

New Brunswick Public Service Pension Plan

Actuarial Valuation Report as at January 1, 2019

Registration number: Canada Revenue Agency: #0305839
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Report prepared July 2019

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Introduction

The Public Service Superannuation Act (“Former PSSA”) was converted to the Public Service Shared Risk Plan (“PSSRP”) effective January 1, 2014. As of April 2016, the PSSRP has been renamed the New Brunswick Public Service Pension Plan (“Plan” or “NBPSPP”).

This report, conducted as at January 1, 2019, was prepared for the NBPSPP Board of Trustees (“Trustees”) and the Superintendent of Pensions (“Superintendent”) for the following purposes:

- To document the results of a funding policy valuation, as required under subsection 100.61(1) of the New Brunswick *Pension Benefits Act* (“PBA”) and subsections 14(5) to 14(7) of Regulation 2012-75, and provide the related actuarial opinion;
- To document the results of the risk management procedures as required under paragraph 100.7(1)(e) of the PBA; and
- To document the results of a hypothetical wind-up valuation of the NBPSPP as required under the Canadian Institute of Actuaries’ Standards of Practice, and provide the related actuarial opinion.

The Board of Trustees is also seeking the approval of the Superintendent for the following items, as required under the PBA and Regulations:

- Approval of the generational mortality table used in the funding policy valuation as required under subparagraph 14(7)(c)(ii) of Regulation 2012-75;
- Approval of the asset liability model used, as described in Section 2, including the stochastic projection assumptions found under Appendix C, as required under subsection 15(1) of Regulation 2012-75; and
- Approval of the economic assumptions used in the asset liability model, as described under Appendix C, as required under subsection 15(3) of Regulation 2012-75.

The Trustees for the NBPSPP retained the services of Morneau Shepell Ltd (“Morneau Shepell”) to prepare this report.

The last actuarial valuation report prepared for the NBPSPP was performed as at January 1, 2018.

The hypothetical wind-up basis has been updated to reflect market conditions as at the valuation date.

The funding policy valuation assumptions have been updated as follows:

- The assumed proportion married at retirement for males is 85%, which is 5% higher than the assumption used for the actuarial valuation as at January 1, 2018. The assumed proportion married at retirement for females is 75%, which is 5% higher than the assumption used for the actuarial valuation as at January 1, 2018. The assumed proportion of retirees married at death has also been updated.
- The assumed spousal age difference is for males to be 2 years older than females. The assumption used for the actuarial valuation as at January 1, 2018 was for males to be 3 years older than females.

These changes are described in more detail in section 1 of this report

The next actuarial valuation report for the NBPSPP will be due no later than one year following the effective date of this report in accordance with the requirements of subsection 100.61(1) of the PBA.

We understand that there are a number of legal actions against the Province of New Brunswick (including one in which the NBPSPP Board of Trustees is named as a defendant) related to the conversion of the Former PSSA to the PSSRP (now the NBPSPP). The outcomes of those various legal actions are not yet known and they may or may not ultimately impact the results of the calculations found in this report. At this time, no special provision is made in this report with respect to any potential outcome related to these legal actions.

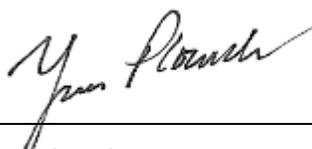
To our knowledge, there are no other events subsequent to the valuation date, which would materially impact the results of the valuation.

The recommendations and opinions are given exclusively from a financial viewpoint. This valuation report does not constitute a legal opinion on the rights and duties of the Trustees or the members of the NBPSPP over the pension fund.

Actuarial valuation results are only estimates. Actuarial valuations are performed based on assumptions and methods that are in accordance with sound actuarial principles. Emerging experience differing from these assumptions will result in gains or losses, which may affect future open group funded ratios of the Plan, which in turn will impact the types and timing of any actions to be taken by the Trustees in accordance with the Funding Policy. These gains and losses will be revealed in future actuarial valuations.

The undersigned is available to provide supplementary information and explanation as appropriate, concerning this report.

Respectfully submitted,



Yves Plourde, FSA, FCIA

2019-07-18

Date

This report was peer reviewed by Sarah Sissons, FSA, FCIA.

Section 1 – Funding Policy Valuation

A funding policy valuation is required under subsection 100.61(1) of the PBA and subsections 14(5) to 14(7) of Regulation 2012-75. The results of the funding policy valuation of the NBPSPP as at January 1, 2019, are found below.

The funding policy valuation results presented in this section are based on asset information found in Appendix A, membership data found in Appendix B, Plan provisions summarized in Appendix D, and provisions of the Funding Policy summarized in Appendix E of this report. The methods and assumptions used in the funding policy valuation are described later in this section.

Funding Policy Valuation Funded Status

The funding policy valuation funded status of the NBPSPP is determined by comparing the fair market value of the assets to the funding policy actuarial liabilities. The funding policy actuarial liabilities are based on the benefits earned up to the valuation date assuming the Plan continues indefinitely. The funding policy valuation funded status of the NBPSPP as at January 1, 2019, along with the results in the previous valuation as at January 1, 2018, are found below:

Table 1.1 – Funding Policy Valuation Funded Status

	January 1, 2019	January 1, 2018
	\$M	\$M
Fair market value of assets (including receivables / payables)	\$7,632.7	\$7,652.0
Funding policy valuation actuarial liabilities		
Active members	\$2,312.1	\$2,297.4
Retirees and survivors	4,513.9	4,303.6
Deferred vested and suspended members	241.0	228.4
Outstanding refunds	2.4	1.6
Total funding policy valuation actuarial liabilities	\$7,069.4	\$6,831.0
Funding policy valuation excess (unfunded liability)	\$563.3	\$821.0
Termination value funded ratio [calculated in accordance with paragraph 14(6)(e) of Reg. 2012-75]	108.0%	112.0%

The termination value funded ratio is used in the calculation of the “termination value” of any individual’s pension benefits at termination of employment, death, marriage breakdown, or retirement, as the case may be, in accordance with the terms of the NBPSPP and subsection 18(1) of Regulation 2012-75. It is calculated in accordance with paragraph 14(6)(e) of Regulation 2012-75.

Funding Policy Valuation Normal Cost and Excess Contributions

The table below provides the funding policy valuation normal cost, being the value of the pension benefits being earned in the twelve-month period after the valuation date. It compares the funding policy valuation normal cost to the level of member and employer contributions in order to determine the level of contributions being made to the NBPSPP in excess of the funding policy valuation normal cost. Results for the year following January 1, 2019 are presented below, along with the results found in the previous actuarial valuation as at January 1, 2018.

Table 1.2 – Funding Policy Valuation Normal Cost and Excess Contributions

	Year Following January 1, 2019		Year Following January 1, 2018	
	\$M	% of payroll	\$M	% of payroll
A. Funding policy valuation normal cost	\$153.7	12.26%	\$149.4	12.40%
B. Contributions:				
Members	\$103.4	8.25%	\$99.4	8.25%
Employers' initial contributions	141.0	11.25%	135.5	11.25%
Employers' temporary schedule 1 (for 5 yrs after 1.1.2014)	0.0	0.00%	6.0	0.50%
Employers' temporary schedule 2 (for 10 yrs after 1.1.2014)	<u>9.4</u>	<u>0.75%</u>	<u>9.0</u>	<u>0.75%</u>
Total	\$253.8	20.25%	\$249.9	20.75%
C. Excess contributions (B. – A.)	\$100.1	7.99%	\$100.5	8.35%
Estimated payroll for following year	\$1,253.4		\$1,204.5	

Determination of 15-Year Open Group Funded Ratio

The table below provides the 15-year open group funded ratio as calculated in accordance with the requirements of paragraph 14(6)(f) of Regulation 2012-75. This ratio is used extensively under the Funding Policy to determine the actions to be undertaken by the Trustees under the funding policy deficit recovery plan and the funding policy excess utilization plan. The 15-year open group funded ratio is calculated as follows:

Table 1.3 – 15-Year Open Group Funded Ratio

	January 1, 2019	January 1, 2018
	\$M	\$M
A. Market value of assets (including receivables / payables)	\$7,632.7	\$7,652.0
B. Present value of excess contributions over next 15 years [calculated in accordance with Reg. 14(6)(c)]	\$1,263.4	\$1,215.8
C. Funding policy valuation actuarial liabilities	\$7,069.4	\$6,831.0
D. 15-Year Open Group Funded Ratio [(A. + B.) / C.]	125.8%	129.8%

Reconciliation of Funding Policy Valuation Funded Status with Previous Valuation

The table below describes the change in the NBPSPP's funded status between the last funding policy valuation as at January 1, 2018 and this funding policy valuation as at January 1, 2019:

Table 1.4 – Reconciliation of Funded Status

	\$M	\$M
Funding policy valuation excess (unfunded liability) as at January 1, 2018		\$821.0
Expected changes in funded status		
Interest on funding excess (unfunded liability)	\$39.0	
Total contributions in excess of normal cost (shortfall)	104.5	
Impact of indexing for retirees and survivors as at January 1, 2019	(77.6)	
Impact of indexing for active, deferred vested and suspended members as at January 1, 2019	(49.7)	
Total		\$16.2
Expected funding policy valuation excess (unfunded liability) as at January 1, 2019		\$837.2
Experience gains (losses) due to the variance from expected for the following factors		
Investment return on actuarial value of assets	(241.3)	
Incidence of mortality	(4.7)	
Incidence of retirements	(7.5)	
Incidence of terminations of employment	(0.3)	
Other miscellaneous factors	6.9	
Total		(246.9)
Funding policy valuation excess (unfunded liability) as at January 1, 2019 (prior to changes in assumptions)		\$590.3
Impact of changes in assumptions		(27.0)
Funding policy valuation excess (unfunded liability) as at January 1, 2019		\$563.3

Reconciliation of Total Normal Cost

The factors contributing to the change in the total normal cost from the last funding policy valuation as at January 1, 2018 to this funding policy valuation as at January 1, 2019 are shown below:

Table 1.5 – Reconciliation of Total Normal Cost

	% of payroll
Total normal cost as at January 1, 2018:	12.40%
Impact of changes in demographics:	(0.10)%
Impact of changes to assumptions:	(0.04)%
Total normal cost as at January 1, 2019:	12.26%

Sensitivity Analysis on the Funding Policy Valuation Basis

The Standards of Practice of the Canadian Institute of Actuaries require actuarial valuation reports to disclose the sensitivity of the liabilities to changes in the discount rate assumption. The table below illustrates the effect of 1% decrease in the discount rate on the funding policy valuation actuarial liabilities. With the exception of the discount rate, all other assumptions and methods used for this valuation were maintained.

Table 1.6 – Sensitivity of Actuarial Liabilities on the Funding Policy Valuation Basis

	January 1, 2019	Discount Rate 1% lower
	\$M	\$M
Actuarial liabilities		
Active members	\$2,312.1	\$2,775.7
Retirees and survivors	4,513.9	4,956.9
Deferred vested and suspended members	241.0	290.8
Outstanding refunds	2.4	2.4
Total	\$7,069.4	\$8,025.8
Increase in actuarial liabilities		\$956.4

Sensitivity Analysis on the Funding Policy Valuation Total Normal Cost

The table below illustrates the effect on the total normal cost of using a discount rate 1% lower than the one used for the funding policy valuation. All other assumptions and methods, as used for this valuation, were maintained.

Table 1.7 – Sensitivity of Funding Policy Valuation Total Normal Cost

	As at January 1, 2019		Discount Rate 1% lower	
	\$M	% of payroll	\$M	% of payroll
Total normal cost	\$153.7	12.26%	\$189.7	15.14%
Increase in total normal cost			\$36.0	2.88%

Funding Policy Valuation Actuarial Methods

Asset Valuation Method

The assets used under the funding policy valuation are equal to the fair market value of the assets. This is a requirement of paragraph 14(6)(d) of Regulation 2012-75.

Actuarial Cost Method

The funding policy valuation actuarial liabilities and total normal cost were calculated using the accrued benefit (or unit credit) actuarial cost method in accordance with the requirements of paragraph 14(7)(a) of Regulation 2012-75.

The funding policy valuation actuarial liabilities are equal to the actuarial present value of benefits earned by members for services prior to the valuation date, taking into account the actuarial assumptions as indicated hereafter. For greater certainty, it does not take into account the impact of any future salary increases and the impact of any future increases in accrued pensions due to cost-of-living adjustments as may be granted from time to time by the Trustees in accordance with the Plan terms and the Funding Policy.

The funding policy valuation normal cost is equal to the actuarial present value of benefits expected to be earned by members in the year following the valuation date. A salary increase estimate has been made to calculate the estimated normal cost and estimated members and employers contributions for the year following the valuation date.

The ratio of the total normal cost to the covered payroll for the period will tend to stabilize over time if the demographic characteristics of the active and disabled members remain stable. All other things being equal, an increase in the average age of the active and disabled members will result in an increase in this ratio.

For valuation purposes, to determine eligibility for benefits and for any other use, the age used is the age on the date of the nearest birthday.

Funding Policy Valuation Actuarial Assumptions

The main actuarial assumptions employed for the funding policy actuarial valuation are summarized in the following table. Emerging experience differing from these assumptions will result in gains or losses, which will be revealed in future funding policy actuarial valuations. Experience gains and losses emerging in future funding policy actuarial valuations will impact, among other things, the open group funded ratio of the Plan, which in turn will impact the types and timing of any actions to be taken by the Trustees in accordance with the Funding Policy. All rates and percentages are annualized unless otherwise noted.

Table 1.8 – Funding Policy Valuation Actuarial Assumptions

January 1, 2019									
Discount rate		4.75% per annum							
Salary increase for the year following valuation (normal cost purposes only)		2.75% per annum plus merit and promotion							
YMPE increase for the year following valuation (normal cost purposes only)		2.75% per annum							
Mortality		Males: 105% of CPM2014_PUBL with generational improvement using projection scale CPM-B							
		Females: 110% of CPM2014_PUBL with generational improvement using projection scale CPM-B							
Termination (membership)		None							
Retirement Age*	Age at Conversion								
	Under 25 or joined Plan after conversion date	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
55	0%	0%	0%	0%	0%	0%	0%	0%	0%
56	0%	0%	0%	0%	0%	0%	0%	2.5%	5%
57	0%	0%	0%	0%	0%	2.5%	5%	5%	5%
58	0%	0%	0%	2.5%	5%	5%	5%	5%	5%
59	0%	0%	5%	5%	5%	5%	5%	12.5%	20%
60	2.5%	5%	5%	5%	5%	12.5%	20%	20%	20%
61	5%	5%	5%	12.5%	20%	20%	20%	20%	20%
62	5%	5%	20%	20%	20%	20%	20%	13.1%	6.25%
63	12.5%	20%	20%	20%	20%	13.1%	6.25%	6.25%	6.25%
64	20%	20%	20%	13.1%	6.25%	6.25%	6.25%	6.25%	6.25%
65	55%	45%	25%	21.9%	18.75%	15.65%	12.5%	9.4%	6.25%
Investment and administrative expenses assumed by the fund		Implicit in the discount rate							

**Notes:*

New members after conversion retire in accordance with the “Under 25” rates. If a member is older than age 55, retirement rates are adjusted proportionately to keep the same retirement pattern for the remaining rates at older ages. Members older than age 65 are assumed to retire in one year.

	January 1, 2019	January 1, 2018
Proportion of members with a spouse or common-law partner		
• Active males	85%	80%
• Active females	75%	70%
• Retirees	Varies by age	Varies by age
Spousal age difference	Males 2 years older than females	Males 3 years older than females

Additional assumptions are required to determine the level of future cash flows to and from the Plan, such as member and employer contributions, normal costs, benefit payments and expenses. These cash flows are calculated on a deterministic basis for each year following the valuation date for a period of 20 years, and allow the determination of the funding policy actuarial liability and assets at each future date, as well as the determination of the present value of 15-year excess contributions in accordance with paragraph 14(6)(c) of Regulation 2012-75. Furthermore, all this information is used in the stochastic analysis required under the risk management procedures for the NBPSPP.

Table 1.9 – Additional Funding Policy Actuarial Valuation Assumptions for Purposes of Calculating Future Year Cash Flows and Actuarial Liability

	January 1, 2019			
New entrants	Each active member is replaced at death or retirement by a new entrant, resulting in a stable active membership			
Distribution of new entrants and salary at entry:	Age	Distribution	Average Salary at Entry	Work Percentage
	25	25.0%	\$53,430	95%
	35	35.0%	\$63,705	95%
	45	25.0%	\$63,705	95%
	55	15.0%	\$63,705	95%
Inflation	2.25% per annum			
Salary increases	2.75% per annum plus merit and promotion			
YMPE increases	2.75% per annum			

Rationale for Material Actuarial Assumptions

The assumptions have been reviewed in light of current economic and demographic conditions.

Inflation

Given the historical increases in consumer prices in Canada, the rates expected by the market, the portfolio managers' expectation, the Bank of Canada policy and the long-term forecasts of the Conference Board of Canada, Morneau Shepell believes that the expected long-term annual rate of inflation should be between 1.75% and 2.25%.

Consistent with this range and prior years, we have continued to use an inflation assumption of 2.25% per annum. Further consideration will be given to reducing the long-term inflation assumption at the next valuation, given that the current assumption has reached the higher end of our suggested range.

Discount Rate Development

The elements considered in the development of the discount rate assumption for purposes of the funding policy valuation are summarized in the table below.

Table 1.10 – Development of Funding Policy Valuation Discount Rate

	%
Expected long-term nominal return based on the results of our stochastic analysis (using long-term target asset mix, and including impact of rebalancing and diversification)	6.07
Assumed margin for adverse deviation (originally set to achieve a high probability of exceeding the discount rate over the next 20 years)	(1.12)
Expected investment and administration expenses paid from the fund	(0.20)
Discount rate	4.75

The expected long-term nominal return by asset class is provided in Appendix C. The target asset mix used in the calculations is found in the Statement of Investment Policies adopted by the Trustees, as summarized in Table A.4. It should be noted that the return assumptions for bonds have been determined mainly on current market conditions while the return assumptions for equities and alternative investments are based more on long-term expectations.

