Report on the Actuarial Valuation of the Canadian Union of Public Employees Employees' Pension Plan as at January 1, 2018

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Prepared by:

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Report on the Actuarial Valuation of the Canadian Union of Public Employees Employees' Pension Plan as at January 1, 2018 (Registration Number 0231910)

Section 1. EXECUTIVE SUMMARY

We are pleased to present this report which was prepared at the request of the Joint Board of Trustees ("JBT") for the following purposes:

1. To report on the financial position of the Canadian Union of Public Employees Employees' Pension Plan ("Plan") as at January 1, 2018;

2. To establish the minimum and maximum contributions required for the period from January 1, 2018 until the results of the next valuation are available, for which the effective date must be no later than January 1, 2021; and

3. To provide the actuarial certifications required under the *Pension Benefits Act* (Ontario) and the federal *Income Tax Act*.

The intended users of this report are the JBT, the Canadian Union of Public Employees ("CUPE" or the "Employer"), the unions representing members of the Plan, the Financial Services Commission of Ontario and Canada Revenue Agency. This report is not intended or necessarily suitable for purposes other than those listed above. Any party reviewing this report for other purposes should have their own actuary or other qualified professional assist in their review to ensure that the party understands the assumptions, results and uncertainties inherent in our estimates.

CHANGES SINCE PREVIOUS VALUATION

Ontario Regulation 250/18 was filed on April 20, 2018 and new funding rules applicable to defined benefit (DB) pension plans became effective on May 1, 2018. These rules apply to actuarial valuations filed with a valuation date on or after December 31, 2017 and filed with the regulators after April 30, 2018. Specific content regarding the changes to the funding rules must be included in the first annual or biennial statements sent to active, former and retired members after the filing of the first valuation report dated on or after December 31, 2017 under these rules.

The last valuation of the Plan filed with government authorities was as at January 1, 2017.

Since the last valuation:

- changes have been made to the actuarial assumptions underlying the current going concern valuation, namely:
    1. change to the discount rate from 5.9% to 6.1% per annum;
    2. change to the price inflation from 2.25% to 2.00% per annum;
    3. change to the wage increase from 3.25% to 3.00% per annum; and
    4. change to the mortality improvement scale from CPM-B to newly published MI-2017.

  All other actuarial assumptions underlying the current going concern valuation remained unchanged;
- the solvency economic assumptions were updated to reflect market conditions and statutory requirements as at the valuation date.

All assumptions and methods are summarized in Appendices B and C.

RELIANCE

We have relied on the asset information as disclosed in the audited financial statements. We have also relied on the JBT to provide all relevant data and to confirm the pertinent Plan provisions.

At the time of preparing this report, the salary rate increase as at January 1, 2018 is still subject to negotiations between the Employer and unions, as part of the renewal of labour agreements. For purposes of this valuation, we have assumed an increase in salary rates as at January 1, 2018 of 3.00%. In addition, salary rates for some members (CSU, Unifor 2013, CDU, Elected, Excluded and certain members of CEU) were increased by 0.25% in order to reflect the wage increase effective April 1, 2018.

SUMMARY OF RESULTS

The following table summarizes the main results of the valuation as at January 1, 2018 and compares such results with those of the prior valuation as at January 1, 2017:

	January 1, 2018	January 1, 2017
Going Concern Financial Position (before PfAD)		
Going concern assets	$776,439,900	$719,375,400
Going concern liabilities	$598,770,700	$586,401,200
Going concern surplus/ (unfunded liability)	$177,669,200	$132,974,200
Funding ratio	129.7%	122.7%
Wind-up Financial Position		
Market value of assets net of provision for expenses	$794,268,000	$752,000,000
Wind-up liability	$854,313,000	$823,708,500
Wind-up excess/ (deficiency)	($60,045,000)	($71,708,500)
Transfer ratio	93.0%	91.3%
Solvency Financial Position		
Adjusted solvency assets net of provision for wind-up expenses	$865,227,800	$767,172,300
Solvency liabilities	$854,313,000	$823,708,500
New solvency excess/ (deficiency)	$10,914,800	($56,536,200)
New reduced solvency excess/ (deficiency)	$139,061,800	n/a
Solvency ratio	93.0%	91.3%
Minimum Contributions in First Year Following Valuation Date		
Current service cost	$18,322,600	$17,981,100
Members' required contributions	$8,863,200	$8,373,000
Employer portion of current service cost excluding PfAD	$9,459,400	$9,608,100
As a percentage of estimated covered payroll	10.35%	11.13%
Provision for adverse deviations (9.9% of current service cost)	$1,813,900	n/a
Total Employer portion of current service cost with PfAD	$11,273,300	$9,608,100
As a percentage of estimated covered payroll	12.33%	11.13%
Employer % of estimated covered payroll limited to:	**11.09%**[1]	n/a
Additional employer contributions required to fund unfunded liability or solvency deficiency	$0	$2,691,500[2]

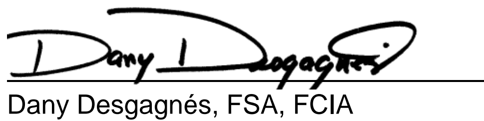
[1] Total contributions for the year 2018 have been limited to reflect transitional measures provided by the Regulations. In the first year following the valuation year, the contribution requirements have been calculated without increases due to PfAD applied to current service cost. Refer to Section 8 for details.

[2] Including an additional special payment amortization schedule of $12,838,800 annually starting January 1, 2019.

This report should be filed with the Financial Services Commission of Ontario, to meet the filing requirements of the *Pension Benefits Act* (Ontario) and with Canada Revenue Agency, in order to ensure that contributions recommended in the report will qualify as eligible contributions for purposes of the *Income Tax Act*. The next actuarial valuation of the Plan should be performed no later than January 1, 2021.

This report has been prepared and our opinions given in accordance with accepted actuarial practice.

Respectfully submitted,



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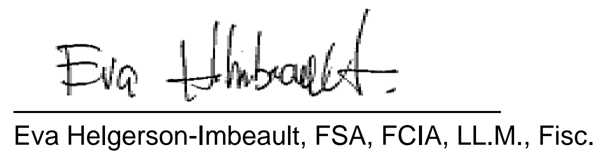


Eva Helgerson-Imbeault, FSA, FCIA, LL.M., Fisc.

Section 2. **INTRODUCTION**

The Canadian Union of Public Employees Employees' Pension Plan (hereinafter referred to as the "Plan") was established effective January 1, 1971. The Plan has been amended from time to time, with the most recent amendment being effective on April 12, 2017.

Our report is based on the provisions of the Plan as at the valuation date and reflects all amendments which have become effective up to that date.

Ontario Regulation 250/18 was filed on April 20, 2018 and new funding rules applicable to defined benefit (DB) pension plans became effective on May 1, 2018. These rules apply to actuarial valuations filed with a valuation date on or after December 31, 2017 and filed with the regulators after April 30, 2018. Specific content regarding the changes to the funding rules must be included in the first annual or biennial statements sent to active, former and retired members after the filing of the first valuation report dated on or after December 31, 2017 under these rules.

The JBT has chosen to prepare a valuation as of December 31, 2017 in order to adopt the new funding rules effective May 1, 2018.

SUBSEQUENT EVENTS

We are not aware of any events that occurred between the valuation date and the date this report was completed that would have a material impact on the results of this valuation.

VALUATIONS INCLUDED IN THIS REPORT

In this report, we describe the results of three different valuations of the Plan:

- The "going concern valuation", which is used to estimate the funded position of the Plan, assuming the Plan is continued indefinitely, and to estimate 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 an unfunded liability, to liquidate the amount of the unfunded liability. The going concern valuation also reflects the new requirement under the Ontario funding rules for the funding of a provision for adverse deviations, both on the past service liabilities and the current service cost.

