



Office of the Superintendent of  
Financial Institutions Canada

Bureau du surintendant des  
institutions financières Canada

Office of the Chief Actuary

Bureau de l'actuaire en chef



# ACTUARIAL REPORT

on the

## **PUBLIC SERVICE DEATH BENEFIT ACCOUNT**

as at 31 March 2017

**Office of the Chief Actuary**

Office of the Superintendent of Financial Institutions Canada

12th Floor, Kent Square Building

255 Albert Street

Ottawa, Ontario

K1A 0H2

Facsimile: **613-990-9900**

E-mail: **[oca-bac@osfi-bsif.gc.ca](mailto:oca-bac@osfi-bsif.gc.ca)**

Web site: **[www.osfi-bsif.gc.ca](http://www.osfi-bsif.gc.ca)**

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14 September 2018

The Honourable Scott Brison, P.C., M.P.  
President of the Treasury Board  
Ottawa, Canada  
K1A 0R5

Dear Minister:

Pursuant to Section 59 of the *Public Service Superannuation Act*, I am pleased to submit the report on the actuarial review as at 31 March 2017 of the Public Service Death Benefit Account established under Part II of this Act.

Yours sincerely,

Jean-Claude Ménard, F.S.A., F.C.I.A.  
Chief Actuary  
Office of the Chief Actuary





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## I. Executive Summary

This actuarial report on the Public Service Death Benefit Account (Account) was made pursuant to Section 59 of the *Public Service Superannuation Act* (PSSA), which states that “a valuation report and an assets report on the state of the Public Service Death Benefit Account shall be prepared in accordance with the *Public Pensions Reporting Act* and as if the supplementary death benefit plan established by this Part were a pension plan established under an Act referred to in subsection 3(1) of that Act.”

This actuarial valuation is as at 31 March 2017 and is in respect of death benefits and contributions defined by Part II of the PSSA.

The previous actuarial report was prepared as at 31 March 2014. The date of the next periodic review is scheduled to occur no later than 31 March 2020.

### A. Purpose of Actuarial Report

The purpose of this actuarial valuation is to determine the state of the Account as well as to assist the President of the Treasury Board in making informed decisions regarding the financing of the government’s death benefit obligation. This is achieved by providing a best-estimate long-term projection of the Account based on the projected contributions and interest credited to the Account and projected death benefits debited from the Account.

### B. Valuation Basis

This valuation report is based on the supplementary death benefit (SDB) plan provisions enacted by the Legislation, summarized in Appendix 1.

There have been no changes to the plan provisions since the last actuarial valuation report.

The financial data on which this valuation is based relate to the Account established to track contributions and benefits under the SDB plan provisions. The Account data is summarized in Appendix 2. The membership data is summarized in Appendix 3.

The valuation was prepared using accepted actuarial practice in Canada, methods and assumptions which are summarized in Appendices 4 to 6.

All actuarial assumptions used in this report are best-estimate assumptions. They are, individually and in aggregate, reasonable for the purposes of the valuation at the date of this report. The actuarial assumptions used in the previous report were revised based on economic trends and demographic experience. A complete description of the assumptions is shown in Appendices 5 and 6.

Death benefits are paid from the Consolidated Revenue Fund and charged against the Account. Contributions by employees, Crown corporations and the government are credited to the Account. Based on the balance of the Account, interest credits are calculated in such manner and at such rates and credited at such times as the SDB Regulations provide. Therefore, the fluctuations of returns observed in financial markets in recent years have no impact on the Account except insofar as long-term Government of Canada bond yields influence the interest credited by the Regulation.



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The following table presents a summary of the ultimate economic assumptions used in this report and a comparison with those used in the previous report.

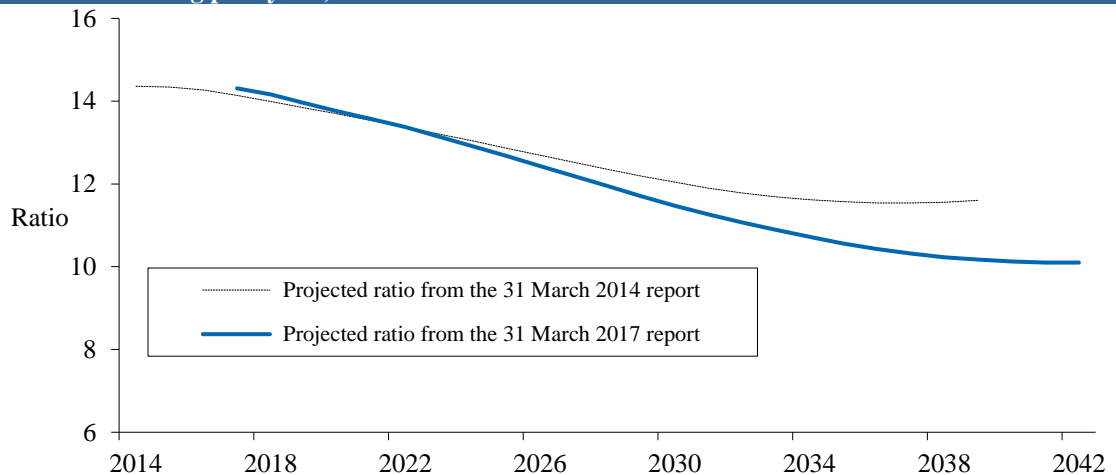
<b>Table 1 Ultimate Best-Estimate Economic Assumptions</b>		
	<b>31 March 2017</b>	31 March 2014
Real increase in average earnings	0.8%	0.9%
Real projected yield on the Public Service Death Benefit Account	2.7%	2.8%

## C. Main Findings

As at 31 March 2017, the SDB plan has an actuarial excess of \$2,827 million resulting from the difference between the Account balance of \$3,627 million and the liabilities of \$800 million.

The actuarial excess is projected to reach \$4,159 million at the end of plan year<sup>1</sup> 2042. Figure 1 shows the ratio of projected actuarial excess at the end of the plan year to annual benefit payments projected for the following plan year. This ratio is expected to decrease from the current level of 14.3 to 10.1 by the end of plan year 2042.

**Figure 1 Projected Ratio of Actuarial Excess to Annual Benefit Payments**  
(Actuarial excess is measured at the end of plan year and annual payments are those of the following plan year.)



<sup>1</sup> Any reference to a given plan year in this report should be taken as the 12-month period ending 31 March of the given year.





## II. Financial Position of the Plan

### A. State of the Account

The state of the Account as at 31 March 2017 was prepared using the Account balance described in Appendix 2, the data described in Appendix 3, the methodology described in Appendix 4, and the assumptions described in Appendices 5 and 6. The results of the previous valuation are also shown for comparison purposes.

<b>Table 2 State of the Account</b>		
<b>(\$ millions)</b>		
	<b>31 March 2017</b>	31 March 2014
<b>Account Balance</b>	<b>3,627</b>	3,310
<b>Liabilities</b>		
Paid-up Death Benefit <sup>1</sup>	771	642
IBNR <sup>2</sup>	<u>29</u>	<u>27</u>
<b>Total Liabilities</b>	<b>800</b>	669
<b>Actuarial Excess</b>	<b>2,827</b>	2,641

### B. Financial Position

As at 31 March 2017, the actuarial excess totals \$2,827 million, which is 14.3 times the total amount of the basic benefits projected for plan year 2018. By comparison, the actuarial excess as at 31 March 2014 in the previous report was \$2,641 million, which was 14.4 times the amount of the basic benefits projected for plan year 2015.

As shown in Appendix 2 and explained in Section IV, the projected contributions to the plan are less than the projected benefits for all future plan years. However, total income exceeds total expenditures in every year of the projection period because interest earnings more than offset the excess of benefit over contributions.

