the previous year.

The eligible Base Pension COLA determined for a given year based on the target indexing formula described above may only be partially granted or waived depending on the funding excess available and the funding excess utilization priorities specified in the plan's funding policy.

Any Base Pension COLA granted based on the available funding excess as at July 1st of a given year shall increase pensions effective as of January 1st of the following calendar year. Such Base Pension COLA will apply to all pensions, including spouses' pensions and deferred pensions. Deferred pensions are increased both before and after normal retirement. Increases are pro-rated for members retiring in the year prior to when the increase is granted.

Base CPI COLA

The Base COLA that may be granted by the Board of Trustees in accordance with the funding policy for members who are accruing benefits at the relevant date.

The amount of eligible Base CPI COLA for a given year is determined as 100% of increase in the average CPI for the 12-months ending June 30th of the current year over the average CPI for the 12-months ending June 30th of the previous year.

The eligible Base CPI COLA determined for a given year may only be partially granted or waived depending on the funding excess available and the funding excess utilization priorities specified in the plan's funding policy.

Any Base CPI COLA granted based on the available funding excess as at July 1st of a given year will apply, effective as of January 1st of the following calendar year, to the following:

- The member's Indexed Best Average Pensionable Salary at Conversion, excluding any Indexed PTR Adjustments;
- The member's Indexed Pensionable Salary in respect of each year since the Conversion Date, excluding any Indexed PTR Adjustments;
- The Indexed Average YMPE at Conversion;
- The Indexed YMPE in respect of each year since the Conversion Date;
- The Indexed PTR Adjustment in effect at the beginning of the year; and
- The Indexed Professor Salary Ceiling in effect at the beginning of the year.

PTR Recapture

A type of COLA that may be granted by the Board of Trustees in accordance with the funding policy, after all eligible Base COLA has been granted.

The eligible PTR Recapture is the amount necessary to increase the Indexed PTR adjustment and the Indexed Professor Salary Ceiling to the actual PTR Adjustment and salary ceiling of the rank of professor, respectively, in effect at the relevant date.

Any such increases are subject to the maximum increases allowed by applicable legislation.

Eligibility for Membership

A full-time academic employee shall become a member of the plan on the effective date, or date of hire if later.

A part-time academic employee may elect to become a member of the plan on a voluntary basis, subject to completion of minimum earnings conditions for two consecutive years.

Member Contributions

Each member who is an academic employee is required to contribute at the rates specified in the plan. The initial contribution rates specified in the plan may be adjusted by the Board of Trustees from time to time, subject to the triggering mechanism and limitations imposed by the funding policy. However, the initial contribution rates for each member who is an academic employee shall not be increased or decreased by an amount greater than 2.25% of Pensionable Salary, unless required in accordance with the Income Tax Act (Canada).

Contributions are limited to Pensionable Salary up to the Maximum Pensionable Salary.

The contribution requirements for the University of New Brunswick shall, at all times, be equal to the total of the Members' contributions, including any adjustments which may be made to the initial contribution rates.

Normal Retirement

Eligibility

Normal retirement date is the June 30 next following the member's 65th birthday.

Annual Pension

Members who retired prior to the Conversion Date, surviving spouses or beneficiaries in receipt of a pension prior to the Conversion Date, and members with a deferred pension entitlement prior to the Conversion Date receive an annual pension under this plan equal to the amount of pension paid or payable at the Conversion Date, plus all Base COLAs granted by the Board of Trustees.

Members who retire, terminate employment or die prior to terminating employment on or after the Conversion Date receive an annual pension under this plan equal to the sum of:

- for each year of pensionable service related to the periods of service before July 1, 2007, the sum of:

- (i) 1.3% of the member's Indexed Best Average Pensionable Salary at Conversion up to the Indexed Average YMPE at Conversion; plus
 - (ii) 2.0% of the member's Indexed Best Average Pensionable Salary at Conversion in excess of the Indexed Average YMPE at Conversion; plus
- for each year of pensionable service related to the periods of service between July 1, 2007 to June 30, 2013, the sum of:
 - (i) 1.0% of the member's Indexed Best Average Pensionable Salary at Conversion up to the Indexed Average YMPE at Conversion; plus
 - (ii) 1.7% of the member's Indexed Best Average Pensionable Salary at Conversion up to the Maximum Pensionable Salary at the date of determination in excess of the Indexed Average YMPE at Conversion; plus
 - for each year of pensionable service on or after the Conversion Date, the sum of:
 - (i) 1.1% of the member's Indexed Pensionable Salary up to the Indexed YMPE; plus
 - (ii) 1.8% of the member's Indexed Pensionable Salary up to the Maximum Pensionable Salary at the date of determination in excess of the Indexed YMPE; and
 - all Base Pension COLAs granted by the Board of Trustees following the member's date of retirement, termination of employment or death prior to termination of employment, as applicable.