- The "wind-up valuation", which 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 *Pension Benefits Act* (Ontario). 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. The wind-up valuation is not used to determine the required contributions to the Plan.

- The "solvency valuation", which is required by the Regulations under the *Pension Benefits Act* (Ontario). This valuation is similar to a wind-up valuation, except that certain adjustments may be made to assets and liabilities. The solvency valuation does affect the required contributions to the Plan. If the solvency valuation reveals that there is a "reduced solvency deficiency" (as defined in the Regulations), then additional contributions must be made to the Plan.

The difference between the hypothetical wind-up and solvency valuations for purposes of this report relates to the value of assets that are included in the valuation. In the "hypothetical wind-up valuation", the only assets taken into account are the invested assets of the Plan, which are taken at their market values net of a provision for wind-up expenses. In the "solvency valuation", in addition to the Plan's invested assets, net of a provision for wind-up expenses, also taken into account is the present value of all previously established amortization payments on a solvency basis.

FILING REQUIREMENTS

The last filed actuarial report was effective January 1, 2017. Under the applicable legislation, the next statutory report that needs to be filed with government authorities is the report on the actuarial valuation of the Plan as at January 1, 2020. However, the JBT has chosen to file this report on the actuarial valuation of the Plan as at January 1, 2018 with the Financial Services Commission of Ontario and the Canada Revenue Agency to adopt the new funding rules effective May 1, 2018. The report covers the period from January 1, 2018 to January 1, 2021 and is to be used by the Employer to determine its funding requirements during that period or until the next actuarial valuation is performed, if sooner. The next actuarial valuation of the Plan should be performed with an effective date no later than January 1, 2021.

Section 3. **DATA**

The valuation was based on data as of the valuation date, January 1, 2018, supplied to us by the Plan Administrator. This data is summarized in Appendix D.

We subjected this 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;
- all dates remained unchanged from the data used in the previous actuarial valuation of the Plan:
- accrued pensions changed by a reasonable amount;
- the form of pension payment did not change (other than resulting from the death of a retired member); and
- we examined the additions to and deletions from each of the data files (i.e. files for active employees, pensioners and terminated members entitled to a deferred vested pension) since the previous valuation date to determine whether all Plan members were accounted for in this valuation, to check for duplicate records and to confirm pension amounts.

All of our tests had satisfactory results or the data was corrected.

Assets of the Plan are invested through RBC Investor and Treasury Services account (#321-068067-004) and managed by independent investment management firms. We have relied on the audited financial statements for the fund prepared by KPMG, LLP for the December 31, 2017 year end.

Section 4. ACTUARIAL ASSUMPTIONS AND METHODS

ACTUARIAL ASSUMPTIONS

The actuarial assumptions used in the going concern, wind-up and solvency valuations are summarized in Appendices B and C of this report.

Economic Assumptions – Going Concern Valuation

For the going concern valuation, the discount rate and salary increase assumptions have been changed for the present valuation to better reflect long term expectations under the Plan. With respect to the discount rate, such rate was increased from 5.90% per annum for the valuation as at 1.1.2017 to 6.10% per annum for the present valuation. With respect to the salary increase assumption, it was decreased from 3¼% per annum for the valuation as at 1.1.2017 to 3% per annum for the present valuation. The impact of these changes is summarised in Section 5.

The selection of the economic assumptions (i.e. those related to interest rates and inflation) for this valuation was based on reasonable expectations for the relationships between key economic variables over the long term, as well as the expected impact of those economic variables on the investment performance of the pension fund given the fund's Statement of Investment Policies and Procedures ("SIP&P").

To determine the going concern discount rate, 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 1,000 paths over 30 years to create expected returns for each asset class. The simulated gross investment return was the return at the median of each asset class weighted by the plan's target asset mix. We have assumed that there will be no added-value returns from the active management strategy employed in excess of the associated additional investment management fees. At its December 2017 quarterly meeting, the JBT approved a change to the SIP&P to move 6% of assets from fixed income investments to real estate investments. The SIP&P effective January 1, 2018 is as follows:

Asset class	Target asset mix
Cash and Equivalents	2.0%
Fixed Income	32.0%
Canadian Equities	36.0%
Foreign Equities	15.0%
Real Estate Investments	15.0%
Total	**100%**

This allocation is typical for a pension plan with provisions and demographic profile similar to the present Plan. The investment risk level inherent to the SIP&P is typical in the current environment and considered appropriate in order to achieve additional investment returns while maintaining potential risks of not meeting the Plan's funding objectives to a minimum.

Also, under the new funding rules, the implicit provision for adverse deviations which was previously included in the development of the going concern discount rate assumption is expected to no longer be required (awaiting FSCO's confirmation) since an explicit provision for adverse deviations will be applied to the going concern liabilities and current service cost, when applicable.

Based on the above, and on key economic expectations over the long term, the going concern discount rate assumption has been developed as follows:

	Discount rate
Nominal return on fixed income investments	3.40%
Adjustment on account of equity risk premium	2.50%
Adjustment on account of active management of the Fund	0.25%
Rebalancing and diversification effects	0.60%
Gross expected investment return	6.75%
Provision for administration and investment expenses	(0.65%)
Estimated net investment return before margin	6.10%
Provision for adverse deviations	0%
Discount rate assumption	**6.10%**

The assumed level of administration and investment expenses is based on the average of the expenses paid from the Pension Fund over the last three calendar years.

Because the assumptions are intended to represent expected economic conditions over long periods of time, covering several decades, it is anticipated that the assumptions will be changed relatively infrequently, and that any change in the assumptions will be justified by new economic conditions that are likely to persist over the long term, rather than by short-term fluctuations in the financial markets, as well as the underlying objectives adopted by the JBT for the funding of the Plan's benefits.

For price inflation, the assumption was decreased from 2¼% per annum for the valuation as at 1.1.2017 to 2% per annum for the present valuation. This revised inflation assumption corresponds to the midpoint of the range targeted by the Bank of Canada monetary policy. For salary increases, we assumed that the real economic growth in salary would be 1% above the assumed price inflation rate. This leads to a long-term rate of 3% per annum for salary increases, which is in line with the findings of the most recent salary experience review performed over the period 2006-2015. The increases in the yearly maximum pensionable earnings ("YMPE") and the Income Tax Benefit limit after 2018 were assumed to be at the same rate of 3% per annum.

Also, the salary rates used as the starting point for projection purposes were the rates paid as at the valuation date. Such salary rates do not include any salary increase as at January 1, 2018, such increase still being subject to negotiations between the Employer and unions. For purposes of this valuation, we have assumed an increase in salary rates as at January 1, 2018 of 3.00%. In addition, salary rates for some members (CSU, Unifor 2013, CDU, Elected, Excluded and certain members of CEU) were increased by 0.25% in order to reflect the wage increase effective April 1, 2018.

In our view, the economic assumptions used for the going concern valuation remain within an acceptable range that would be considered by actuaries to be appropriate for the current circumstances of the Plan.

