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City of Toronto

Revised Investment Policy – Presentation to the Investment Board

November 13, 2017

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Health · Benefits · Employee Assistance · Retirement

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In light of amendments to Ontario regulation 360/15, under the *City of Toronto Act, 2006*, a study was conducted leading to a new proposed investment policy
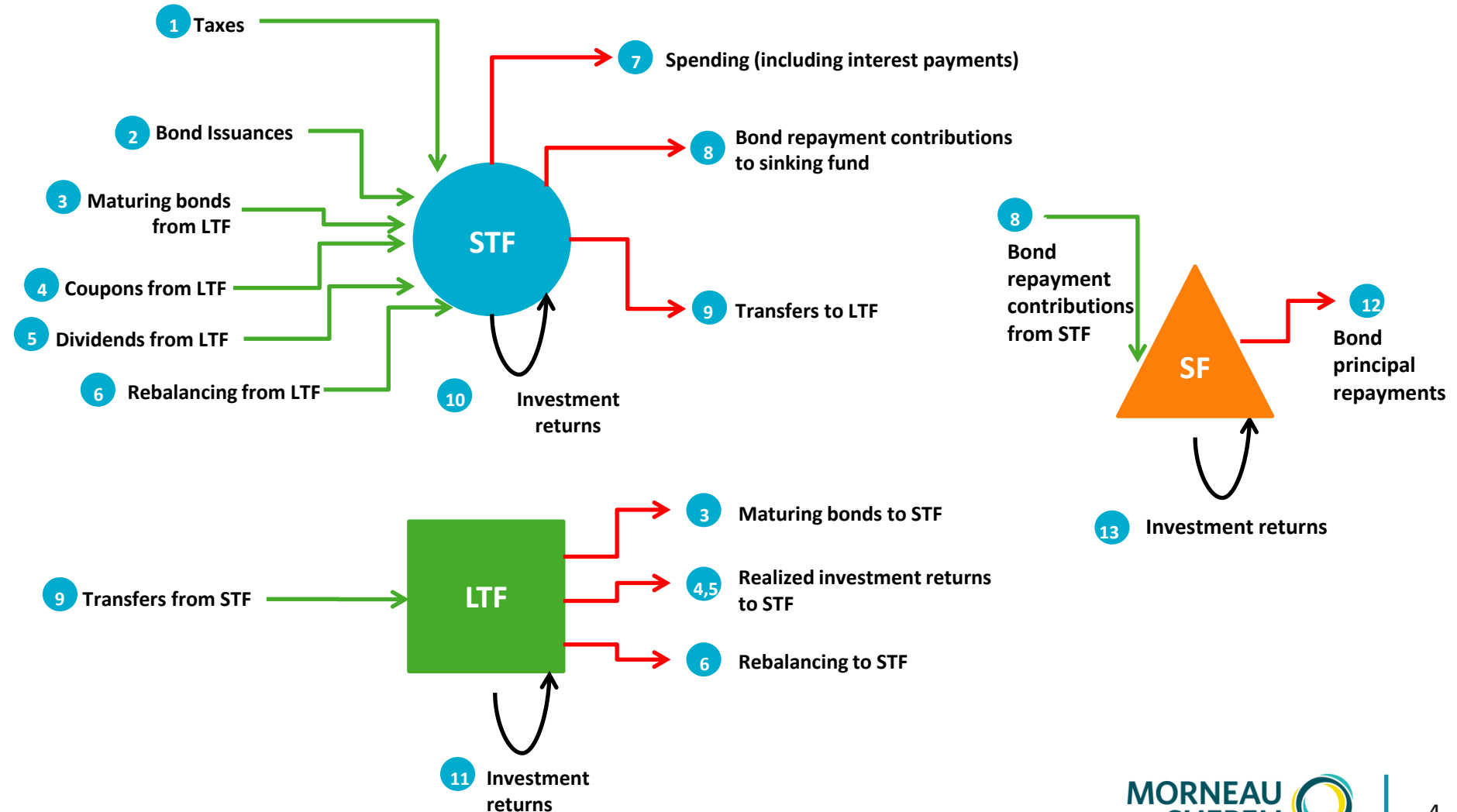
The key steps of the study were:

- Determine the City's investment objectives and constraints

- Build a financial model that incorporates the interactions among all applicable funds in order to project the impact of investment decisions

- Agree upon potential asset classes to model and their weights

- Project all funds under the existing investment policy and compare it to alternative investment policies using stochastic projections and stress test scenarios

- Make a recommendation for asset mix to include in a Revised Investment Policy that best meet the City's objectives and constraints

The City's investment objectives and their relative priority for all of their funds remained essentially unchanged

The policy's objectives were identified as follows:

- Preservation of capital
  - In short term as well as long term on a market value basis
- Adequate liquidity
  - Duration of assets in excess of 5 for the LTF and SF but can't lock in a significant portion of the portfolio in illiquid assets
- Diversification of assets
  - Broader diversification of assets will reduce overall market volatility
- Capital appreciation
  - Current economic environment and eligible asset classes caused pressure to generate the investment income the City was expecting

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Extensive work was performed in collaboration with City staff to properly incorporate the current fund interactions into the model

1 Taxes

2 Bond Issuances

3 Maturing bonds from LTF

4 Coupons from LTF

5 Dividends from LTF

6 Rebalancing from LTF

STF

7 Spending (including interest payments)

8 Bond repayment contributions to sinking fund

9 Transfers to LTF

10 Investment returns

8 Bond repayment contributions from STF

SF

12 Bond principal repayments

13 Investment returns

9 Transfers from STF

LTF

3 Maturing bonds to STF

4,5 Realized investment returns to STF

6 Rebalancing to STF

11 Investment returns

A discussion on what asset classes to include in the study took place and it was determined to invest conservatively initially

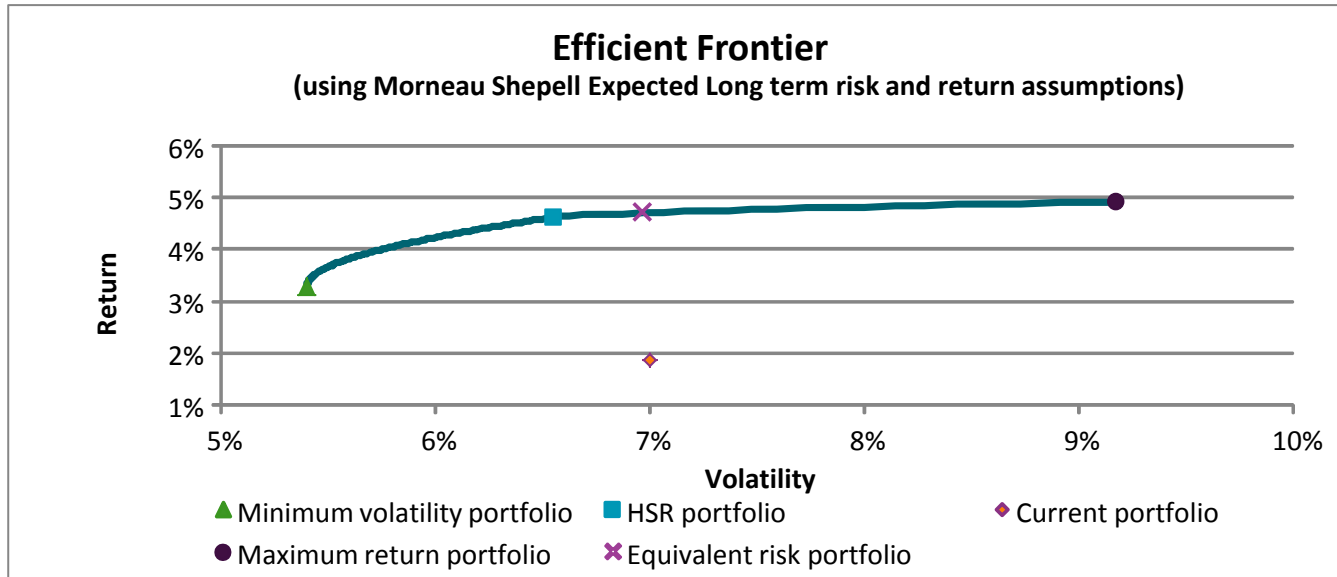|	Asset Class	Strategy	Municipal Usage	Public Pension Plan Usage	Suggested for Consideration
Return Seeking	Equity	Domestic	🔴 Low/None	🟢 High	🟢 High
		US	🔴 Low/None	🟢 High	🟢 High
		International	🔴 Low/None	🟢 High	🟢 High
		Emerging Markets	🔴 Low/None	🟡 Moderate	🟡 Moderate
		Private Equity	🔴 Low/None	🔴 Low/None	🔴 Low/None
	Hedge Funds	---	🔴 Low/None	🔴 Low/None	🔴 Low/None
	Alternative Credit	Mortgages	🔴 Low/None	🟡 Moderate	🟡 Moderate
		Distressed Debt	🔴 Low/None	🔴 Low/None	🔴 Low/None
Volatility Dampening	Bonds	Government	🟢 High	🟢 High	🟢 High
		Provincial/ Municipal	🟢 High	🟢 High	🟢 High
		Corporate	🟡 Moderate	🟢 High	🟢 High
	Real Assets	Real Estate	🔴 Low/None	🟡 Moderate	🟡 Moderate
		Infrastructure	🔴 Low/None	🟡 Moderate	🟡 Moderate
		Commodities	🔴 Low/None	🔴 Low/None	🔴 Low/None