### C. Sensitivity of Valuation Results to Variations in Key Assumptions

The following supplementary estimates indicate the degree to which the valuation results depend on some of the key assumptions. Differences between these results and those shown in the valuation can also serve as a basis for approximating the effect of other numerical variations in a key assumption to the extent that such effects are indeed linear.

#### 1) Projected Interest Yields

As a measure of sensitivity, an increment of one percentage point in the projected yields would increase the actuarial excess projected at the end of plan year 2042 from \$4,159 million to \$6,222 million, an increase of 49.6%.

<sup>1</sup> The \$10,000 portion of the basic benefit for which monthly contributions are no longer required from either the participant or the government. See Appendix 4 – G.1.

<sup>2</sup> Incurred But Not Reported claims. See Appendix 4 – G.2.



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Similarly, a decrease of one percentage point in the projected yields would decrease the actuarial excess projected at the end of plan year 2042 from \$4,159 million to \$2,471 million, a decrease of 40.6%.

### 2) Mortality

If the assumed improvements in longevity after plan year 2018 were disregarded, then the monthly benefit cost rate<sup>1</sup> of 18.8 cents projected for plan year 2042 would climb to 23.5 cents, an increase of 25.0%. The actuarial excess projected at the end of plan year 2042 would decrease by 29.4% from \$4,159 million to \$2,937 million.

However, if the assumed improvements in longevity were kept at the level of plan year 2018, resulting in greater improvements in longevity than those assumed in Table 31, then the monthly benefit cost rate of 18.8 cents projected for 2042 would decline to 16.7 cents, a decrease of 11.2%. The actuarial excess projected at the end of plan year 2042 would climb by 9.7% from \$4,159 million to \$4,564 million.

### 3) Non-elective Population Growth Rate

If the assumed percentage increase in the non-elective population in each plan year were double the current assumption, then the projected population would be relatively younger. The monthly cost projected for plan year 2042 would decrease by 3.2% from 18.8 to 18.2 cents. The actuarial excess projected at the end of plan year 2042 would climb by 2.1% from \$4,159 million to \$4,245 million.

If the assumed percentage increase in the non-elective population were set to 0%, then the projected population would be relatively older. The monthly cost projected for plan year 2042 would increase by 3.7% from 18.8 to 19.5 cents. The actuarial excess projected at the end of plan year 2042 would decrease by 3.9% from \$4,159 million to \$3,995 million.

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<sup>1</sup> *Monthly benefit cost rate* is defined as the ratio of the total expected monthly *term insurance* payments over the total amount of expected monthly term insurance benefit coverage, where coverage is expressed per thousand dollars. In this report, *term insurance benefit* means the basic benefit excluding the \$10,000 paid-up death benefit applicable from age 65.



### III. Reconciliation of Results with Previous Report

Table 3 illustrates the impact of the updated assumptions, intervaluation economic experience, population changes and changes in mortality assumption methodology since the last valuation report as at 31 March 2014. The projected monthly cost for plan year 2042 slightly fell 0.2 cents from 19.0 cents as at 31 March 2014 to 18.8 cents as at 31 March 2017. The principal reason comes from retroactive data correction. The population data maintained by PSPC is constantly subject to retroactive changes such as new collective agreements. Additionally, our findings show that for the first time over approximately the last 20 years, mortality did not improve in the period of study. This results to an increase of 0.2 cents of the projected monthly cost for plan year 2042 by the non-elective mortality rates.

The projected ratio of actuarial excess at the end of plan year 2042 to benefit payments in plan year 2043 decreased by 14.4% from 11.8 to 10.1. The main source of change comes from the change in the interest rates, which decreased the projected ratio of actuarial excess at the end of plan year 2042 by 1.9.

**Table 3 Reconciliation of Projected Results**

	Monthly Cost Per \$1000 of Term Insurance (Cents)	Year End Actuarial Excess to the Following Year's Benefit Payments (Ratio)
<b>Previous report as at 31 March 2014</b>		
<b>Plan Year 2039 Projection</b>	<b>19.2</b>	<b>11.6</b>
<b>Plan Year 2042 Projection</b>	<b>19.0</b>	<b>11.8</b>
Retroactive data correction	(0.2)	0.0
New population and intervaluation account experience	0.0	0.2
<b>Changes in Assumptions</b>		
New entrant	(0.1)	(0.2)
Economic salary increases	0.1	0.4
Promotional & merit salary increases	(0.1)	0.0
Valuation interest rates	0.0	(1.9)
Non-elective mortality rates	0.2	(0.3)
Elective mortality rates	(0.1)	0.1
Termination rates	0.1	0.0
Retirement rates	(0.2)	0.1
Disability rates	0.1	(0.1)
<b>Plan Year 2042 Projection as at 31 March 2017</b>	<b>18.8</b>	<b>10.1</b>



### IV. Legislated Contribution Rates

The aggregate amount of death benefit payments projected for plan year 2018 is \$197.6 million, which is made up of \$155.3 million in respect of the term insurance and \$42.3 million in respect of the paid-up insurance. In this report, *term insurance* means the basic coverage (two times salary) less 10% reduction per year from age 66 and less \$10,000 paid-up insurance from age 65.

#### A. Paid-up Insurance

For plan year 2018, the estimated single premiums at age 65 for each \$10,000 of paid-up insured benefit are \$4,844 and \$4,531 for males and females, respectively. The corresponding legislated contribution rates for each \$10,000 of paid-up insured benefits for males and females are \$310 and \$291, respectively.

The assumed improvements in longevity cause the projected single premium for the paid-up death benefit to decrease over time. Moreover, the projected ultimate yield of 4.70% is higher than the projected yield of 4.20% for plan year 2018. This has the effect of gradually decreasing the projected single premium over the years.

The net effect of longevity improvements and increasing projected yields is to decrease the projected single premiums at age 65 for each \$10,000 of paid-up insured benefit. A male participant's projected single premium decreases from \$4,844 for plan year 2018 to \$4,645 for plan year 2042, and a decrease from \$4,531 to \$4,328 for a female participant.

#### B. Term Insurance

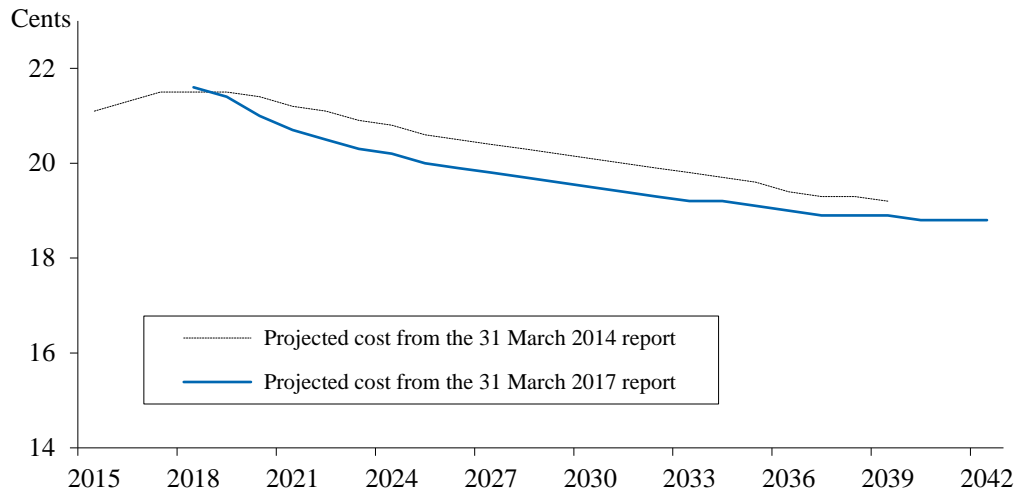
The total amount of term insurance proceeds projected to be payable during plan year 2018 is \$155.3 million. Given that the total amount of term insurance projected to be in force for plan year 2018 is \$59,991 million, the benefit cost rate projected for plan year 2018 is 21.6 cents per month per \$1,000 of term insurance.

