Actuarial Report of the

WorkSafeBC Pension Plan

as at March 31, 2017

Vancouver, B. C.

December 13, 2017

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Highlights and Actuarial Opinion

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We have completed an actuarial valuation of the WorkSafeBC Pension Plan (the "Plan") as at March 31, 2017 and have pleasure in submitting our report thereon. Our report is concerned with the experience in the three year period since March 31, 2014, the date of the last valuation.

Scope of the Valuation

The purpose of the actuarial valuation is to:

1. Report on the financial position of the Basic Account as at March 31, 2017;
2. To determine the contribution requirements for the period from April 1, 2017 until the results of the next valuation are available, for which the effective date must be no later than March 31, 2020; and
3. To provide the actuarial certifications required under the *B.C. Pension Benefits Standards Act* ("*PBSA*") and the federal *Income Tax Act* ("*ITA*").

The intended users of this report are WorkSafeBC, the Pension Committee of the Plan, the Financial Institutions Commission of British Columbia (FICOM) and Canada Revenue Agency (CRA). This report is not intended or necessarily suitable for purposes other than those listed above.

The valuation is concerned primarily with the future Basic non-indexed benefits provided under the Plan (including all indexing granted up to the valuation date). The valuation does not directly consider the liabilities for future indexing as such future indexing is to occur only to the extent it can be adequately financed by amounts available in the Inflation Adjustment Account ("IAA"); the future indexing liabilities have been considered indirectly, by setting liabilities exactly equal to the assets in the IAA.

Changes in Benefits and Assumptions since the Last Valuation

There have been a number of Plan amendments since the previous valuation, including amending the plan rules to ensure compliance with the new *BC PBSA* and Regulation, which became effective September 30, 2015. Most of these amendments had no impact on the benefits for the purpose of the valuation, except for the following changes:

- Effective September 30, 2015, the plan rules were amended to include immediate vesting as required by the new *PSBA*; and

- Effective January 1, 2016, employer contributions to the Basic Account were decreased from 8.63% to 5.50% of that part of the employee’s salary that does not exceed the Canada Pension Plan Year's Maximum Pensionable Earnings ("YMPE"), and from 10.13% to 7.00% of the employee's salary which is in excess of the YMPE.

With the changes to employer contribution rates, from January 1, 2016 the total (employer plus employee) contributions to the Basic Account are 11.00% of that part of the employee’s salary that does not exceed the YMPE, and 14.00% of the employee's salary which is in excess of the YMPE. In addition to the above contribution requirements for basic non-indexed benefits, the employees and WorkSafeBC each contribute 1% of salaries to the IAA.

The plan rules are summarized in Appendix A.

The going concern actuarial assumptions have been revised since the previous valuation. In particular, the discount rate was lowered in view of reduced long-term expectations of investment returns. The key long-term economic assumptions used include (assumptions for the previous valuation are in brackets).

	Funding Valuation
Annual Investment Return	5.65% (6.0%)
Annual Salary Increase	2.75% (3.0%) plus seniority
Annual Indexing	0% for basic costs 2.25% (2.5%) for indexed costs

The going concern mortality rate assumptions were changed from 100% for males and 95% for females of the rates in 2014 Public Sector Mortality Table (CPM2014Publ) to the Club Vita Canada’s 2016 VitaCurves[1], both projected generationally with improvement scale CPM-B. This produced a small increase in the going concern liabilities and current service cost.

Minor adjustments were made to the assumed rates of retirement, disability and withdrawal from the Plan.

The hypothetical wind-up/solvency economic assumptions were revised to reflect market conditions as at the valuation date.

The assumptions are described in detail in Appendix D.

[1] Club Vita Canada’s longevity dataset is composed of a subset of Canadian registered pension plans across Canada, and includes plans covering a range of industries in both the private and public sector. Club Vita Canada’s 2016 VitaCurves have been developed based on longevity experience consisting of 1.4 million exposure years and 38 thousand deaths over 2012 to 2014. More detail is provided in Appendix D.

Summary of Results

The results as at March 31, 2017 for the Basic Account are summarized below.

($,000's)	Going concern	Hypothetical Wind-up/ Solvency
Assets (net of wind-up expenses if applicable)	1,538,077	1,638,226
Liabilities	1,188,529	1,596,841
Going Concern Actuarial Excess (Unfunded Liability)	**349,548**	
Solvency Surplus (Deficiency)		**41,385**
Funded/Solvency Ratio	129.4%	102.6%
Total current service cost (% of active payroll)	18.51%	
Going Concern Special Payments	Nil	
Solvency Special Payments	Nil	

The current going concern valuation indicates that the actuarial excess of $242,241,000 that existed at March 31, 2014 has increased to $349,548,000 at March 31, 2017. The increase in actuarial excess is the net result of a number of items, the major one being the investment earnings on a smoothed asset value basis greater than the rates assumed in the last valuation, partially offset by the change in the economic assumptions and the excess interest transfers made to the Inflation Adjustment Account. More detailed analysis of the going concern results and changes is given in Appendix E.

The current valuation indicates that the total current service cost for Basic Account (non-indexed benefits) has increased from 17.72% to 18.51% (integrated[1]). The increase in the Basic Account current service cost is the result of a number of factors, the major causes being the change in the economic and mortality assumptions. These changes are analyzed in detail in Appendix F.

The hypothetical wind-up/solvency valuation indicates that the solvency surplus of $90,575,000 that existed at March 31, 2014 has reduced to a solvency surplus of $41,385,000 at March 31, 2017. The primary drivers for the deterioration were the decrease in the prescribed solvency rates at March 31, 2017 over those in effect at March 31, 2014 and the excess interest transfers made to the Inflation Adjustment Account, partially offset by the investment earnings on a market value basis being greater than the solvency rates prescribed for the last valuation. The solvency ratio of the Plan is 102.6% (greater than 100%) and, because of this,

[1] The term "integrated" refers to the set of two contribution rates that apply to earnings up to and over the YMPE. For employees, 7% integrated means 5.5% of that part of the employee's salary that does not exceed the YMPE, and 7.0% of the employee's salary which is in excess of the YMPE. For the employer, 11.51% integrated means 10.01% of salary up to the YMPE, and 11.51% on the portion of salary in excess of the YMPE.

where lump sums are transferred from the Basic Account by a terminated member or with respect to a deceased member, they are due to be paid in full and no additional contributions will be required.

As in previous valuations, we evaluated the going concern actuarial excess and maximum contributions in terms of the limits permitted under the *ITA*. The *ITA* surplus/contribution tests have been calculated on a basis that recognizes full indexing of benefits on a pre-funded basis, as permitted by the *ITA* – detail is provided in Appendix A.

Since there is both a going concern actuarial excess and a solvency surplus, no special funding payments are required.

The current service cost rate for the Basic Account is 18.51% integrated. Assuming that employee contributions continue to be made at the rate of 7% of salaries (integrated), WorkSafeBC's portion would be 11.51% (integrated). As well, as required under the plan rules, the employees and WorkSafeBC each contribute 1% of salaries to the IAA. Based on the payroll rates as at March 31, 2017, the current service costs are summarized below:

Current Service Cost

	Basic Account		**IAA**		**Total**
	Rate	**$ at March 31, 2017**	**Rate**	**$ at March 31, 2017**	**$**
Employees	7.0% integrated	14,024,000	1.0%	2,332,000	16,356,000
WorkSafeBC	11.51% integrated	24,543,000	1.0%	2,332,000	26,875,000
Total	**18.51% integrated**	**38,567,000**	**2.0%**	**4,664,000**	**43,231,000**

The foregoing valuation results recognize only those benefits up to the maximum *ITA* benefit limits. Benefits above these limits are paid under Part 11 of the Plan, via a Supplemental Benefit Account, which is maintained at a zero balance. Since WorkSafeBC may need to recognize a liability for these Part 11 benefits in its financial statements for the Accident Fund, we have recalculated the liabilities and costs, ignoring the *ITA* limits. When this is done, the going concern actuarial excess reduces by $14,136,000 to $335,412,000 and the employer current service cost requirement for basic non-indexed benefits increases by 0.10%, from 11.51% integrated to 11.61% integrated of salaries, assuming employees continue to contribute at 7% integrated.

Summary of Results – Impact of Current Going Concern Actuarial Excess

Due to the going concern actuarial excess and solvency surplus, contributions to the Basic Account may be made at a rate lower than the current service cost rate of 18.51% integrated.

After setting aside a buffer equal to 5% of the Basic Account liability, as required under the *PBSA,* the remaining $290,122,000 of accessible going concern excess (the actuarial excess above the 5% buffer) may be used in part or full to reduce contributions. Alternatively, WorkSafeBC could elect to retain the accessible going concern excess in the fund. Under the *PBSA*, the total contributions to the Basic Account can be any amount between nil and Basic Account current service cost of 18.51% of payroll, prior to allowance for the maximum under the *ITA* as summarized below.

WorkSafeBC is currently contributing at a rate of 7.00% integrated to the Basic Account. Combined with the employee contributions of 7.00%, this gives current total contributions to the Basic Account of 14.00% integrated.

Further details are given in Appendix H.

The maximum contribution rate under the *ITA* that can be paid until the next valuation is the current service cost on an indexed basis. Including the IAA contributions, the total indexed current service cost is 23.23% (integrated). Assuming employee contributions remain at 8% (integrated; including IAA contributions), the maximum contribution WorkSafeBC can make is 15.23% (integrated).

More details are provided in Appendix I.

Reliance

We have relied on the asset information as provided in the audited financial statements of the Plan as of March 31, 2015, 2016 and 2017. We have also relied on WorkSafeBC and the plan administrator to provide all relevant data, additional asset information and to confirm the pertinent Plan terms.

Further detail with respect to both the results of the valuation and the information and methods used for the valuation is set out in the attached appendices.

Subsequent Events

To the best of our knowledge there have been no events subsequent to the valuation date that would have an impact on the results of this valuation, or alter our opinion.

Actuarial Opinion

In our opinion,

(a) the membership data on which the valuation is based are sufficient and reliable for purposes of the valuation,

(b) the assumptions are appropriate for the purposes of the valuation, and

(c) the methods employed in the valuation are appropriate for the purposes of the valuation.

This report has been prepared, and our opinions given, in accordance with accepted actuarial practice in Canada. For regulatory purposes, the next valuation should be completed no later than as of March 31, 2020.

We would be pleased to discuss the report with you at your convenience.

Respectfully submitted,

Catherine Robertson

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December 13, 2017

[1] The Canadian Institute of Actuaries is the Primary Regulator.

Appendix A Summary of Plan and Amendments

Changes to the Plan

The previous valuation was based on the provisions of the plan as at March 31, 2014. There were a number of amendments between March 31, 2014 and March 31, 2017, to modernize the plan rules, comply with the new *PBSA* and *Regulations* and address compliance and housekeeping issues. The main changes are summarized below.

Effective September 30, 2015:

- the board changed the name of the pension plan from the Workers' Compensation Board Superannuation Plan to the WorkSafeBC Pension Plan. The plan trustees were also redesignated as pension committee members and constituted as the plan's pension committee.
- the plan rules were modernized to align with the format of the BC public sector pension plans.
- the plan rules were amended to implement all changes required under the new *PBSA* and *Regulations*. This included new and modified definitions and the incorporation of required benefit changes such as immediate vesting, change to the small benefit test, and unlocking of pension benefits based on a medical practitioner's determination that the member has an illness or disability that is terminal or will considerably shorten their life expectancy.
- the plan rules were amended to make it clear that where a member commences their pension and later becomes re-employed in an employment that would normally require or offer participation in the plan, the retired member must continue to receive their pension and cannot recommence contributions to the plan. The amendment also clarifies that the provision does not apply where the member receives a pension from the plan following the death of a member.
- the reinstatement of a refund provision was removed from the plan rules for members who join the plan on or after January 1, 2017. Members who joined the plan prior to January 1, 2017 can still apply to reinstate a refund within five years from when they became an active member or before termination of employment (whichever occurs first).
- the non-contributory purchase provisions were removed from the plan rules as there are no eligible non-contributory periods available for a member to purchase.
- the disability pension provisions were removed from the plan rules since all eligible WorkSafeBC employees also qualify for LTD benefits. Continued pension accrual while on LTD is retained in the plan rules.