Demographic Assumptions – Going Concern Valuation

Some demographic assumptions used for this valuation and prior valuations were based mainly on standard population tables instead of the Plan's experience, due to the limited statistical volume of data available. For mortality, we have used the 2004 Canadian Pensioners' Mortality ("CPM") Table for the private sector, without size adjustment factor, and Improvement Scale MI-2017 (previously Improvement Scale CPM-B). This table is expected to be commonly used for valuations of pension plans where the amount of data relating to actual mortality experience of the specific Plan is of limited statistical significance and there is no reason to believe mortality experience for the Plan will differ significantly from that of other plans. With regards to the improvement scale, in December 2017, the CIA released the "Educational Note – Second Revision: Selection of Mortality Assumptions for Pension Plan Actuarial Valuations" containing mortality improvement scales based on experience studies conducted by the CIA and expert opinions. The report recommends a new two-dimensional mortality enhancement scale, the MI-2017, developed in 2017 using general population data from 1967 to 2015. Considering the most recent data and study made available, and in absence of any additional credible information under the Plan, we have used the newly published Improvement Scale MI-2017 for the present valuation.

With respect to the retirement assumption, the early retirement table has been derived from a review of the actual experience observed under the Plan over recent years. Such study was performed in 2007 and updated in 2010; the rates of early retirement are function of the sum of age and credited service, as the review of the actual experience under the Plan indicated that this parameter was that having the most significant impact on the actual early retirement experience. The rates used for the present valuation are identical to those used in the prior valuation.

For termination of employment prior to retirement, the rates were developed based on standard termination tables; a review of actual experience observed under the Plan over recent years indicated that the standard rates used are in line with the termination patterns observed under the Plan.

Assumptions - Wind-up/ Solvency Valuations

For the solvency and wind-up valuations, the economic assumptions were changed to reflect market conditions at January 1, 2018 and statutory requirements thereon. We made no provisions for adverse deviation in these valuations as these assumption bases are stipulated by regulation and reflect market conditions at the valuation date.

ACTUARIAL COST METHOD

Going Concern Valuation

As for the previous valuation, we have used the projected unit credit actuarial cost method to determine the going concern actuarial liabilities of the Plan and the Employer's current service cost in respect of the Plan. Under this method, the actuarial liabilities consist of the present value of pensions in payment and vested deferred benefits for terminated members, plus that portion of the future benefits expected to be paid to present members which are related to their credited service up to the valuation date. Amounts of pension are determined based on each member's projected final average earnings. If the value of these actuarial liabilities exceeds the actuarial value of the assets (determined as described below), the excess is defined as the unfunded actuarial liability and is funded by fixed special payments over a specified period or periods.

The total current service cost for the year following the valuation date is the present value of benefits accrued by Plan members with respect to their service in that year.

The characteristics of this actuarial cost method are that it matches year-by-year costs of benefits expected to be accrued by the Plan members each year to the contributions required for those years and since it results in a pattern of progressively increasing costs for an individual employee as that employee ages, it may also result in progressively increasing costs for the Plan as a whole if the average age profile of the Plan membership increases from year to year.

Hypothetical Wind-up/Solvency Valuation

As for the prior valuation, we valued the termination benefits payable under the Plan or the *Pension Benefits Act*, if different. Under this valuation, the actuarial liabilities consist of the present value of pensions in payment and vested deferred benefits for terminated members, plus the accrued benefits that would have been paid to present members in the event of plan wind-up and which are related to their credited service up to the valuation date. Amounts of pension for active members are determined based on each member's final average earnings at the valuation date.

Asset Valuation Method

For the going concern valuation, we have used a smoothing method to determine the value of the assets recognized for valuation purposes. Under this smoothing method, the asset value is determined as the average of the current market value as at January 1, 2018 and the four prior

years adjusted market values, where the adjusted market value of a prior year is determined by accumulating the prior year's market value to the valuation date, such accumulation being made at the valuation interest rate and taking into account the net cash-flow during the accumulation period. Appendix E presents the details of the determination of the smoothed value of assets as at January 1, 2018. The smoothing method used is the same as that used for the preceding going concern valuation as at January 1, 2017.

With respect to the wind-up and solvency valuations, the market value of assets has been used for the present valuation and the last valuation of the Plan, i.e. January 1, 2018 and January 1, 2017.

Benefits Valued

The benefits valued were those in effect at the valuation date. A summary of the Plan provisions is provided in Appendix A. The valuation does not make any provision for future changes in Plan provisions and no provisions are included in liabilities for indexation adjustments on or after January 1, 2018.

Incremental Cost

The incremental cost is the present value, at the valuation date, of the expected aggregate change in the hypothetical wind-up liability between the valuation date and the next valuation date. It also reflects expected benefit payments between the valuation date and the calculation date.

The incremental cost under the wind-up basis was determined as the sum of (a) and (b) minus (c) below:

(a) the projected wind-up liability at the next valuation date for those members at the current valuation date, allowing for service accrual and increase in earnings between the current valuation date and the next valuation date. No adjustment was made for new entrants and decrements between the two valuation dates. The resulting projected wind-up liability was then discounted to the current valuation date;

(b) the present value of the benefit payments expected to be paid between current valuation date and the next valuation date, discounted to the current valuation date;

(c) the wind-up liability as at the current valuation date.

Section 5. GOING CONCERN VALUATION

VALUATION BALANCE SHEET

The following is the going concern valuation balance sheet as at January 1, 2018 based on:

* the Plan provisions (summarized in Appendix A);
* the going concern valuation assumptions (described in Appendix B);
* the membership data (summarized in Appendix D);
* the actuarial value of assets (determined in Appendix E); and
* the provision for adverse deviations ("PfAD") equal to 9.9% (determined in Appendix F).

with comparative figures from the valuation as at January 1, 2017.

	January 1, 2018	January 1, 2017
Going Concern Assets		
Market value	$793,798,600	$753,082,900
Smoothing adjustment	($18,628,100)	($33,424,600)
Present value of future buyback contributions	$771,400	$723,100
Contributions receivable	$1,607,000	$1,577,900
Benefits and expenses accrued but unpaid	($1,109,000)	($2,583,900)
Total actuarial value of assets	$776,439,900	$719,375,400
Going Concern Liabilities		
Active members	$249,840,100	$243,723,400
Retired members and survivors	$345,631,700	$338,601,000
Terminated vested members and outstanding payments	$3,298,900	$4,076,800
Total actuarial liabilities	$598,770,700	$586,401,200
PfAD on actuarial liabilities	$59,278,300	n/a
Total actuarial liabilities including PfAD	$658,049,000	$586,401,200
Going Concern Surplus/ (Unfunded Liability) before PfAD	$177,669,200	$132,974,200
Going Concern Surplus/ (Unfunded Liability) with PfAD	$118,390,900	n/a
Funding Ratio before PfAD	129.7%	122.7%

The Plan has a going concern surplus before PfAD of $177,669,200 as at January 1, 2018. As at the previous valuation date, the actuarial surplus was $132,974,200 and there was therefore an increase of $44,695,000 during the one-year period since the preceding valuation date.

Table A below quantifies the various factors which had an impact on the evolution of the actuarial surplus since the preceding valuation date.

TABLE A

Reconciliation of the Actuarial Surplus

Actuarial Surplus as at January 1, 2017	**$132,974,200**
Interest on the actuarial surplus at prior valuation rate of 5.90% p.a.	7,845,500
Gains from special payments on account of solvency deficiencies	2,836,100
Expected actuarial surplus as at January 1, 2018, if plan experience had coincided with actuarial assumptions	**143,655,800**
Effects of smoothed investment return different than anticipated in the actuarial basis	22,880,500
Effects of salary, OAS and YMPE increases different from levels anticipated in the actuarial basis	(984,600)
Effects of early retirement experience different from assumption	976,900
Effects of pensioners mortality experience different from assumption	(313,600)
Effects of recognition of additional periods of credited service from Reciprocal Transfer Agreements and buybacks	1,006,200
Effects of employee contributions growing at rates different than anticipated in the actuarial basis	(394,600)
Effects of change in salary rate and inflation rate assumptions	2,257,100
Effects of change in mortality improvement scale assumption	(2,655,100)
Effects of change in discount rate assumption	11,599,600
Miscellaneous other actuarial gains (losses)	(359,000)
Actuarial Surplus before PfAD as at January 1, 2018	**$177,669,200**

Current Service Cost

The current service cost for the year 2018 (with comparative results from the preceding valuation) has been determined according to the table below. Required employee contributions are negotiated and represent 9.7% of covered payroll.