Non-elective participants and elective participants in receipt of an immediate annuity or an annual allowance are required to contribute monthly 15 cents per \$1,000 of term insurance. As a minimum, the government contribution credited monthly to the Account is equal to one-twelfth of the total amount of term insurance proceeds payable during the month. For plan year 2018, the government's monthly contribution is estimated at 1.8 cents per \$1,000 of term insurance.

The total amount credited to the Account resulting from participants and government contributions in plan year 2018 is therefore 16.8 cents (15 cents plus 1.8 cents) per month per \$1,000 of term insurance, which is significantly less than the estimated monthly cost of 21.6 cents per \$1,000 of term insurance for plan year 2018.



**Figure 2 Projected Monthly Cost  
(cents per \$1,000 of term insurance)**



As shown in Figure 2, the monthly cost per \$1,000 of term insurance is projected to gradually decrease to 18.8 cents by plan year 2042 while the total contribution rate is projected to be 16.6 cents (15 cents from the participants and one-twelfth of 18.8 cents from the government) in the same plan year.

The following table shows the projected monthly costs per \$1,000 of term insurance by participant type for selected plan years.

Participants	2018	2022	2027	2032	2037	2042
Non-elective	10.8	10.3	10.2	10.2	9.9	9.6
Elective	54.3	53.7	53.6	52.6	49.8	48.9
All	21.6	20.5	19.8	19.3	18.9	18.8

For non-elective participants, the monthly cost projected for plan year 2042 is 88.9% of the monthly cost estimated for plan year 2018. This results mainly from the following two factors:

- A lower mortality assumed for plan year 2042 in accordance with the longevity improvement factors shown in Table 31 applied to the current mortality rates shown in Table 30. This has the effect of decreasing the costs.
- Heavier weights at older ages on the distribution of non-elective participants in plan year 2042 than the current weight. This has the effect of increasing the costs.

Altogether, the increased costs due to heavier weights at older ages is more than offset by the decreased costs due to assumed mortality improvements.



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In respect of elective participants in receipt of an immediate annuity or an annual allowance, the monthly benefit cost rate projected for plan year 2042 is 90.1% of the monthly cost projected for plan year 2018. This decrease is mostly the result of the new elective mortality assumption.

For all plan participants in aggregate, the monthly cost projected for plan year 2042 is 87.0% of the monthly cost projected for plan year 2018.



## V. Actuarial Opinion

In our opinion, considering that this report was prepared pursuant to the *Public Pensions Reporting Act* per Section 59 of the *Public Service Superannuation Act*,

- the valuation input data on which the valuation is based are sufficient and reliable for the purposes of the valuation;
- the assumptions that have been used are, individually and in aggregate, appropriate for the purposes of the valuation;
- the methods employed are appropriate for the purposes of the valuation; and
- this report has been prepared, and our opinions given, in accordance with accepted actuarial practice in Canada.

In particular, this report was prepared in accordance with the Standards of Practice (General Standards) published by the Canadian Institute of Actuaries.

To the best of our knowledge, after discussion with Public Services and Procurement Canada and the Treasury Board of Canada Secretariat, there were no subsequent events between the valuation date and the date of this report that would have a material impact on the results of this valuation.

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Daniel Hébert, F.C.I.A., F.S.A.  
Senior Actuary  
Office of the Chief Actuary

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Jean-Claude Ménard, F.C.I.A., F.S.A.  
Chief Actuary  
Office of the Chief Actuary

Ottawa, Canada  
14 September 2018



### Appendix 1 - Summary of Plan Provisions

The following is a summary description of the main provisions of the SDB plan established for public servants under Part II of the PSSA. This plan supplements benefits payable under the pension plan for the Public Service of Canada (PSPP) by providing a lump sum benefit upon the death of a plan participant.

#### A. Plan Participants

##### 1. Non-elective Participants

The term *non-elective participant* means all contributors to the PSPP who are employed in the Public Service except employees of Crown corporations covered under other group life insurance plans.

##### 2. Elective Participants

The term *elective participant* means all participants who have ceased to be employed in the Public Service following disability or retirement and have opted to continue their coverage under the SDB plan. Such right is limited to participants who, at the time they cease to be employed in the Public Service, have completed at least two years of continuous service in the Public Service or two years of participation in the SDB plan.

A non-elective participant who ceases employment and becomes entitled to an immediate annuity or annual allowance under the PSPP automatically becomes an elective participant. During the first 30 days as an elective participant, an individual has the right to opt out of the plan, effective on the 31<sup>st</sup> day.

#### B. Contributions

##### 1. Non-elective Participants and Elective Participants in Receipt of an Immediate Annuity or an Annual Allowance

For non-elective participants as well as elective participants in receipt of an immediate annuity (disability or retirement) or an annual allowance under the PSPP, the rate of contribution is 15 cents per month for each \$1,000 of death benefit. When these participants attain age 65 (or complete two years of service, if later), their contribution is reduced by \$1.50 per month in recognition of the fact that \$10,000 of basic benefit becomes paid-up (by the government) for the remaining lifetime of the participant.

##### 2. Elective Participants Entitled to a Deferred Annuity

For elective participants entitled to a deferred annuity under the PSPP, the contribution rate set in the legislation varies in accordance with the attained age of the participant, and the corresponding contributions become chargeable on the 30th day immediately following cessation of employment.





The contribution rates for selected ages are shown in the following table:

Age Last Birthday	Annual <sup>1</sup>	Monthly <sup>2</sup>
25	\$9.70	\$0.82
30	11.42	0.97
35	13.58	1.15
40	16.29	1.39
45	19.72	1.67
50	24.11	2.05
55	29.80	2.53
60	37.65	3.20

### 3. Government

The government credits monthly to the Account an amount equal to one-twelfth of the total amount of death benefits paid in the month.

Crown corporations and public boards whose employees are participants in the plan contribute at the rate of four cents per month for each \$1,000 of death benefit.

When a participant, other than one entitled to a deferred annuity, reaches age 65 (or completes two years of service, if later), the government credits to the Account a single premium for the individual \$10,000 paid-up portion of basic benefit in respect of which contributions are no longer required from the participant.

The legislated amount of single premium for each such \$10,000 paid-up portion of basic benefit is shown in the following table and corresponds to one-twentieth of \$10,000 times the single premium rate for each dollar of death benefit, computed on the basis of the Life Tables, Canada, 1950-1952 and interest at 4% per annum.

Age Nearest Birthday	Male	Female
65	\$310	\$291
66	316	298
67	323	306
68	329	313
69	336	320
70	343	328
71	349	335
72	356	342
73	362	349
74	369	356
75	375	363

<sup>1</sup> For elective participants entitled to a deferred annuity during deferral period.

<sup>2</sup> For elective participants who were entitled to a deferred annuity once it is in payment.



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Under the statutes, if for whatever reason the Account were to become exhausted, the government would then credit special contributions to the Account in an amount at least equal to the basic benefits then due but not paid by reason of such cash shortfall.

### C. Amount of Basic Benefit

Subject to the applicable reductions described below, the lump sum benefit payable upon the death of a participant is equal to twice the participant's current salary, the result being rounded to the next higher multiple of \$1,000 if not already equal to such a multiple. For this purpose, the current salary of an elective participant is defined as the annual rate of pay at the time of cessation of employment in the Public Service.