Effective October 21, 2016, the WorkSafeBC Pension Plan established a Governance Policy as contemplated in section 42 of the *PBSA* and section 50 of the *Regulations*.

The main provisions of the plan are summarized below. The section references are to the WorkSafeBC Pension Plan Rules, as at March 31, 2017. The Workers' Compensation Board is referred to in the plan rules as "board".

Employee Eligibility

Section 2 states the plan applies to all eligible WorkSafeBC employees.

Section 3 outlines eligible employees as:

a) a permanent employee of the board in receipt of a salary in payment for service; or

b) any other employee of the board who has completed two years of continuous employment with salary from the board of at least 35% of the year's maximum pensionable earnings (YMPE) in each of two consecutive calendar years and who elect to have the plan apply to them.

Member Contributions

Section 5 defines the following contributions which are deducted from a member's salary during a calendar year:

a) 5.5% of the member's salary payable that does not exceed the YMPE (paid into the Basic Account);

b) 7.0% of the member's salary payable that exceeds the YMPE (paid into the Basic Account); and

c) 1.0% of the member's entire salary (paid into the Inflation Adjustment Account (IAA)).

Member contributions cease after 35 years of pensionable service have been accrued.

Employer Contributions

Section 6 outlines how WorkSafeBC is required to contribute such amounts which, based on the recommendation of the actuary, are determined by WorkSafeBC to be necessary to provide for the benefits under the plan. Actuarial excess funds may be used to reduce or eliminate contributions that might otherwise be required. All WorkSafeBC contributions must also comply with the requirements of the *ITA* and the *PBSA*.

Effective January 1, 2016, the employer contribution rate to the Basic Account decreased by 3.13%, to:

a) 5.5% of that part of the employee's salary that does not exceed the YMPE (paid into the Basic Account);

b) 7.0% of the employee's salary which is in excess of the YMPE (paid into the Basic Account); and

c) 1.0% of the employee's salary (paid into the IAA).

Employer contributions also cease in respect of an employee's salary after the employee has accrued 35 years of pensionable service.

Retirement Benefits: Eligibility Conditions for Pension

Section 96 defines earliest retirement age as age 55, normal retirement age as age 65 and latest retirement age as November 30th of the year the member turns age 71.

Section 50 provides that an active member who, on or after September 30, 2015, terminates employment, is on application, entitled to an unreduced pension and bridge benefit calculated under section 54 if the member has reached:

a) age 55 and the sum of the member's age plus years of contributory service is 90, or

b) age 60 with at least 2 years of contributory service, or

c) age 65.

Section 51(a) provides for a reduced pension and bridge benefit calculated under section 55(1) if the terminated member has reached age 55 and completed at least 2 years of contributory service.

Section 51(b) provides for a reduced pension and bridge benefit calculated under section 55(2) if the terminated member has attained age 55 but has not completed 2 years of contributory service.

Calculation of Unreduced Retirement Benefit

Section 54 provides that a member referred to in section 50 is entitled to receive an unreduced pension payable in the form of a single life option guaranteed for 10 years, calculated as follows:

a) 2% of the member’s highest average salary multiplied by the number of years of pensionable service (not exceeding 35 years), less:

   0.7% of the lesser of:

   1) the member’s highest average salary, and
   2) 1/12 of the YMPE for the calendar year immediately before the calendar year of the pension effective date,

   multiplied by the member’s years of pensionable service not exceeding 35 years.

b) plus a bridge benefit, until member reaches age 65 or dies, equal to:

   0.7% of the lesser of:

   1) the member’s highest average salary, and
   2) 1/12 of the YMPE for the calendar year immediately before the calendar year of the pension effective date, multiplied by the member’s years of pensionable service not exceeding 35 years.

Sections 97 and 98 define highest average salary as one-twelfth of the average annual salary earned by a member during the 5 years of pensionable service (not necessarily consecutive) in which the salaries were highest (or, if the member has accrued less than 5 years of pensionable service, the total number of years and partial years of pensionable service).

Calculation of Reduced Retirement Benefit

Section 55 provides that a member referred to in section 51 is entitled to receive a reduced pension payable in the form of a single life option guaranteed for 10 years.

The pension is reduced for each year of age that either:

a) the member is over age 55 but under 60, and age plus contributory service total less than 90, or
b) the member is over age 60 but under 65, with fewer than two years of contributory service

If a member terminates employment after age 50 and has at least 10 years of contributory service, the pension is reduced by 3% for each year of age that either:

a) the member’s age plus years of contributory service is less than 90, or
b) the member is under age 60

In all other cases, the pension is reduced by 5%. Pension reductions are pro-rated by month for partial years.

Optional Forms of Pension

Section 56 provides a pension may be granted on the single life option, single life with a guaranteed period of 5, 10 (normal form) or 15 years, joint life and last survivor option, temporary annuity option in combination with one of the aforementioned options, or a combination of these options with the approval of the plan administrative agent. The amount of any pension granted on a form other than the normal form is calculated on an actuarially equivalent basis.

Where a member has a spouse at retirement, the member is required to elect a 60% joint life and last survivor option, unless the spouse waives this requirement in writing or there is a written agreement or court order made under Part 5 or 6 of the *Family Law Act* that is filed with the plan administrative agent. This option provides for a reduced amount payable to the member, continuing to the spouse on death of the member at 60% of the initial reduced amount. A spouse is as defined in the *PBSA*, and includes a common-law or same-sex spouse.

Long-Term Disability (LTD)

Sections 12(5) and 99(2) provide that if a member is receiving a monthly income benefit from a group disability plan, approved for pension purposes, the member and employer do not make contributions. The member is not entitled to a pension under the plan, but the period for which the member receives such group LTD income benefit is considered pensionable service, with the final pension based on the highest average salary at disablement increased to retirement in accordance with changes in the Consumer Price Index (CPI).

Disability Pension

The disability pension provisions were removed from the plan rules. Disability pensions were available to members who were not eligible for long-term disability (LTD) benefits. Since all WorkSafeBC employees would have qualified for LTD benefits (as long as they met eligibility criteria) before qualifying for a disability pension, the plan's disability pension provisions were deemed redundant and therefore removed.

Pre-retirement Death Benefits

Section 69 outlines the following pre-retirement death benefits provisions for active and inactive members who die on or after September 30, 2015, but before being granted a termination or retirement benefit.

a) if there is no surviving spouse or a valid spousal waiver has been filed, the benefit payable to the beneficiary is equal to the commuted value (calculated per section 46) which the member would have been entitled to in respect of the member's pensionable service had the member terminated employment immediately before the date of death.

b) if the member has not attained age 55 at the date of death and is not entitled to a pension, and there is a surviving spouse and a valid spousal waiver has not been filed, the spouse may elect to receive either of the following benefits:

    1) the commuted value which the member would have been entitled to in respect of the member's pensionable service had the member terminated employment immediately before the date of death, or

    2) an immediate pension that is actuarially equivalent to the commuted value and payable as if the member had chosen the joint life and last survivor option.

c) if the member has attained age 55 on the date of death and is entitled to an immediate pension, and there is a surviving spouse and a valid spousal waiver has not been filed, an immediate pension is payable to the spouse which is actuarially equivalent to the commuted value which the member would have been entitled to in respect of the member's pensionable service had the member terminated employment immediately before the date of death, and payable as if the member had chosen the joint life and last survivor option.

Vesting, Termination Benefits and Portability

The new PBSA introduction of immediate vesting means that upon joining the plan the member’s benefit is locked-in and must be used to provide a lifetime benefit. An active member who terminates on or after September 30, 2015, will be immediately vested regardless of the amount of service accrued.

Under sections 42 and 46, a member who terminates employment on or after September 30, 2015 is eligible to receive one of the following:

a) if the member has reached age 55, a deferred unreduced or reduced pension calculated (see above "Eligibility conditions for pension" section), or;
b) if the member has not reached age 55, a commuted value under section 46, subject to the commuted value being payable on a locked-in basis.

Under certain limited conditions (small pensions, or small commuted values) the *PBSA* permits the election of a lump-sum payout, regardless of age, and on a non-locked-in basis (section 48).

An inactive member who terminated employment before September 30, 2015, is entitled to receive that retirement benefit or commuted value calculated in accordance with the rules in force at the date of termination of employment.

Section 100 provides that if an inactive member, whose employment terminated on or after January 1, 1983, is entitled to and applies to receive a deferred pension, their highest average salary is to be increased in each year from the first of the month following the month in which termination of employment occurred to the end of the month immediately preceding the month in which the pension benefit is to be granted, and is based on the percentage increase granted to retirement benefits each January 1 (under section 73) and prorated for the number of complete months.

Section 75(3)(i) provides that the cost of the deferred indexing described above is funded from the IAA.

The plan has in place transfer agreements with other public sector pension plans in Canada, including the four main BC public sector pension plans. Under these agreements members may elect to transfer their service from one plan to another. Transfers under the agreement take into account the benefits under the transferring plans and pro-rate service if the importing plan's reserve requirements are higher than those available from the exporting plan. Members may pay for any shortfall, subject to CRA approval, within certain deadlines.

Cost of Living Benefits (Indexing)

Section 73 sets out how cost of living benefits are to be administered. The Plan provides for increases to retired members on January 1 of each year, with the benefits funded from the IAA. The benefit is based on the total amount of pension being received, including previous indexing increases, less any portion of the pension that is a result of voluntary contributions (which are no longer permitted). The maximum increase is equal to the percentage increase in the CPI over the 12 months ending on September 30 of the previous year.

Section 73 sets out additional requirements with regards to the indexing benefit, including:

a) the same uniform percentage increase will be granted in respect of all pensions eligible for adjustment;
b) the increase is prorated if the pension has not been in payment for at least 12 months;
c) the total capitalized value of all indexing benefits granted on January 1 must not exceed the amount in the IAA on the preceding September 30; and
d) the capitalized value of all indexing benefits granted annually is transferred from the IAA to the Basic Account.

Plan Termination

Section 103 states for purposes of testing the *PBSA* solvency rules, benefits are to be calculated as follows:

a) all active members are deemed to be terminated and 100% vested;
b) benefits are calculated only on the basis of earnings and service frozen at the valuation date;
c) future indexing is ignored, both before and after retirement; and
d) the liability for future indexing is limited to assets in the IAA.

In the event the Plan is terminated, priorities are set out for any surplus that might emerge: wage and CPI indexing are first restored before any residual surplus is considered.

Pension Fund

Section 75 provides that the pension fund is divided into the following three accounts:

a) the Basic Account consisting of all the assets in the fund other than assets in the IAA and the Supplemental Benefits Account;
b) the IAA consisting of:
    1) the 1% active members' contributions made under section 5(1)(c),
    2) the 1% board contributions under section 6,
    3) net investment income earned on the account,
    4) income, as specified by the plan administrative agent, that

i. is earned on other pension fund assets held in the Basic Account in respect of indexable benefits being paid, and

ii. is in excess of the investment rate of return assumed by the actuary in the most recent actuarial valuation of this plan, and

5) where the most recent actuarial valuation discloses a actuarial excess in the Basic Account, such amount as the board determines be transferred from such actuarial excess,

less

6) amounts transferred to the Basic Account under sections 73 and 88,

7) contributions made under section 5(1)(c) refunded to members who terminated employment before September 30, 2015 without vesting in accordance with the terms of the plan in effect on the date the member terminated employment,

8) amounts determined by the plan administrative agent in respect of the portion of any commuted value, actuarial reserve value or other form of lump sum transferred out of the pension fund that is attributable to the cost of living adjustment,

9) amounts transferred to the Basic Account that are equal to the capitalized value of the increase in a member's retirement benefit resulting from any increase in the member's highest average salary under section 100, and

10) amounts, specified by the board, contributed to the supplemental benefits account.

c) the Supplemental Benefits Account consisting of:

1) contributions to the pension fund provided for in section 86,

2) amounts from contributions under section 6 specified by the plan administrative agent as necessary to cover any annual shortfall between current assets in the account and the cost of providing benefits under section 87 and the cost of providing cost of living benefits under section 88,

3) amounts otherwise contributed under section 6 which are specified by the plan administrative agent to be required to pay for the cost of administering the account, including the costs to administer any benefits under Part 11, and

4) other amounts that may be specified by the board,

less

5) amounts paid in respect of benefits under section 87,

6) amounts paid in respect of cost of living benefits under section 88, and

7) amounts determined by the plan administrative agent as the cost of administering the account, including the costs to administer any benefits under Part 11.