Maximum Pension

The pension payable under the plan is subject to the maximum limits set forth in the *Income Tax Act (Canada)* and Regulations or such higher amount as permitted from time to time for each period of service (before July 1, 2017, between July 1, 2017 and June 30, 2013 and on and after July 1, 2013).

Regular Early Retirement

Eligibility

Any time within 10 years of normal retirement date.

Annual Pension

Eligible to receive a pension calculated the same way as a normal retirement pension, except that:

- For years of pensionable service prior to the Conversion Date: the pension is reduced by 5/12 of 1% for each month between the date of retirement and the member's 65th birthday (or the actuarially equivalent pension if higher); and
- For years of pensionable service after the Conversion Date: the pension is reduced on an actuarial equivalent basis for each month between the date of retirement and the member's 65th birthday.

Unreduced Early Retirement for years of service before the Conversion Date

Eligibility

Eligible to receive an unreduced early retirement pension if the member's combined years of age and eligible service (pensionable service plus service counted as pensionable service under the PSSRP for those who joined this plan prior to February 28, 2009) total 85 or more.

Annual Pension

Eligible to receive an unreduced early retirement pension which equal to:

- a) for each year of pensionable service before the Conversion Date, the pension calculated in the same way as a normal retirement pension; plus
- b) a temporary pension equal to 0.7% of the member's Indexed Best Average Pensionable Salary at Conversion up to the Indexed Average YMPE at Conversion for the periods of pensionable service prior to the Conversion Date and payable to age 60.
- c) for each year of pensionable service under the PSSRP, the excess of:
 - the pension determined in (a) above, over
 - the pension actually paid under the PSSRP.

A member is also eligible to receive an unreduced early retirement pension if he or she has served as a deputy head as defined under the PSSRP for at least one year, has completed 25 years of pensionable service prior to the Conversion Date under the PSSRP and this plan, and has attained age 55.

Normal Form of Pension

The pension shall be payable during the lifetime of the member and shall continue after the member's death in accordance with the following provision:

- The pension payable to the surviving spouse is equal to 60% of the member's accrued pension, payable for the lifetime of the spouse.

Termination of Employment

Eligibility

Employment terminates after completing two years of plan membership under the plan.

Annual Pension

Eligible to a deferred pension commencing at normal retirement date equal to the pension accrued at the date of termination adjusted for Base Pension COLAs granted by the Board of Trustees since termination. Such a member may elect to start receiving pension payments on the first day of any month within 10 years preceding normal retirement date. In that case, the amount of early retirement pension will be equal to the normal retirement pension reduced by $\frac{5}{12}$ of 1% for each month preceding normal retirement date for periods of service prior to the Conversion Date and to the actuarial equivalent pension for period of service on or after the Conversion Date. The amount of deferred pension is also subject to the minimum requirements of New Brunswick pension legislation.

Such a member may elect to leave his or her entitlements in the plan or, if not entitled to an immediate early retirement pension, transfer the termination value to a subsequent employer's pension plan, to an individual Registered Retirement Saving arrangement or to purchase a lifetime pension.

Any other terminating member is entitled to a refund of his or her contributions with interest.

Pre-retirement Death Benefit

The benefits payable on or after the death of a member before retirement are guaranteed to be at least equal to the member's contributions with interest. For periods of service prior to the Conversion Date, subject to a minimum of two years of plan membership, the surviving spouse's pension payable should be at least equal to the greater of:

- a) 60% of the value of the member's accrued pension entitlement; or
- b) 100% of the termination value of the deferred pension to which the member was entitled.

For periods of service on or after the Conversion Date, the surviving spouse's pension payable should be equal to 100% of the termination value of the deferred pension to which the member was entitled.

Disability Benefit

The period during which a member is absent on account of disability and receives a disability benefit from a long-term disability plan established by the University of New Brunswick shall be deemed to be pensionable service. A member who is absent on account of such a disability shall be treated as a full-time academic employee or a part-time academic employee, depending on the member's employment status at the date of disability.

A member shall not be required to make contributions to the plan during such period.