A provision for adverse deviations equal to 9.9% must be applied to the total current service cost and is calculated at $1,813,900 in 2018 (please refer to Appendix F for additional details on the calculation of the PfAD).

	January 1, 2018	January 1, 2017
Total current service cost	$18,322,600	$17,981,100
Members' contributions	$8,863,200	$8,373,000
Employer portion of current service cost, excluding PfAD	$9,459,400	$9,608,100
Employer cost as a percentage of covered payroll	10.35%	11.13%
Provision for adverse deviations (9.9% of current service cost)	$1,813,900	n/a
Total Employer portion of current service cost with PfAD	$11,273,300	$9,608,100
As a percentage of estimated covered payroll	12.33%	11.13%
According to the transitional measures, employer cost (as a percentage of covered payroll) is limited to (please refer to Section 8 for more details):	**11.09%**	**n/a**
Total Employer portion of current service cost with limited PfAD	**$10,130,900**	**$9,608,100**

The Employer current service cost expressed as a percentage of covered payroll is based on an estimated total payroll of $91,373,500 as at January 1, 2018. The actual dollar amount of current service cost for 2018 will be function of actual covered payroll and will vary from the estimate indicated above. Based on projected covered payroll, using the assumed salary increase assumption of 3% per annum, the Employer required contributions for current service and provision for adverse deviations are estimated at $11,611,500 for 2019 and $11,959,800 for 2020.

Based on the above information, the Employer negotiated contribution rate of 12.20% (less some payments stipulated under applicable collective agreements) is sufficient to cover the employer portion of the current service cost for the year 2018.

SENSITIVITY ANALYSIS

The following table shows the impact on the going concern actuarial liabilities as at January 1, 2018 and current service cost for 2018 of a 1% reduction in the discount rate assumption. All other assumptions were kept unchanged.

	Impact of 1% decrease (6.10% to 5.10%)
Increase of going concern actuarial liabilities	$67,138,300
Increase of current service cost	$3,159,900 (3.46% of covered payroll)

The change in the accrued liabilities would have the impact of reducing the surplus by $67,138,300 as at January 1, 2018.

Section 6. **WIND-UP VALUATION**

The purpose of the wind-up valuation is to determine the financial position of the Plan if it were wound up on the valuation date. Accordingly, the following approach was used:

1. The Plan assets were valued at their market value.

2. The benefits valued were the pensions to which members would be entitled under applicable legislation and the Plan provisions, if the Plan were wound up on the valuation date. All Plan members become fully vested on Plan wind-up, regardless of age or service.

3. In respect of members employed in Ontario, for whom age and service add to 55 or more, the pension may start at any age at which the member would have qualified for a pension if the Plan had not been wound up and if the member had continued in employment until retirement. Thus, the pension for such a member would be subject to a reduction of 3% for each year by which the retirement age precedes the earlier of (i) the date on which the member would have attained 80 points if employment had continued until retirement and (ii) the date the member attains age 60. In the wind-up valuation, we assumed that the pension would start at the age which produced the highest present value of the pension for such members.

4. The actuarial assumptions are determined in accordance with the Canadian Institute of Actuaries' (CIA's) Standard of Practice for Pension Commuted Values effective April 1, 2009 and the educational note *Assumptions for Hypothetical Wind-up and Solvency Valuations with Effective Dates between December 31, 2017 and December 30, 2018*. These assumptions are described in detail in Appendix C.

5. The values of the pensions are not discounted for death or disability before the pension start date.

Based on the Plan provisions in effect on January 1, 2018, the wind-up valuation assumptions mentioned above and the membership data supplied by the Plan Administrator, the following is the wind-up position as at January 1, 2018:

	January 1, 2018	January 1, 2017
Wind-up Assets		
Market value of Plan assets	$793,798,600	$753,082,900
Present value of future buyback contributions	$771,400	$723,100
Contributions receivable	$1,607,000	$1,577,900
Benefits and expenses accrued but unpaid	($1,109,000)	($2,583,900)
Allowance for wind-up expenses	($800,000)	($800,000)
Total wind-up assets	$794,268,000	$752,000,000
Wind-up Liabilities		
Active members	$376,565,300	$364,497,300
Retired members and survivors	$472,586,100	$453,538,800
Terminated vested members and outstanding payments	$5,161,600	$5,672,400
Total wind-up liabilities	$854,313,000	$823,708,500
Wind-up excess/ (deficiency)	($60,045,000)	($71,708,500)
Transfer (Wind-up) Ratio	93.0%	91.3%

As shown above, if the Plan had been terminated on January 1, 2018, we estimated that the wind-up liabilities would have exceeded the wind-up assets by $60,045,000.

INCREMENTAL COST

In accordance with the Canadian Institute of Actuaries' Standards of Practice, we have estimated the incremental cost of the wind-up liabilities as at January 1, 2018. This is the expected aggregate change in wind-up liabilities between January 1, 2018 and January 1, 2021 and it is based on the assumptions presented in Section 4.

The incremental cost as at January 1, 2018 is $98,570,200 The incremental cost does not impact the funding requirements of the Plan under the *Pension Benefits Act* (Ontario) and is for information purposes only.

WIND-UP VALUATION SENSITIVITY ANALYSIS

If the wind-up discount rate decreased by 1% from the assumptions described in Appendix C, and all other assumptions remained the same, the total wind-up liabilities would increase by $122,439,400 as at January 1, 2018.

Section 7. **SOLVENCY VALUATION**

The table below shows the solvency position of the Plan as at January 1, 2018. The calculations are based on the Plan provisions in effect on the valuation date, on the solvency valuation assumptions and methods described in Appendix C, and on the membership data supplied by the Plan Administrator.

The solvency valuation is similar to the wind-up valuation except for the adjustments to assets, as described in Section 2.

	January 1, 2018	January 1, 2017
Solvency Assets		
Market value of Plan assets	$793,798,600	$753,082,900
Present value of future buyback contributions	$771,400	$723,100
Contributions receivable	$1,607,000	$1,577,900
Benefits and expenses accrued but unpaid	($1,109,000)	($2,583,900)
Present value of special payments in respect of previously established solvency deficiency (asset adjustment)	$70,959,800	$15,172,300
Allowance for wind-up expenses	($800,000)	($800,000)
Total solvency assets including the asset adjustment	$865,227,800	$767,172,300
Solvency Liabilities		
Active members	$376,565,300	$364,497,300
Retired members and survivors	$472,586,100	$453,538,800
Terminated vested members and outstanding payments	$5,161,600	$5,672,400
Total solvency liabilities	$854,313,000	$823,708,500
Prior year credit balance	$0	$0
Solvency excess/ (deficiency) arising during the year	$10,914,800	($56,536,200)
Reduced solvency excess/ (deficiency) arising during the year - at 85%	$139,061,800	n/a
Solvency ratio	93.0%	91.3%

The Plan has a reduced solvency excess of $139,061,800.

The reduced solvency excess/ (deficiency) arising during the year is equal to the solvency assets plus the solvency asset adjustment minus 85% of the solvency liabilities minus 85% of the solvency liability adjustment minus the prior year credit balance.