Income Tax Act Limits

The *ITA* imposes certain limits on the contributions that may be made to, and the benefits that may be paid from, a registered pension plan. However, in total, the contribution requirements from, and the benefit promises to, plan members have not been altered under the WorkSafeBC Pension Plan.

To this end, a Supplemental Benefits Account was created to cover the financing and payment of benefits in excess of those registrable under the *ITA*. The excess benefits are paid on a current cash basis, by allocating from the regular employer contributions, the amounts necessary to maintain the Supplemental Benefit Account at a zero balance. Effectively, from a plan member's perspective, it is expected that these procedures will be invisible - the employee contribution and benefit obligations remain unchanged. In completing this valuation, we have calculated the liabilities and costs on two bases, once recognizing the *ITA* limits and again ignoring those limits. In the plan summary herein, and elsewhere in this valuation report, our references to contributions/benefits to/from the Basic Account/IAA are inclusive of the allocations to/from the Supplemental Benefit Account; in general, the allocations to/from the Supplemental Benefit Account have not been referenced.

We have also completed supplementary valuations recognizing income tax limits on pensions. Section 49 of the plan rules states benefits payable for service accrued after 1991 are limited to pension benefits in accordance with the maximum lifetime retirement benefits under the Income Tax Regulations. The maximum annual pension currently permitted in 2017 (before application of any early retirement reductions, where applicable) is the lesser of:

a) $2,914.44 multiplied by the years of service; and
b) 2% multiplied by the years of service further multiplied by the average of the best 3 years of remuneration paid to the member.

The plan also imposes a 35-year cap on accruals at the above maximum rate.

Plan Termination

Section 103 states for purposes of the plan-termination assumptions needed in calculating the ongoing *PBSA* minimum funding requirements:

a) all active members are deemed to have terminated employment at the date of such plan termination,
b) benefits shall be calculated only on service and salaries credited up to the termination date and there shall be no projection of salary increases beyond such date,
c) in the calculation of the plan’s liabilities in respect of benefits to be provided from the Basic Account, the future indexing of benefits shall be ignored, both before and after retirement, and
d) the liability for such future indexing shall be limited to the assets in the IAA.

Pension Committee

Section 112 prescribes the creation of the Pension Committee. The Pension Committee Terms of Reference provides for WorkSafeBC to appoint three Pension Committee members, comprising:

a) one member who represents WorkSafeBC;
b) one member who represents the employees; and
c) one member nominated jointly by the two members referred to in (a) and (b).

Other Items

a) Section 6(4) provides that expenses incurred in the administration shall be paid from the fund.
b) Section 13 states a maximum of 5 years taken to raise a child may be recognized in establishing eligibility for a pension provided the employee has a record of pensionable service immediately before and after the child-rearing period(s).
c) Section 57 enables WorkSafeBC to request the board to adopt a Special Retirement Incentive Plan (SRIP), whereby the age and service conditions, or the early retirement percentage reductions, or both, may be adjusted. Where the board agrees, they must also determine the employees eligible for the SRIP, the period it remains open, the conditions applicable to the incentives, the additional costs to WorkSafeBC, and the timing of these payments to fund the SRIP.

Appendix B Membership Information

Data as of March 31, 2017 were prepared by the Pension Corporation for 2,889 active employees, 2 inactive employees on leave of absence, 256 employees currently receiving long-term disability benefits, 408 former employees entitled to deferred pensions, 91 other inactive employees, 7 non-retired individuals with very limited data, 1,719 former employees in receipt of pensions and 168 beneficiaries in receipt of pensions as a result of the deaths of Plan members (a total of 1,887 pensioners). The Pension Corporation advised us that the data supplied are generally proper, complete and in accordance with specifications, unless otherwise noted.

Where possible, we compared totals with corresponding details in the Plan's Annual Report. We also subjected the data to a number of tests of reasonableness and consistency, including the following:

- A member's (and partner's as applicable) age is within a reasonable range;
- A member's gender or date of birth did not change;
- A member joined the Plan or commenced pension at a reasonable age;
- Accrued service increased by a reasonable amount (e.g. no more than 36 months since the last valuation);
- The salary level and the salary increase from the previous valuation was within a reasonable range;
- Pensions in pay increased by a reasonable amount (e.g. in line with the indexation since the last valuation); and
- We examined the additions to and deletions from each of the data files (i.e. the files for active employees, pensioners and terminated members) since the previous valuation to determine whether all Plan members were accounted for in this valuation, to check for duplicate records and to confirm pension amounts.

There were a number of discrepancies recorded during our examination of the data and we sought clarification of these from the Pension Corporation. Where necessary, we modified the data, our assumptions, or both, to compensate for these discrepancies, as summarized below.

Data Adjustments

The active member data included 82 persons who had no salary or service reported for the year ending March 31, 2017, or with a last-contribution-date prior to March 2017. We excluded them from the active member base, and have included them with the inactive data.

We treated the 2 inactive employees on leave of absence as if they were active employees at the valuation date.

The information supplied with respect to 36 of the 408 former employees entitled to deferred pensions was incomplete. We held liabilities for them equal to twice their contributions plus interest. Of the 91 other inactive employees, the bulk of them had less than 2 years of service at termination. For these 91 other inactive and the 7 non-retired individuals with very limited data, we also held a liability equal to twice their contributions plus interest.

Of the total pensioner data, there were 3 members excluded from the valuation because they died prior to the valuation date with no outstanding guaranteed pensions due, or they were in receipt of a remaining guarantee only which rounded to zero months remaining and hence their liability is zero.

The data from the Pension Corporation, and our treatment of this data, are summarised below:

Treatment of Member Data in Valuation

Category of Membership From Pension Corporation	Pension Corporation Membership Count	Treatment in Valuation					
		Active Members	LTD	Deferred Vested	Refund 2 x CWI[1]	Pensioners with zero liability	Pensioners
Active Members	2,889	2,807			82		
Leave of Absence	2	2					
Long Term Disability	256		256				
Terminated Vested	408			372	36		
Inactive Members	91				91		
Limited Data	7				7		
Pensioners	1,887					3	1,884
Total membership	**5,540**	**2,809**	**256**	**372**	**216**	**3**	**1,884**

[1] Contributions with interest.

Data Reconciliation

A reconciliation of the data received and membership movements between March 31, 2014 and March 31, 2017 is included below:

Summary of Changes in Membership – March 31, 2014 to March 31, 2017

	Active	LOA	LTD	Deferred Vested	Inactive	Limited Data	Pensioners and Beneficiaries	Total
Data Received March 31, 2014	**2,798**	**4**	**249**	**377**	**102**	**9**	**1,559**	**5,098**
Additions:								
- new members	533		11	35	3		13	
Changes:								
- vested terminations	(60)	2	(1)	56	1	2		
- retirements	(288)		(48)	(37)		(1)	374	
- deaths with beneficiary	(7)		(1)				8	
- disablement	(71)	(1)	74	(1)		(1)		
- pension split								
- returned to active	29	(2)	(21)	(2)	(2)	(2)		
Deletions:								
- terminations with CV	(35)	(1)	(2)	(20)	(13)			
- terminations – refund	(5)		(1)					
- deaths with CV	(1)		(3)					
- deaths, no benefit due							(67)	
- guarantee expired								
- reciprocal transfer out	(4)		(1)					
Data Received March 31, 2017	**2,889**	**2**	**256**	**408**	**91**	**7**	**1,887**	**5,540**

Data Summaries

Details regarding the data used in the valuation are set out below.

The data for the 2,809 actives are summarized below:

Active Employee Data – March 31, 2017

Age[1]	Males			Females		
	Number	Average Service (years)	Average Salary[2]	Number	Average Service (years)	Average Salary[3]
Under 25	3	1.0	$41,345	18	1.5	$46,662
25 - 29	36	2.5	58,001	80	2.2	52,322
30 – 34	91	4.1	72,329	153	4.0	68,301
35 – 39	127	5.8	75,599	146	5.9	73,922
40 – 44	138	8.1	84,752	226	10.2	77,900
45 – 49	175	11.8	95,419	303	14.3	83,029
50 – 54	200	16.4	98,592	318	17.1	85,623
55 – 59	199	18.4	100,671	260	18.7	80,829
60 – 64	108	16.8	103,464	150	17.7	76,401
65 & over	31	23.8	100,602	47	18.4	78,054
Total	**1,108**	**12.6**	**$91,005**	**1,701**	**13.0**	**$77,839**

Summary Statistics Male and Female Combined	
Total Actives	2,809
Average Age	48.1
Average Service	12.8
Average Salary	$83,032

[1] Age nearest birthday at valuation date.

[2] Actual earnings for the 12 months ended March 31, 2017 for those employees employed all year and annualized for others.

A comparison of the March 31, 2017 active membership with the March 31, 2014 active membership is as follows:

Comparison of Active Employee Data[1] – March 31, 2017 vs March 31, 2014

	March 31, 2014	March 31, 2017	Change 2014 to 2017
Males			
- Number	1,044	1,108	+ 6.1%
- Proportion of total	38.2%	39.4%	+ 1.2%
- Average age	48.8	48.5	- 0.3 years
- Average service	13.2	12.6	- 0.6 years
- Average salary[2]	$90,484	$91,005	+ 0.6%
Females			
- Number	1,686	1,701	+ 0.9%
- Proportion of total	61.8%	60.6%	- 1.2%
- Average age	48.0	47.8	- 0.2 years
- Average service	12.8	13.0	+ 0.2 years
- Average salary[2]	$75,281	$77,839	+ 3.4%

The above comparison indicates a 2.9% increase in the covered membership during the 3 year inter-valuation period. The proportion of males to females has increased slightly. The average ages have decreased slightly, by 0.3 years for males and 0.2 years for females. The average service has also decreased by 0.6 years for males but increased by 0.2 years for females.

The percentage increase in the average salary is higher for females (3.4% increase) than males (0.6% increase). These increases compare with an expected average salary increase, prior to allowance for seniority increases, of about 9.3% (3 years compounded at 3.0% per year) based on the previous valuation assumptions, producing a liability gain during the inter-valuation period (as shown in the gain and loss analysis in Appendix E).

[1] Including members on a leave of absence who are treated as active for the valuation.

[2] Average salary in the 12 months ending on the valuation date.

The data for the 256 employees receiving long-term disability benefits are summarized below.

Members on Long-Term Disability – March 31, 2017

	Number	Average age	Average service	Average salary
Males	45	55.4	18.8	$81,145
Females	211	52.6	18.0	70,358
Total	**256**	**53.1**	**18.1**	**$72,255**

Summary of Active Employees and Members on Long-Term Disability – March 31, 2017

	Number	Average age	Average service	Average salary	Expected Average Remaining Service Lifetime
Actives & LTD	**3,065**	**48.5**	**13.3**	**$82,132**	**9.0**

The data for the 372 deferred vested members are summarized below.

Deferred Vested Member Data – March 31, 2017

	Number	Average age	Average initial annual pension[1]	Average annual offset at age 65	Employee regular contributions with interest
Males	121	50.3	$12,836	$2,434	$4,931,387
Females	251	48.3	8,258	1,991	6,981,721
Total	**372**	**49.0**	**$9,747**	**2,135**	**$11,913,108**

The data for the 216 other inactive members is summarized below.