Termination Value

The termination value of the member's entitlements corresponds to the funding policy liability for that member times the Termination Value Funded Ratio in accordance with Applicable Legislation.

Special Provisions on Plan Windup

There are no special benefits payable on plan windup, other than those prescribed by legislation.

Historical COLA Granted by the Board of Trustee

Effective date	New Eligible Base Pension COLA			
	New Eligible Base CPI COLA	For benefits in respect of service prior to June 30, 2004	For benefits in respect of service on or after July 1, 2004	% of Eligible Base COLA granted ¹
January 1, 2015	1.43%	1.43%	1.34%	100%
January 1, 2016	1.49%	1.49%	1.29%	100%
January 1, 2017	1.40%	1.40%	0.50%	47.16%
January 1, 2018	1.46%	1.46%	0.50%	47.16%
January 1, 2019	1.88%	1.88%	0.50%	47.16%
January 1, 2020	2.12%	2.12%	0.50%	30.59%

Note:

¹ % of Eligible Base COLA granted on the effective date is in respect of current year new Eligible Base COLA and past Eligible Base COLA not yet granted by the Board of Trustees.

Historical Indexed PTR Adjustment and Indexed Professor Salary Ceiling ¹

Effective date	Indexed PTR Adjustment	Indexed Professor Salary Ceiling
July 1, 2014	\$2,784	\$152,662
July 1, 2015	\$2,784	\$159,450
July 1, 2016	\$2,784	\$159,450
July 1, 2017	\$2,784	\$159,450
July 1, 2018	\$2,815	\$161,283
July 1, 2019	\$2,864	\$164,127

Note:

¹ The actual PTR Adjustment and professor salary ceiling figures are \$2,964 and \$175,636, respectively, as at July 1, 2019.

Funding Policy

Funding Deficit Recovery Plan

Triggered when the open group funded ratio drops below 100% in two successive actuarial valuation reports. The following actions must be taken prior to any other:

1. Increase Member and employer contributions equally, subject to funding policy limits; and
2. Reduce base benefits (required only if the primary risk management goal is not met following the maximum permitted contribution increase), subject to the following conditions:
 - Base benefits must be reduced in equal proportion for all members; and
 - As soon as funding position improves, any reductions to base benefits must be reversed.

Funding Excess Utilization Plan

Triggered when the open group funded ratio exceeds 105%. The funding excess available for benefit improvements is defined by the plan's funding policy as:

- 17% of the funding excess between funding levels 105% and 140%; and
- 100% of any funding excess above a 140% funding level.

The following actions must be taken prior to any other:

1. Reverse any previous reductions to base benefits;
2. Remove any contribution increases in effect;
3. Provide Base COLA; and
4. After the above priorities have been met:
 - A. 50% of any available funding excess will be used to provide PTR Recapture.
 - B. 50% of any available funding excess above a 140% funding level shall be used to reduce contributions in accordance with the funding policy limits.

Policy for Adjusting Funding Policy Discount Rate

The discount rate assumption must remain unchanged for at least the first two funding policy valuations after the Conversion Date. Thereafter, future discount rates will be determined in a manner consistent with the objectives of the Plan and will include margins for adverse deviations.

Specifically, the discount rate assumption shall be assessed annually relative to the distribution of annualized asset returns over the next 20 years from the economic scenarios generated by the stochastic asset/liability model used to perform the risk management tests based on the Plan's target asset allocation. The Board of Trustees shall change the discount rate if the proportion of scenarios in which the annualized asset returns meet or exceed the discount rate falls below 70% or increases above 90% for two consecutive years. In such an event, the Board of Trustees would adjust the discount rate such that the proportion of scenarios described above is between 75% and 85%. The resulting discount rate would then be rounded to the nearest 0.25%.

Notwithstanding the foregoing, the Board of Trustees may otherwise change the discount rate, at its discretion, if required by the Superintendent, actuarial standards of practice, applicable laws or if there are changes in the economy or investment policy or other relevant factors that in the opinion of the Board of Trustees, further to discussions with the Plan's actuary, would warrant such a change in the discount rate. Any such changes shall be subject to the conditions that the resulting discount rate is consistent with the objectives of the Plan and includes a margin for adverse deviations.

It is expected that the discount rate will remain fairly stable over the long-term.

The considerations above with respect to reviewing the discount rate may be changed from time to time if deemed necessary by the Board of Trustees and with approval by the Parties.