The amount of basic benefit described above is reduced by 10% per year starting at age 66 until it would normally vanish at age 75. However, the amount of basic benefit cannot at any time be reduced below a basic floor value of \$10,000 subject to the following exceptions:

- For those elective participants who had, upon cessation of employment prior to 5 October 1992, made an election to reduce their basic benefit to \$500 and further had made a second election, within one year thereafter, to keep their basic benefit at \$500, the floor value is \$500 instead of \$10,000. Such election is irrevocable.
- For non-elective participants, the amount of basic benefit cannot be reduced below the multiple of \$1,000 equal to or next above one-third of the participant's annual salary, even if the resulting amount is higher than \$10,000.
- All participants aged between 61 and 70 prior to 1 October 1999 may elect to retain the 10% a year reduction schedule starting at age 61.
- For elective participants entitled to a deferred annuity, there is no coverage past age 75.

Upon ceasing to be employed in the Public Service, elective participants in receipt of an immediate annuity or in receipt of an annual allowance under the PSPP may opt to reduce their amount of basic benefit to \$10,000.



## Appendix 2 - Account Balance

### A. Public Service Death Benefit Account

The SDB plan is financed entirely through the Account, which forms part of the Public Accounts of Canada. The Account records the transactions for the plan, meaning that no formal debt instrument has been issued to the Account by the government in recognition of the amounts therein. The Account is:

- credited with all contributions made by participants, Crown corporations and the government;
- credited with interest earnings every three months on the basis of the actual average yield for the same period on the combined Superannuation Accounts of the Public Service, Canadian Forces and Royal Canadian Mounted Police pension plans. These accounts generate interest earnings as though net cash flows were invested quarterly in 20-year Government of Canada bonds issued at prescribed interest rates and held to maturity; and
- debited with basic benefit payments when they become due.

Table 6 shows the reconciliation of the balance of the Account from the last valuation date to the current valuation date. Since the last valuation, the Account balance has grown by \$317 million (a 9.6% increase) to \$3,627 million as at 31 March 2017. The net growth in the Account balance is to a large extent the result of interest credits made.



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**Table 7 Public Service Death Benefit Account  
(\$ millions)**

Plan Year	2015	2016	2017	2015-2017
<b>Opening Balance</b>	<b>3,310.0</b>	<b>3,424.1</b>	<b>3,526.6</b>	<b>3,310.0</b>
INCOME				
Employee Contributions				
Active members				
Public Service employees	69.5	69.9	68.8	208.2
Public Service corporations	5.2	5.4	5.6	16.2
Retired employees	<u>24.0</u>	<u>25.0</u>	<u>25.8</u>	<u>74.8</u>
<b>Total Employee Contributions</b>	<b>98.7</b>	<b>100.3</b>	<b>100.2</b>	<b>299.2</b>
Employer Contributions				
Public Service corporations	1.4	1.4	1.5	4.3
Death benefit - general	10.9	10.9	11.0	32.8
Death benefit - single premium \$10,000	2.8	2.9	3.0	8.7
Interest	<u>167.2</u>	<u>160.9</u>	<u>154.8</u>	<u>482.9</u>
<b>Total Income</b>	<b>281.0</b>	<b>276.4</b>	<b>270.5</b>	<b>827.9</b>
EXPENDITURES				
Benefits payments				
General	130.5	130.0	132.4	392.9
Life coverage for \$10,000	36.0	43.6	37.6	117.2
Other death benefit payments	<u>0.4</u>	<u>0.3</u>	<u>0.2</u>	<u>0.9</u>
<b>Total Expenditures</b>	<b>166.9</b>	<b>173.9</b>	<b>170.2</b>	<b>511.0</b>
<b>Closing Balance</b>	<b>3,424.1</b>	<b>3,526.6</b>	<b>3,626.9</b>	<b>3,626.9</b>

### B. Rates of Interest

The following rates of interest on the Account by plan year were calculated using the foregoing entries.

**Table 8 Rates of Interest**

Plan Year	Interest
2015	5.09%
2016	4.74%
2017	4.42%

### C. Sources of the Financial Data

The Account entries shown previously were taken from the Public Accounts of Canada.



**D. Account Projection**

The following table shows a projection of the Account over 25 years commencing 1 April 2017.

**Table 9 Account Projection (\$ millions)**

Plan Year	State of the Account at the End of Plan Year			Ratio of Projected Actuarial Excess at the End of the Plan Year to Annual Benefit Payments Projected for the Following Plan Year
	Account	Liabilities	Actuarial Excess	
2017	3,627	800	2,827	14.3
2018	3,706	839	2,867	14.2
2019	3,781	878	2,903	14.0
2020	3,853	916	2,936	13.8
2021	3,923	954	2,968	13.6
2022	3,991	992	3,000	13.4
2023	4,058	1,029	3,029	13.1
2024	4,122	1,064	3,058	12.9
2025	4,187	1,098	3,089	12.7
2026	4,249	1,131	3,118	12.4
2027	4,311	1,160	3,150	12.2
2028	4,369	1,187	3,181	12.0
2029	4,427	1,212	3,215	11.7
2030	4,484	1,234	3,250	11.5
2031	4,545	1,252	3,292	11.3
2032	4,605	1,267	3,338	11.1
2033	4,670	1,280	3,390	10.9
2034	4,734	1,290	3,444	10.7
2035	4,803	1,300	3,503	10.6
2036	4,881	1,310	3,571	10.4
2037	4,969	1,321	3,649	10.3
2038	5,063	1,330	3,732	10.2
2039	5,167	1,340	3,827	10.2
2040	5,283	1,352	3,931	10.1
2041	5,407	1,364	4,043	10.1
2042	5,534	1,375	4,159	10.1



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### E. Income and Expenditure Projection

The following table shows a projection of the income and expenditure which served as the basis of the projection of the Account over 25 years commencing plan year 2018.

**Table 10 Income and Expenditure Projection**  
(\$ millions)

Plan Year	Contributions				Benefit Payments			Interest Credits	Net Credits
	Participants	Term	Paid-Up	Total	Term	Paid-Up	Total		
2018	108	15.1	3.1	126	155	42	198	151	79
2019	112	15.6	3.2	131	160	43	202	147	75
2020	118	16.2	3.3	137	165	43	208	142	71
2021	123	16.7	3.3	143	169	44	214	141	70
2022	127	17.2	3.3	147	174	45	219	140	69
2023	132	17.7	3.3	153	178	46	224	138	67
2024	136	18.2	3.3	158	183	47	230	137	64
2025	141	18.8	3.3	163	188	49	237	139	65
2026	146	19.4	3.4	169	194	50	244	137	62
2027	151	20.0	3.3	174	199	52	251	139	62
2028	156	20.6	3.3	180	205	54	258	137	58
2029	161	21.3	3.2	186	210	56	266	138	58
2030	166	22.0	3.2	192	217	58	275	140	57
2031	172	22.7	3.0	198	223	60	283	147	61
2032	178	23.4	2.9	204	230	63	292	148	60
2033	184	24.1	2.9	211	236	65	302	155	65
2034	191	24.9	2.9	218	243	68	311	157	64
2035	197	25.8	3.0	226	251	70	321	164	69
2036	204	26.6	3.0	234	259	73	332	176	78
2037	211	27.5	3.0	242	267	75	342	188	88
2038	219	28.5	3.1	250	276	78	354	197	93
2039	226	29.5	3.1	259	285	80	365	210	104
2040	234	30.5	3.2	268	294	83	376	225	116
2041	242	31.5	3.3	277	304	85	388	235	124
2042	250	32.6	3.3	286	313	87	400	241	127

<sup>1</sup> Government term contributions include the four cents per month per \$1,000 contribution made by participating Crown corporations and public boards.



## Appendix 3 - Participant Data

### A. Source of Participant Data

The valuation input data required in respect of contributors (both active and non-active) and pensioners are extracted from master computer files maintained by the Superannuation Directorate of Public Services and Procurement Canada. The Compensation Systems Branch of that department is responsible for the extraction of the data.