Other Inactive Member Data – March 31, 2017

	Number	Employee regular contributions with interest
Other inactives	180	$2,220,800
Incomplete Data	36	$115,642
Total	**216**	**$2,336,442**

We held a liability for the 180 other inactive members and the 36 deferred vested members with incomplete date equal to twice the employee regular contributions with interest balance.

[1] These pensions are calculated based on salaries at date of termination and assumed to commence at the first age at which the employee is entitled to an unreduced pension, i.e. at various ages between 60 and 65.

The information with respect to those in receipt of pension benefits as at March 31, 2017 is as follows:

Pensions in Payment to Former Employees – March 31, 2017

Age Group[1]	Number of Pensioners[2]	Annual Pensions ($,000's)[3]				
		Single Life	Joint Life & Survivor	Single Life with Guarantee	Joint with Guarantee	Temporary Life
Males						
Under 59	48	-	636	402	154	471
60 - 64	116	174	1,972	735	874	1,199
65 - 69	211	870	3,456	855	1,449	1
70 - 74	165	1,141	2,492	635	880	-
75 - 79	94	992	1,444	51	35	-
80 - 84	50	572	486	-	-	-
85 - 89	37	424	485	-	-	-
90 & over	20	224	102	-	-	-
Total Males	**741**	**4,397**	**11,073**	**2,678**	**3,392**	**1,671**
Females						
Under 59	78	27	641	820	431	827
60 - 64	258	696	1,829	2,337	1,704	2,657
65 - 69	307	2,227	1,495	1,866	1,088	-
70 - 74	166	1,882	702	536	125	-
75 - 79	83	941	211	121	-	-
80 - 84	48	414	108	-	-	-
85 - 89	22	325	6	-	-	-
90 & over	15	229	-	-	-	-
Total Females	**977**	**6,741**	**4,992**	**5,680**	**3,348**	**3,484**
Basic Total	**1,718**	**11,138**	**16,065**	**8,358**	**6,740**	**5,155**
Supplemental Pensions included		**25**	**322**	**53**	**245**	**0**

The average age of the pensioners was 69.7 as of March 31, 2017.

[1] Age nearest birthday at March 31, 2017.

[2] These figures include only those who were formerly contributors to the Plan.

[3] Including indexing supplements granted through January 1, 2017.

Pensions in Payment to Beneficiaries – March 31, 2017

Age Group[1]	**Number of Beneficiaries**[2]	**Annual Pensions ($,000's)**[3]	
		Single Life	**Single Life with Guarantee**
Males			
Under 65	11	192	33
65 - 69	9	110	24
70 - 79	10	199	-
80 & over	5	36	-
Total Males	**35**	**537**	**57**
Females			
Under 65	11	168	112
65 - 69	12	296	-
70 - 74	20	531	-
75 - 79	14	275	-
80 - 84	12	202	-
85 - 89	30	505	-
90 & over	30	563	-
Total Females	**129**	**2,540**	**112**
Remaining guarantees	**2**	**-**	**40**
Basic Total	**166**	**3,077**	**209**
Supplemental Pensions included above	**-**	**13**	**-**

The average age of the 164 beneficiaries in receipt of lifetime pensions was 78.2 as of March 31, 2017.

[1] Age nearest birthday at March 31, 2017.

[2] These figures include spouses (or estates) currently receiving benefits where the former contributor is deceased.

[3] Including indexing supplements granted through January 1, 2017.

Appendix C Operation of the Fund

The Fund's financial statements are prepared by the Pension Corporation and based on the market or fair values of assets. The day-to-day investment of the Fund is carried out by the British Columbia Investment Management Corporation. We have relied upon the audited financial statements of the fund for purposes of our valuation.

The change in the Basic Account during the last three years plan years to March 31 is shown below.

Year by Year Change in Basic Account Fund Balance from March 31, 2014 to March 31, 2017

		Basic Account ($,000's)			
		2015	**2016**	**2017**	**Total**
Opening Fund balance		**1,344,588**	**1,517,971**	**1,499,850**	**1,344,588**
Plus:	Contributions – employees	13,639	14,317	13,774	41,730
	Contributions – employer	20,307	19,498	13,171	52,976
	Transfers from other plans	1,317	1,404	974	3,695
	Investment income	188,749	1,025	175,137	364,911
Less:	Pensions paid	(40,479)	(43,794)	(47,694)	(131,967)
	Termination & death benefits	(2,490)	(1,803)	(2,251)	(6,544)
	Administration expenses	(922)	(907)	(1,054)	(2,883)
	Investment expenses	(2,154)	(2,496)	(2,614)	(7,264)
	Transfers to other plans	(672)	(46)	(193)	(911)
Internal account transfers		(3,912)	(5,319)	(9,674)	(18,905)
Net increase		**173,383**	**(18,121)**	**139,576**	**294,838**
Closing Fund balance		**1,517,971**	**1,499,850**	**1,639,426**	**1,639,426**

The change in the fund balance by sub-account from March 31, 2014 to March 31, 2017 is shown below.

	($,000's)			
	Basic Account	**Inflation Adjustment Account**	**Supplemental Benefit Account**	**Total**
Fund balance March 31, 2014	**1,344,588**	**239,430**	**-**	**1,584,018**
Plus: Contributions – employees	41,729	6,999	83	48,811
Contributions – employer	52,976	6,955	1,535	61,466
Transfers from other plans	3,695	852	-	4,547
Investment income	364,911	74,468	-	439,379
Less: Pensions paid	(131,967)	-	(1,577)	(133,544)
Termination & death benefits	(6,544)	(4,374)	-	(10,918)
Administration expenses	(2,882)	-	(41)	(2,923)
Investment expenses	(7,264)	(1,367)	-	(8,631)
Transfers to other plans	(911)	(900)	-	(1,811)
Internal account transfers	(18,905)	18,905	-	0
Net increase	**294,838**	**101,538**	**-**	**396,376**
Fund balance March 31, 2017	**1,639,426**	**340,968**	**-**	**1,980,394**

The distribution of assets on March 31 for each of the last three years is summarized below. All figures are taken from the audited financial statements.

	March 31, 2015		March 31, 2016		March 31, 2017	
	Amount $,000's	% of total	Amount $,000's	% of total	Amount $,000's	% of total
Cash	5	-	8	-	4	-
Contributions receivable	57	-	3,481	0.2	3,496	0.2
Accounts payable and accrued expenses	(806)	-	(661)	-	(1,176)	(0.1)
Investments in process						
Due from sales	1,193	0.1	981	-	6,539	0.3
Payable for purchase	(6,316)	(0.4)	(4,233)	(0.2)	(1,111)	(0.1)
Derivatives	(1,617)	(0.1)	3,232	0.2	(976)	-
Investments (at market value)						
Short-term	126,632	7.0	112,499	6.3	36,256	1.8
Bonds	352,236	19.6	364,326	20.3	409,299	20.7
Mortgages	35,507	2.0	38,305	2.1	39,419	2.0
Canadian equities	185,092	10.3	184,345	10.3	222,789	11.2
US equities	242,090	13.4	232,267	12.9	264,954	13.4
International equities	450,320	25.0	417,238	23.3	451,415	22.8
Private placements	84,073	4.7	96,700	5.4	112,454	5.7
Real estate	241,575	13.4	229,097	12.8	247,386	12.5
Infrastructure and renewable resources	89,379	5.0	114,335	6.4	189,646	9.6
Fund Balance	**1,799,420**	**100.0**	**1,791,920**	**100.0**	**1,980,394**	**100.0**
Comprising: Basic Account	1,517,971		1,499,850		1,639,426	
Inflation Adjustment Account	281,449		292,070		340,968	
Supplemental Benefit Account	0		0		0	

Asset Allocation Policy

The plan's Statement of Investment Policies and Procedures (last amended April 1, 2016) sets out the following minimum, maximum and target allocations, effective April 1, 2017:

	Minimum Allocation (%)	Maximum Allocation (%)	Target Mix (%)
Short Term	0	10	2
Mortgages	0	10	5
Nominal Bonds	10	25	18
Real Return Bonds	0	10	5
Fixed Income Sub-total	**20**	**40**	**30**
Canadian Equities	6	19	11
Global Equities	15	35	24
Emerging Markets	2	15	6
Public Equity Sub-total	**25**	**55**	**41**
Real Estate	10	25	16
Real Estate Sub-total	**10**	**25**	**16**
Private Placements	0	12	6
Infrastructure and Renewable Resources ("IRR")	2	15	7
Private Placements and IRR Sub-total	**5**	**25**	**13**
Other	**0**	**5**	**0**

Fund Returns

The fund market values and the total fund returns during the last 10 years are set out below. Our yield calculations are determined assuming that cash flows occur at mid-year. The assumption of mid-year cash flows will distort the results if the weighted cash flows are too far from mid-year. The yields are based on the total net assets of the fund including both invested and non-invested assets (i.e. receivables and payable are included in the asset base to determine yields). The nature of our calculations is such that the results will likely differ somewhat from those produced by performance measurement services who apply more refined techniques. The yields are also shown on the smoothed asset value basis (described in Appendix D).

Historical Market Value Yields

	Market Values ($,000's)			Total Fund Yields on Market Value (%)
March 31	Basic Account	Inflation Adjustment Account	Total Fund	
2008	774,726	178,806	953,532	1.9
2009	694,504	153,457	847,961	(11.4)
2010	795,108	177,461	972,569	13.9
2011	1,023,479	193,998	1,217,477	9.3
2012	1,100,645	199,051	1,299,696	6.7
2013	1,198,633	215,175	1,413,808	8.7
2014	1,344,588	239,430	1,584,018	12.3
2015	1,517,971	281,449	1,799,420	14.0
2016	1,499,850	292,070	1,791,920	0.0
2017	1,639,426	340,968	1,980,394	11.7

Historical Smoothed Value Yields

	Smoothed Values ($,000's)			Total Fund Yields on Smoothed Value (%)
March 31	Basic Account	Inflation Adjustment Account	Total Fund	
2008	746,963	172,398	919,361	10.0
2009	782,849	172,978	955,827	3.6
2010	821,830	183,425	1,005,255	4.5
2011	1,023,795	194,058	1,217,853	6.0
2012	1,077,086	194,790	1,271,876	4.4
2013	1,131,678	203,156	1,334,834	4.9
2014	1,236,647	220,209	1,456,856	9.4
2015	1,366,174	253,304	1,619,478	11.6
2016	1,439,682	280,353	1,720,035	6.7
2017	1,538,077	319,890	1,857,967	9.3

Appendix D Actuarial Basis and Assumptions

Monies contributed to the Plan are deposited in a trust fund. There is not, of course, any guarantee that the assets of the fund will be sufficient at any particular time to meet the liabilities for plan benefits that have accrued up to then. The adequacy of the fund is examined at the time of each actuarial valuation, when the value of the assets on hand is compared with the value placed upon the plan's liabilities according to certain actuarial assumptions. Emerging experience, differing from the assumptions, will result in gains or losses which will be revealed in future valuations.

The going concern valuation assumes that the plan will continue to operate indefinitely, and is used to estimate the funded position of the Plan, and to determine the contributions currently required to be made to the Plan's fund, both to fund the cost of any benefits being earned by members for current service and, in the event there is a funding deficiency, to liquidate the amount of the funding deficiency.

The assumptions that underlie the calculation of the liabilities for the going concern valuation are unchanged from those used for the previous valuation with the exception of the following:

- the going concern economic assumptions have been updated in view of current long-term expectation of interest rates;
- the going concern mortality table has been changed to the Club Vita Canada’s 2016 VitaCurves; and
- the withdrawal, disability and retirement scale assumptions were updated.

A hypothetical wind-up/solvency valuation is intended to reflect the status of the Plan as if it had been wound up on the valuation date and the Plan members had been provided with the benefits specified by the Plan and the *PBSA*. The purpose of this valuation is to show the degree of benefit security provided for all of the Plan members' accrued benefit by the current assets of the pension fund. If the solvency valuation reveals that there is a "solvency deficiency" (as defined in the Regulations), then additional contributions, over and above the contributions required under the going concern valuation, must be made to the Plan (unless a Letter of Credit is secured, or another deficit funding arrangement is approved).

