



The Regional Municipality of Durham Report

To: Committee of the Whole
From: Commissioner of Finance
Report: #2017-COW-216
Date: September 6, 2017

Subject:

2017 Regional Program Climate Change Update

Recommendations:

That the Committee of the Whole recommends to Regional Council:

- A) That initiatives and strategic investments related to corporate climate change mitigation (energy efficiency, renewable energy implementation and other initiatives to reduce energy/fuel usage and emissions) and corporate climate adaptation (climate risk assessment, planning and mitigation), including those referred to the Region through the 2016 Durham Community Climate Adaptation Plan “Towards Resilience” report, continue to be implemented through the Region’s annual Business Planning Cycle including risk management, asset management and long-term financial planning processes to ensure a well-positioned and pro-active approach.
- B) That this report be forwarded for information to the Durham Region Roundtable on Climate Change.

Report:

1. Purpose

- 1.1 This report summarizes greenhouse gas (GHG) data, provincial climate change legislation and climate mitigation and adaptation initiatives across all Regional program areas, including Durham Region Police Service (DRPS), Durham Region Transit (DRT), and Durham Region Local Housing Corporation (DRLHC).
- 1.2 Updates are provided regarding various legislation related to energy management and climate change, specifically around energy and water usage reporting and benchmarking initiatives as well as the Provincial cap and trade program and carbon offset protocols which are currently in the development stages.

- 1.3 Climate change mitigation (GHG emission reduction) initiatives and plans by program area and/or asset class are highlighted in Section 7.0, including significant progress made in implementing initiatives from the approved 2014 to 2019 Energy Conservation and Demand Management (CDM) Plan.
- 1.4 The climate adaptation (climate risk mitigation) initiatives related to the delivery of Regional programs and infrastructure are also outlined in Section 8.0, including a summary of progress since approval of the Corporate Adaptation Plan and identified strategic actions for consideration within the 2018 to 2022 forecast period (subject to the 2018 business and financial planning cycle).

2. Executive Summary

- 2.1 The corporate GHG emissions inventory (2007 to 2016) and forecast (2017 to 2021) is based on currently approved and potential program initiatives and plans, including Regionally owned and leased facilities, vehicle fleets, traffic signals and related infrastructure, water supply and sanitary sewerage treatment, pumping and storage operations and Regional solid waste management, including the Durham York Energy Centre (DYEC) which commenced commercial operations in 2016.

Table 1- Corporate Greenhouse Gas Emissions Inventory
tonnes of carbon dioxide equivalent (CO₂e)
2007 to 2016 (estimated and rounded)

	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>
Facilities	18,600	17,800	14,800	15,400	14,400	13,400	13,600	12,800	11,700	11,600
Vehicle Fleets	24,600	24,800	23,800	24,100	25,300	25,900	29,100	31,000	29,500	30,200
Traffic Signals	800	600	300	400	200	200	100	100	100	100
Water and Sewer	34,800	36,800	28,800	29,900	29,100	30,300	31,700	29,300	27,500	28,000
Durham York Energy Centre	-	-	-	-	-	-	-	-	-	55,600
Solid Waste Landfill	82,400	80,800	78,100	75,500	72,900	70,300	68,500	67,800	66,100	63,400
Total Corporate GHG	161,200	160,800	145,800	145,300	141,900	140,100	143,000	141,000	134,900	188,900

Notes: The scope of reported emissions is consistent with prior years with the exception of the newly-added DYEC emissions total for 2016.

2.2 The Region reports annually to the Ministry of Energy as per O.Reg 397/11 under the *Green Energy Act, 2009* on designated Regional facilities energy and GHG emissions information. On a broader scale, the Province's climate change legislative framework through the underlying *Climate Change Mitigation and Low-carbon Economy Act, 2016* has various impacts to Regional operations through direct compliance obligations (DYEC) and indirect cost impacts to Regional operations through upstream regulation of entities such as fuel and gas distributors. Overall, total Regional energy spending in 2016 was just over \$43 million, with approximately \$29 million attributed to electricity usage; \$3 million to natural gas consumption for Regional facilities and operations; and \$11 million related to fleet and facility fuel (non-natural gas) usage.¹

2.3 Current climate mitigation priorities are focused on:

- A) Reducing Regional program energy and fuel usage, while maximizing opportunities provided under provincial, federal and utility incentive programs and grants;
- B) Continuing the investigation of renewable energy and renewable fuel opportunities; and,
- C) Ensuring the Region's understanding and adaptation to new protocols, reporting mechanisms, and regulatory frameworks related to Asset Management Planning, the Cap and Trade program and associated carbon offset protocols under development; and, the provincial Climate Change Action Plan and related regulatory and reporting frameworks and programs.