Degree

Low/None	🔴
Moderate	🟡
High	🟢

Sample municipalities include: Vancouver, Calgary, Edmonton, Montreal, and Halifax.
Sample public pension plans include: BC TPP, HOOP, Metropolitan Toronto Pension Fund, Metropolitan Toronto Police Benefit Fund, Municipal BC Pension Plan, OMERS, OPSEU, OTPP, and PSP Investments,

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Different efficient portfolios were presented and a decision to opt for an asset allocation that minimized volatility (risk) while increasing expected return was the most attractive option

Efficient Frontier
(using Morneau Shepell Expected Long term risk and return assumptions)

▲ Minimum volatility portfolio ■ HSR portfolio ◆ Current portfolio
● Maximum return portfolio ✕ Equivalent risk portfolio

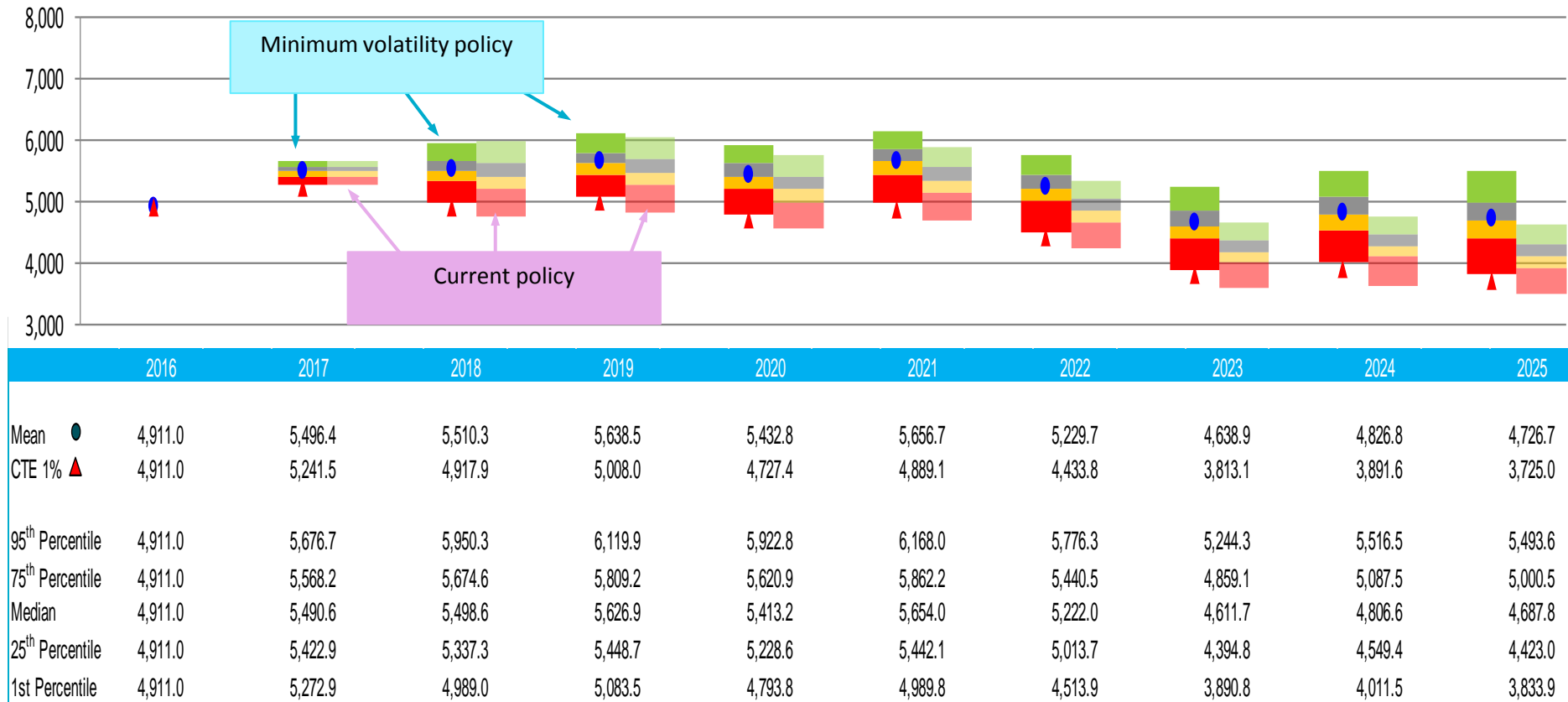|	Minimum volatility portfolio	HSR portfolio	Current portfolio	Equivalent risk portfolio	Maximum return portfolio
Bond portfolio	71,5%	50,0%	100,0%	50,0%	50,0%
Canadian equity	0,0%	0,0%	0,0%	0,0%	0,0%
US equity $CA	4,4%	16,0%	0,0%	5,8%	0,0%
US equity $US	0,0%	0,0%	0,0%	5,8%	35,0%
International equity $CA	0,5%	0,0%	0,0%	5,3%	0,0%
International equity $Local	0,0%	0,0%	0,0%	0,0%	0,0%
Emerging market equity $CA	3,6%	14,0%	0,0%	15,0%	15,0%
Canadian real estate	10,0%	10,0%	0,0%	10,0%	0,0%
Global infrastructure $US	10,0%	10,0%	0,0%	8,1%	0,0%
Expected return	**3,3%**	**4,6%**	**1,9%**	**4,7%**	**4,9%**
Expected volatility	**5,4%**	**6,6%**	**7,0%**	**7,0%**	**9,2%**

HSR: Highest Sharpe Ratio
A volatility of 7% on a portfolio with an Expected Return of 4% means that the future portfolio returns will be between -3% and 11% 2 out of 3 years