The hypothetical wind-up/solvency valuation reflects current transfer value assumptions and market annuity interest rates; these differ from those required at the time of the previous valuation.

The significant actuarial assumptions used for the going concern valuation are summarized below.

Investment Return	5.65% per annum (6.0% used in the previous valuation)
General ("across-the-board") Salary Increases	2.75% per annum (3.0% used in the previous valuation)
Seniority Salary Increases	Annual percentages varying by age and sex
Pension Indexing	Future indexing of pensions and deferred pensions ignored, as will be covered by Inflation Adjustment Account Future indexing (by inflation) of wage base for disability accruals assumed to be a charge to the Basic Account and to be 2.25% per annum (2.5% used in the previous valuation) Indexing to date is capitalized and forms part of pension liability
Asset Values	Assets carried at smoothed values
Actuarial Costing Method	Recommended contributions are based on an accrued benefit approach

More detail with respect the actuarial basis and assumptions is set out below.

Investment Return and General Salary Increase Rates

Our actuarial costing method involves projecting future benefit disbursements and investment income. In such projections, the most significant assumptions are those that are made for the future rates of return to be earned by the fund and the future general salary increases (which are across-the-board increases applying to employees regardless of service, rank or position).

(a) Relationship to excess investment return threshold

The investment return assumption is also significant for another reason. Since 1982, the provisions of the Plan relating to the indexing of pensions provide that the income to be credited to the Inflation Adjustment Account in respect of pensions being paid is determined by reference to the amount "in excess of the interest anticipated in the most recent actuarial valuation". An increase in the investment return assumption, and hence in the excess return threshold, would have at least two effects:

(i) it would reduce the amount of excess investment return allocated to the IAA, and hence reduce the potential for future indexing; and

(ii) it would reduce the cost of the basic non-indexed Plan, provided benefit levels are not changed.

A reduction in the investment return assumption would have the opposite effects. In this context, consistency in the assumptions, from one valuation to the next, takes on added significance.

The previous valuation used a long-term investment return assumption of 6% per annum. As noted earlier, this also becomes the threshold rate used to determine excess investment return transfers to the IAA during the post-retirement period; effectively, this is the same as saying that the Basic Account would earn no more than 6% per annum during the post-retirement period.

(b) Actual returns and asset mix

We have calculated market value returns on the total fund (i.e. Basic plus IAA), including non-invested assets (i.e. receivables, net of payables), net of investment-related expenses, and assuming that all cash flows occur at mid-year, as 14.0% for 2014/15,0.0% for 2015/16 and 11.7% for 2016/17. At March 31, 2017, approximately 53.3% of the total portfolio was invested in equities and private placements, a further 22.1% in real estate and infrastructure, and the balance of 24.6% in fixed income (including mortgages).

After examining the net average investment return earned by the fund's investments, the yield on investments made in recent years, the likely future trend of investment returns in general, the investment practices, and the provisions of this plan - e.g. the allocation of excess investment income to the Inflation Adjustment Account - we have, following discussions with WorkSafeBC and the Pension Committee , reduced our long-term investment return assumption from 6.0% to 5.65% per annum for the purposes of this valuation.

The discount rate was determined using Eckler’s 2017 funding discount rate model. Our model determined expected long term capital market returns, standard deviations and correlations for each major asset class (universe bonds, Canadian equities, global equities, etc.) by using historic returns, current yields and forecasts. We then stochastically generated projected asset class returns for 5,000 paths over 30 years to create expected returns for each asset class. The simulated going concern expected return was the return at the median of each asset class weighted by the Plan’s target asset mix.

Further adjustment is made to reflect the diversification and rebalancing effect (the discipline of rebalancing at intervals to the plan’s target asset mix provides a mechanism for “selling high and buying low” that is expected to enhance the fund’s return over the long term).

For the purposes of establishing the discount rate used in this report, we have assumed that there will be no added-value returns from employing an active management strategy in excess of the associated additional investment management fees. The investment expense allowance of 0.25% provides for expected future investment management fees (both active and passive).

Based on these key economic expectations over the long term, adjusting for expenses, and taking into account a margin for adverse deviations, the going-concern discount rate assumption has been developed as follows:

	Discount rate
Expected return, before diversification and rebalancing effect	6.06%
Diversification and rebalancing effect	0.30%
Provision for investment related expenses	(0.25%)
Rounding	(0.01%)
Estimated net investment return before margin	**6.10%**
Margin for adverse deviation	(0.45%)
Discount return assumption	**5.65%**

(c) Real return and salary relationships – derive salary assumption

The 6% investment return assumption used in the 2014 valuation was viewed as consisting of a real return component of about 3.5% per annum plus a long-term underlying inflation assumption of about 2.5% per annum. We reduced the real return component to 3.4% for this valuation, which generates a long-term underlying inflation assumption of 2.25% per annum.

The general salary increase assumption used in the 2014 valuation was 3% per annum. This was viewed as consisting of the underlying inflation assumption of 2.5% per annum, plus a real salary increase component of 0.5% per annum. We continued with the same real salary increase component of 0.5% which, combined with the revised underlying inflation assumption of 2.25%, produces the general salary increase assumption of 2.75%.

(d) Implication of assumption interrelationships

During the **post-retirement period**, the investment return is critical, as this is the discount rate for the Basic Account post-retirement liabilities. It also sets the excess investment return threshold that effectively puts a ceiling on the amounts the Basic Account can earn on the portion of the assets that support post-retirement liabilities. For example, if the investment return assumption is 5.65%, then the excess investment return threshold is 5.65%, and if the actual long-term returns exceed 5.65% on average, all of the excess will be transferred to the IAA, i.e. the Basic Account will only retain 5.65% on those assets.

During the **pre-retirement period**, it is the relationship, i.e. the net difference, between the investment return and general salary increase assumptions that is the key, rather than their absolute levels - projected benefits increase each year by the salary assumption and are then discounted by the investment assumption. The net result is that the liabilities are effectively being discounted by the net difference between the two assumptions. For example, the long-term assumptions we have used in this valuation (i.e. 5.65% investment return, 2.75% salary, 2.25% underlying inflation) would produce results similar to those using assumptions of 6.0% investment return and 3.1% salary, with 2.6% underlying inflation; or 5.5% investment return and 2.6% salary, with 2.1% underlying inflation, etc. Thus, the underlying inflation assumption itself is not relevant.

(e) Summary of interrelationships

The 2017 and 2014 annual investment return and general salary increase assumptions, and their underlying economic interrelationships, are summarized below.

	2017 valuation	2014 valuation
1. Investment return = excess investment return threshold	5.65%	6.0%
2. Real return rate	3.40%	3.5%
3. Implied underlying inflation = 1 - 2	2.25%	2.5%
4. Real salary increase	0.50%	0.5%
5. General salary increase = 3 + 4	2.75%	3.0%

(f) Salary Data and Salary Growth Assumption

The salary data provided to us for this valuation were the actual earnings during 2016/17. Based on our understanding of the pattern of salary increases during this period, we used these salary amounts without further adjustment as being equal to the salary rates on the valuation date (this may understate very slightly the actual salary rates at the valuation date). Thereafter, the assumed rates of salary increase are applied continuously during each future year.

Because the assumed rate of salary increase is a long-term assumption, we did not adjust it to reflect any specific future salary increases that are agreed to in the near future. To the extent that the assumed salary increase differs from the actual increases during the coming valuation period, gains or losses will emerge at the next valuation.

(g) YMPE increase

We also assumed that the YMPE under the Canada Pension Plan would increase at the general salary increase rate of 2.75% per year from its 2017 level of $55,300. In the previous valuation we assumed that the YMPE would increase at the rate of 3% per year from its 2014 level of $52,500.

Pension Indexing – Valuation of Basic Account

Indexing supplements on and after January 1, 1984 are on an annual basis and are limited to those amounts that can be appropriately financed by the balances available in the Inflation Adjustment Account. Thus we do not need to allow for future indexing in our calculations, as the costs of this indexing are currently fixed at 1% of salaries to be paid by each of the employees and WorkSafeBC. With respect to indexed supplements granted through January 1, 2017, the present values have been included in the actuarial liabilities for pensions in the course of payment and thus form part of the determination of the recommended contribution.

With regard to the vested pensions of members who have terminated employment, the amounts of deferred pensions quoted to us include indexing during the deferred period to date. We understand that such transfers from the Inflation Adjustment Account do not occur until retirement (theoretically, such transfers should be made on an annual basis as the indexing occurs, so as to reduce the inter-generational transfer of the costs of such indexing). We have therefore adjusted the deferred pension amounts to remove this indexing so that the Basic Account liability is aligned with the allocation of assets between the Basic and IAA accounts.

The indexing of salaries before retirement in the case of employees on long-term disability is, on the other hand, a charge to the Basic Account rather than to the Inflation Adjustment Account. Accordingly, in valuing the deferred pensions for those members currently on long-term disability, we have made an allowance for this by applying an escalation assumption (at the full underlying inflation assumption) of 2.25% per annum during the deferral period to retirement.

Asset Values

The fund's audited financial statements record assets on a market value basis. As in previous valuations, we applied a smoothing technique for purposes of the previous actuarial valuation by adjusting the market values over a five year period. We believe a smoothing approach is appropriate as it would cushion the actuarial valuation results against the dramatic swings in market value that can occur.

To determine the smoothed value of assets, we first determine the actual return on the basis of market values during the year after allowing for the net contributions minus benefits and non-investment expenses. We then determine an assumed return for the year at a rate equal to the assumed underlying real interest rate plus the year-over-year change in the consumer price index. The difference between the two returns is then spread over a five year period, recognizing one-fifth of it in each of the current and four succeeding years. This approach effectively spreads the difference between (a) the total investment return (including both realized and unrealized capital changes) and (b) a hypothetical return based on a long-term real interest rate, over a five year period.

The application of this approach to the total fund yields the following results:

Total Fund Smoothing

	2013/14	2014/15	2015/16	2016/17
1. Mar-over-Mar increase in CPI	1.5%	1.2%	1.3%	1.6%
2. Base return = (1) + 3.5%	5.0%	4.7%	4.8%	5.1%
Year-end asset values - ($,000's)				
3. Market value	1,584,018	1,799,420	1,791,920	1,980,394
4. Smoothed value	1,456,856	1,619,478	1,720,035	1,857,967
5. Ratio of (4) ÷ (3)	92.0%	90.0%	96.0%	93.8%
Annual returns				
6. Market value	12.3%	14.0%	0.0%	11.7%
7. Smoothed value	9.4%	11.6%	6.7%	9.3%

Using the relationship between the market and adjusted values shown in line 5 above, and applying this relationship to the Basic Account and Inflation Adjustment Account balances, we get:

Basic Account ($,000's)	March 31, 2017
8. Market value	1,639,426
9. Smoothed value	1,538,077
10. Ratio of (9) ÷ (8)	93.8%
Inflation Adjustment Account ($,000's)	
11. Market value	340,968
12. Smoothed value	319,890
13. Ratio of (12) ÷ (11)	93.8%

The figures above indicate that the smoothed asset value is 6.2% lower than the market value as at March 31, 2017. This is a slight decrease in smoothing cushion relative to the last valuation, when the smoothed asset value was 8.0% lower than the market value. The small decrease occurred because the cumulative market value returns in the 3 years prior to the last valuation were slightly higher than the cumulative market value returns during the 3-year inter-valuation period. The financial position of the plan has improved significantly due to the performance of the assets on both a market value basis and a smoothed value basis.

Mortality

A key demographic assumption is the longevity of the plan members. For this valuation, Club Vita Canada’s 2016 VitaCurves were used, with generational projection using the CPM-B improvement scale. VitaCurves are baseline mortality rates that vary by member based on their individual longevity characteristics and have been developed using a generalized linear modelling framework. The 2016 VitaCurves have been calibrated based on Club Vita Canada’s longevity dataset for the years 2012 to 2014 and thus an appropriate base year is 2013. Improvements in baseline mortality from 2013 to the calendar year of determination are projected based on each member's year of birth.