2.4 The current focus of corporate climate adaptation work, based upon staff assessments of climate risk and existing Regional program mitigation controls in place are to achieve the following:

- A) Ensure adequate standby power, redundancies, business continuity and supervisory control and data systems throughout program areas;
- B) Reduce potential infiltration of groundwater or stormwater into the sanitary sewer collection system to mitigate flooding and inflow risk;
- C) Enhance erosion protection at creek crossings to protect watermains and sanitary sewer systems;
- D) Assess climate adaptation requirements within the asset management planning process, which includes (since 2004) the annual reporting of asset inventory and valuations by asset class; state of infrastructure reviews; and vulnerability and risk assessments to inform:
 - Operations and preventative maintenance programs;
 - Capital rehabilitation and replacement priorities;
 - Inventory management planning;
 - Redundancy and contingency planning;
 - Business continuity and emergency planning; and,

¹ Values are reflected as gross costs including York Region's share of Duffin Creek WPCP and excluding purchased utilities within the Durham York Energy Centre contractor operating agreement.

E) Incorporate consideration of recommended initiatives under the 2016 Durham Community Climate Adaptation Plan “Towards Resilience”, as approved in principle by Regional Council, into the 2018 business planning cycle.

2.5 Regional program based climate mitigation and adaptation priorities have been a focus since 2009 and staff continue to implement initiatives through the annual business cycle per Regional Council direction, including through the multi-year forecast, long-term servicing and financing studies, risk management and asset management processes, in consultation with the Climate Change Staff Working Group, and its Energy Advisory and Adaptation Sub-committees.

2.6 Regional asset management plans have been reported annually since 2004 and, as noted by the Province, will be key to the establishment of a long-term and effective corporate response to climate change and to ensuring long-term sustainability.

3. Data Accounting: Corporate Carbon Footprint and Forecast

3.1 This section provides an update to the corporate GHG emissions inventory (2007 to 2016) and forecast (2017 to 2021) and covers Regionally-owned and/or leased facilities, vehicle fleets, traffic signals and related infrastructure, water supply and sanitary sewerage treatment, pumping and storage operations as well as Regionally owned solid waste landfills and DYEC. The accounting of the Region’s corporate GHG emissions is coordinated through the Finance Department in consultation with Regional departments based on Council-endorsed GHG emission reporting protocols. The following summary provides an overview of the Region’s corporate carbon footprint from 2007 to 2016.

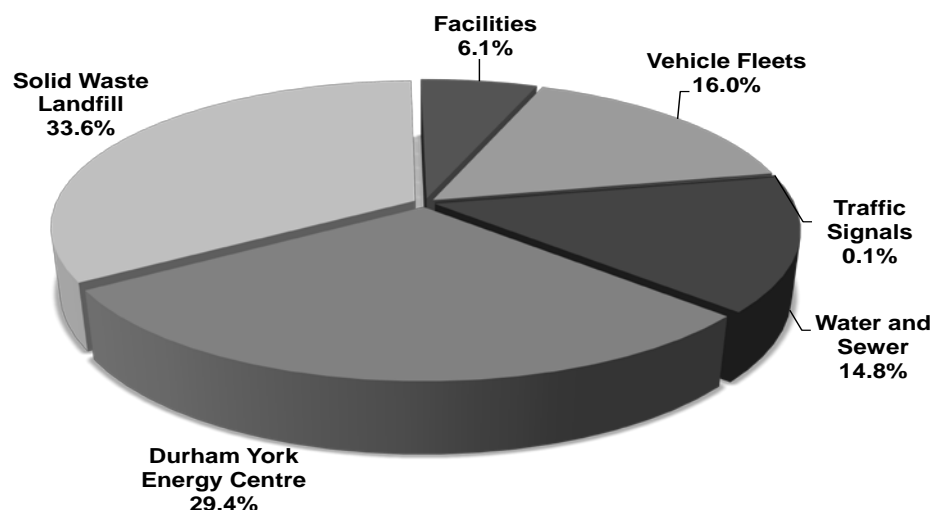
**Table 2- Corporate Greenhouse Gas Emissions Inventory
tonnes of carbon dioxide equivalent (CO₂e)
2007 to 2016 (estimated and rounded)**

	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>
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Notes: The scope of reported emissions is consistent with prior years with the exception of the newly-added DYEC emissions total for 2016.