The modeling consisted of stochastic projections as well as several stress testing scenarios

- Each year for a period of 25 years, 2,000 economic scenarios are produced

- In addition to the above scenarios, the City is interested in various stress testing scenarios which include isolated and combined shocks to:

    - Interest rates

    - Credit spreads

    - Equity returns

    - Volatility of asset classes

    - Correlations between asset classes

    - Inputs (including tax revenues, issuance of debt and spending)

    - Different regimes (increasing, decreasing yield environments)

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The minimum volatility asset mix provides increased upside potential while decreasing downside risk over the current asset mix - even more so over a longer time horizon

EOY STF and LTF market value of assets ($M)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Mean ●	4,911.0	5,496.4	5,510.3	5,638.5	5,432.8	5,656.7	5,229.7	4,638.9	4,826.8	4,726.7
CTE 1% ▲	4,911.0	5,241.5	4,917.9	5,008.0	4,727.4	4,889.1	4,433.8	3,813.1	3,891.6	3,725.0
95th Percentile	4,911.0	5,676.7	5,950.3	6,119.9	5,922.8	6,168.0	5,776.3	5,244.3	5,516.5	5,493.6
75th Percentile	4,911.0	5,568.2	5,674.6	5,809.2	5,620.9	5,862.2	5,440.5	4,859.1	5,087.5	5,000.5
Median	4,911.0	5,490.6	5,498.6	5,626.9	5,413.2	5,654.0	5,222.0	4,611.7	4,806.6	4,687.8
25th Percentile	4,911.0	5,422.9	5,337.3	5,448.7	5,228.6	5,442.1	5,013.7	4,394.8	4,549.4	4,423.0
1st Percentile	4,911.0	5,272.9	4,989.0	5,083.5	4,793.8	4,989.8	4,513.9	3,890.8	4,011.5	3,833.9