Club Vita Canada's longevity dataset is composed of a subset of Canadian registered pension plans across Canada, and includes plans covering a range of industries in both the private and public sector. Club Vita Canada's 2016 VitaCurves have been developed based on longevity experience consisting of 1.4 million exposure years and 38 thousand deaths over 2012 to 2014, and vary by the following longevity factors:

- Gender;
- Pensioner type – pensioner or surviving spouse;
- Disability status at retirement for pensioners – disabled or non-disabled pensioner;
- Postal code-based lifestyle/longevity group – five groups for each of males and females;
- Affluence as measured by pension amount or earnings – there are three pension bands for males and females, while there are four earnings bands for males and three for females; and
- Occupation type – currently or formerly employed in a blue or white collar occupation.

Given that the availability of longevity factors varies by plan, and also by members within a plan, the 2016 VitaCurves are calibrated based on different combinations of the factors outlined above, resulting in just over 300 baseline mortality tables. The best VitaCurve is assigned to each individual member based on the longevity factors available for that member.

An aggregate ill health VitaCurve is assigned for all current active disabled members, for pensioners who retired on account of disability, and after incidence of disability for those assumed to become disabled in the future.

For deferred vested pensions, mortality was ignored during the deferral period before retirement. The same assumption was used in the previous valuation.

In the previous valuation, the incidence of mortality both prior to and after retirement (other than employees retired on account of disability) was assumed to be in accordance with 100% for males and 95% for females of the rates in 2014 Public Sector Mortality Table (CPM2014Publ), projected using CPM Improvement Scale B (CPM-B). For employees retired on account of disability we assumed 75% for males and females of the mortality rates (applicable in 2012) for similar retirees used for the valuation of the Pension Plan for the Public Service of Canada as at March 31, 2011.

The change in mortality rates was made to better reflect the member specific mortality expected for Plan members and to allow for the increased longevity of members.

Withdrawal

We examined the rates of withdrawal for reasons other than death, retirement or disability over the period April 1, 2014 to March 31, 2017 and compared this with the experience observed and the rates used for previous valuations. We made modest changes to the withdrawal rates used for the previous valuation, by adopting the following multiples of those rates:

Multiples Applied to 2014 Withdrawal Rates

	In the first 3 years of service			After 3 years of service
	1st year	2nd year	3rd year	
Males	110%	100%	100%	105%
Females	110%	100%	100%	105%

Sample withdrawal rates are shown in the following tables. The withdrawal rates applicable in the first 3 years of service include terminations from disability.

Withdrawal Rates Applicable in the First 3 Years of Service *(including terminations from disability)*

	2017 valuation			2014 valuation		
Age at entry	1st year	2nd year	3rd year	1st year	2nd year	3rd year
Males						
20	.177	.141	.136	.161	.141	.136
30	.091	.086	.089	.083	.086	.089
40	.084	.075	.062	.076	.075	.062
50	.067	.051	.055	.061	.051	.055
Females						
20	.112	.122	.147	.102	.122	.147
30	.106	.122	.127	.096	.122	.127
40	.074	.074	.053	.067	.074	.053
50	.059	.060	.049	.054	.060	.049

Withdrawal Rates Applicable After 3 Years of Service

	2017 valuation		2014 valuation	
Attained age	Males	Females	Males	Females
23	.134	.124	.128	.118
33	.047	.072	.045	.069
43	.023	.030	.022	.029
53	.014	.014	.013	.013

The withdrawal rates we have used do not extend past age 54. They are the same as those used for the March 31, 2017 valuation under the BC Public Service Pension Plan, as we believe that the withdrawal experience of this Plan is likely to be similar to the experience of the BC Public Service Pension Plan, and that it is reasonable for this Plan to use the same assumption.

Disability

The Plan provides for the continued accrual of pension benefits for employees receiving long-term disability benefits. We examined the experience of employees going on long-term disability and in some cases increased the rates used in the previous valuation. We have continued to value the disability cost for active employees as a deferred pension (indexed before retirement) with continued accrual of service, and we have continued to assume that the deferred pensions would commence at age 65.

Sample disability rates are shown in the following table. No direct allowance is made for the possibility of an individual recovering from disability prior to retirement – the rates used have been reduced from the observed disability incidence to implicitly allow for such recoveries. The rates adopted are the same as those used for the March 31, 2017 actuarial valuation for the BC Public Service Pension Plan, as we believe that the disability experience of this Plan is likely to be similar to the experience of the BC Public Service Pension Plan, and that it is reasonable for this Plan to use the same assumption.

Sample Disability Rates

Age	2017 Valuation		2014 Valuation	
	Males	Females	Males	Females
25	.0003	.0001	.0003	.0001
35	.0004	.0011	.0004	.0011
45	.0023	.0037	.0023	.0036
55	.0075	.0100	.0073	.0098

The rates used for the 2017 valuation are 195% for males and 170% for females of the respective rates used for the valuation of the Pension Plan for the Public Service of Canada as at March 31, 2011. The previous valuation used 190% for males and 165% for females of the respective rates used for the valuation of the Pension Plan for the Public Service of Canada as at March 31, 2011.

Retirement

We examined the 2014-2017 retirement experience and compared this with the experience observed in our previous analyses of the retirement rates and with the rates used in the previous valuation. In general, the actual experience shows fewer retirements than were expected on the basis of the rates used in the previous valuation. We gave partial recognition to the observed experience by making modest adjustments at some ages to the rates previously used.

The rates used in this and the previous valuations, are as follows:

Rates of Retirement

Age	Service	2017 valuation		2014 valuation	
		Males	**Females**	**Males**	**Females**
For unreduced retirement pensions					
55 - 59	rule of 90	.40	.70	.45	.70
60	10	.26	.32	.26	.32
61	10	.18	.23	.18	.23
62	10	.16	.20	.18	.23
63	10	.21	.18	.21	.18
64	10	.23	.23	.26	.24
65	0	1.00	1.00	1.00	1.00
55 - 59	at least 10 years, but not rule-of-80	.06	.06	.06	.06
55 - 59	rule-of-80	.10	.10	.10	.12

Even though pensions (unreduced and reduced) are available with less than 10 years of service, we have continued to apply the retirement rates before age 65 only to those with 10 or more years of service, on the assumption that those with fewer than 10 years would not retire until the age 65.

Seniority Salary Scales

Seniority salary increases are in addition to the general salary increases and are intended to reflect increasing seniority, recognition of merit and promotion. We examined the seniority salary scales based both on the earnings history of the active members during the 3 year period ended March 31, 2017 and on the graduated average salaries of the active members as of March 31, 2017, and compared these with the experience observed and rates used in the previous valuation. Based on these investigations we decided to continue with the previous salary scales.

The annual seniority increases are assumed to reduce with age. Sample seniority increase assumptions at key ages are shown below. The assumptions represent the assumed seniority increase in the next year.

Sample Seniority Salary Rate Increases

	2017 and 2014 valuations	
Age	**Males**	**Females**
25	.037	.029
35	.016	.015
45	.007	.009
55	.003	.004
65	.000	.000

Proportion of Eligible Terminating Employees Electing a Vested Pension

Following the introduction of the new PBSA effective September 30, 2015, which requires that a vested pension is payable for all service, we have valued all terminations as vested pensions. In the previous valuation, we valued all terminations with 2 or more years of service as vested pensions and assumed that those with less than 2 years of service would elect a refund of contributions with interest.

Proportions of Contributors Married at Death

Since the pre-retirement death benefit is 100% of the commuted value of the earned pension, the benefit does not differ by single vs. married status, and thus this assumption is not relevant.

Expenses

Administration expenses are paid out of the pension fund. These amounts (excluding investment-related expenses) totalled 0.42%, 0.39% and 0.46% of salaries for the 2014/15, 2015/16 and 2016/17 fiscal years respectively. Projected expenses provided by the Pension Corporation for the next few years indicate that estimated administration expenses will remain at a similar level as in the past three years. Accordingly, we continued to assume an expense provision at 0.45% of payroll, as was used in the previous valuation. This provision is added to the current service cost.

The investment management fees are excluded from our analysis above. They are reflected in the long-term investment return assumption.

Refunds

Since we have valued all active terminations as vested pensions, the interest assumed to be earned in the future on member contributions is irrelevant for this valuation. In the previous valuation, we assumed an interest assumption for accumulation and refunds of member contributions of 1.5% less than the valuation investment return assumption, i.e. at 4.5% per annum.

Recognition of Child-Rearing Periods for Pension Eligibility

We assumed this would only affect female members, and that, on average, it would increase the member's contributory service (which is used for determining pension eligibility) by 2 years; there would, of course, be no increase to the member's pensionable service (which is used for determining pension amounts). The impact of this would be to reduce the eligibility requirement for unreduced pensions between ages 55 and 59, from a rule-of-90 to a rule-of-88. We assumed that there would be no impact on the eligibility assumptions made for other benefits. The same assumption was made in the previous valuation.

Voluntary Contributions

As in the 2014 valuation, this is not a material figure, and we have ignored it in the valuation balance sheet.

Maximum Pension Rule

The tax-registered provisions of the pension plan limit the amount of pension as required by the *ITA*, in respect of service after 1991. The maximum annual pension currently permitted is the lesser of:

(i) $2,914.44 in 2017 multiplied by the years of service (adjusted as described below); and

(ii) 2% multiplied by the years of service further multiplied by the average of the best 3 years of remuneration paid to the member.

While the Plan applies the *ITA* limits only in respect of service after 1991, we have, for ease of calculation, assumed that this limit applies on all service; this assumption does not affect the current service costs, but the accrued liabilities will be slightly understated. The Plan also imposes a 35 year cap on accruals at the above maximum rate, which we have applied.

For an individual in this Plan to be currently affected by the $2,914.44 maximum, the final average salary must be very high; while current salaries are not such as to cause many problems, the salaries projected in the future through application of the assumed salary increase rates outlined above are such that more individuals would be limited. However, under the income tax rules, the flat $2,914.44 limit is automatically indexed each year after 2017 in accordance with increases in the average wage (at the previous valuation the corresponding dollar limit was $2,770.00). Accordingly, we have applied a 2.75% per annum increase to the $2,914.44 limit after 2017 (a rate of 3.0% per annum increase was applied in the previous valuation).

While the provisions of the Plan limit the normal formula benefits to the *ITA* maxima, the excess benefits are paid under the Part 11 provisions via the Supplemental Benefit Account. Even though no assets are to be accumulated in this account, WorkSafeBC may still need to recognize a liability for these excess benefits in its financial statements for the Accident Fund. Accordingly, we have also calculated the liabilities and costs ignoring the *ITA* limits.

It should also be noted that, in the tax-limited results, we valued the deferred vested pensions in full as provided to us, i.e. we were unable to carve out any "excess" portions. This will slightly overstate the accrued liabilities, but the impact should be minimal when combined with the slight understatement mentioned above resulting from applying the *ITA* limits on all service.

Treatment of Inflation Adjustment Account

Our valuation of the liabilities deals primarily with the basic non-indexed benefits covered under the Basic Account; the Inflation Adjustment Account is "ignored" on the basis that it is akin to a defined contribution or money-purchase account, used to provide indexing. Where there are sufficient monies in the IAA, full CPI indexing is provided; alternatively, if the monies in the IAA cannot provide full CPI indexing, then the amount of indexing is limited to the monies available. In either case, the mechanics are such that the capitalized value of the indexing granted is transferred from the IAA to Basic, each time indexing is granted.

For disclosure purposes in WorkSafeBC's financial statements for the Accident Fund, the Inflation Adjustment Account component is treated as if it is a defined contribution plan, with liabilities set equal to the assets, i.e. the Inflation assets are added to both the Basic assets and liabilities. The net effect of this is neutral on the actuarial excess (unfunded liability) calculated for the Basic Account. Consistent with the 2014 valuation, we included the Inflation Adjustment Account assets with offsetting liabilities exactly equal to these assets.