The Funding Policy mandated the discount rate to be used for funding policy actuarial valuations up to and including January 1, 2017. A change in discount rate could be considered for actuarial valuations on or after January 1, 2018. The Trustees considered the issue and decided to continue at this time to use a discount rate of 4.75% per annum.

Expenses

The allowance for investment management and administrative expenses paid from the Plan built into the discount rate is 0.20% of assets based on recent Plan history and our expectation for future expenses.

Rate of Salary Increase

Salary increases consist of a combination of inflation, productivity growth (i.e. real increase in average employment earnings in excess of inflation) and merit and promotional increase.

The basic salary increase assumption is 2.75% per annum (based on assumed inflation of 2.25% per annum and productivity growth of 0.5% per annum). A merit and promotion scale is added to this salary increase assumption using five decreasing levels depending on age. A merit and promotion increase of 2.2% per annum is used for ages 29 and under, 1.3% per annum for ages 30 to 39, 0.7% per annum for ages 40 to 49, 0.2% per annum for ages 50 to 64 and 0% for ages 65 and above.

For example, a member at age 20 would receive a 4.95% salary increase each year up to age 29, at which time the annual increases would be reduced to 4.05% per annum until age 39, and so forth until expected retirement age. The average salary increase for this member's career would be approximately 3.75% per annum.

Mortality

In order to take into account the improvements in life expectancy substantiated by the Canadian Institute of Actuaries in its report on Canadian Pensioners Mortality (published on February 13, 2014), we used the CPM-2014Publ Mortality Table, and the CPM-B Improvement Scale, which varies by gender, age and calendar year. A mortality study was completed using Plan experience from 2004 to 2012. This study revealed that NBPSPP mortality rates were higher than those produced by the above standard mortality table and projection scale. As a result, and after considering the statistical credibility of the experience, we used adjustment factors of 105% for males and 110% for females. The same adjustments were used for all participants before and after retirement. This is the same mortality assumption as used in the previous valuation.

The mortality rates described above result in the following life expectancies for females and males:

Table 1.11 - Life Expectancy for Females and Males

Females		Life expectancy by Age in Year				
Age	2019	2024	2029	2034	2039	
55	33.6	33.8	34.1	34.3	34.6	
60	28.7	29.0	29.2	29.5	29.7	
65	24.0	24.3	24.5	24.7	24.9	
70	19.5	19.8	20.0	20.2	20.4	
75	15.2	15.5	15.6	15.8	16.0	
80	11.3	11.5	11.6	11.8	11.9	
Males		Life expectancy by Age in Year				
Age	2019	2024	2029	2034	2039	
55	31.8	32.1	32.4	32.6	32.9	
60	27.1	27.4	27.6	27.9	28.1	
65	22.5	22.8	23.0	23.3	23.5	
70	18.1	18.3	18.6	18.8	19.0	
75	13.9	14.1	14.3	14.5	14.7	
80	10.1	10.3	10.4	10.6	10.7	

For existing disability pensioners (this is a closed group of 127 retirees who retired under a disability provision which existed before January 1, 1993 under the Former PSSA), the mortality table adopted is the 1971 GAM Table. This table is the same as for the previous valuation for disabled pensioners and remains appropriate for this group of pensioners.

Rate of Increase in YMPE

We have continued to assume in this valuation that the YMPE will increase at the same rate as salary (before merit and promotional increase). As a result, we have used a rate of 2.75% per annum. The YMPE is automatically updated to its revised base level at each valuation date.

Retirement

Given the changing early retirement subsidies for service after the Conversion Date, we estimate that plan members will slowly start to delay retirement as we move away from the Conversion Date. As a result, we adopted retirement assumptions that vary depending on the member's age at conversion as well as an ultimate retirement assumption for new members after conversion. A younger member at the valuation date will be expected to retire later on average than an older worker at the same date. This is the same assumption as the one used for the last valuation. We will continue to monitor this assumption for reasonableness.

Difference in Age between Spouses

The assumed age difference between spouses is used for active, deferred and suspended members as well as some retirees. A review of recent Plan experience has indicated that the difference between the ages of spouses has been decreasing. Reflecting this analysis, the assumed spousal age difference is now for males to be 2 years older than females. The assumption used for the actuarial valuation as at January 1, 2018 was for males to be 3 years older than females.

Proportion with a Spouse or Common-law Partner

An assumption is required for the proportion of retirees who have a spouse at retirement as well as for the proportion of deceased retirees with a spouse or common-law partner at death when no spousal information is available. A review of recent Plan experience was conducted and used to update assumptions related to the proportion of retirees with a spouse or common-law partner at retirement and at death. The assumed proportion with a spouse or common-law partner at retirement for males is 85%, which is 5% higher than the assumption used for the actuarial valuation as at January 1, 2018. The assumed proportion with a spouse or common-law partner at retirement for females is 75%, which is 5% higher than the assumption used for the actuarial valuation as at January 1, 2018. The assumed proportion of deceased retirees with a spouse or common-law partner at death has also been updated and can be found in table 1.12.

Table 1.12 – Proportion of deceased retirees with a spouse or common-law partner at death

Ages	January 1, 2019		January 1, 2018	
	Males	Females	Males	Females
59 or younger	85%	75%	90%	90%
60-64	85%	75%	77.5%	65%
65-69	82.5%	70%	75%	57.5%
70-74	80%	65%	70%	45%
75-79	75%	57.5%	65%	35%
80-84	70%	45%	60%	17.5%
85-89	60%	30%	45%	10%
90-94	45%	10%	45%	10%
95 or older	25%	10%	45%	10%

Opinion on Funding Policy Valuation

In our opinion, for the purposes of the funding policy valuation section of the report:

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

This funding policy valuation report has been prepared, and our opinions given, in accordance with accepted actuarial practice in Canada.

The assumptions used under the funding policy valuation of this report were reasonable and consistent with the objectives of the NBPSPP at the time this actuarial valuation report was prepared.

Respectfully submitted,



Yves Plourde, FSA, FCIA

2019-07-18

Date

Section 2 – Risk Management Goals and Procedures

Meeting Risk Management Goals

The NBPSPP was designed to achieve or exceed the risk management goals prescribed under the PBA and Regulation 2012-75. Certain procedures were developed to test whether these goals can be achieved given the contribution rules and benefits defined in the NBPSPP. These goals and procedures are described separately below, along with the relevant results of the stochastic analysis required under the PBA as at January 1, 2019.

Risk Management Goals

The primary risk management goal under the PBA is to achieve a 97.5% probability that past base benefits at the end of each year will not be reduced over the 20 years following the valuation.

The goal is measured by taking into account the following funding management plans:

1. the funding deficit recovery plan except for reduction in past or future base benefits, and
2. the funding excess utilization plan excluding permanent benefit changes.

The funding deficit recovery plan and the funding excess utilization plan are described in Sections IV and V of the Funding Policy, respectively.

There are two secondary risk management goals under the PBA. These are:

- On average be expected to provide contingent indexing on base benefits (all members) in excess of 75% of the indexation provided under the Former PSSA over the next 20 years.
- On average be expected to provide at least 75% of the value of the ancillary benefits described in the Plan documents over the next 20 years.

For the purposes of meeting these goals, base benefits include the accrual of extra service of members and any contingent indexing provided based on the financial performance represented by each scenario tested.

If as a result, through the testing process, a scenario allows for indexing in a given future year, then this contingent indexing amount becomes part of the base benefits that the Plan is to strive to protect in accordance with Regulation 2012-75. In other words, the base benefit is dynamically adjusted based on the stochastic results for each economic scenario tested.

Risk Management Procedures

The risk management goals are measured using an asset liability model with future economic scenarios developed using a stochastic process.

The model was run with 2,000 alternative economic scenarios over 20 years. This exceeds the minimum requirements under the PBA of 1,000 economic scenarios.

For each of these scenarios and for each year, the financial position of the NBPSPP is measured. For each of these measurements, a decision consistent with the funding deficit recovery plan or the funding excess utilization plan, as applicable, is modeled with the exceptions noted under the goals above. When modeling the funding deficit recovery plan actions over the 20-year period of each of the 2,000 economic scenarios, each of the four steps identified in the funding deficit recovery plan under Section IV of the Funding Policy is implemented in sequence until such time as the open group funded ratio of the NBPSPP reaches 100% or higher. A “benefit reduction trial” is recorded (for purposes of the primary risk management goal calculation) when step 4 of the funding deficit recovery plan found in Section IV of the Funding Policy is triggered (i.e. a reduction in past base benefits) at any point in the 20-year period of an economic scenario. The primary risk management measure is therefore the proportion of those 2,000 scenarios that do not lead to a base benefit reduction over a 20-year period. In order to pass the primary risk management goal, at least 1,950 of those 2,000 scenarios must not trigger a “benefit reduction trial” at any point over the 20-year period.

The asset liability model using a stochastic process requires that a number of important modeling assumptions be made. The main assumptions are described below:

- The economic assumptions are developed for each asset class and for key economic parameters based on a combination of past experience, current economic environment and a reasonable range of future expectations. These assumptions are reviewed annually and updated as required. They are also subject to approval by the Superintendent. These assumptions are found in Appendix C.
- For purposes of this report, the NBPSPP’s contributing member population is assumed to remain stable in each year of the projection period. As such, departures from the Plan, for any reason, are assumed to be replaced by the same number of new entrants such that the overall contributing member population remains stable in each year of the projection period. The new entrant population reflects the profile of new plan members expected in the future based on Plan experience. The profile of new entrants used for this analysis is found under Table 1.9 in Section 1 of this report.