The main valuation data file supplied by the Superannuation Directorate contained the historical status information on all participants up to 31 March 2017.

### B. Validation of Participant Data

The participant data were validated with respect to the Actuarial Report on the Pension Plan for the Public Service of Canada as at 31 March 2017. Details of the data validation can be found in Appendix 4 of that report.

### C. Participant Data Summary

Tables 11 to 15 on the following pages show the detailed participant data upon which this valuation is based.

**Table 11 Reconciliation of Non-Elective Participants**

	Male	Female	Total
<b>As at 31 March 2014</b>	<b>127,094</b>	<b>161,858</b>	<b>288,952</b>
Data corrections	2,170	1,910	4,080
Eligibility Change	(2,237)	(945)	(3,182)
<b>New non-elective from</b>			
New non-elective	22,394	28,473	50,867
Rehired cash-outs	1,390	2,400	3,790
Rehired pensioners	<u>230</u>	<u>394</u>	<u>624</u>
Subtotal	24,014	31,267	55,281
<b>Non-elective terminations</b>			
Disability	(627)	(1,430)	(2,057)
Deferred annuity (DA)	(3,019)	(4,655)	(7,674)
Annuity (IA/AA) <sup>1</sup>	(12,052)	(14,580)	(26,632)
Death (no survivors)	(193)	(228)	(421)
Death (with survivors)	(418)	(308)	(726)
Contributor ROC or TV	<u>(7,004)</u>	<u>(9,512)</u>	<u>(16,516)</u>
Subtotal	(23,313)	(30,713)	(54,026)
<b>As at 31 March 2017</b>	<b>127,728</b>	<b>163,377</b>	<b>291,105</b>

<sup>1</sup> IA refers to Immediate Annuity while AA means Annual Allowance.



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**Table 12 Reconciliation of Elective Participants**

	Male	Female	Total
<b>As at 31 March 2014</b>	<b>94,179</b>	<b>72,157</b>	<b>166,336</b>
Data corrections	(264)	(131)	(395)
<b>New elective from</b>			
New non-elective	12,378	15,730	28,108
Rehired non-elective	<u>8</u>	<u>12</u>	<u>20</u>
Subtotal	12,386	15,742	28,128
<b>Transfer status to</b>			
Non-elective	(34)	(48)	(82)
<b>Terminations</b>			
Death	(9,500)	(4,248)	(13,748)
<b>As at 31 March 2017</b>	<b>96,767</b>	<b>83,472</b>	<b>180,239</b>





**Table 13 Non-Elective Participants<sup>1</sup>  
As at 31 March 2017**

Age <sup>2</sup>	Number			Basic Benefits (\$ thousands)		
	Male	Female	Total	Male	Female	Total
15-19	94	74	168	8,665	5,677	14,342
20-24	2,575	3,471	6,046	263,558	348,311	611,869
25-29	7,739	10,802	18,541	972,936	1,333,595	2,306,530
30-34	13,618	18,806	32,424	1,978,663	2,646,480	4,625,143
35-39	17,543	24,857	42,400	2,806,855	3,771,049	6,577,904
40-44	18,637	25,312	43,949	3,159,767	4,034,314	7,194,081
45-49	18,582	24,323	42,905	3,249,906	3,878,450	7,128,357
50-54	21,041	26,147	47,188	3,715,653	4,111,591	7,827,244
55-59	16,977	19,252	36,229	2,993,041	2,938,322	5,931,363
60-64	7,912	7,994	15,906	1,390,662	1,179,224	2,569,886
65-69	2,484	1,997	4,481	372,626	242,084	614,710
70-75	<u>526</u>	<u>342</u>	<u>868</u>	<u>40,161</u>	<u>19,215</u>	<u>59,376</u>
<b>Total</b>	<b>127,728</b>	<b>163,377</b>	<b>291,105</b>	<b>20,952,493</b>	<b>24,508,313</b>	<b>45,460,806</b>

	Average	Male	Female	Total
<b>As at 31 March 2014</b>	Age <sup>2</sup>	45.9	44.3	45.0
	Service <sup>2</sup>	14.3	13.0	13.6
	Basic Benefit (\$)	158,525	142,871	149,756
<b>As at 31 March 2017</b>	Age <sup>2</sup>	46.4	44.7	45.5
	Service <sup>2</sup>	14.3	13.2	13.7
	Basic Benefit (\$)	164,040	150,011	156,166

<sup>1</sup> Includes Correctional Services Canada employees and members from participating Crown corporations and public boards.

<sup>2</sup> Expressed in completed years calculated at the beginning of the plan year. Averages are calculated on a dollar-weighted basis.



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**Table 14 Elective Participants in Receipt of a Disability Pension  
As at 31 March 2017**

Age <sup>1</sup>	Number			Basic Benefits (\$ thousands)		
	Male	Female	Total	Male	Female	Total
To 34	11	28	39	1,236	3,315	4,551
35- 39	32	117	149	4,175	14,754	18,928
40- 44	83	283	366	11,197	37,031	48,229
45- 49	169	492	661	23,183	62,670	85,854
50- 54	460	1,061	1,521	60,630	131,678	192,308
55- 59	762	1,898	2,660	95,397	220,893	316,290
60- 64	1,009	1,764	2,773	111,372	180,737	292,109
65- 69	938	1,241	2,179	71,019	90,635	161,654
70- 74	697	748	1,445	18,329	18,163	36,492
75- 79	592	574	1,166	5,920	5,740	11,660
80- 84	416	394	810	4,160	3,940	8,100
85- 89	193	173	366	1,930	1,730	3,660
90- 94	84	93	177	840	930	1,770
95- 99	29	24	53	290	240	530
100-104	<u>1</u>	<u>2</u>	<u>3</u>	<u>10</u>	<u>20</u>	<u>30</u>
Total	5,476	8,892	14,368	409,687	772,477	1,182,164

	Average	Male	Female	Total
<b>As at 31 March 2014</b>	Age <sup>1</sup>	59.8	56.9	58.0
	Basic Benefit (\$)	69,620	78,400	74,770
<b>As at 31 March 2017</b>	Age <sup>1</sup>	59.6	57.2	58.0
	Basic Benefit (\$)	74,815	86,873	82,278

<sup>1</sup> Expressed in completed years calculated at the beginning of the plan year. Averages are calculated on a dollar-weighted basis.



**Table 15 Elective Retired Participants<sup>1</sup>  
(In Receipt of an Immediate Annuity or an Annual Allowance)  
As at 31 March 2017**

Age <sup>2</sup>	Number			Basic Benefits (\$ thousands)		
	Male	Female	Total	Male	Female	Total
To 44	0	0	0	0	0	0
45- 49	10	3	13	1,636	424	2,060
50- 54	377	613	990	63,492	95,466	158,958
55- 59	6,355	9,945	16,300	1,127,524	1,535,069	2,662,592
60- 64	16,144	19,019	35,163	2,744,165	2,747,401	5,491,566
65- 69	21,430	18,804	40,234	2,706,352	1,994,369	4,700,720
70- 74	18,105	11,479	29,584	799,164	414,915	1,214,078
75- 79	11,478	6,061	17,539	114,780	60,610	175,390
80- 84	8,124	3,792	11,916	81,240	37,920	119,160
85- 89	5,595	2,635	8,230	55,950	26,350	82,300
90- 94	2,830	1,642	4,472	28,300	16,420	44,720
95- 99	784	518	1,302	7,840	5,180	13,020
100-104	57	67	124	570	670	1,240
105-109	<u>2</u>	<u>2</u>	<u>4</u>	<u>20</u>	<u>20</u>	<u>40</u>
<b>Total</b>	<b>91,291</b>	<b>74,580</b>	<b>165,871</b>	<b>7,731,032</b>	<b>6,934,813</b>	<b>14,665,844</b>

	<b>Average</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
<b>As at 31 March 2014</b>	Age <sup>2</sup>	64.2	62.5	63.4
	Basic Benefit (\$)	82,149	86,727	84,072
<b>As at 31 March 2017</b>	Age <sup>2</sup>	64.7	63.2	64.0
	Basic Benefit (\$)	84,686	92,985	88,417

<sup>1</sup> Participants entitled to a deferred annuity were not taken into account for valuation purposes. Their impact is considered negligible.