The solvency ratio is the ratio of the solvency assets (before accounting for the asset adjustment) of the plan to the total solvency liabilities.

Under the new funding rules, solvency special payments are only required for plans that are less than 85% funded on a solvency basis. If the solvency ratio falls below 85%, only the portion of the deficiency that falls below the 85% threshold needs to be amortized.

Since there is a solvency excess as at January 1, 2018, the previously certified solvency special payments can be eliminated in accordance with Section 5 of the Regulations under the *Pension Benefits Act*. Therefore, solvency special payments are nil as at January 1, 2018.

Section 8. ELIGIBLE CONTRIBUTIONS

MINIMUM CONTRIBUTIONS

The Plan has a going concern surplus as at January 1, 2018. In addition, as mentioned in Section 7, the Plan solvency ratio is above 85% and there is therefore no solvency special payments required to be paid. As a result, the Employer is only required to make current service cost contributions plus the provision for adverse deviations.

Under the new funding rules, the 2018 Employer current service cost has been calculated at 10.35% and the provision for adverse deviations at 1.98% of covered payroll.

As prescribed under subsection 4.4 of Section 6 of the Regulations to the *Pension Benefits Act*, if payments required under subsection 4.3 of Section 6 are greater than they would have been under subsection 4.2 as it read immediately before May 1, 2018, the required contributions will be equal to “A – [(A – B) x C]”, where:

> “A” is the total of the payments required under subsection (4.3) for the year based on the most recent report filed (i.e. present report),
>
> “B” is the total of the payments that would have been required for the year under subsection (4.2) as it read immediately before May 1, 2018, and
>
> “C” is equal to one in 2018, 0.667 in 2019 and 0.333 in 2020.

The following table shows the values calculated for each of the above variables (on an annual basis):

	Year 2018	**Year 2019**	**Year 2020**
“A”, i.e. Employer total cost under new funding rules	$11,273,300	$11,611,500	$11,959,800
“B”, i.e. Employer total cost under old funding rules	$10,130,900	$23,264,400	$23,568,000
“C”	1.000	0.667	0.333

If the number of actively employed members remains at the January 1, 2018 level, if the covered payroll of $91,373,500 for 2018 is to increase as per the actuarial assumptions and if no changes are made to cost sharing provisions through labour agreements, the minimum required monthly Employer contributions under the *Pension Benefits Act* (Ontario) for the three-year period following the valuation date would be estimated as follows:

	Monthly Required Employer Contributions		
	2018*	2019	2020
	$	$	$
Current service cost contributions	788,283	811,932	836,290
Provision for adverse deviations	151,158	155,693	160,364
Contribution adjustment (i.e. (A – B) x C)	(95,199)	n/a	n/a
Total required contributions	**844,242***	**967,625**	**996,654**

∗ As previously described, the Plan contributions for year 2018 have been limited to the contributions that would have been required if the old funding rules as they read immediately before May 1, 2018 still applied. Such valuation basis assumes that contributions would correspond to the current service cost without PfAD, but including an implicit margin in the determination of the going concern valuation discount rate, plus solvency special payments required to be paid in 2018 after applying the solvency gain realised in 2018 to reduce certain previously certified solvency special payments.

Therefore, the Employer total required contributions for 2018 represent 11.09% of covered payroll, based on the estimated payroll of $91,373,500. For both the years 2019 and 2020, the Employer total required contributions will represent 12.33% of the estimated covered payroll.

Under the new funding rules, there is available actuarial surplus for a contribution holiday if the Plan's provision for adverse deviations (PfAD) is fully funded on a going concern basis, that is, the value of going concern Plan assets (excluding the amount of any letter of credit, if applicable), is equal to 100% + PfAD on the Plan's going concern liabilities. In addition, the plan's transfer ratio must be at least 105%. As at January 1, 2018, the available actuarial surplus is nil.

MAXIMUM CONTRIBUTIONS

At the Employer's option, the Employer may choose to fund at a higher level than the minimum requirement stated above. The maximum tax-deductible contributions the Employer could make is equal to the sum of:

1. A lump sum amount equal to the wind-up deficiency, which was $60,045,000 as of January 1, 2018; plus
2. The current service cost contributions certified above for each year until the date of the next valuation.

Under the Ontario pension legislation, all contributions due to the Plan should be remitted monthly. Employee and Employer current service cost contributions are due within 30 days following the end of the relevant month.

Section 9. PENSION BENEFIT GUARANTEE FUND ("PBGF")

For the purposes of the Regulations under the *Pension Benefits Act* (Ontario), the PBGF assessment base and liabilities for the year following the valuation date are calculated as follows:

PBGF liabilities	$384,278,300	(a)
Total solvency liabilities	$854,313,000	(b)
Ontario asset ratio	44.98%	(c) = (a) ÷ (b)
Market value of assets (net of wind-up expenses)	$794,268,000	(d)
Ontario portion of assets	$357,261,700	(e) = (c) x (d)
PBGF assessment base	$27,016,600	(f) = (a) – (e)

The PBGF assessment[1] for 2018 is then calculated as:

$5 for each Ontario member	$4,170.00
PLUS	
0.5% of PBGF assessment base up to 10% of PBGF liabilities	$135,083.00
PLUS	
1.0% of PBGF assessment base between 10% and 20% of PBGF liabilities	$0.00
PLUS	
1.5% of PBGF assessment base over 20% of PBGF liabilities	$0.00
PLUS	
2.0% of special PBGF assessment base[2]	$0.00
SUBTOTAL	$139,253.00
Limit of $300 per Ontario member	$250,200.00
PBGF assessment (minimum of subtotal and limit)	$139,253.00
Retail sales tax (8% of PBGF assessment)	$11,140.24
Total amount to be remitted	$150,393.24

[1] The PBGF assessment for year 2019 and 2020 will be determined using the new assessment formula introduced by Regulation 250/18 filed April 20, 2018.

[2] Arising from additional liability due to plant closures and/or permanent layoffs, as described in Regulation 37(4)(a)(ii).

Section 10. **TRANSFER RATIO**

The "transfer ratio" for purposes of the Regulations under the *Pension Benefits Act* (Ontario) is the ratio of:

1. The solvency assets at market value, minus the lesser of the prior year credit balance or the sum of the minimum contributions required under the Regulation until the next valuation date, (i.e. $794,268,000) to

2. The solvency liabilities (i.e $854,313,000).

As at January 1, 2018, the transfer ratio was determined to be 93.0%.

The Regulations under the *Pension Benefits Act* (Ontario) provide that, if the transfer ratio is greater than 100%, transfers of commuted values to terminating employees may be made in full, immediately. If the transfer ratio is less than 100%, the administrator can choose to do one of the following:

1. transfer a portion of the commuted value on the basis of the most recently determined transfer ratio and pay the portion held-back in instalments, with interest, over a 5-year period; or

2. transfer the full commuted value after an amount equal to the portion of the transfer deficiency based on the most recently determined transfer ratio has been remitted to the plan; or

3. transfer the full amount if the total of all amounts that should be held back for all transfers made since the last transfer ratio was determined is less than 5% of the assets of the Plan at that time.

However, if the transfer ratio is less than 100% and the administrator knows or ought to know that since the date of the last filed valuation, the transfer ratio has fallen by 10% or more of the most recently determined transfer ratio, then no commuted values can be paid out of the plan until approval is obtained from the Superintendent. Once given, the administrator can choose to do one of the above, or an alternative method approved by the Superintendent.