Testing of Income Tax Maximum Surplus and Contribution Limits

The foregoing assumptions deal with the regular liabilities under the Basic Account. For purposes of testing the Plan surplus and current service contribution requirements against the maximum permissible *ITA* limits, we also carried out a subsidiary valuation assuming the pensions are fully indexed to inflation. In this scenario, we made the following changes to the regular valuation:

- We combined the assets in the Basic and Inflation Adjustment Accounts, using a smoothed asset value of $1,857,967,000;
- We applied an indexing assumption equal to the full assumed underlying inflation rate, i.e. 2.25% per annum. This indexing rate was applied both to pensions after retirement and during the pre-retirement period in the case of deferred vested pensions and disability salary accruals. Indexing is applied annually, in arrears; and
- In determining the employer portion of the current service costs, we combined the employee contributions to the IAA with those to the Basic Account, i.e. we assumed a total employee contribution rate of 7% + 1% = 8% (reduced by 1.5% of salaries below the YMPE).

Actuarial Cost Method

We have continued with the approach used in the previous valuation, namely, the Accrued Benefit Actuarial Cost Method. Under this approach, the actuarial present value of benefits earned for service before the valuation date is compared with the assets on hand to determine the unfunded actuarial liability or actuarial excess, as the case may be.

With regard to current service costs, the actuarial present values for benefits to be earned for service after the valuation date are calculated only for the one year following the valuation date to determine the rate of contribution required to finance currently accruing benefits. This cost will rise as an individual ages and gets closer to retirement. For the group as a whole this step-rate increase in cost is mitigated by the addition of younger new entrants to the plan but, to the extent the group ages, costs can be expected to rise.

The intent of this method is to accumulate assets systematically to provide security for the benefits provided in respect of service that has already been rendered, without further recourse to any other assets; of course, such security is not guaranteed.

Hypothetical Wind-up / Solvency Valuation

Under the *PBSA*, certain certifications are required with respect to the hypothetical wind-up/solvency position of the Plan. These are needed for a variety of reasons, including: (a) to ensure minimum funding requirements are met, and (b) to determine whether transfers of commuted values in respect of terminating or deceased members can be made in full, immediately, as these may be restricted by the "solvency" position of the Plan.

For this purpose, liabilities must be determined on a "plan termination basis". The Standards of Practice – Practice Specific Standards for Pension Plans issued by the Canadian Institute of Actuaries require the actuary to postulate a scenario upon which a hypothetical wind-up valuation is based. For this purpose, when calculating the wind-up/solvency liabilities, we have assumed the plan has terminated due to the insolvency of the Plan sponsor (although we believe this scenario is very unlikely). Note that the liabilities would be the same even if a different termination scenario was used.

As with the prior valuation, we used the unit credit method. Under this method, the actuarial liabilities consist of the present value of pensions in payment and vested deferred benefits for terminated employees.

The Plan text indicates that for purposes of testing the *PBSA* solvency rules, benefits are to be calculated as follows:

- all active members are deemed to be terminated and 100% vested;
- benefits are calculated only on the basis of earnings and service frozen at the valuation date;
- future indexing should be ignored, both before and after retirement; and

- the Inflation Adjustment Account continues to be recognized on a defined-contribution basis with liabilities set equal to the assets, as for the going-concern valuation.

Accordingly, we have applied the following changes to the actuarial assumptions in determining the hypothetical wind-up/solvency status of the Plan as at March 31, 2017:

- all non-terminated members assumed to be terminated and 100% vested in their accrued pensions as at March 31, 2017;
- for those inactive and deferred vested members with incomplete data, we assumed their hypothetical wind-up/solvency liability to be equal to twice the employee regular contributions with interest balance;
- for all other active, disabled and deferred vested members, liabilities are determined as deferred vested pensions payable at age 55 if the member is now below age 55, or as an immediate pension if the member is now over age 55, subject to the regular 3% or 5% per year early retirement reductions below age 60, as applicable, based on actual average earnings over the last 5 years (or such shorter period of plan membership) and the 2016 YMPE of $54,900;
- interest: 2.3% per annum for 10 years, 3.9% per annum thereafter for actives, deferred vested and LTD members below age 55 (2.9%/4.4% was used at the previous valuation); for pensioners and other non-retired members aged 55 and over, we used a flat rate of 3.2% (based on a duration for these liabilities of 11.0 years) throughout as a proxy to immediate annuity purchase rates (a flat rate of 3.6% was used in 2014, based on a duration for these liabilities of 10.1 years);
- mortality: for all members, the 2014 Canadian Pensioners Mortality Table (CPM2014) combined with projection scale CPM Improvement Scale B (CPM-B) on a sex distinct basis (the 1994 Uninsured Pensioner Mortality Table projected generationally was used in the previous valuation); for non-retired members and former members, mortality is ignored before assumed pension commencement date; and
- wind-up expenses: $1,200,000 assumed; subtracted from the assets. The allowance has been developed as our expectation of best estimate allowance for expenses which would be expected for termination of the plan based on the Plan provisions and our experience with other similar plans, and an assumption that the plan wind-up will occur within 12 months following the valuation date. The same wind-up expense allowance of $1,200,000 was included at the previous valuation.
- as required, we used the market value of assets for the hypothetical wind-up/solvency valuation (the market value of assets was also used at the previous valuation).

Emerging Experience

It should be noted that emerging experience differing from the assumptions described above will result in gains or losses that will be revealed in future valuations.

Appendix E Going Concern Valuation Balance Sheet

The results of the valuation as of March 31, 2017 with respect to benefits accrued for service to the valuation date are set out below. The March 31, 2014 results are shown for comparison. The cost of benefits for future service subsequent to the valuation date is dealt with in Appendix F.

The Basic Account liabilities include the capitalized value of indexing supplements granted through January 1, 2017, but exclude future indexing to be granted after the valuation date; the Inflation Adjustment Account liabilities are set equal to the Inflation Adjustment Account assets.

Going Concern Valuation Balance Sheet

($,000's)	**March 31, 2017**	**March 31, 2014**
Assets (smoothed value)		
1. Basic Account	1,538,077	1,236,647
2. Inflation Adjustment Account	319,890	220,209
3. Total Assets	**1,857,967**	**1,456,856**
Liabilities		
4. Actuarial present values of Basic Account (non-indexed):		
(a) active employees	545,829	492,870
(b) disabled employees	56,949	54,047
(c) inactive employees (deferred pensions and refunds)	33,739	31,169
(d) pensions in payment	552,012	416,320
5. Basic Account sub-total	1,188,529	994,406
6. Inflation Adjustment Account	319,890	220,209
7. Total Liabilities	**1,508,419**	**1,214,615**
Actuarial excess (Unfunded Liability)		
8. Actuarial excess (unfunded liabilty) = 3 - 7	**349,548**	**242,241**
9. Going Concern Funded Ratio = 1 / 5	**129.4%**	**124.4%**
10. Accessible going concern excess = 8 – 5 x 0.05	**290,122**	**192,521**

If the market value of assets were to be substituted for the smoothed value, the actuarial excess would increase to $450,897,000.

Excess (Income Tax) Benefit Liabilities

The above liabilities and actuarial excess recognize the maximum Income Tax limits on benefits from the registered portion of the pension plan. If these limits are ignored (the excess benefits are currently provided through the Supplemental Benefit Account, which does not accumulate any assets), the liabilities would increase by $14,136,000 to $1,522,555,000 and the actuarial excess would reduce to $335,412,000.

Reconciliation with Previous Valuation

The previous valuation at March 31, 2014 indicated an actuarial actuarial excess of $242,241,000, compared to the actuarial excess of $349,548,000 for this valuation. The change in actuarial position can be traced in an approximate fashion (with all values adjusted for interest to March 31, 2017) as follows:

Change in Actuarial Position

		Approximate Effect on Actuarial excess ($,000's)
1. Actuarial excess at March 31, 2014		**242,241**
2. Interest @ 6% on item 1 for 3 years		46,272
3. Investment income (on smoothed values) greater than 6%		131,679
4. Actual salary and YMPE lower than previously assumed		32,121
5. Actual WorkSafeBC contributions lower than current service cost rate		(15,387)
6. Excess interest transferred to IAA		(41,822)
7. Assumption changes		
economic assumptions	(45,249)	
withdrawal/disability rates	660	(46,316)
mortality rates	(3,284)	
retirement rates	1,557	
8. Other factors including changes in plan membership and other differences between actuarial assumptions and actual experience during the inter-valuation period		760
9. Actuarial excess at March 31, 2017		**349,548**

The main sources of gain/loss were as follows:

- The smoothed rate of return over the inter-valuation period was about 9.2% per annum, compared to the 6% per annum going concern investment return assumption, generating a gain of $131.7 million (item 3).
- As discussed in Appendix B, actual cumulative salary increases over the inter-valuation period were lower than the valuation assumption. Combined with the lower YMPE increases, this generated a gain of $32.1 million (item 4).

- WorkSafeBC contributed to the Basic Account at a rate of 10.13% integrated to December 31, 2015 and 7.00% integrated from January 1, 2016. The employees contributed at a rate of 7% integrated during the inter-valuation period. The total contributions to the Basic Account were less than the current service cost indicated by the previous valuation, decreasing actuarial excess by about $15.4 million (item 5).
- The 5 year average market returns were higher than the 6% investment return assumption in each of the three years over the inter-valuation period, which triggered excess investment return transfers from the Basic Account to the IAA. The total amounts transferred were $39.6 million, which, allowing for interest decreased the actuarial excess by $41.8 million at March 31, 2017 (item 6).
- The assumption changes combined to decrease the actuarial excess by about $46.3 million (item 7). The bulk of this decrease arose from the reduction in the discount rate assumption. The move to the Club Vita Canada's 2016 VitaCurves for the mortality assumptions also slightly reduced the actuarial excess, partially offset by changes to the retirement, withdrawal and disability rate as a result of the recent history of gains on the previous assumptions.
- The remainder, an increase in actuarial excess of about $0.8 million, is due to changes in plan membership, other differences between actuarial assumptions and actual experience during the inter-valuation period and other miscellaneous experience gains and losses.

Thus, the major factors leading to the net increase in the actuarial excess may be summarized as investment income earned at a rate higher than the rate assumed in the previous valuation, partially offset by the valuation assumption changes.

Sensitivity Analysis

Below we show the going concern actuarial liability and the current service cost as at March 31, 2017 based on a one percentage point drop in the going concern discount rate assumption. All other assumptions were kept unchanged.

The liability increase per member group is as follows:

Impact on liabilities of 1% drop in discount rates	Going Concern 5.65% ($,000's)	Going Concern 4.65% ($,000's)	Increase ($,000's)
Active members	545,829	644,281	98,452
Disabled members	56,949	68,024	11,075
Deferred members	33,739	38,923	5,184
Pensioners and beneficiaries	552,012	604,751	52,739
Total increase in liabilities			**167,450**

The increase in the current service cost as percentage of salaries (integrated) is as follows (see Appendix F for more details on the current service cost):

Impact on current service cost rate of 1% drop in discount rates	Going Concern 5.65%	Going Concern 4.65%	Increase
Current service cost rate	18.51%	22.05%	3.54%

Appendix F Costs for Future Service

The contribution rate required to fund the Basic Account benefits attributable to service on and after April 1, 2017 is 18.51% of salaries (less 3.0% of salaries up to the YMPE). This rate is calculated using the accrued benefit method.

The total current service cost rate calculated in the previous valuation was 17.72% of salaries (integrated). The change from the 17.72% rate to the 18.51% rate indicated by this valuation can be traced as follows:

Change in Total Basic Account Current Service Rate

	Approximate Effect on Current Service Cost
1. 2014 integrated total Basic Account current service cost rate	**17.72%**
2. Changes in membership profile from 2014 to 2017	(0.10)
3. Assumption changes:	
- immediate vesting	0.01
- withdrawal/disability rates	(0.01)
- mortality rates	0.16
- retirement rates	(0.03)
- economic assumptions	0.76
4. 2017 integrated total Basic Account current service cost rate	**18.51%**

Assuming that employee contributions continue to be made at the rate of 7% of salaries (integrated), WorkSafeBC's portion would be is 11.51% (integrated).