Appendix I: Additional Disclosures

Open Group Funded Ratio and Termination Value Funded Ratio

Open Group Funded Ratio		July 1, 2019 ¹
Funding Policy Value of Assets	\$	464,782,131
Funding Policy Liability	\$	406,174,386
Open Group Funded Ratio		114.4%
Termination Value Funded Ratio		
Market Value of Assets	\$	379,046,873
Funding Policy Liability	\$	406,174,386
Termination Value Funded Ratio		93.3%

Note:

¹ After application of the funding policy.

Comment:

- The funding policy value of assets includes the present value of future excess contributions.

Hypothetical Windup Incremental Cost

The hypothetical windup incremental cost for a given year represents the present value, at the actuarial valuation date, of the expected aggregate change in the defined benefit hypothetical windup liability during the year, increased for expected benefit payments during the year. The hypothetical windup incremental cost in respect of the year between July 1, 2019 and July 1, 2020 is \$22,699,002.

Sensitivity Information

Amounts determined with a discount rate 1% lower:

Funding Policy Liability	\$	467,027,212 ¹
Present Value of Excess Contributions	\$	56,737,597 ¹
Going Concern Liability	\$	536,266,538
Hypothetical Windup Liability	\$	798,021,726
Funding Policy Normal Actuarial Cost	\$	14,875,997 ¹
Going Concern Normal Actuarial Cost	\$	18,570,093

Note:

¹ After application of the funding policy.

Effects of Plausible Adverse Scenarios

In accordance with Canadian Institute of Actuaries Standards of Practice, the risk assessments below have been performed only for the funding policy valuation of the plan.

Interest Rate Risk

Yields on the plan's fixed income investments have been assumed to decline immediately by 109 basis points on a weighted average basis, resulting in a reduction in the funding policy discount rate of 25 basis points. For this purpose, fixed income investments have been deemed to include only universe bonds. The market values and expected returns for global equities, global equities – low volatility, real estate, infrastructure, high yield bonds, cash and short-term securities have been assumed to be unaffected by the bond yield changes.

The market value of assets has been adjusted to reflect the changes in fixed income investment values under this interest rate risk scenario.

The present value of excess contributions has also been adjusted to reflect the decrease in the funding policy discount rate of 25 basis points.

The adverse scenario for interest rate risk is based on the capital market assumptions from Willis Towers Watson's capital market model, with a 10th percentile scenario used for each relevant asset class independently.

No allowance has been made for any other effects on the funding policy liability due to the change in bond yields, including any rebalancing effects.

Deterioration of Asset Values

Market values of global equities, global equities – low volatility, real estate, infrastructure and high yield bonds have been assumed to decline immediately by 14.5% on a weighted average basis. Market values of universe bonds, expected future returns for all asset classes, as well as the funding policy discount rate, have been assumed to be unaffected by this deterioration of asset values.

No allowance has been made for any other effects of the deterioration of asset values, including any rebalancing effects.

The adverse scenario for a deterioration of asset values is based on the capital market assumptions from Willis Towers Watson's capital market model, with a 10th percentile scenario used for each relevant asset class independently.

Longevity Risk

Longevity risk has been assessed by applying a one-year setback to the mortality table (i.e., assumes employees mortality will be that of an employee one year younger).

No allowance has been made for any effects on asset values or any effects on the funding policy liability or funding policy normal cost other than the mortality assumption change.

Lower Contribution Base

Lower contribution base risk has been assessed by assuming the reduction in complement (i.e. the rate at which the active population decreases) would be by -0.5% per annum over 20 years instead of -0.25% per annum over 20 years. This has an impact on the present value of excess contributions and reduces the total funding policy value of assets.

Effects

The effects of the plausible adverse scenarios above on the funded status of the plan and on the funding policy normal cost is shown in the following table.