The risk management goals were tested as at January 1, 2019, effective date of this report. The results of these tests combined with the results of the funding policy actuarial valuation at the same date will determine the actions the Board of Trustees is required to take, or can consider, under the terms of the Funding Policy.

The primary risk management goal must be achieved or exceeded:

- At January 1, 2014 (i.e. the Conversion Date);
- At the date a permanent benefit change as defined in the Regulations is made;
- At the date a benefit improvement as defined in the Regulations is made; or
- At the date contribution adjustments that exceed those provided under the Funding Policy are implemented.

The secondary risk management goals must be achieved or exceeded:

- At January 1, 2014 (i.e. the Conversion Date); or
- At the date a permanent benefit change as defined in the Regulations is made.

The definitions of permanent benefit change and benefit improvement are as follows:

- “permanent benefit change” means a change that is intended to permanently change the formula for the calculation of the base benefits or ancillary benefits after the date of the change, including a change made in accordance with the funding excess utilization plan.
- “benefit improvement” means an escalated adjustment for past periods or an increase in other ancillary benefits allowed under the Funding Policy.

Results of Stochastic Analysis as At January 1, 2019

The stochastic analysis undertaken as at January 1, 2019, took into account the main following items:

- Membership Data as at January 1, 2019 summarized in Appendix B;
- Economic and demographic assumptions as at January 1, 2019 for the funding policy valuation summarized in Section 1;
- NBPSPP target asset mix as summarized in Table A.4 of Appendix A;
- Stochastic projection assumptions as summarized in Appendix C;
- Risk management procedures described above;
- NBPSPP provisions, summarized in Appendix D;
- Funding deficit recovery plan found under Section IV of the NBPSPP’s Funding Policy (except for reduction in past or future base benefits);
- Funding excess utilization plan found under Section V of the NBPSPP’s Funding Policy (excluding permanent benefit changes).

Based on the above, the results of the stochastic analysis for the various risk management goals as at January 1, 2019 are as follows:

Table 2.1 – Results of Stochastic Analysis for the Various Risk Management Goals

Risk Management Goal	Goal under PBA	Results for NBPSPP as at January 1, 2019
<p>Primary Goal [Regulation 7(1)] -</p> <p>There is at least a 97.5% probability that the past base benefits at the end of each year will not be reduced over a 20-year period</p>	<p>97.5%</p>	<p>99.15%</p> <p>PASSED</p>
<p>Secondary Goal 1 [Regulation 7(3)(a)] -</p> <p>Expected contingent indexing of base benefits of active members for service before the conversion date shall, on average over the next 20-year period, exceed 75% of the increase in the Consumer Price Index;</p> <p>or</p> <p>Expected contingent indexing of base benefits of retirees and deferred vested members for service rendered before the conversion date shall, on average over the next 20-year period, exceed 75% of the escalated adjustments specified in the pension plan immediately before it was converted to a shared risk plan (i.e. Full CPI subject to a maximum increase of 5.0% or 6.0% per year depending on the date of retirement.)</p>	<p>75.0% of the assumed increase in CPI</p>	<p>88.9% of the assumed increase in CPI</p> <p>PASSED</p>
<p>Secondary Goal 2 [Regulation 7(3)(b)] -</p> <p>The amount of ancillary benefits (other than contingent indexing) that are expected to be provided shall, on average over the next 20-year period, exceed 75% of the value of the ancillary benefits specified in the plan text</p>	<p>75.0% of the value of ancillary benefits will be provided</p>	<p>Above 98.7% of the value of ancillary benefits is expected to be provided (See Note below)</p> <p>PASSED</p>

Note: The Funding Policy provides for the reduction of one type of ancillary benefit under the Funding Deficit Recovery Plan at actions 1 and 2. This is the replacement of early retirement reductions for post conversion service under action 1, and for pre-conversion service at action 2, by a full actuarial reduction for members not yet eligible to receive an immediate pension. We expect these two ancillary benefits would be reduced in about 1.3% of our 2,000 20-yr scenarios. If those were the only two ancillary benefits reduced, and they were eliminated completely, then we could expect that 98.7% of the value of ancillary benefits would be provided over the 20-year period. Given that there are other ancillary benefits under the Plan that will not be touched (because they are not mentioned as a benefit that can be reduced under the Funding Policy), the percentage for this test is expected to be higher than 98.7%, which is well above minimum required under the PBA of 75%.

Section 3 – Hypothetical Wind-up Valuation

A hypothetical wind-up valuation assumes that the Plan is wound-up on the valuation date and member's benefit entitlements are calculated as of that date. Although this type of valuation is not required under Part 2 of the *New Brunswick Pension Benefits Act* for a shared risk plan, the Standards of Practice of the Canadian Institute of Actuaries require that actuarial valuation reports provide information with respect to hypothetical wind-up situations.

Subsection 16(3) of Regulations 2012-75 under the PBA prescribes that if a shared risk plan is wound-up by the persons who established the plan within 5 years of its conversion date, the conversion of the plan is void and the plan has to be wound-up as a defined benefit plan under Part 1 of the PBA. In addition, effective January 1, 2018, subsection 16(3.1) of Regulation 2012-75 provides that if the wind-up occurs between 5 and 10 years after the plan conversion date, 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 I of the PBA.

It is important to note that the Former PSSA was not subject to the PBA and the procedures to be followed if a wind-up occurred were not defined within the Former PSSA. As a result, the procedures for payments at wind-up were not defined. In conducting the hypothetical wind-up valuation as at January 1, 2019, we therefore made the assumption that the conversion to a shared risk plan would be void, and that the NBPSPP would be wound-up as at January 1, 2019 in accordance with rules found under Part 1 of the PBA. This assumption has been made solely on the basis that subsection 16(3.1) would apply on January 1, 2019, and does not represent a legal opinion on the validity of this scenario.

In order to estimate the accrued pensions of active members at the valuation date under a scenario in which the conversion would have been void, we increased the accrued pensions by the differential between cost-of-living granted since the conversion date and the salary increase assumption under the funding policy basis. No adjustments were made to retiree pensions for this purpose.

We have valued the hypothetical wind-up liability using discount rates consistent with the requirements of the PBA for plan wind-ups under Part 1. The PBA requires that benefits paid out to each member upon wind-up be not less than the cost to purchase an annuity for that member. Accordingly, we have followed the Canadian Institute of Actuaries' recommendations for the estimated cost of fully indexed annuity purchases as at January 1, 2019.

Hypothetical Wind-Up Funded Status

The hypothetical wind-up funded status under the scenario postulated above, including the results of the last hypothetical wind-up valuation, is as follows:

Table 3.1 – Hypothetical Wind-Up Funded Status

	January 1, 2019	January 1, 2018
	\$M	\$M
Assets		
Market value of assets	\$7,632.7	\$7,652.0
Provision for expenses	(3.0)	(3.0)
Total	\$7,629.7	\$7,649.0
Hypothetical wind-up liabilities		
Active members	\$7,116.0	\$7,402.5
Retirees and survivors	7,605.3	7,430.0
Deferred vested and suspended members	697.5	727.8
Outstanding refunds	2.4	1.6
Total	\$15,421.2	\$15,561.9
Assets less liabilities on the hypothetical wind-up basis	(\$7,791.5)	(\$7,912.9)

The hypothetical wind-up funded status is presented for information purposes. There is no requirement under the PBA to fund the hypothetical wind-up deficit of the NBPSPP while it is not in a wind-up state.

Sensitivity Analysis on the Hypothetical Wind-up Basis

The Standards of Practice of the Canadian Institute of Actuaries require valuation reports to disclose the sensitivity of the liabilities to changes in the discount rate assumption. The table below illustrates the effect on the actuarial liabilities of using discount rates 1% lower than those used for the hypothetical wind-up valuation. All other assumptions and methods, as used in this valuation, were maintained.

Table 3.2 – Sensitivity of Actuarial Liabilities on the Hypothetical Wind-up Basis

	January 1, 2019	Discount rates 1% lower
	\$M	\$M
Actuarial liabilities		
Active members	\$7,116.0	\$9,117.0
Retirees and survivors	7,605.3	8,700.9
Deferred vested and suspended members	697.5	899.5
Outstanding refunds	2.4	2.4
Total	\$15,421.2	\$18,719.8
Increase in actuarial liabilities		\$3,298.6

Incremental Cost on the Hypothetical Wind-up Basis

The incremental cost on the hypothetical wind-up basis represents the present value of the expected aggregate change in the actuarial liabilities from January 1, 2019 to January 1, 2020, adjusted for expected benefit payments in the inter-valuation period. This incremental cost is estimated to be \$444.7M as at January 1, 2019.

Hypothetical Wind-up Asset Valuation Method

Wind-up assets are equal to the market value of assets less an allowance for wind-up expenses. This valuation method is the same as the one used in the last valuation.