Findings for the long term fund

- Based on best estimates of the projected cashflows, the Long Term Fund (LTF) assets will be decreasing over the next 25 years

- The LTF's current policy of holding bonds until maturity will be challenged as sales of existing bonds will be required

- The market value of asset is therefore the relevant basis to quantify the expected return and the risk related to the LTF's current policy

- In that context, there are asset allocations that are yielding a higher expected return while being less risky on a market value basis than the LTF's current policy

- A "gradual" allocation of 30% to diversified non-fixed income asset classes would be desirable if real assets such as infrastructure and real estate are permissible investments

- "Gradual" allocation means that the LTF's current holdings will be maintained and only new money to be directed to the LTF will be invested as per the proposed asset allocation

  - According to our projections and implicit rebalancing rules, 84% of the LTF assets will be invested in fixed income assets at the end of 2021 under the proposed allocation

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Findings for the sinking fund

- Contrarily to the Long Term Fund, based on current holdings and projected cashflows, the SF is growing over time

- The duration of the Sinking Fund is also expected to increase as future debt is mostly issued over 10, 20 and 30 years

- Similar to the Long Term Fund, our finding is that a "gradual" allocation of 30% to diversified non-fixed income asset classes will increase the SF's expected return and decrease its downside risk

- "Gradual" allocation means that the SF's current holdings will be maintained and only contributions attributable to debt maturing in, for example, 10 years or later could be invested as per the proposed asset allocation

Different theoretical asset mixes were considered and ultimately, an allocation of 30% to diversified, non-fixed income asset classes was determined to be efficient

Asset Class	Current	Baseline	AAM 1A	AAM 1B	AAM 1C	AAM 2A	AAM 2B	AAM 2C	Practical
Bond portfolio	**100.0%**	**71.5%**	**73.3%**	**76.1%**	**70.0%**	**77.0%**	**79.7%**	**78.4%**	**70%**
Canadian Equity	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**4%**
US Equity	0.0%	4.4%	6.8%	5.0%	8.5%	6.2%	4.3%	5.2%	**10%**
International Equity	0.0%	0.5%	3.8%	4.7%	5.8%	6.4%	7.2%	6.8%	**3%**
Emerging Market Equity	0.0%	3.6%	6.1%	4.3%	5.7%	5.5%	3.7%	4.6%	**3%**
Total Equity	**0.0%**	**8.5%**	**16.7%**	**13.9%**	**20.0%**	**18.1%**	**15.3%**	**16.6%**	**20%**
Canadian real estate	0.0%	10.0%	10.0%	5.0%	5.0%	5.0%	0.0%	2.5%	**10%**
Global infrastructure	0.0%	10.0%	0.0%	5.0%	5.0%	0.0%	5.0%	2.5%	**0%**
Total real assets	**0.0%**	**20.0%**	**10.0%**	**10.0%**	**10.0%**	**5.0%**	**5.0%**	**5.0%**	**10%**
Total	100.0%	100.0%	100%	100.0%	100.0%	100%	100%	100%	**100%**
A - Expected return	**1.9%**	**3.3%**	**3.3%**	**3.1%**	**3.5%**	**3.1%**	**3.0%**	**3.0%**	**3.4%**
B - Expected volatility	**7.0%**	**5.4%**	**5.7%**	**5.7%**	**5.8%**	**5.9%**	**6.0%**	**6.0%**	**5.8%**
Ratio of A over B	**0.27**	**0.61**	**0.58**	**0.54**	**0.60**	**0.53**	**0.50**	**0.50**	**0.59**

Questions?

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