Section 11. ACTUARIAL OPINION

With respect to the Canadian Union Public Employees Employees' Pension Plan forming part of the actuarial report dated June 11, 2018 and based on a valuation of the Plan as at January 1, 2018:

1. The purpose of the report was to provide actuarial estimates of the funding payments required to be made by the Employer over the period from January 1, 2018 to the date of the next valuation. The effective date of the next valuation must be no later than January 1, 2021 in order to comply with applicable legislation.

2. The Plan had a going concern surplus of $177,669,200 as at January 1, 2018.

3. In our opinion, the value of the Plan assets would be less than the actuarial liabilities if the Plan were to be wound up as at January 1, 2018. The estimated shortfall would be approximately $60,045,000.

4. The Plan had a solvency excess of $10,914,800 and a reduced solvency excess of $139,061,800 as at January 1, 2018.

5. Employee contributions are equal to 9.7% of pensionable earnings. We recommend Employer's current service cost contributions of 10.35% of pensionable earnings plus provision for adverse deviations (subject to the contribution adjustment as defined in Section 8 of this report) from January 1, 2018 until the date of next valuation, due no later than January 1, 2021. Based on the Plan membership and pensionable earnings used for this valuation, and estimated annual salary increases of 3%, the employee contributions and the Employer current service cost contributions for the next three years would be:

	Estimated Annual Employee Contributions	Estimated Annual Employer Current Service Cost (with PfAD)	Total Estimated Annual Current Service Cost
2018	$8,863,200	$10,130,900	$18,994,100
2019	$9,129,100	$11,611,500	$20,740,600
2020	$9,403,000	$11,959,800	$21,362,800

6. For purposes of the Regulations under the *Pension Benefits Act* (Ontario):

   (a) The PBGF assessment base was $27,016,600 as at January 1, 2018;
   (b) The PBGF liabilities were $384,278,300 as at January 1, 2018;
   (c) The additional liability described in Regulation 37(4)(a)(ii) was nil as at January 1, 2018;
   (d) The transfer ratio was 93.0% as at January 1, 2018; and
   (e) The prior year credit balance was nil as at January 1, 2018.

7. In our opinion, in respect of the going concern valuation, the wind-up valuation and the solvency valuation,

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

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

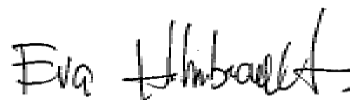
   (c) the methods employed in the valuation are appropriate for the purpose of the valuation.

8. Notwithstanding the foregoing opinion, emerging experience differing from the assumptions will result in gains or losses which will be revealed in future valuations.

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

10. This report has been prepared in a manner consistent with the recommendations for the preparation of actuarial valuation reports issued by the Canadian Institute of Actuaries.

Dany Desgagnés
Fellow, Canadian Institute of Actuaries



Eva Helgerson-Imbeault
Fellow, Canadian Institute of Actuaries

June 11, 2018

Appendix A. SUMMARY OF PLAN PROVISIONS

Effective Date

January 1, 1971.

Eligibility

All permanent full-time and part-time employees and term employees must join the Plan from their first day of employment; full-time and part-time temporary employees are eligible under rules compliant with applicable provincial legislation.

Retirement Date

Normal retirement is at age 65; a Member may however elect early retirement from the earlier of attainment of age 50 or completion of 25 years of credited service.

Contributions

Employees – 9.7% of earnings

Employer – Balance of cost.

Pension at Retirement

2% of average of the best 3 years earnings, times total credited service up to a maximum of 35 years, subject to a maximum pension equal to ITA defined benefit limit multiplied by years of credited service.

On early retirement after the earlier of age 60 and the age at which the sum of age and credited service totals at least 80, the full accrued pension is payable. On early retirement after age 50 or after 25 years of service, the accrued pension is reduced by ¼ of 1% for each month by which the early retirement date precedes the earlier of age 60 or the age at which the sum of age and credited service totals at least 80.

In addition, for members retiring on or after January 1, 1996, a bridge benefit is payable from early retirement date until attainment of age 65, subject to any maximum under the applicable legislation. The annual amount of such bridge benefit is calculated as follows:

- For members who were accruing benefits under the Plan on or before December 3, 1996, the sum of OAS and CPP benefits, reduced by 3% for each year by which the early retirement date precedes age 60 and pro-rated if credited service is less than 10 years.

- For members who were not accruing benefits under the Plan on December 3, 1996 but were accruing benefits on December 31, 1997, the sum of OAS and CPP benefits reduced by 3% for each year by which the early retirement date precedes age 60 and pro-rated if credited service accrued while an employee is less than 10 years.

- For members who were not accruing benefits on December 31, 1997 but were accruing benefits on December 31, 1999 and who retired after May 16, 2007 but before January 1, 2010, the sum of OAS and CPP benefits reduced by 3% for each year by which the early retirement date precedes age 60 and pro-rated if credited service accrued while an employee is less than 10 years.

- For members who were not accruing benefits under the Plan on December 31, 1999 but were accruing benefits on May 16, 2007, $8,000 reduced by 3% for each year by which the early retirement date precedes age 60 and pro-rated if credited service accrued while an employee is less than 10 years.

- For members who were not accruing benefits under the Plan on May 16, 2007, $8,000 reduced by 3% for each year by which the early retirement date precedes age 60 and pro-rated if credited service accrued while an employee is less than 15 years.

Death Benefits

Death prior to retirement – Maximum between the commuted value of the accrued pension and a refund of two times the member's required contributions with interest, subject to a minimum death benefit equal to that required under applicable provincial pension legislation.

Death after retirement – On death of a retired member who had a spouse at date of retirement, a 66 2/3% surviving spouse benefit is payable, subject to a guarantee of 60 monthly pension payments from the member's date of retirement. If the retiring member did not have a spouse at date of retirement, normal form of pension is a life pension with a guarantee of 120 monthly payments. Optional forms of payment are available at retirement, subject to actuarial adjustment.

The bridge pension post-retirement death benefits are the same as those applicable to the basic pension except that bridge payments always terminate at the time the member would have attained age 65.

Termination Benefits

All benefits accrued to date of termination are fully vested; terminating members may elect a deferred pension commencing at age 60 or a transfer of the commuted value of the accrued pension to another pension vehicle. All vested benefits, except those resulting from the purchase of service while not a temporary employee, must have been at least 50% funded by employer contributions.

Subject to any locked-in requirement under the applicable pension legislation, a terminating member may also elect a refund of his regular employee required contributions with interest.

Voluntary Contributions

Effective January 1, 1987 and January 1, 1989, a portion of the members' required contributions made by certain Plan members prior to those dates were deemed to be optional contributions.

Indexation of Benefits

Pensions in course of payment may be indexed on an ad hoc basis. Under current plan provisions, indexation adjustments have become payable at the beginning of 2006, 2007 and 2008 to compensate for full CPI increase in the preceding year. In addition, indexation adjustments have become payable at the beginning of 2009 and 2010 to compensate for 50% of CPI increases in the preceding year. Indexation adjustments effective on or after January 1, 2011 are subject to certain conditions with respect to the financial status of the Plan; no indexation adjustments have become payable at the beginning of year 2011 to 2018. For the purpose of the present valuation, no indexation adjustments beyond January 1, 2018 have been assumed.