Hypothetical Wind-up Actuarial Cost Method

The hypothetical wind-up liabilities are determined using the accrued benefit (or unit credit) actuarial cost method. The hypothetical wind-up liabilities are equal to the actuarial present value of all benefits earned by members for services prior to the valuation date assuming the NBPSPP is wound up on the valuation date. This method is the same as the one used in the last valuation.

For valuation purposes, to determine eligibility for benefits and for any other uses, the age used is the age on the date of the nearest birthday. This method is the same as the one used in the last valuation.

Hypothetical Wind-up Actuarial Assumptions

The main actuarial assumptions used in the hypothetical wind-up valuation correspond to those prescribed by the PBA.

Although the Former PSSA was not subject to the PBA before it was converted to a shared risk plan, in the absence of specific direction to the contrary in the Former PSSA, we have valued the hypothetical wind-up liability using discount rates consistent with the requirements of the PBA if the NBPSPP were to be wound up. The PBA requires that benefits paid out to each member upon wind-up be not less than the cost to purchase an annuity for that member. Accordingly, we have followed the Canadian Institute of Actuaries' recommendations for the estimated cost of fully indexed annuity purchases as at January 1, 2019.

The main actuarial assumptions employed for the hypothetical wind-up actuarial valuation are summarized in the following table. All rates and percentages are annualized unless otherwise noted. The rates below represent the estimated annuity purchase rates for fully indexed annuities.

Table 3.3 – Hypothetical Wind-Up Actuarial Assumptions

	January 1, 2019	January 1, 2018
Interest rate		
Interest rate for active, deferred vested and suspended members under age 55	0.08% per annum (rate net of inflation for fully indexed annuities)	-0.13% per annum (rate net of inflation for fully indexed annuities)
Interest rate for retirees and survivors and all other members age 55 and over	0.08% per annum (rate net of inflation for fully indexed annuities)	-0.13% per annum (rate net of inflation for fully indexed annuities)
Salary increases	None	None
Mortality	CPM14 generational using Scale CPM-B	CPM14 generational using Scale CPM-B
Termination (membership)	None	None
Retirement	Age which maximizes the value of the pension	Age which maximizes the value of the pension
Provision for expenses	\$3,000,000	\$3,000,000

The Canadian Institute of Actuaries (CIA) collects data annually from insurance companies and annually determines interest rates suitable for estimating the cost of single premium group annuities in hypothetical wind-up valuations. For retirees and survivors and for active members and deferred vested and suspended members eligible for immediate retirement at the valuation date, the interest rate used in the hypothetical wind-up valuation is an estimate of the rate that would be used by insurance companies in pricing single premium fully indexed group annuities for annuitants already retired, based on the suggested rates for such annuitants published by the CIA.

The discount rate used for active members and deferred vested and suspended members not eligible for immediate retirement is the rate used for retirees and survivors without adjustment, as suggested by the CIA as an appropriate estimate of the cost of deferred annuities based on their survey data from insurance companies.

Emerging experience differing from these assumptions will result in gains or losses, which will be revealed in future hypothetical wind-up actuarial valuations.

Termination Scenario

The termination scenario used in the hypothetical wind-up valuation includes the following assumptions:

- Plan wind-up would not result from employer insolvency.
- All assets could be realized at their reported market value.
- NBPSPP conversion would be void and the Plan would be wound-up under Part 1 of the PBA.
- Fully indexed annuities would be purchased for all plan members.

Margin for Adverse Deviations

As specified by the Standards of Practice of the Canadian Institute of Actuaries, the hypothetical wind-up assumptions do not include a margin for adverse deviations.

Provision for Fees

Allowance has been made for administrative, actuarial and legal costs which would be incurred if the NBPSPP were to be wound up, based on sufficient and reliable data. It is assumed that the wind-up date, the calculation date and the settlement date are coincident, and as such, expenses related to investment policy reviews, investment and custodial fees are not included. Expenses related to the resolution of surplus and deficit issues are not taken into account. The amount of expenses is only an approximation and may differ significantly from real expenses incurred on Plan wind-up, for example, in case of litigation, bankruptcy and eventual replacement by a third-party administrator.

Hypothetical Wind-up Incremental Cost

The method used to calculate the hypothetical wind-up incremental cost may be described as follows:

1. Present value of expected benefit payments between January 1, 2019 and January 1, 2020, discounted to January 1, 2019;
Plus
2. Projected hypothetical wind-up liabilities as at January 1, 2020, discounted to January 1, 2019;
Less
3. Hypothetical wind-up liabilities as at January 1, 2019.

Opinion on Hypothetical Wind-up Valuation

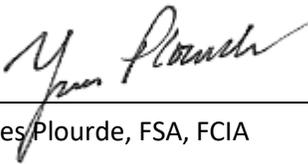
In our opinion, for the purposes of the hypothetical wind-up valuation section of the report:

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

This hypothetical wind-up valuation report has been prepared, and our opinions given, in accordance with accepted actuarial practice in Canada.

The assumptions used under the hypothetical wind-up valuation of this report were reasonable at the time this actuarial valuation report was prepared.

Respectfully submitted,



Yves Plourde, FSA, FCIA

2019-07-18

Date

Appendix A – Assets

Description of Plan Assets

The assets of the NBPSPP are held in trust and are being managed by Vestcor Inc. (“Vestcor”). The information on Plan assets as at December 31, 2018 was taken from unaudited financial statements prepared by Vestcor for the Board of Trustees.

Statement of Market Value

The following table shows the asset mix as at December 31, 2018:

Table A.1 – Assets at Market Value

	December 31, 2018
Asset classes	\$M
Canadian equities	\$950.6
Foreign equities	1,766.1
Fixed income	2,762.2
Inflation linked assets	1,153.3
Alternatives	979.2
Other investments and net amount receivable	21.3
Total assets	\$7,632.7

Changes to Plan Assets

The following table shows changes to the NBPSPP’s assets during the inter-valuation period, based on market values. The reconciliation from January 1, 2018 to December 31, 2018 is based on the unaudited financial statements prepared by Vestcor for the Board of Trustees.

Table A.2 – Reconciliation

	2018 (\$M)
Assets at beginning of period	\$7,652.0
Receipts	
Member contributions	\$100.8
Employer contributions	152.8
Investment income plus realized and unrealized capital appreciation and depreciation	132.3
Total receipts	\$385.9
Disbursements	
Pension and refunds	\$391.9
Expenses	13.3
Total disbursements	\$405.2
Assets at end of period	\$7,632.7

Return on Assets

The Plan assets earned the following rates of return, net of investment management fees and other expenses charged to the Fund, based on our calculations which assume cash flow occurred in the middle of the period:

Table A.3 – Net Investment Return

Year	Net rate of return
	%
2018	1.6
2017	7.6
2016	6.4
2015	7.2

Actuarial Value of Assets

We have used the market value of assets (including receivables / payables) without adjustment. The actuarial value of assets as at December 31, 2018 was \$7,632.7M.

Target Asset Mix

The Statement of Investment Policies for the NBPSPP, as last modified by the Board of Trustees, effective June 27, 2018, provides for the following long term target asset mix:

Table A.4 – Target Asset Mix

Asset Classes	Target Allocation (%)
Fixed income:	
Short term assets	1.0%
Government bonds	17.8%
Corporate bonds	17.7%
Inflation linked:	
Real return bonds	5.0%
Real estate	5.0%
Infrastructure	5.0%
Public equity (regular volatility):	
Canadian equities	6.5%
Canadian small cap equities	1.0%
US equities	5.0%
EAFE equities	5.0%
Public equity (low volatility):	
Canadian low vol	5.0%
US low vol	5.0%
EAFE low vol	5.0%
Emerging market low vol	4.0%
Private equity	4.0%
Absolute return	8.0%
Total	100%

This target asset mix is the same as the one used for the last valuation, and is used to determine the discount rate assumption under the NBPSPP, and to conduct the stochastic analysis required under the PBA to assess the various risk management goals.

Appendix B – Membership Data

Description of Membership Data

Data on Plan membership was obtained from the PIBA pension system maintained by Vestcor. The data was provided as at January 1, 2019.

In developing the valuation membership data set as at January 1, 2019, the following adjustments were made following conversations with Vestcor:

- Accrued pensions for suspended UNB professors were adjusted to take into account an estimate of the salary progression that they would have experienced while actively employed but no longer active members of the Plan, up to conversion. The indexation granted following conversion was also applied, based on our understanding of their benefit.
- Accrued pensions for other pre-conversion suspended members were indexed to the valuation date based on our understanding of their benefit.

We have taken the following additional steps to review data for accuracy, completeness and consistency purposes:

- A reconciliation of data was performed in order to follow the changes concerning some of the active members, retirees and vested members.
- Basic data checks were performed to ensure that age, salary, service and pension accrual data were reasonable for the purposes of the valuation.

Summary of Membership Data

The following tables were prepared using data provided by Vestcor regarding its active members, retirees and former members. Accrued pensions, in payment or not, for all members reflect the cost-of-living adjustment granted by the Board of Trustees effective January 1, 2019.