- 3.2 Where required, the previously-reported 2007 to 2015 GHG emission inventory has been adjusted to reflect improved data and updated coefficients. Emissions from the DYEC are included in the carbon footprint for the first time and this new source of emissions from disposal effectively replaces emissions from disposal of waste in jurisdictions outside of Durham Region (where such emissions are generally not reflected in the corporate scope).
- 3.3 As shown in the following graphic, just under 15 per cent of estimated corporate GHG emissions can be attributed to water and sanitary sewer operations while 63 per cent is sourced from Regional landfills, all of which are closed, in combination with the newly-added DYEC. Approximately 16 per cent of corporate GHG emissions are attributed to fuel combustion in vehicle fleets (total), while just over 6 per cent and 0.1 per cent are from emissions associated with Regional owned or leased facilities (non-plant) and traffic signals and related infrastructure, respectively.

**Figure 1 - Estimated 2016 Greenhouse Gas Emissions Inventory
(tonnes of carbon equivalent – CO₂e)**



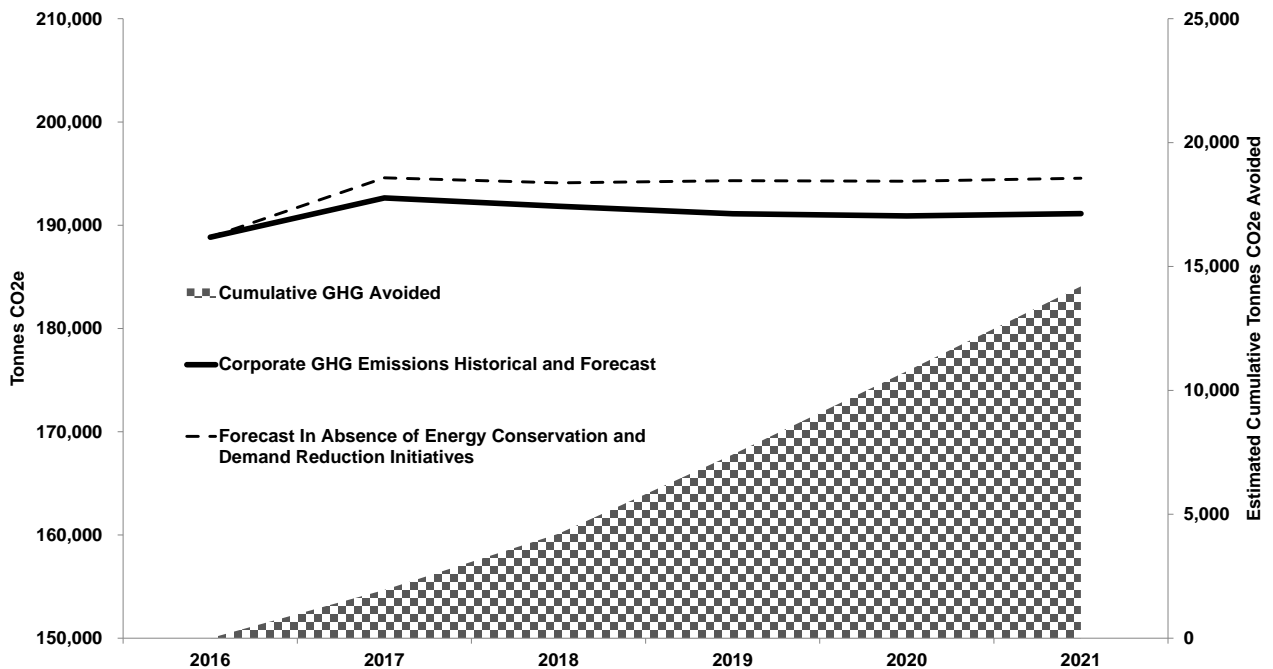
2016 Estimated CO₂e = 188,900 tonnes

The Corporate Carbon Footprint Forecast

- 3.4 The Region continues to respond to the growing service needs of the local community with new and/or expanded Regional facilities and fleets. As indicated by the Region's Planning and Economic Development Department forecast, the Region's population is expected to reach approximately 960,000 people by 2031.
- 3.5 The following GHG emission inventory forecast for the 2017 to 2021 period includes estimated incremental effects attributed to the Region expanding services to meet its growth requirements. Such increases include fleet and facilities adjustments as detailed within departmental operational and capital and forecasts including DRPS, DRT and RDPS program areas. The following chart also depicts a separate trend line which captures the effects and offsetting reductions as a result of various

environmental and conservation initiatives which will serve to offset the overall absolute increases that can be expected through the growth and expansion of Regional services (mainly facilities and fleet). While the full range of potential impacts from growth of Regional operations cannot be quantified, the projection provides some indication of the general trend where provision has been made for potential growth impacts.