Appendix B. ACTUARIAL ASSUMPTIONS – GOING CONCERN BASIS

Discount rate:	6.10% per annum, net of all expenses that are paid from the assets of the Plan. In the previous valuation, the discount rate was 5.90%.
Salary Increase:	3% per annum; in the previous valuation, the salary increase rate was 3¼%.
Increases in YMPE:	3% per annum from the 2018 level of $55,900.
Expense:	Discount rate includes an allowance of 0.65% for administration and investment expenses.
ITA Benefit Maximum:	$2,944.44 for year 2018, indexed by 3% p.a. from 2019.
Mortality:	2004 Private Sector Canadian Pensioners' Mortality Table, without size adjustment factor, and Improvement Scale MI-2017; in the previous valuation, the same mortality table was used, combined with Improvement Scale CPM-B.
Disability:	None
Retirement:	Following retirement rates are assumed, based on points (age + service):

Points	Rate	Points	Rate
64	0%	77	11.0%
65	1.0%	78	15.0%
66	1.5%	79	20.0%
67	2.0%	80	25.0%
68	2.5%	81	23.0%
69	3.0%	82	22.0%
70	4.0%	83 – 85	20.0%
71	5.0%	86	21.0%
72	6.0%	87	23.0%
73 – 75	7.0%	88 – 99	25.0%
76	8.0%	100	100%

Turnover: Termination rates are based on service. Sample rates are as follows:

Years of service	Termination Rate
0	0.036
5	0.019
10	0.007
15	0.003
20	-

Survivors' benefits: 85% of active members assumed to be married at retirement; female spouses assumed to be three years younger than male spouses.

Appendix C. ACTUARIAL ASSUMPTIONS – WIND-UP AND SOLVENCY BASES

Interest (Wind-up and Solvency Basis):	3.06% per annum for annuity purchases 2.80% per annum for 10 years and 3.30% per annum thereafter for lump sum transfers.
Increases in Pensionable Earnings:	None
YMPE:	$55,900 for 2018; no future increase in YMPE
ITA Benefit Maximum:	$2,944.44 per year of pensionable service
Mortality:	2014 Combined Sector Canadian Pensioners' Mortality Table, without size adjustment factor, and Improvement Scale B. • Annuity purchases: Sex-distinct basis • Lump sum transfers for Quebec members: Sex-distinct basis • Lump sum transfers for all other members: Unisex basis with 40% male ratio
Disability:	None
Retirement:	Retirement is assumed at the age producing the highest present value of the vested pension (i.e. at the earliest eligible age).
Turnover:	None
Marital Status:	85% of members are married, with male spouse 3 years older than female spouse.
Allowance for wind-up expenses:	$800,000
Value of assets:	Assets are recognized at market value for wind-up and solvency valuations. Future special payments are discounted using a weighted rate of 2.97%.

Assumption on settlement option at plan termination:

Percentage electing transfers	
Pensioners	0%
Active and terminated members	
• Quebec members	100%
• Other members	
✓ Eligible for retirement	50%
✓ Not eligible for retirement	75%

Appendix D. MEMBERSHIP DATA

TABLE I

Active Membership Distribution by Age and Years of Credited Service with Average Salary Rate[1]

Males

Age at 1/1/2018	0-4	5-9	10-14	15-19	20-24	25-29	30 & over	Total
25-29	4							4
	103,876							103,876
30-34	9	5						14
	101,705	97,403						100,168
35-39	19	14	3					36
	102,318	108,553	96,375					104,248
40-44	16	17	10	4				47
	107,783	112,476	111,735	112,155				110,693
45-49	9	9	17	6	3			44
	117,050	111,777	111,281	112,774	110,380			112,704
50-54	10	15	15	20	3	4	2	69
	117,303	115,036	110,246	112,880	110,313	115,069	110,546	113,365
55-59	10	6	16	23	8	6	1	70
	105,231	113,392	116,585	107,789	152,881	113,727	*	*
60-64	1	2	4	7	5	4	2	25
	*	110,246	106,032	125,783	120,078	124,674	110,650	*
65-69		1		3		2	3	9
		*		102,258		123,808	116,942	*
Total	78	69	65	63	19	16	8	318
	*	*	111,407	111,893	130,816	118,059	*	112,007

Average age: 49.9
Average credited service: 11.7 year

[1] Average salary rates as at January 1, 2018 include a provision of 3.00% for retroactive salary increases that are still subject to negotiations as at the date of this report, in addition to a 0.25% salary increase effective April 1, 2018 for some members (CSU, Unifor 2013, CDU, Elected, Excluded and certain members of CEU).

TABLE II

Active Membership Distribution by Age and Years of Credited Service with Average Salary Rate [1]

Females

Age at 1/1/2018	0-4	5-9	10-14	15-19	20-24	25-29	30 & over	Total
20-24	3							3
	73,771							73,771
25-29	13	5						18
	79,093	91,468						82,530
30-34	23	16	2					41
	82,494	80,322	100,186					82,510
35-39	27	18	8	6				59
	92,018	98,430	86,778	103,907				94,472
40-44	21	14	16	14				65
	94,442	96,229	87,314	86,133				91,283
45-49	28	34	23	22	4			111
	92,034	92,646	95,153	90,558	84,926			92,319
50-54	16	19	30	32	22	10	2	131
	90,974	97,600	93,284	90,953	91,973	100,113	88,991	93,294
55-59	10	14	27	26	21	5		103
	87,443	95,571	89,900	92,000	94,950	120,320		93,469
60-64	3	12	5	12	8	4		44
	81,766	86,442	102,214	101,330	110,650	120,371		99,462
65-69		4		2	1	4	3	14
		100,114		110,348	*	71,409	71,884	*
Total	144	136	111	114	56	23	5	589
	88,659	92,953	92,045	92,638	*	103,037	78,727	*

Average age: 48.6
Average credited service: 11.6 years

[1] Average salary rates as at January 1, 2018 include a provision of 3.00% for retroactive salary increases that are still subject to negotiations as at the date of this report, in addition to a 0.25% salary increase effective April 1, 2018 for some members (CSU, Unifor 2013, CDU, Elected, Excluded and certain members of CEU).

TABLE III

Active Membership Distribution by Age and Years of Credited Service with Average Salary Rate[1]

All Active Members

Age at 1/1/2018	0-4	5-9	10-14	15-19	20-24	25-29	30 & over	Total
20-24	3							3
	73,771							73,771
25-29	17	5						22
	84,924	91,468						86,411
30-34	32	21	2					55
	87,897	84,389	100,186					87,005
35-39	46	32	11	6				95
	96,272	102,859	89,395	103,907				98,177
40-44	37	31	26	18				112
	100,211	105,139	96,707	91,915				99,428
45-49	37	43	40	28	7			155
	98,119	96,650	102,007	95,318	95,835			98,106
50-54	26	34	45	52	25	14	4	200
	101,100	105,292	98,938	99,386	94,174	104,386	99,769	100,218
55-59	20	20	43	49	29	11	1	173
	96,337	100,917	99,829	99,411	110,931	116,724	*	*
60-64	4	14	9	19	13	8	2	69
	*	89,843	103,911	110,339	114,276	122,522	110,650	*
65-69		5		5	1	6	6	23
		*		105,494	*	88,876	94,413	96,839
Total	222	205	176	177	75	39	13	907
	*	*	99,196	99,491	*	109,200	*	*

Average age: 49.1
Average credited service: 11.6 years

[1] Average salary rates as at January 1, 2018 include a provision of 3.00% for retroactive salary increases that are still subject to negotiations as at the date of this report, in addition to a 0.25% salary increase effective April 1, 2018 for some members (CSU, Unifor 2013, CDU, Elected, Excluded and certain members of CEU).