<sup>2</sup> Expressed in completed years calculated at the beginning of the plan year. Averages are calculated on a dollar-weighted basis.



## Appendix 4 - Methodology

### A. Account Balance

The balance of the Account forms part of the Public Accounts of Canada. The Account records the transactions for the plan, meaning that no debt instrument has been issued to the Account by the government in recognition of the amounts therein. The recorded balance is shown at the book value of the underlying notional bond portfolio described in Appendix 2.

The Account balance corresponds to the cumulative historical excess of contributions and interest credits over basic benefit payments. The Account balance is accordingly projected to the end of a given plan year by adding to the Account at the beginning of that plan year the net income (i.e. the excess of contributions and interest credits over benefits) projected as described below for that plan year. Administration expenses are ignored because they are not charged to the Account.

### B. Contributions

#### 1. Participants

Participants' annual contributions are projected for a given plan year by multiplying

- the legislated annual contribution rate of \$1.80 per \$1,000 of coverage (equivalent to the monthly rate of 15 cents per \$1,000 of coverage)
- by
- the aggregate of two times the salaries of participants projected for that plan year on an open-group basis,
- less
- 10% per year reduction from age 66 if applicable, and
  - \$10,000 paid-up coverage after age 65, if applicable.

Non-elective participants' salaries are projected for a given plan year using the assumed rates of increase described in Appendix 5 and the assumed seniority and promotional salary increases described in Table 17. Elective participants' salaries are frozen at the time of retirement or disability and are not subject to further increases.

#### 2. Government

The government's annual contribution is projected for a given plan year as the sum of:

- one-twelfth of the amount of term insurance death benefits projected to be paid during that plan year,
- and
- the legislated single premiums in respect of relevant participants 65 years of age (or participants completing two years of service, if older).



### 3. Crown Corporations and Public Boards

Crown corporations' and public boards' annual contributions are projected for a given plan year by multiplying

- the legislated annual contribution rate of \$0.48 per \$1,000 of coverage (equivalent to the monthly rate of 4 cents per \$1,000 of coverage)
- by
- the aggregate of two times the salaries of each participant who is employed by the Crown corporation or public board projected for that plan year on an open-group basis,
- less
- 10% a year reduction from age 66 if applicable, and
  - \$10,000 paid-up coverage after age 65, if applicable.

### C. Discount Rates

The rates used to calculate the present value of actuarial liabilities in respect of paid-up death benefits are the same as the yields described and shown in Appendix 5.

### D. Interest Credits

Annual interest credits are projected for a given plan year as the product of the yield projected for that plan year (shown in Appendix 5) and the projected average Account balance in that plan year.

### E. Treatment of Correctional Service of Canada (CSC) Employees

As at 31 March 2017, there are approximately 175 deemed operational employees and 13,825 actual operational employees. For simplification, all deemed operational employees of CSC are treated as actual operational service employees, which means a total of 14,000 employees of CSC were reported as actual operational for valuation purposes.

### F. Basic Benefit Payments

The total amount of basic benefits (term and paid-up insurance) for a given plan year is projected as the total amount of insurance in force during that plan year multiplied by the mortality rates assumed to apply during that plan year. The amount of basic benefit in force depends on the salary projected to time of death. Salaries are projected for this purpose using the assumed rates of increase in salaries and the number of participants projected on an open-group basis as described in Appendix 6.

### G. Liabilities

#### 1. Paid-up Reserve

At the end of a given plan year, the liabilities associated with the individual \$10,000 paid-up death benefit in force correspond to the amount which, together with interest at the projected yields, is sufficient to pay for each individual \$10,000 paid-up death benefit projected payable on the basis of the assumed mortality rates.



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### 2. IBNR and Pending Claims Reserves

On the basis of the plan's experience, the reserve at the end of a given plan year for claims incurred but not reported (IBNR) and for pending claims is set equal to one-sixth of the projected annual death benefits paid on average during the six previous plan years.

### 3. Extension of Coverage

Due to the negligible financial impact of the 30-day extension of the basic benefit upon termination of coverage and the nature of basic benefit paid for on a monthly basis, no explicit liability was calculated in respect of that basic benefit provision.



## Appendix 5 - Economic Assumptions

The following economic assumptions are required for valuation purposes:

### A. Increases in Salary

Salary increases consist of a combination of inflation, productivity growth (i.e. real<sup>1</sup> increase in average employment earnings in excess of inflation) and seniority and promotional increase. Seniority and promotional increase is strongly service-based and is therefore considered to be a demographic assumption rather than an economic assumption.

Price increases, as measured by changes in the Consumer Price Index (CPI), tend to fluctuate from year to year. In 2016, the Bank of Canada and the government renewed their commitment to keep inflation between 1% and 3% until the end of 2021. However in recent years, the level of inflation has been lower than the 2% target. In this report, it is assumed that the level of inflation will increase from 1.6% in plan year 2018 to its ultimate rate of 2.0% in 2019. The ultimate rate of 2.0% is unchanged from the assumed rate in the previous valuation.

The actual increase in average earnings<sup>2</sup> for plan year 2018 was 1.6%. The assumed increase in average earnings were 2.0% and 2.3% for plan years 2019 and 2020, respectively, based on recently approved contracts which apply to the majority of non-elective participants. The assumed increase in average earnings for plan years 2021+ was calculated as the sum of assumed inflation and assumed productivity growth. Thus, the ultimate increase in average earnings is 2.8%.

The assumed increases in average earnings are shown in Table 16.

### B. Projected Yields on Account

These yields are required for the long-term projection of the Account's balance, liabilities and excess or shortfall. The projected yields on the Account are the projected annual yields on the combined book value of the Superannuation Accounts of the Public Service, Canadian Forces, and Royal Canadian Mounted Police pension plans.

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<sup>1</sup> The real rates in this report are differentials, i.e. the difference between the effective annual rate and the inflation rate.

<sup>2</sup> Exclusive of seniority and promotional increases.



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**Table 16 Summary of Economic Assumptions  
(percentage)**

Plan Year	Average Earnings Increase <sup>1</sup> of Non-Elective Participants	Projected Yield
2018	1.6	4.2
2019	2.0	4.0
2020	2.3	3.8
2021	2.6	3.7
2022	2.7	3.6
2023	2.7	3.5
2024	2.8	3.4
2025	2.8	3.4
2026	2.8	3.3
2027	2.8	3.3
2028	2.8	3.2
2029	2.8	3.2
2030	2.8	3.2
2031	2.8	3.3
2032	2.8	3.3
2033	2.8	3.4
2034	2.8	3.4
2035	2.8	3.5
2036	2.8	3.7
2037	2.8	3.9
2038	2.8	4.0
2039	2.8	4.2
2040	2.8	4.4
2041	2.8	4.5
2042	2.8	4.5
2043	2.8	4.6
2044	2.8	4.6
2045+	2.8	4.7

<sup>1</sup> Exclusive of seniority and promotional increases.





## Appendix 6 - Demographic and Other Assumptions

All contributors to the pension plan for the Public Service of Canada (PS) are covered by a supplementary death benefit as defined under Part II of the PSSA. Hence, given the size of the population subject to the PSSA, except where otherwise noted, all demographic assumptions were determined using the PSPP’s own experience, as was done in the past. Where applicable, assumptions used in the previous valuation were updated to reflect the intervaluation experience.