These tables show the following:

- B.1 Summary of Membership Data
- B.2 Changes in Plan Membership
- B.3 Age/Service Distribution for Active Members as at January 1, 2019
- B.4 Distribution of Retirees and Survivors by Age Groups as at January 1, 2019
- B.5 Distribution of Deferred Vested and Suspended Members by Age Groups as at January 1, 2019

Table B.1 – Summary of Membership Data

		January 1, 2019	January 1, 2018
Active members	Number	18,502	18,010
	Average salary	\$70,659	\$69,633
	Average age	46.6 years	46.8 years
	Average accrued life benefit	\$12,380	\$12,527
	Average accrued bridge benefit	\$4,074	\$4,172
	Average pensionable service	12.1 years	12.5 years
Deferred vested and suspended members	Number	4,129	3,842
	Average age	47.0 years	47.3 years
	Average accrued life benefit	\$5,824	\$5,809
	Average accrued bridge benefit*	\$2,088	\$2,048
Retirees and survivors	Number	16,536	16,099
	Average accrued life benefit	\$21,701	\$21,239
	Average accrued bridge benefit*	\$8,441	\$8,412
	Average age	71.6 years	71.3 years

*Average for those entitled to receive a bridge benefit.

Table B.2 – Changes in Plan Membership

	Active Members	Deferred Vested and Suspended Members	Retirees and Survivors	Total
Members at January 1, 2018	18,010	3,842	16,099	37,951
New members	1,879	--	--	1,879
Retirements	(585)	(119)	704	--
Members who returned to active status	380	(370)	(10)	--
Terminations				
Deferred vested	(3)	3	--	--
Paid lump sum	(166)	(112)	--	(278)
Outstanding	(72)	(24)	--	(96)
Deaths or cessation of pension	(23)	(9)	(434)	(466)
New survivor pensions	--	--	177	177
Became suspended members	(918)	918	--	--
Data adjustments	--	--	--	--
Members at January 1, 2019	18,502	4,129	16,536	39,167

Table B.3 – Age/Service Distribution for Active Members as at January 1, 2019

											Age	
Years of Service		Under 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65 and Over	Total
0 - 4	Number	300	1,122	1,072	899	906	741	598	506	316	68	6,528
	Tot. Sal.	15,171,520	64,024,225	69,178,776	59,029,352	60,471,381	49,195,486	38,926,302	30,393,981	18,710,709	4,138,117	409,239,849
	Avg. Sal.	50,572	57,063	64,532	65,661	66,745	66,391	65,094	60,067	59,211	60,855	62,690
5 - 9	Number		92	460	613	545	456	409	260	134	28	2,997
	Tot. Sal.		6,303,163	30,889,378	42,680,931	39,612,131	33,511,629	29,738,849	18,143,412	9,384,005	1,829,383	212,092,881
	Avg. Sal.		68,513	67,151	69,626	72,683	73,490	72,711	69,782	70,030	65,335	70,768
10 - 14	Number		***	107	490	522	493	423	305	156	34	2,531
	Tot. Sal.		***	8,993,479	38,437,093	39,924,394	36,818,382	31,618,493	21,870,457	11,085,762	2,749,570	191,546,170
	Avg. Sal.		***	84,051	78,443	76,484	74,682	74,748	71,706	71,063	80,870	75,680
15 - 19	Number				100	503	543	527	416	181	43	2,313
	Tot. Sal.				7,982,179	39,797,928	42,886,937	40,001,296	29,985,908	12,419,963	3,506,606	176,580,817
	Avg. Sal.				79,822	79,121	78,981	75,904	72,082	68,619	81,549	76,343
20 - 24	Number					66	333	399	288	121	26	1,233
	Tot. Sal.					5,006,541	26,452,308	30,573,204	21,115,153	8,642,840	1,812,428	93,602,474
	Avg. Sal.					75,857	79,436	76,625	73,317	71,428	69,709	75,914
25 - 29	Number						161	666	505	171	30	1,533
	Tot. Sal.						13,218,164	55,013,303	37,150,135	12,603,389	1,961,629	119,946,620
	Avg. Sal.						82,100	82,603	73,565	73,704	65,388	78,243
30 - 34	Number						3	277	429	132	21	862
	Tot. Sal.						283,199	22,064,224	32,521,060	9,904,608	1,863,766	66,636,857
	Avg. Sal.						94,400	79,654	75,807	75,035	88,751	77,305
35 and over	Number							4	305	155	41	505
	Tot. Sal.							236,909	22,926,499	11,397,626	3,125,475	37,686,509
	Avg. Sal.							59,227	75,169	73,533	76,231	74,627
Total number		300	1,215	1,639	2,102	2,542	2,730	3,303	3,014	1,366	291	18,502
Total salaries		15,171,520	70,375,928	109,061,633	148,129,555	184,812,375	202,366,105	248,172,580	214,106,605	94,148,902	20,986,974	1,307,332,177
Average of salaries		50,572	57,923	66,542	70,471	72,704	74,127	75,136	71,037	68,923	72,120	70,659

Average age: 46.6 years

Average years of service: 12.1 years

Notes:

The age is computed at the nearest birthday. Years of service means the number of years credited for pension plan purposes.

Membership for active members is composed of 8,956 males and 9,546 females.

*** Certain cells are not shown to protect confidentiality

Table B.4 – Distribution of Retirees and Survivors by Age Groups as at January 1, 2019

Age Group	Number	Total Annual Payments	
		Lifetime	Bridge
Under 60	987	20,131,789	6,171,904
60-64	3,211	78,436,345	26,283,206
65-69	4,062	96,633,214	0
70-74	3,184	68,748,226	0
75-79	2,079	41,426,209	0
80-84	1,461	27,767,574	0
85-89	912	15,582,260	0
90 and over	640	10,128,953	0
Total	16,536	358,854,570	32,455,110

Average age: 71.6 years

Notes: Age groups are based on exact age. The pension used is the pension payable as at January 1, 2019. Membership for retirees and survivors is composed of 8,193 males and 8,343 females.

Table B.5 – Distribution of Deferred Vested and Suspended Members by Age Groups as at January 1, 2019

Age Group	Number	Total Annual Payments	
		Lifetime	Bridge
Under 25	37	\$11,399	\$4,880
25-29	240	296,778	118,116
30-34	413	892,937	359,714
35-39	517	1,908,455	739,584
40-44	528	2,546,676	943,770
45-49	614	3,999,393	1,409,880
50-54	720	6,666,348	2,282,476
55-59	604	5,058,527	1,735,316
60-64	291	1,886,660	618,986
65 and over	165	780,865	0
Total	4,129	\$24,048,038	\$8,212,722

Average age: 47.0 years

Note: Age groups are based on exact age. Membership for deferred vested and suspended members is composed of 1,755 males and 2,374 females.

Appendix C – Stochastic Projection Assumptions

Our assumptions for stochastic analysis are built each year using Conference Board of Canada (CBoC) forecasts, internal research, inflation expectations and by surveying the asset manager universe. This ensures we are not using inputs that are out of touch with broader expectations. We strive for a moderate level of conservatism in our assumptions, as high expectations can lead to biased results, understating the true risk level of plans.

Stochastic projection assumptions are updated annually by Morneau Shepell Asset and Risk Management with an anchor date of December 31st and a time horizon of up to 25 years. A multi-stage process is used to set the economic assumptions. First, a long term inflation rate assumption is selected based primarily on the current Bank of Canada Monetary Policy. Volatility for inflation is based on historical data since the early 1990's when the current monetary policy was introduced. Market implied inflation is used as an indicator of the market expectation for long term trends for inflation. Secondly, historical and current bond data is used to determine the long term interest rates for key bond indices. It is assumed that current yields will revert to the projected long term rates over a projected period. Volatility assumptions are based on historical data modified to reflect current low yield rates. Expected return levels and standard deviations for Canadian bond indices are generated in a stochastic simulation approach.

The next stage is to determine nominal equity return assumptions. The process uses multiple sources including our inflation assumptions, historical data, GDP and other economic data, growth forecasts and dividend information. Standard deviations and correlations of equity returns are mainly derived from historical data. Purchasing power parity is assumed in setting foreign equity return assumptions. Alternative asset classes are primarily based on historical data but adjusted by factors specific for each asset class.

The following expected return and volatility by asset class was used as at January 1, 2019:

Table C.1 – Expected Long-term Return and Volatility (standard deviation) by Asset Class

	Expected Annualized Long-term Return	Volatility of Annual Return (standard deviation)
Inflation	2.25%	1.25%
Asset Classes		
Fixed income:		
Short term assets	2.20%	1.2%
Government bonds	3.00%	7.4%
Corporate bonds	3.95%	5.7%
Inflation linked:		
Real return bonds	2.65%	12.7%
Real estate	6.25%	9.9%
Infrastructure	6.85%	13.0%
Public equity (regular volatility):		
Canadian equities	7.25%	16.3%
Canadian small cap equities	7.50%	19.9%
US equities	6.70%	17.1%
EAFE equities	7.55%	15.1%
Public equity (low volatility) ¹ :		
Canadian low vol	6.75%	13.0%
US low vol	6.20%	13.7%
EAFE low vol	7.05%	12.1%
Emerging market low vol	9.60%	19.5%
Private equity	10.25%	23.8%
Absolute return	6.20%	10.3%

¹ For purposes of our stochastic analysis at January 1, 2019, specific assumptions were made for the public equities (low volatility) strategies. The methodology for deriving assumptions for such strategies was approved by the Superintendent of Pensions in a letter dated August 18, 2015. The conditions ultimately imposed by the Superintendent of Pensions for such strategies are as follows:

- Expected long term rate of return of 0.25% to 0.5% lower than regular market capitalization index.
- Volatility of 80% of the regular market capitalization index
- Correlation of 30% lower than regular market capitalization index
- Maximum of 25% of the funds in such strategies for modeling purposes, with any excess modeled using the regular market capitalization index assumptions

For every year in the 20-year projection, expenses of 8 basis points to reflect the cost of passive management and another 5 basis points for the cost of non-investment expenses are deducted from the expected return to account for the payment of expenses from the Plan (the additional cost of any active management activities is expected to be offset by additional returns over the expected returns shown above and therefore are not included in the analysis).