Terminated Vested Members

TABLE IV
Males

Age Group	Number	Average Monthly Pension
		$
25-29	--	--
30-34	5	243
35-39	5	296
40-44	5	401
45-49	3	455
50-54	3	512
55-59	1	262
60-64	0	0
>65	1	40
Total	**23**	**344**

Average age: 42.6

TABLE V
Females

Age Group	Number	Average Monthly Pension
		$
25-29	--	--
30-34	2	139
35-39	8	313
40-44	9	512
45-49	6	666
50-54	13	424
55-59	5	424
60-64	3	49
>65	--	--
Total	**46**	**442**

Average age: 47.7

TABLE VI
All Terminated Vested Members

Age Group	Number	Average Monthly Pension
		$
25-29	--	--
30-34	7	213
35-39	13	306
40-44	14	472
45-49	9	595
50-54	16	440
55-59	6	590
60-64	3	49
>65	1	40
Total	**69**	**409**

Average age: 46.0

Retired Members (including surviving spouses)

TABLE VII
Males

Age Group	Number	Average Monthly Pension*
		$
<50	--	--
50-54	3	3,822
55-59	23	5,142
60-64	63	4,083
65-69	90	3,379
70-74	70	3,680
75-79	42	2,806
80-84	22	2,672
85-89	9	2,621
>90	3	1,781
Total	**325**	**3,552**

*Include bridging benefit

Average age: 69.7

TABLE VIII
Females

Age Group	Number	Average Monthly Pension*
		$
<50	1	3,902
50-54	8	3,296
55-59	68	4,085
60-64	114	3,966
65-69	127	2,629
70-74	83	2,165
75-79	39	1,989
80-84	23	1,731
85-89	10	1,609
>90	12	1,365
Total	**485**	**2,935**

*Include bridging benefit

Average age: 68.0

TABLE IX
All Retirees

Age Group	Number	Average Monthly Pension*
		$
<50	1	3,902
50-54	11	3,440
55-59	91	4,352
60-64	177	4,008
65-69	217	2,940
70-74	153	2,858
75-79	81	2,412
80-84	45	2,191
85-89	19	2,089
>90	15	1,449
Total	**810**	**3,182**

*Include bridging benefit

Average age: 68.7

Appendix E. PLAN ASSETS

The assets taken into account for the present valuation have been based on the audited financial statements prepared by KPMG LLP Chartered Accountants for the plan year ending on December 31, 2017.

As at the valuation date, most of the Plan assets are invested through balanced investment mandates with two investment managers, Letko, Brosseau & Associates Inc. and Guardian Capital LP. The balance of the Fund (approximately 24% of the total Fund) is invested in a real estate pooled fund managed by Bentall Investment Management (approximately 9%), in a Canadian Small/Mid Cap Equity fund managed by Barrantagh (approximately 6%) and in a Canadian core plus bond pooled fund managed by TD Asset Management (approximately 9%).

As at January 1, 2018, the market value of assets was $794,296,600. The market value includes contributions receivable of $1,607,000 and amounts payable of $1,109,000.

For the wind-up and solvency valuations, assets are recognized at market value. For the going concern valuation, the actuarial value of the assets is determining using a smoothing method, under which the actuarial value of the assets is equal to the average of five values, i.e. the market value as at the valuation date and the values obtained by accumulating for cash flow elements and for interest (at the valuation rate of interest) the market value at each of the four preceding year ends. Relevant details on the determination of the actuarial value of the assets using this smoothing method are presented on the next page.

Adjusted Market Value (AMV) Beginning From:

	1/1/2014	1/1/2015	1/1/2016	1/1/2017	1/1/2018
Assumed Interest Rate:	5.90%	5.90%	5.90%	5.90%	
AMV as at January 1, 2014:	630,505,600				
Net Contributions	(7,302,824)				
Investment Income	36,984,397				
AMV as at January 1, 2015:	660,187,174	683,947,670			
Net Contributions	(8,002,306)	(8,002,306)			
Investment Income	38,714,975	40,116,845			
AMV as at January 1, 2016:	690,899,843	716,062,209	682,120,803		
Net Contributions	(7,139,419)	(7,139,419)	(7,139,419)		
Investment Income	40,552,478	42,037,057	40,034,515		
AMV as at January 1, 2017:	724,312,902	750,959,848	715,015,899	751,964,534	
Net Contributions	(8,022,439)	(8,022,439)	(8,022,439)	(8,022,439)	
Investment Income	42,497,799	44,069,969	41,949,276	44,129,246	
AMV as at January 1, 2018:	**758,788,262**	**787,007,377**	**748,942,736**	**788,071,341**	**793,987,568**
Actuarial Value of Assets as at January 1, 2018 before payments in transit:					**775,359,457**
Resulting Actuarial Adjustment:					**(18,628,111)**

Appendix F. PROVISION FOR ADVERSE DEVIATIONS

In accordance with Section 11.2 of the Regulations, the Plan's Provision for Adverse Deviations (PfAD) to be applied to the going concern liabilities and current service cost, has been determined as outlined in this Appendix. For the purpose of determining the PfAD, this Plan is classified as a, open plan as defined in the Regulations.

PfAD = A + B + C

Where:

"A" = Fixed Component = 4% (for open plan) and 5% for (closed plan)

Therefore, A = 4%

"B" = First Variable Component = Asset Mix Component

This component is based on the plan's target asset allocation to non-fixed income assets.

Classification	Target Allocation
Cash	2.0%
Bonds	32.0%
Real Estate, Infrastructure, Mortgages	15.0%
Return seeking assets (e.g. equities, other alternative assets classes)	51.0%

Assets allocated to Non-Fixed Income Securities = Return seeking assets + 50% x Real Estate, Infrastructure and Mortgage Assets
= 51.0% + 0.50 X 15.0%
= 58.5%

Target allocation for Non-Fixed Income Assets	PfAD – Closed Plan	PfAD – Open Plan
0%	0%	0%
20%	2%	1%
40%	4%	2%
50%	5%	3%
60%	7%	4%
70%	11%	6%
80%	15%	8%
100%	23%	12%

Therefore, B = 3.85%

“C” is the greater of zero, and a value relative the plan’s benchmark discount rate calculated in accordance with the Regulations

F = Value of the plan’s going concern liabilities as of the valuation date, determined using a discount rate that is 1% less than the discount rate used in this report

G = Value of the plan’s going concern liabilities as of the valuation date

Duration of the going concern liabilities = (F – G) / (G x 0.01) = 10.5

H = benchmark yield on long term bonds issued by the Government of Canada for the valuation date, as determined by CANSIM V39056 = 2.26%

J = combined target asset allocation for fixed income assets = 41.5%

K = combined target asset allocation for non-fixed income assets = 100% - J = 58.5%

E = Benchmark Discount Rate (BDR)
= 0.5% + H + (1.5% x J) + (5% x K)
= 0.5% + 2.26% + (1.5% x 41.5%) + (5% x 58.5%)
= 6.31%

D = Best Estimate Discount Rate = 6.50%

C = Duration x Max (0, D – E) = 10.5 x (6.50% - 6.31%) = 2.00%

Therefore, the total PfAD for the Plan is = A + B + C = 4% + 3.85% + 2.00% = 9.85% rounded to 9.9%

CERTIFICATE OF EMPLOYER

With regards to the January 1, 2018 actuarial report for the Canadian Union of Public Employees Employees' Pension Plan, I hereby certify that, to the best of my knowledge and belief:

- A copy of the official Plan document and all amendments made to January 1, 2018, were provided to the actuary;
- The membership data provided to the actuary includes a complete and accurate description of every person who is entitled to benefits under the terms of the Plan for service up to January 1, 2018; and
- All events subsequent to January 1, 2018 that may have an impact on the valuation have been communicated to the actuary.

June 11, 2018
Date

[signature]
Signature

Administrative Officer
Title