	Baseline	Interest Rate Risk	Deterioration of Asset Values	Longevity Risk	Lower Contribution Base Risk
Funding Policy Discount Rate	4.00% p.a.	3.75% p.a.	4.00% p.a.	4.00% p.a.	4.00% p.a.
Reduction in Complement	-0.25% p.a.	-0.25% p.a.	-0.25% p.a.	-0.25% p.a.	-0.50% p.a.
Weighted Average Fixed Income Yield Change	N/A	-1.1%	N/A	N/A	N/A
Fixed Income Asset Value Change	N/A	+8.8%	N/A	N/A	N/A
Non-Fixed Income Asset Value Deterioration	N/A	N/A	-14.5%	N/A	N/A
Funding Policy Value of Assets					
Market value of assets	\$ 379,046,873	\$ 390,734,783	\$ 343,346,343	\$ 379,046,873	\$ 379,046,873
Present value of excess contributions	85,735,258	77,334,620	85,735,258	85,735,258	84,895,502
Total funding policy value of assets	\$ 464,782,131	\$ 468,069,403	\$ 429,081,601	\$ 464,782,131	\$ 463,941,925
Funding Policy Liability	\$ 406,174,386	\$ 420,591,266	\$ 406,174,386	\$ 415,213,508	\$ 406,174,386
Funding Policy Excess (Deficit)	\$ 58,607,745	\$ 47,478,137	\$ 22,907,215	\$ 49,568,623	\$ 57,767,539
Open Group Funded Ratio	114.4%	111.3 %	105.6%	111.9%	114.2%
Termination Value Funded Ratio	93.3%	92.9 %	84.5%	91.3%	93.3%
Funding Policy Normal Actuarial Cost	12,178,258	12,802,960	12,178,258	12,375,733	12,178,258

Stochastic Model Output Disclosures

In accordance with Canadian Institute of Actuaries Standards of Practice, the disclosures below are based on the assumptions set out in Appendix D.

Normative Key Bond Yields and Spreads

The projection of future yield curves in the Capital Market Investment Model is based on the following central assumptions:

- For the federal bond yield curve, the mean yields at the end of the 20-year projection period at one-year, 10-year, and 30-year terms are 3.33%, 3.69% and 3.90%, respectively.
- The average normative credit spread for short, medium and long-term provincial bonds are 0.26%, 0.54% and 0.79%, respectively, prior to adjustments for downgrade/default.
- The average normative credit spreads for short, medium and long-term investment-grade corporate bonds are 0.85%, 1.25% and 1.65%, respectively, prior to adjustments for downgrade/default.

Forecasted Total Portfolio Return (net of investment expenses)

Percentile	2019	2021	2023	2025	2027	2029	2034	2038
Mean	3.83%	3.89%	4.03%	4.20%	4.36%	4.52%	4.85%	5.06%
Std Dev	7.51%	4.16%	3.19%	2.70%	2.37%	2.16%	1.84%	1.67%
5th	-8.87%	-3.52%	-1.52%	-0.38%	0.33%	0.77%	1.73%	2.22%
25th	-0.36%	1.29%	1.95%	2.46%	2.84%	3.13%	3.66%	3.96%
50th	4.21%	4.16%	4.24%	4.33%	4.45%	4.59%	4.88%	5.08%
75th	8.54%	6.68%	6.22%	6.04%	6.00%	6.00%	6.09%	6.21%
95th	15.13%	10.44%	8.94%	8.46%	8.16%	7.97%	7.75%	7.76%

Forecasted Discount Rate

Percentile	2019	2021	2023	2025	2027	2029	2034	2038
Mean	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
Std Dev	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5th	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
25th	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
50th	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
75th	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
95th	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%

Forecasted Demographic Summary Statistics

Statistics	2019	2021	2023	2025	2027	2029	2034	2038
Active and disabled members								
▪ Number	592	589	586	583	580	577	570	565
▪ Average age	50.8	50.4	50.0	49.8	49.7	49.6	50.0	50.4
▪ Average credited service ¹	13.5	13.0	12.5	12.2	11.9	11.7	11.9	12.2
▪ Mean total pensionable salary (\$M) ²	81.1	84.3	88.3	92.9	98.0	103.5	120.7	137.2
▪ Mean total liability (\$M) ³	185	188	189	189	192	195	225	260
Retired members, beneficiaries and terminated vested members								
▪ Number	668	733	791	844	889	923	989	1,009
▪ Mean total annual pension paid (\$M)	16.5	19.3	22.0	24.9	27.6	30.2	35.8	40.3
▪ Mean total liability	214	247	280	311	338	365	413	451
Mean active / inactive liability split	46%	43%	40%	38%	36%	35%	35%	36%

Notes:

- ¹ Including credited service payable under the Public Service Shared Risk Plan (the "PSSRP").
- ² Capped pensionable salary in each forecasted year.
- ³ Before application of the funding policy

Forecasted Funding Policy Value of Assets (\$M)