Figure 2 - Corporate Greenhouse Gas Inventory Baseline Forecast



- 3.6 The projected increase in absolute emissions over the 2017 to 2021 period from facility operations and related energy usage is driven in large part by estimated growth in Regional fleets and related fuel usage, the addition of new Regional facilities and expansion of existing locations as well as projected growth in water and wastewater treatment to meet the projected growing needs within in the Region. The largest fleet increases are associated with projected DRT service expansions over the forecast period.
- 3.7 While transit’s share of the overall corporate carbon footprint may increase as a result of expanded fleet (even accounting for continuous improvements in vehicle efficiency, including the fleet replacement program), such an expanded public transit system can assist with reducing overall community emissions through convenient alternative transportation options, supporting a more compact form of urban development and working to reduce emissions per passenger kilometer-travelled.
- 3.8 Similarly, the DYEC is part of an integrated solid waste management system which moves materials out of the residual waste stream and into re-use or recycling/composting options. Durham Region provides a variety of programs to minimize residual waste with programs such as re-use, curbside blue box

recycling, curbside organics diversion for composting and resident education and energy recovery from residual waste. These programs have resulted in significant reductions in carbon emissions by minimizing the amount of waste sent to disposal.

- 3.9 With full Commercial Operations on January 28, 2016, the DYEC is now included in the 2016 carbon footprint and forecast projections (net Durham share, prorated for Commercial Operations period). Municipal energy-from-waste (EFW) options are recognized internationally as effective carbon mitigation tools: they produce electricity for the grid to offset alternative, higher GHG-emitting fossil fuel combustion sources that otherwise would have accommodated system demand requirements; they produce lower overall carbon emissions relative to landfilling; and; they assist in the recovery of additional metals for recycling which further reduces carbon emissions associated with the production of metals from raw materials. Emissions from trucking and haulage of waste (contracted services) to landfill are not captured within the corporate inventory. However, the emissions from the DYEC replace the higher transportation and landfill emissions for the same waste that was previously hauled long distance for landfill disposal (emissions not included from a corporate perspective).
- 3.10 Landfill methane, while representing a large share of overall estimated corporate GHG emissions, are declining over time as all Regional landfills are closed. Options for remediation of landfills, including the Blackstock landfill mining project can also be expected to provide environmental benefits including removal of non-hazardous waste from the site for possible processing at the DYEC facility, in addition to the removal of metals for recycling and/or marketing. The current landfill emissions projections do not yet account for GHG reduction effects of the Blackstock landfill mining initiative (or possible future application at other Regionally owned landfills) but future updates will acknowledge reduced methane emissions, where applicable.
- 3.11 For additional Regional facilities which reflect expansion of Regional services to accommodate growth, while absolute emission increases may be realized, the relative energy usage for newly designed facilities may be less given enhanced design standards and improved energy efficiency and performance.
- 3.12 The Region continues to be active in its identification, evaluation and implementation of energy conservation and demand management initiatives. Given the expectation for continued rising energy costs in the coming years, including anticipated cost impacts associated with carbon pricing under the cap and trade program, such conservation measures have and will assist in providing material energy savings and cost avoidance to the Region. While such activities by the Region will continue, it is recognized that reductions serve as an offset in program areas which can expect continued growth, such as water and sanitary sewer treatment and related operations (i.e. storage, pumping).

- 3.13 As shown in Figure 2, the alternative scenario assumes a business-as-usual approach in the absence of energy conservation and demand management initiatives as assumed over the forecast period, including but not limited to, energy efficient building construction, natural gas displacement by digester gas at sanitary sewer treatment facilities, lighting and equipment retrofits and/or refurbishments and other operational enhancements and strategies. Given this, the lower trajectory for forecast corporate GHG emissions can be considered an avoidance of GHG emissions, much of which can also be tied to associated lower energy usage and cost for which the Region also realizes a significant benefit.
- 3.14 The alternative scenarios and the lower emission trajectory is not inclusive of all possible initiatives and implementation of proposed or potential initiatives may not be realized as a result of a number of factors (i.e. competing priorities, resource limitations, projects deemed not feasible, alternative technologies and options for consideration). Nonetheless, the forecast provides a potential order of magnitude and context to the numerous corporate energy conservation and GHG emission reduction initiatives currently underway and those that are being considered for further review and analysis. With the continued collection and analysis of data related to energy conservation and other climate change mitigation initiatives, Regional staff will continue to monitor and provide updates relating to energy savings and corporate GHG emissions avoidance.