### A. Demographic Assumptions

#### 1. Seniority and Promotional Salary Increases

Seniority means length of service within a classification and promotion means moving to a higher paid classification.

The seniority and promotional salary increases are the same as those used in the Actuarial Report on the Pension Plan for the Public Service of Canada as at 31 March 2017. Details of this assumption can be found in Appendix 7 of that report.

The following table shows a sample of the assumed seniority and promotional salary increases.

**Table 17 Sample of Assumed Seniority and Promotional Salary Increases  
(Percentage of annual earnings)**

Completed Years of Pensionable Service	Male	Female
0	5.6	5.7
1	5.1	5.1
2	4.5	4.5
3	4.0	3.9
4	3.5	3.5
5	3.1	3.1
6	2.8	2.8
7	2.6	2.6
8	2.4	2.4
9	2.2	2.2
10	2.0	2.1
15	1.5	1.6
20	1.2	1.4
25	1.1	1.2
30	1.0	1.0



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### 2. New Participants

It was assumed that the distribution of new participants by age and sex would be the same as that of participants with less than one year of service at the valuation date. The assumed percentage increases for each plan year are shown in the following table:

**Table 18 Assumed Annual Increases in Number of Non-Elective Participants**

Plan year	Percentage
2018	1.7
2019	4.0
2020	2.0
2021	0.5
2022+	0.5

The initial salary of new participants in a given age-sex cell in plan year 2018 is assumed to be the same as the corresponding experience in plan year 2017 with an economic salary increase for plan year 2018. Initial salary is assumed to increase in future years in accordance with the assumption for average earnings increases.

### 3. Pensionable Retirement

The assumed rates of pensionable retirement are the same as those used in the Actuarial Report on the Pension Plan for the Public Service of Canada as at 31 March 2017. Details of this assumption can be found in Appendix 7 of that report.

The following tables show a sample of the assumed rates of pensionable retirement.

**Table 19 Sample of Assumed Rates of Retirement - Main Group 1- Male  
(Per 1,000 individuals)**

Age <sup>1</sup>	Completed Years of Pensionable Service						
	1	2	10	20	29	30	35
50	93	58	17	13	26	14	0
55	74	73	25	25	253	191	290
60	128	126	86	155	268	232	353
65	216	243	225	260	299	318	393
70	316	265	305	320	389	417	489

**Table 20 Sample of Assumed Rates of Retirement - Main Group 1- Female  
(Per 1,000 individuals)**

Age <sup>1</sup>	Completed Years of Pensionable Service						
	1	2	10	20	29	30	35
50	98	78	15	10	19	16	0
55	121	108	40	38	346	251	439
60	151	143	109	187	309	250	391
65	236	223	258	295	245	295	354
70	333	280	295	423	444	304	391

<sup>1</sup> Expressed in completed years calculated at the beginning of the plan year.



**Table 21 Sample of Assumed Rates of Retirement - Main Group 2 - Male  
(Per 1,000 individuals)**

Age <sup>1</sup>	Completed Years of Pensionable Service						
	1	2	10	20	29	30	35
55	95	61	20	18	26	14	0
60	92	94	54	64	276	191	290
65	216	243	225	260	299	318	393
70	316	265	305	320	389	417	489

**Table 22 Sample of Assumed Rates of Retirement - Main Group 2 - Female  
(Per 1,000 individuals)**

Age <sup>1</sup>	Completed Years of Pensionable Service						
	1	2	10	20	29	30	35
55	101	81	19	15	19	16	0
60	137	130	74	94	367	251	439
65	236	223	258	295	245	295	354
70	333	280	295	423	444	304	391

**Table 23 Sample of Assumed Rates of Retirement - Operational Service Group  
(Per 1,000 individuals)**

Age <sup>1</sup>	Completed Years of Pensionable Service						
	1	2	10	19	20	30	35
34-47	-	-	-	2	2	63	-
48	-	-	-	5	3	79	-
50	96	68	16	7	9	135	43
55	98	91	33	30	30	233	523
60	140	135	98	143	171	241	372
65	226	233	242	270	278	307	374

<sup>1</sup> Expressed in completed years calculated at the beginning of the plan year.



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## 4. Disability Retirement

The assumed disability incidence rates are the same as those used in the Actuarial Report on the Pension Plan for the Public Service of Canada as at 31 March 2017. Details of this assumption can be found in Appendix 7 of that report.

The following table shows a sample of the assumed rates of disabled retirement.

**Table 24 Sample of Assumed Rates of Pensionable Disability  
(Per 1,000 individuals)**

Age <sup>1</sup>	Group 1		Group 2	
	Male	Female	Male	Female
25	0.05	0.05	0.05	0.05
35	0.36	1.01	0.36	1.01
45	1.61	2.94	1.61	2.94
55	4.20	7.92	4.20	7.92
58	6.12	8.96	6.12	8.96
59	-	-	7.25	10.13
60	-	-	8.78	11.38
61	-	-	10.66	12.63
62	-	-	12.73	13.76
63	-	-	14.65	14.63

<sup>1</sup> Expressed in completed years calculated at the beginning of the plan year.



**5. Withdrawal**

Withdrawal with less than two years of service includes termination of employment for any reason. Withdrawal with two or more years of service means termination of employment for reasons other than death, disability or retirement with an immediate annuity or an annual allowance.

The assumed rates of withdrawal are the same as those used in the Actuarial Report on the Pension Plan for the Public Service of Canada as at 31 March 2017. Details of this assumption can be found in Appendix 7 of that report.

The following tables provide a sample of assumed rates of withdrawal.

**Table 25 Sample of Assumed Rates of Withdrawal - Main Group 1 - Male  
(Per 1,000 individuals)**

Age <sup>1</sup>	Completed Years of Pensionable Service						
	0	1	5	10	20	25	30
20	363	365	60	-	-	-	-
25	143	131	36	34	-	-	-
30	107	93	31	14	-	-	-
35	95	83	27	13	3	-	-
40	98	86	25	17	9	20	-
45	99	84	24	17	6	9	5
48	111	87	24	19	10	7	7
50	128	-	-	-	-	-	-
55	146	-	-	-	-	-	-
60	235	-	-	-	-	-	-

**Table 26 Sample of Assumed Rates of Withdrawal - Main Group 1 - Female  
(Per 1,000 individuals)**

Age <sup>1</sup>	Completed Years of Pensionable Service						
	0	1	5	10	20	25	30
20	349	349	84	-	-	-	-
25	132	117	27	8	-	-	-
30	117	99	23	9	-	-	-
35	106	92	25	14	3	-	-
40	113	96	25	17	7	5	-
45	122	104	25	18	9	5	8
48	139	108	27	21	11	8	4
50	179	-	-	-	-	-	-
55	202	-	-	-	-	-	-
60	268	-	-	-	-	-	-

<sup>1</sup> Expressed in completed years calculated at the beginning of the plan year.



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**Table 27 Sample of Assumed Rates of Withdrawal - Main Group 2- Male  
(Per 1,000 individuals)**

Age <sup>1</sup>	Completed Years of Pensionable Service						
	0	1	5	10	20	25	30
20	363	365	60	-	-	-	-
25	143	131	36	34	-	-	-
30	107	93	31	14	-	-	-
35	95	83	27	13	3	-	-
40	98	86	25	17	9	20	-
45	99	84	22	16	5	9	6
48	111	87	17	14	5	4	3
50	128	63	17	13	5	4	2
53	141	74	17	14	7	4	5
55	146	-	-	-	-	-	-

**Table 28 Sample of Assumed Rates of Withdrawal - Main Group 2 - Female  
(Per 1,000 individuals)**

Age <sup>1</sup>	Completed Years of Pensionable Service						
	0	1	5	10	20	25	30
20	349	349	84	-	-	-	-
25	132	117	27	8	-	-	-
30	117	99	23	9	-	-	-
35	106	92	25	14	3	-	-
40	113	96	25	17	7	5	-
45	122	104	23	17	7	6	5
48	139	108	21	16	6	5	6
50	179	89	22	15	6	5	6
53	189	79	24	17	8	7	4
55	202	-	-	-	-	-	-

<sup>1</sup> Expressed in completed years calculated at the beginning of the plan year.