The following is the correlation among the various asset classes identified in Table C.1 used as at January 1, 2019:

Table C.2 – Correlation among Asset Classes

Asset Classes	Short Term	Gov.	Corp.	Real Return	Real Estate	Infra.	Cad Equity	Cad Small Cap	US Equity	EAFE Equity	Cad Low Vol	US Low Vol	EAFE Low Vol	Emerg. Low Vol	Private Equity	Abs. Return
Short Term Assets	1.00	-0.12	-0.22	-0.24	0.31	0.01	-0.02	-0.10	-0.07	-0.05	-0.02	-0.05	-0.04	-0.16	-0.04	0.12
Government Bonds		1.00	0.85	0.49	0.00	0.16	-0.12	-0.28	0.01	-0.20	-0.09	0.01	-0.14	-0.18	-0.02	-0.07
Corporate Bonds			1.00	0.50	-0.18	0.14	0.19	0.12	0.14	-0.01	0.14	0.10	-0.01	0.04	0.17	0.18
Real Return Bonds				1.00	0.02	0.41	0.20	0.12	-0.15	-0.20	0.14	-0.11	-0.14	0.07	0.02	0.14
Real Estate					1.00	0.03	0.12	-0.13	0.05	0.20	0.08	0.03	0.14	0.05	0.06	0.21
Infrastructure						1.00	0.13	0.08	-0.08	-0.12	0.09	-0.06	-0.08	0.02	0.04	0.13
Canadian Equities							1.00	0.75	0.40	0.53	0.70	0.29	0.37	0.50	0.54	0.74
Canadian small cap								1.00	0.22	0.36	0.53	0.16	0.25	0.43	0.43	0.59
US Equities									1.00	0.73	0.29	0.70	0.51	0.08	0.62	0.43
EAFE Equities										1.00	0.37	0.51	0.70	0.35	0.56	0.39
Canadian Low Vol											1.00	0.20	0.26	0.35	0.38	0.52
US Low Vol												1.00	0.35	0.05	0.44	0.30
EAFE Low Vol													1.00	0.25	0.39	0.28
Emerging Market Low Vol														1.00	0.23	0.38
Private Equity															1.00	0.55
Absolute Return																1.00

Using a Monte Carlo simulation technique, the expected returns, volatility and correlation of the various asset classes shown above are used to model 2,000 series of alternative economic scenarios over 20-year periods. This provides 40,000 observations from which to measure whether the risk management goals have been achieved.

This exceeds the minimum requirements under the PBA of 1,000 series of economic scenarios for 20 years.

For each of these scenarios and for each year, the financial position of the NBPSPP is measured on a funding policy basis. For the purpose of the stochastic analysis, the margin for adverse deviation in the discount rate is modified in each future period in the projection such that the resulting discount rate remains fixed at 4.75% per annum throughout the projection period. The discount rate of 4.75% per annum is used to project the funding policy liability and determine the present value of excess contributions throughout the projection period. The projection of the liability and future cash flows under the stochastic analysis uses the same demographic assumptions as used for the calculation of the funding policy liability, as required under paragraph 15(2)(c) of Regulation 2012-75.

The risk management procedures are described in Section 2 of this report.

Appendix D – Summary of Plan Provisions

The following is a brief summary of the main provisions of the NBPSPP effective January 1, 2019. For an authoritative statement of the precise provisions of the NBPSPP, reference must be made to the official NBPSPP documents.

Introduction

Various unions, the Province of New Brunswick and the Minister of Finance, in his capacity as plan governor and administrator of the Former PSSA entered into a Memorandum of Understanding pursuant to which they agreed to convert the Former PSSA to the Public Service Shared Risk Plan (“PSSRP”) effective on January 1, 2014. As of that date, the Public Service Superannuation Act (“Former PSSA”) was repealed by An Act Respecting Pensions Under the Public Service Superannuation Act (New Brunswick) which provided that the Former PSSA be converted to a shared risk plan in accordance with Part 2 of the PBA.

Effective January 1, 2014, the PSSRP was administered by an independent Board of Trustees. As of April 2016, the PSSRP has been renamed the New Brunswick Public Service Pension Plan.

Eligibility and Participation

Each Member of the Former PSSA joined the NBPSPP on January 1, 2014. Active members of the Pension Plan for Part-Time and Seasonal Employees of the Province of New Brunswick who were eligible to join the PSSRP ceased active membership in the said plan and were required to join the NBPSPP as of January 1, 2014.

Each employee who commences full-time or part-time employment on or after January 1, 2014 is required to join the NBPSPP upon employment. Most of the other categories of employees must join when they become eligible in accordance with the minimum requirements of the PBA.

Members of the Legislative Assembly on September 23, 2014 and after are required to join the NBPSPP.

Required Contributions

Each member is required to contribute 7.5% of earnings up to the YMPE, plus 10.7% of earnings in excess of the YMPE.

The participating employers are required to contribute 11.25% of earnings. In addition, the employers make temporary contributions of 0.75% of earnings for a 10-year period starting January 1, 2014.

The YMPE is the Year’s Maximum Pensionable Earnings under the Canada Pension Plan, and is equal to \$57,400 in 2019.

Contribution rates are subject to change in accordance with triggers found under the Funding Policy for the NBPSPP.

Normal Retirement

The normal retirement date is the first day of the month following the member's sixty-fifth birthday.

A member's annual normal retirement pension is equal to the sum of:

- A. In respect of service before January 1, 2014, the product of:
- i. The number of years of the member's pensionable service before January 1, 2014, and
 - ii. 1.3% of the annual average of the best five (5) consecutive years of earnings at January 1, 2014, up to the annual average YMPE for the 3 years prior to January 1, 2014, plus 2.0% of the excess of the annual average of the best five (5) consecutive years of earnings at January 1, 2014 over the annual average YMPE for the 3 years prior to January 1, 2014;

and

- B. In respect of service from January 1, 2014, the sum of (i) and (ii) for each calendar year (or pro-rated for a portion thereof):
- i. 1.4% of the Member's annualized earnings for the calendar year, up to the YMPE for the calendar year; and
 - ii. 2.0% of the portion of the Member's annualized earnings for the calendar year that are in excess of the YMPE for the calendar year.

Pensions accrued above are subject to cost-of-living adjustments, before and after retirement, every January 1st following January 1, 2014, subject to approval by the Board of Trustees, and in accordance with the trigger requirements found under the Funding Policy for the NBPSPP.

The following cost-of-living adjustments have been granted by the Board of Trustees based on the results of the actuarial valuation preceding the effective date of the adjustment and the terms of the Funding Policy.

Table D.1 – Cost of Living Adjustments

Effective Date	Cost of Living Adjustment
January 1, 2015	1.43%
January 1, 2016	1.49%
January 1, 2017	1.40%
January 1, 2018	1.47%
January 1, 2019	1.88%

Normal and Optional Forms of Pension

The normal form of pension is a pension payable in equal monthly installments commencing on the member's pension commencement date and continuing thereafter during the lifetime of the member. For a member with a spouse or common-law partner at the time of the member's death, 50% of the member's pension (before application of reductions for early retirement) continues to such spouse or common-law partner in equal monthly installments for the life of the spouse or common-law partner. Should the member have dependent children at the time of his/her death, such dependent children may be entitled to a pension if there is no spouse

or common-law partner or after the death of such spouse or common-law partner. A minimum amount of pension equal to the member's own contribution with interest to retirement will be payable in total. Optional forms of pension are also available on an actuarially equivalent basis.

Early Retirement and Bridge Benefit

Early retirement is permitted on or after age 55 if the member has at least 5 years of employment or 2 years of plan membership.

On early retirement, an annual bridge benefit is payable in addition to the lifetime pension found under "Normal Retirement". The annual bridge benefit is payable to age 65 or to the death of the member, if earlier, and is equal to the sum of:

- A. In respect of service before January 1, 2014, the product of:
 - i. The number of years of the member's pensionable service before January 1, 2014, and
 - ii. 0.7% of the annual average of the best five (5) consecutive years of earnings at January 1, 2014 up to the annual average YMPE for the 3 years prior to January 1, 2014;

and

- B. In respect of service from January 1, 2014, for each calendar year (or pro-rated for a portion thereof), 0.6% of the Member's annualized earnings for the calendar year up to the YMPE for the calendar year.

The portions of the lifetime pension and bridge benefit accrued for service before January 1, 2014 are unreduced if the pension and bridge commence to be paid at age 60 or later. If such pension and bridge commence to be paid before age 60, they are each reduced by 1/4% per month (3% per year) that the pension and bridge commencement date precedes the first day of the month following age 60.