The 18.51% integrated rate deals only with the combined employer and employee current service contribution rates for the Basic Account. Both WorkSafeBC and the employees are, in addition, required to pay 1% of salaries each to the IAA, for a total of 2%.

On the basis of the valuation data and assumptions, and assuming that the covered active membership remains constant, the projected payroll rate as at March 31, 2017 is $233,238,000. The current service costs calculated as at March 31, 2017, and based on that payroll, are as follows:

Current Service Cost

	Basic Account		IAA		Total
	Rate	**$ at March 31, 2017**	**Rate**	**$ at March 31, 2017**	**$**
Employees	7.0% integrated	14,024,000	1.0%	2,332,000	16,356,000
WorkSafeBC	11.51% integrated	24,543,000	1.0%	2,332,000	26,875,000
Total	**18.51% integrated**	**38,567,000**	**2.0%**	**4,664,000**	**43,231,000**

The foregoing amounts recognize the maximum Income Tax limits on benefits. If these limits are ignored, the 18.51% integrated total Basic Account current service cost would increase by 0.10%, to 18.61% integrated.

Appendix G Hypothetical Wind-up / Solvency Valuation

The results of the wind-up/solvency valuation as of March 31, 2017 on the basis of the solvency assumptions described in Appendix D are set out below. Comparative results for March 31, 2014 are also included.

Hypothetical Wind-up / Solvency Balance Sheet as at March 31, 2017

($,000's)	**March 31, 2017**	**March 31, 2014**
Basic Account Assets		
1. Basic Account Assets at Market Value	1,639,426	1,344,588
2. Wind-up expenses	(1,200)	(1,200)
3. Hypothetical Wind-up/Solvency Assets[1]	**1,638,226**	**1,343,388**
Basic Account Liabilities		
4. Actuarial present values of:		
(a) active employees	763,621	643,992
(b) disabled employees	85,772	76,290
(c) inactive employees (deferred pensions and refunds)	47,786	42,708
(d) pensions in payment	699,662	489,823
5. Hypothetical Wind-up/Solvency Liabilities	**1,596,841**	**1,252,813**
Surplus (Deficiency)		
6. Hypothetical Wind-up/Solvency surplus/(deficit) = 3 - 5	**41,385**	**90,575**
7. Solvency ratio = 3 / 5	**102.6%**	**107.2%**
8. Accessible solvency excess = (6 – 5 x 0.05), if greater than 0	**0**	**27,934**

On the basis of the solvency methods and assumptions described in Appendix D, in our opinion, the value of the plan assets would be greater than the actuarial liabilities if the plan were to be wound up on the valuation date. The surplus would have been $41,385,000, based on the market value of assets.

[1] The IAA assets and liabilities, which are equal to the assets, have not been included in the solvency balance sheet, because the indexing is not a guaranteed benefit. Including the IAA would not affect the solvency deficiency, but would increase the solvency ratio.

The breakdown of active and disabled members' solvency liabilities between those assume to take a commuted value on plan termination and those assumed to elect an annuity purchase is as follows:

Actuarial Liabilities ($,000's)	Actives	Disabled
Assumed to take an annuity	392,667	60,984
Assumed to take a commuted value	370,954	24,788
Total liabilities	**763,621**	**85,772**

Solvency Ratio and Transfer Deficiencies

The solvency ratio for the plan is 102.6%, which is greater than 100%. Under the *PBSA*, if a plan has a solvency deficiency (a "solvency ratio" less than 100%), there are limits on the amounts that may be transferred out of the Plan. Since the solvency ratio is greater than 100%, amounts transferred from the Plan may be paid in full.

Sensitivity Analysis

Below we show the impact on the solvency liabilities as at March 31, 2017 of a one percentage point drop in the discount rate assumption.

- interest for those assumed to take a commuted value – reduced from 2.3% per annum for 10 years and 3.9% per annum thereafter to 1.3% and 2.9% respectively;
- interest for those assumed to take an annuity – reduced from 3.2% per annum to 2.2% per annum.

All other assumptions were kept unchanged.

Impact on liabilities of 1% drop in discount rates	Solvency 2.3% for 10 years/3.9% thereafter and 3.2% ($,000's)	Solvency 1.3% for 10 years/2.9% thereafter and 2.2% ($,000's)	Increase ($,000's)
Active members	763,621	891,044	127,423
Disabled members	85,772	98,511	12,739
Deferred members	47,786	55,166	7,380
Pensioners and beneficiaries	699,662	780,156	80,494
Total increase in liabilities			**228,036**

Incremental Cost

In accordance with the Canadian Institute of Actuaries' Standard of Practice, we have estimated the incremental cost of the solvency liability as at March 31, 2017. This is the expected aggregate change in solvency liability between March 31, 2017 and the next valuation as of March 31, 2020.

The incremental cost as at March 31, 2017 of amounts funded from the Basic Account is $108,645,000. This amount makes no allowance for any pension increases that may be granted over the period. The incremental cost does not impact the funding requirements of the Plan under the *PBSA*, and is for information purposes only.

The expected current service cost contributions towards the Basic Account are $38,567,000 per annum, assuming contributions are increased to the current service cost rates. This is more than the incremental solvency cost over the 3 year period commencing on the valuation date. In other words, if the solvency experience is as expected we would expect a small improvement in the solvency position as of the next valuation date, assuming no other changes in solvency assumptions and that contributions are made at the current service cost rate.

Appendix H Required Contributions

Current Service Cost

Our calculations indicate that the benefits currently accruing will require total contributions to the Basic Account equal to 18.51% of salaries (integrated); based on the current plan rules, this would be allocated as 7% from employees and 11.51% from WorkSafeBC.

Using the projected pensionable payroll as at March 31, 2017 of $223,238,000, we have estimated that the 18.51% integrated rate will produce an annual contribution to the Basic Account of $38,567,000 for fiscal 2017/2018. This figure will vary, of course, depending upon the actual pensionable payrolls.

The following table sets out the estimated contributions, assuming that contributions are made at the current service cost:

Estimated Current Service Cost

		Basic	IAA
Current Service Cost %			
	Employees	7.0 integrated	1.0
	WorkSafeBC	11.51 integrated	1.0
Current Service Cost $			
	Employees	$14,024,000	$2,332,000
	WorkSafeBC	$24,543,000	$2,332,000
	Total	**$38,567,000**	**$4,664,000**

Minimum Contributions

As the Plan is in a surplus position at March 31, 2017 under both the going concern and the solvency valuations, WorkSafeBC may elect to contribute at lower rate, by applying some of the going concern actuarial excess towards its required contribution.

In such a case, the *PBSA* requires that a buffer is set aside equal to 5% of the Basic Account liability, or $59,426,000. The remaining $290,122,000 of accessible going concern excess may be used in part or full to reduce contributions. The maximum contribution reduction permitted by the *PBSA* is the amortization of the remaining actuarial excess over a 5 year period. This amounts to a maximum contribution reduction of 26.6%, which exceeds the current service cost. Hence, WorkSafeBC could elect to take a contribution holiday for 5 years from March 31, 2017 and could also elect to provide the members with a contribution holiday for the same period. All else being equal, this would be expected to reduce the going concern actuarial excess (on the Basic Account) to close to 105%.

Alternatively, WorkSafeBC could elect to retain the accessible going concern excess assets in the fund or use it in part to reduce contributions. Under the PBSA, the total contributions to the Basic Account can be any amount between nil and Basic Account current service cost of 18.51% of payroll, prior to allowance for the maximum as per the next section.

Written notice of any contribution reduction must be provided to the Superintendent and to the plan members.

Maximum Contributions

At WorkSafeBC's option, WorkSafeBC may choose to fund at a higher level than the current service cost stated above. Based on the Plan's surplus position, the maximum current contribution rate is the current service cost on an indexed basis. Including the IAA contributions, the total indexed current service cost is 23.23% (integrated). Assuming employee contributions remain at 8% (integrated; including IAA contributions), the maximum contribution WorkSafeBC can make is 15.23% (integrated).

More details are provided in Appendix I.

Appendix I Maximum Surplus and Contributions – ITA

Section 147.2(2) of the *ITA* limits employer contributions that may be made to a plan if surplus[1] exceeds a certain amount – the Plan becomes revocable if contributions are made when such surplus exists. This surplus threshold is equal to the lesser of (a) and (b), where

(a) = the (defined-benefit, i.e. Basic Account) actuarial surplus, and

(b) = 25% x the (defined-benefit, i.e. Basic Account) actuarial liability

Subsection (c) of Section 147.2(2) of the *ITA* also provides that the benefits taken into account for the purposes of a contribution recommendation “may include anticipated cost-of-living and similar adjustments where the terms of a pension plan do not require that those adjustments be made but it is reasonable to expect that they will be made”.

Indexing at full CPI has been provided since January 1, 1984 under the present plan terms, and for many years before that under earlier plan provisions. As discussed earlier, indexing is currently financed on a mixture of a pay-as-you-go basis (from a matching 1% employee/WorkSafeBC contribution for active members), an excess interest basis (interest in excess of the valuation assumption is transferred each year from Basic to IAA in respect of pensioner liabilities), and a “terminally-funded” basis (each year the full capitalized cost of any indexing granted is transferred from IAA to Basic). Thus, it may be considered appropriate for purposes of testing the *ITA* 147.2(2) limits to recognize, in advance, the future indexing of pensions for the present plan membership. Accordingly, we carried out a subsidiary, fully indexed valuation, with modifications to the regular assumptions as described in Appendix D. On this basis, the statement of actuarial position and the future costs shown earlier are revised as shown below (only the summary totals are shown):

[1] For the purpose of this test, the ITA terminology, including the word “surplus”, is used.

Statement of Actuarial Position ($,000's)	Regular Valuation	Fully-Indexed Valuation
Assets (smoothed value)		
1. Basic	1,538,077	n/a
2. IAA	319,890	n/a
3. Total Assets	**1,857,967**	**1,857,967**
Liabilities		
4. Basic sub-total	1,188,529	n/a
5. IAA	319,890	n/a
6. Total Liabilities	**1,508,419**	**1,507,906**
Surplus (Deficit)		
7. Surplus (Deficit) = 3 - 6	**349,548**	**350,061**
8a. Funded Ratio = 1 / 4	**129.4%**	
8b. Funded Ratio = 3 / 6		**123.2%**

The following table sets out the costs of future benefits:

	Regular Non-Indexed Current Service Cost		Indexed (Maximum Current Service Cost Contributions)
	Basic	**IAA**	**Basic and IAA Combined**
Future Cost Rates (%)			
Employees	7.0 integrated	1.0	8.0 integrated
WorkSafeBC	11.51 integrated	1.0	15.23 integrated
Total	**18.51 integrated**	**2.0**	**23.23 integrated**
Future Cost $			
Employees	$14,024,000	$2,332,000	$16,356,000
WorkSafeBC	$24,543,000	$2,332,000	$33,220,000
Total	**$38,567,000**	**$4,664,000**	**$49,576,000**

The foregoing results indicate that the $349,548,000 actuarial surplus in the regular valuation slightly increases to an actuarial surplus of $350,061,000 when the full value of indexing is recognized on an advance-funding basis. WorkSafeBC's required current service contributions also increase from 11.51% Basic (integrated with the YMPE) plus 1% IAA, to a combined requirement of 15.23% (integrated). On the indexed basis, the *ITA* 147.2(2) surplus limit works out to $350,061,000. Thus, the Plan does not have an excess *ITA* surplus, and WorkSafeBC contributions - total Basic plus IAA - may be made at a level not exceeding the current service cost rate (on the indexed basis), i.e. at 15.23% (in addition to the total Basic plus IAA employee contributions).