Percentile	2019	2021	2023	2025	2027	2029	2034	2038
Mean	379	411	445	482	521	565	697	838
5th	379	341	345	358	370	386	428	480
25th	379	388	405	428	452	482	565	655
50th	379	412	444	479	517	556	678	806
75th	379	437	485	533	584	641	806	986
95th	379	475	547	612	691	770	1,027	1,317
CVaR 5th	379	319	324	329	339	352	382	421
CVaR 2.5th	379	305	309	310	319	329	353	384

Forecasted Funding Policy Liability (\$M – Before Application of Funding Policy)

Percentile	2019	2021	2023	2025	2027	2029	2034	2038
Mean	399	435	469	500	529	559	638	711
5th	399	428	451	471	490	505	540	570
25th	399	432	461	485	507	529	584	634
50th	399	435	469	498	526	554	627	694
75th	399	438	476	512	547	583	679	770
95th	399	442	488	534	582	632	777	913
CVaR 95th	399	444	493	545	600	657	822	975
CVaR 97.5th	399	445	497	552	612	675	849	1,015

Forecasted Funding Policy Excess (Deficit) (\$M – Before Application of Funding Policy)

Percentile	2019	2021	2023	2025	2027	2029	2034	2038
Mean	67	68	74	86	102	122	191	275
5th	67	2	(13)	(19)	(24)	(23)	(15)	3
25th	67	47	41	43	47	56	88	125
50th	67	69	74	84	98	113	171	233
75th	67	93	108	126	151	180	274	389
95th	67	128	162	198	242	294	471	689
CVaR 5th	67	(20)	(34)	(47)	(52)	(56)	(58)	(47)
CVaR 2.5th	67	(34)	(48)	(66)	(71)	(78)	(84)	(79)

Forecasted Open Group Funded Ratio (Before Application of Funding Policy)

Percentile	2019	2021	2023	2025	2027	2029	2034	2038
Mean	117%	116%	116%	117%	119%	121%	129%	138%
5th	117%	100%	97%	96%	95%	96%	97%	100%
25th	117%	111%	109%	109%	109%	110%	114%	118%
50th	117%	116%	116%	117%	118%	120%	126%	132%
75th	117%	121%	123%	125%	128%	131%	141%	153%
95th	117%	129%	134%	138%	144%	151%	171%	195%
CVaR 5th	117%	95%	92%	90%	90%	89%	90%	92%
CVaR 2.5th	117%	92%	89%	86%	86%	85%	85%	87%

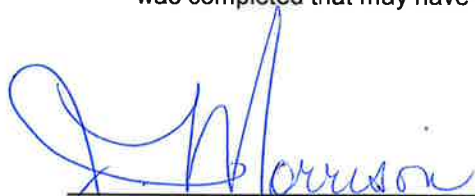
Forecasted Termination Value Funded Ratio (Before Application of Funding Policy)

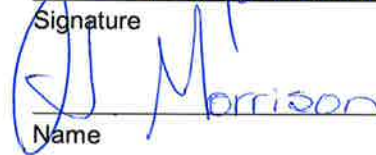
Percentile	2019	2021	2023	2025	2027	2029	2034	2038
Mean	95%	94%	95%	96%	98%	101%	109%	117%
5th	95%	79%	76%	75%	74%	74%	76%	79%
25th	95%	89%	88%	88%	88%	89%	93%	97%
50th	95%	95%	95%	96%	97%	99%	105%	111%
75th	95%	100%	102%	104%	107%	111%	121%	133%
95th	95%	108%	113%	118%	125%	132%	152%	176%
CVaR 5th	95%	74%	71%	69%	68%	68%	69%	71%
CVaR 2.5th	95%	71%	68%	65%	64%	64%	64%	66%

Appendix J: Certificate of the Board of Trustees


I hereby certify that to the best of my knowledge and belief:


- the significant terms of engagement contained in Appendix A of this report are accurate and reflect the plan administrator's judgement of the plan provisions and/or an appropriate basis for the actuarial valuation of the plan;
- the information on plan assets forwarded to Société Towers Watson Canada inc. and summarized in Appendix B of this report is complete and accurate;
- the data forwarded to Société Towers Watson Canada inc. and summarized in Appendix G of this report are a complete and accurate description of all persons who are members of the plan, including beneficiaries who are in receipt of a retirement income, in respect of service up to the date of the actuarial valuation;
- the summary of plan provisions contained in Appendix H of this report is accurate; and
- other than the events described in the Introduction section of this report, there have been no events which occurred between the actuarial valuation date and the date this actuarial valuation was completed that may have a material impact on the results of the actuarial valuation.



Signature


Name



Date


Title
AESRP