The portions of the lifetime pension and bridge benefit accrued for service on and after January 1, 2014 are reduced by 5/12% for each month (5% per year) that the pension and bridge commencement date precede the first day of the month following age 65.

Benefits on Termination of Employment

If a member terminates employment prior to completing five years of continuous employment and prior to completing two years of plan membership, the member is entitled to a refund of the total amount of his/her contributions to the NBPSPP and Former PSSA, if any, with interest.

If a member terminates employment before age 55 but after completing at least five years of continuous employment or two years of plan membership, the member may elect to:

- i. receive a deferred lifetime pension payable from normal retirement date equal to the accrued pension to which the member is entitled as at his/her date of termination in accordance with the formula specified above for the normal retirement pension; or
- ii. transfer the termination value of the deferred lifetime pension calculated in accordance with the PBA, to a registered retirement savings arrangement as allowed under the PBA.

Members electing a deferred lifetime pension will also be entitled to retire early in accordance with the "Early Retirement" section, and will also be eligible for a bridge benefit.

Death Benefits

If a member dies prior to completing five years of continuous employment and prior to completing two years of plan membership, the benefit payable is a refund of the member's own contributions to the NBPSPP and Former PSSA, if any, with interest.

If the member dies after completing at least five years of continuous employment or two years of plan membership, but before pension commencement, the death benefit is as follows:

- i. If there is a spouse or common-law partner:
 - The Termination Value, as defined under the PBA; or
 - Pension of 50% of the accrued lifetime pension;
- ii. If there is no spouse or common-law partner, but there are dependent children designated as beneficiaries:
 - Pension of 50% of the accrued lifetime pension split equally among dependent children until they no longer qualify as dependent;
- iii. If there is no spouse or common-law partner and no dependent children designated as beneficiaries:
 - The Termination Value, as defined under the PBA, payable to the designated beneficiary(ies) or estate.

Any amount by which the Termination Value, as defined under the PBA, exceeds the aggregate of all pension payments made above, shall be paid to the designated beneficiary(ies) or estate.

In the event of death after pension commencement, the benefit payable is determined in accordance with the form of pension selected by the member at retirement.

Primary Purpose, Benefit Security and Cost-of-living Adjustments

The primary purpose of the NBPSPP is to provide pensions to eligible employees after retirement and until death in respect of their service as employees. A further purpose of this NBPSPP is to provide secure pension benefits to members without an absolute guarantee but with a risk-focused management approach delivering a high degree of certainty that full base benefits will be payable in the vast majority of potential future economic scenarios. As a shared risk plan, all future cost-of-living adjustments and other ancillary benefits under the NBPSPP shall be provided only to the extent that funds are available for such benefits, as determined by the Board of Trustees in accordance with applicable laws and the Funding Policy.

Appendix E – Summary of Funding Policy

The following is a brief summary of the main provisions of the Funding Policy for the NBPSPP effective January 1, 2019. For an authoritative statement of the precise provisions of the Funding Policy, reference must be made to the official document.

Purpose of the Plan and Funding Policy

The purpose of the NBPSPP is to provide secure pension benefits to members and former members without an absolute guarantee, but with a risk focused management approach delivering a high degree of certainty that base benefits can be met in the vast majority of potential future economic scenarios.

The primary focus is to provide a highly secure base lifetime pension at normal retirement age. However, the intention is that additional benefits may be provided depending on the financial performance of the NBPSPP.

The Funding Policy is the tool used by the Board of Trustees to manage the risks inherent in a shared risk plan. The Funding Policy provides guidance and rules regarding decisions that must, or may be made by the Board of Trustees around funding levels, contributions and benefits.

Risk Management

In accordance with legislation on shared risk plans, the primary risk management goal is to achieve a 97.5% probability that past base benefits at the end of each year will not be reduced over a 20-year period.

In addition, secondary risk management goals are to provide, on average, contingent indexing on base benefits for service rendered on or before the conversion date in excess of 75% of the indexation provided under the pre-conversion plan over a 20-year period, as well as to provide, on average over a 20-year period, other ancillary benefits that exceed 75% of the value of the ancillary benefits described in the Plan text at conversion.

Contributions

The initial employee contribution rate is equal to 7.5% of earnings up to the YMPE and 10.7% of earnings above the YMPE while the initial employer contribution rate is set at 11.25% of earnings. During the first 5 years after conversion, employers shall make temporary additional contributions at the rate of 0.5% of earnings as well as a further 0.75% of earnings for the first 10 years following conversion. These temporary contributions are to stop if the NBPSPP achieves an open group funded ratio of 140%.

The above-mentioned initial contribution rates may be adjusted by the Board of Trustees. A total contribution increase of up to 3% of earnings (1.5% each for employee and employer contributions) is to be triggered by the Board of Trustees if the open group funded ratio of the NBPSPP, as defined by the PBA, falls below 100% for two successive year ends until such time as the open group funded ratio reaches 110% without considering the effect of the contribution increase and the funding goal under regulation is met.

A reduction in contributions of up to 0.5% of earnings for employees and 3.5% of earnings for the employers can be triggered by the Board of Trustees (subject to employers never contributing less than employees) if the conditions set forth in the funding excess utilization plan are met, and the open group funded ratio is at least 140%.

If, at any time, there is an increase or a decrease in employees employed by the employer of more than 5% in a given year, the initial contribution rates shall be re-calculated.

Finally, effective as of the date 15 years after the conversion, the employee and employer contributions shall be set such that the total initial contributions remitted are shared equally between the employees and employers.

Funding Deficit Recovery Plan

The funding deficit recovery plan must be implemented by the Board of Trustees if the open group funded ratio falls below 100% for two successive plan year-ends and after implementing the 3% maximum total increase in contribution discussed above.

The funding deficit recovery plan consists of the following actions in the order of priority as listed below:

1. Change retirement rules for service on or after the conversion date for non-vested members to a full actuarial reduction for retirement before age 65;
2. Change retirement rules for service prior to the conversion date for non-vested members to a full actuarial reduction for retirement before age 60;
3. Reduce base benefit accrual rates for future service after the date of implementation of the funding deficit recovery plan by not more than 5%;
4. Reduce base benefits on a proportionate basis for all members regardless of membership status for both past and future service in equal proportions.

The above actions shall be taken one by one and when the funding goal under regulation is met, no further actions are required at that time.

The base benefit reduction in point 4, if required, shall be such that the funding goals under the Regulations for such purposes are achieved.

Changes set out under points 1 through 3 shall take effect no later than 12 months following the date of the funding policy valuation report that triggered the need for the changes. Base benefit reductions described in point 4 shall take effect no later than 18 months following the date of the funding policy valuation report that triggered the need for the action.

Funding Excess Utilization Plan

The funding excess utilization plan describes the actions the Board of Trustees must take or consider when the open group funding levels exceeds 105%.

The amount available for utilization is as follows:

- 1/6th of the excess funds that make up the difference between the open group funding level at the valuation date (to a maximum of 140%) and 105%; plus
- 100% of the excess above 140%, if any.

If base benefits and/or ancillary benefits have been reduced, all excess available for utilization must first be used to reinstate those reductions. Afterwards, the following actions are to be taken in the following order of priority:

1. Provide indexing of base benefits up to the full CPI since the last date where full CPI was achieved.
2. Apply total contribution reduction adjustment of up to 4% of earnings, provided the open group funded ratio is over 140%.
3. Establish a reserve to cover the next 10 years of potential contingent indexing.
4. If steps 1 through 3 have been taken, the Board of Trustees can propose other benefit changes provided such benefit changes meet the criteria outlined in the funding excess utilization plan.

Except for the timing of contribution reductions, the timing of the above actions shall be the first of the year that is 12 months after the date of the funding policy valuation report that triggered the actions.

Actuarial Assumptions

A funding policy actuarial valuation shall be conducted by the Plan's actuary at December 31st of each year. The discount rate is 4.75% per year and shall remain in effect for the first two actuarial valuation reports filed following the conversion report hence until the January 1, 2016 actuarial valuation. The Board of Trustees may consider a change in the discount rate for subsequent funding policy actuarial valuations.

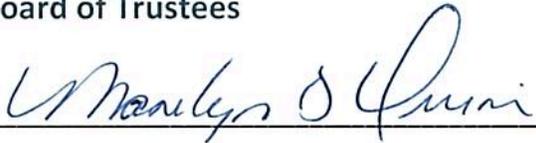
Other assumptions may be changed by the Board of Trustees as experience evolves.

Appendix F – Plan Administrator Confirmation Certificate

With respect to the Actuarial Valuation Report of the Public Service Pension Plan as at January 1, 2019, I hereby confirm that to the best of my knowledge:

- The data regarding Plan members and beneficiaries provided to Morneau Shepell as at January 1, 2019 constitutes a complete and accurate description of the information contained in the files;
- Copies of the official Plan text, Funding Policy and Statement of Investment Policies of the NBPSPP and all amendments to date were provided to Morneau Shepell; and
- There are no subsequent events or any extraordinary changes to the Plan membership as at January 1, 2019, which would materially affect the results.

The NBPSPP Board of Trustees

Signature: 
Name: Marilyn Quinn
Title: Chairperson
Date: July 17, 2019