**Table 29 Sample of Assumed Rates of Withdrawal - Operational Service Group  
(Per 1,000 individuals)**

Age <sup>1</sup>	Completed Years of Pensionable Service					
	0	1	5	10	15	18
20	109	95	11	-	-	-
25	39	34	10	12	-	-
30	44	34	14	14	6	-
35	52	39	12	9	8	3
40	59	50	14	8	3	8
45	69	54	40	18	5	5
48	78	61	25	18	7	10
50	92	-	-	-	-	-
55	129	-	-	-	-	-
60	136	-	-	-	-	-

**6. Elective Participants Entitled to a Deferred Annuity**

Due to their negligible impact on costs and liabilities, actual and future deferred annuitants are not taken into consideration for the purpose of this valuation.

**7. Mortality**

For the last valuation, a study of mortality as a function of coverage was conducted over the period of plan years 2012 to 2014. This resulted in giving 50% credibility to the SDB plan’s experience over the last three plan years and 50% credibility to the SDB plan’s experience over the period 2007 to 2011 for ages 65 and below. Due to various factors described in the last report, the mortality rates for ages above 65 were those used in the PSPP.

For this valuation, the assumed rates of mortality are the same as those used in the Actuarial Report on the Pension Plan for the Public Service of Canada as at 31 March 2017 because the mortality study for the PSPP is now taking into account different levels of salary. Since the new methodology of the PSPP mortality study is similar to that of the previous SDB plan mortality study, the need to do a mortality study only for the SDB plan was not necessary. Therefore, the PSPP mortality rates are used for all ages.

For more details on the development of the PSPP’s mortality rates, please refer to Appendix 7 of the PSPP report as at 31 March 2017.

<sup>1</sup> Expressed in completed years calculated at the beginning of the plan year.



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**Table 30 Sample of Assumed Rates of Mortality - SDB Plan  
(Per 1,000 individuals)  
Plan Year 2018**

Age <sup>1</sup>	Non-Elective Participants and Elective Participants who Retired Normally		Elective Participants who Retired on Disability	
	Male	Female	Male	Female
30	0.3	0.2	6.2	4.5
40	0.5	0.6	9.2	6.0
50	1.2	1.2	13.8	8.3
60	4.0	3.1	20.7	12.9
70	13.1	9.8	36.7	22.6
80	42.8	33.0	80.3	56.6
90	155.1	123.5	188.3	155.5
100	362.8	301.2	419.8	467.5
110	500.0	500.0	500.0	500.0

Beginning with the 2005 Actuarial Report for the PSPP, the longevity improvement assumptions have been based on the corresponding assumptions published in the latest Actuarial Report on the Canada Pension Plan (CPP). The longevity improvement assumptions of the previous report were based on the 26<sup>th</sup> CPP Actuarial Report. The 27<sup>th</sup> CPP Actuarial Report is the latest published report and the longevity improvement assumptions in this report are larger than those published in the 26<sup>th</sup> CPP Actuarial Report. Given that our findings that mortality during the inter-valuation period has not improved as expected, which are in contrary to the historical trend, the longevity improvement assumptions stated in the 27<sup>th</sup> CPP Actuarial Report are not used in this report. Thus, the longevity improvement assumptions of the previous report are carried over to this valuation.

A sample of assumed longevity improvement factors is shown in the following table.

**Table 31 Sample of Assumed Longevity Improvement Factors  
(applicable at the end of the plan year)**

Age <sup>1</sup>	Initial and Ultimate Plan Year Mortality Reductions (%)			
	Male		Female	
	2018	2030+	2018	2030+
30	1.86	0.80	1.02	0.80
40	1.46	0.80	1.24	0.80
50	1.24	0.80	1.02	0.80
60	1.74	0.80	1.40	0.80
70	1.89	0.80	1.40	0.80
80	1.97	0.80	1.40	0.80
90	1.15	0.48	1.03	0.48
100	0.49	0.30	0.49	0.30
110+	0.21	0.23	0.21	0.23

<sup>1</sup> Expressed in completed years calculated at the beginning of the plan year.





## 8. Election Proportions

The following table provides a sample of the assumed rates of non-elective participants who opt to continue coverage under the plan at retirement.

Table 32 Election Proportions (Non-elective participants choosing to become elective participants at retirement)				
Age <sup>1</sup>	Pensionable Retirement <sup>2</sup>		Disability Retirement	
	Male	Female	Male	Female
15-43	0.00	0.00	1.00	1.00
44	0.12	0.13	1.00	1.00
45	0.20	0.17	1.00	1.00
46	0.27	0.21	1.00	1.00
47	0.34	0.25	1.00	1.00
48	0.41	0.31	1.00	1.00
49	0.48	0.37	1.00	1.00
50	0.55	0.45	1.00	1.00
51	0.63	0.53	1.00	1.00
52	0.70	0.62	1.00	1.00
53	0.77	0.71	1.00	1.00
54	0.83	0.79	1.00	1.00
55	0.88	0.86	1.00	1.00
56	0.91	0.90	1.00	1.00
57	0.93	0.91	1.00	1.00
58	0.93	0.92	1.00	1.00
59	0.94	0.93	1.00	1.00
60	0.94	0.93	1.00	1.00
61	0.94	0.94	1.00	1.00
62	0.94	0.94	1.00	1.00
63	0.94	0.94	1.00	1.00
64	0.94	0.94	1.00	1.00
65	0.94	0.95	1.00	1.00
66	0.94	0.95	1.00	1.00
67	0.95	0.95	1.00	1.00
68	0.95	0.96	1.00	1.00
69	0.95	0.96	1.00	1.00
70+	1.00	1.00	1.00	1.00

<sup>1</sup> Expressed in completed years calculated at the beginning of the plan year.

<sup>2</sup> A pensionable retirement is a retirement resulting in either an immediate annuity for reasons other than disability or an annual allowance.



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### **B. Other Assumptions**

#### **1. Option to Reduce Coverage to \$10,000**

The valuation data indicates that the proportion of elective participants opting to reduce their basic benefit to \$10,000 is negligible. Accordingly, no elective participants were assumed to make such an option.

#### **2. Option to Continue the Annual 10% Reduction from Age 61**

Bill C-78 introduced this option to participants effective 1 October 1999. Election of this option by participants would have a positive effect on the plan's actuarial excess. The valuation data indicates that approximately 2.3% of participants have opted to continue their 10% annual reduction from age 61 instead of age 66. Accordingly, no participants were assumed to make such an election.

#### **3. Administrative Expenses**

In the projection of the Account, no assumption was made regarding the expenses incurred for the administration of the plan. These expenses, which are not debited to the Account, are commingled with all other government charges.



## **Appendix 7 - Acknowledgements**

The Superannuation Directorate of Public Services and Procurement Canada provided the data on plan participants.

The following individuals were instrumental in the preparation of this report:

Linda Benjauthrit

Alice Chiu

Christopher Dieterle, F.C.I.A., F.S.A.

François Lemire, F.C.I.A., F.S.A.

Guillaume Lépine-Mathieu, A.S.A.

Véronique Ménard, F.C.I.A., F.S.A.