4. Provincial Reporting Requirements and the Energy Conservation and Demand Management (CDM) Plan

Reporting under the Green Energy Act

- 4.1 Since 2013, the Province has required public agencies, including municipalities, to report on their annual energy usage and GHG emissions for designated facilities, as required by Ontario Regulation 397/11 under the Green Energy Act. With the first compliance reporting date coinciding with 2011 energy usage data, the Region's recent submission, as detailed within Report #2017-INFO-70, covers the Region's 2015 energy usage data for many of its facilities and operations. The Ministry of Energy has made all submission data available to the public through its OpenData website where comparisons with comparable facilities can provide insights to relative energy consumption and facility performance based on energy intensity.
- 4.2 The regulation also requires broader public sector entities to develop and implement a comprehensive Energy Conservation and Demand Management (CDM) Plan. The Plan outlines previous, current and proposed means for conserving energy, while also outlining goals and objectives around energy conservation and management of energy and provides a forecast of expected results including cost and savings estimates. The Region's CDM Plan was endorsed by Regional Council on June 4, 2014 (Report #2014-J-17) and the primary goals of the Plan were identified as follows:

- A) Enhance corporate energy awareness, communications, engagement and information sharing, including educational opportunities for staff to foster a “culture of conservation”;
- B) Investigate existing standards and potential for new energy-related standards to ensure an effective and consistent approach to operations, maintenance, asset management and procurement;
- C) Per previous Council direction, continue to enhance energy-related performance measurement, to better understand energy usage variations and incorporate specific performance measures into individual business planning and budget documentation;
- D) Further integrate energy conservation into existing business planning and asset management analysis, including strategic assessments of specific corporate options for 2015 to 2024 Business Planning and the leveraging of external grant funding opportunities;
- E) Develop a corporate-wide five-year lighting retrofit strategy for consideration, including Works and Finance staff consolidation of the existing lighting inventory, options analysis, business case analysis and comprehensive reporting through Joint Committee, of a comprehensive technically and financially feasible plan, including recommendations and timelines for Council approval; and,
- F) Complete a retrospective assessment of the approved 2014/15 Embedded Energy Manager program, and provide future recommendations to Regional Council regarding potential implementation of similar programs across other Regional facilities and program areas.

4.3 Initiatives to achieve the goals of the Region’s Energy CDM Plan are highlighted in Section 7.0.

Additional Energy and Water Usage Benchmarking Initiatives

- 4.4 On February 6, 2017, Ontario Regulation 20/17, Reporting of Energy Consumption and Water Use was filed. The regulation, which came into force on July 1, 2017, outlines the requirements for building owners and utilities for compliance with the Energy and Water Reporting and Benchmarking (EWRB) Initiative which requires building/property owners to report energy and water usage annually as well as GHG emissions and building characteristics (e.g. gross floor area). The regulation was enabled by the *Energy Statute Law Amendment Act, 2016*, which came into force on July 1, 2016 and included amendments to the *Green Energy Act, 2009*.
- 4.5 Regional facilities will not be required to report as government and government agency-owned buildings do not fall under the EWRB initiative. Reporting facilities will consist mainly of privately-owned buildings that are 50,000 square feet or more, including commercial, multi-unit residential (greater than 10 units) and some industrial buildings such as warehouses. Reporting facilities will be required to report annually on building details and energy (i.e. electricity, natural gas), water and greenhouse gas (GHG) emission data to the Ministry of Energy. Annual reporting will be for prior year energy usage and emissions data with required use of the web-based ENERGY STAR Portfolio Manager. Reporting requirements will be phased-in over a period of three years, with the first compliance date on July 1, 2018.

Reporting Requirements for Other Regional Operations

- 4.6 To-date, in addition to the DYEC, annual GHG emissions reporting has been undertaken regularly based on O.Reg 452/09 under the *Environmental Protection Act* for select Regional operations such as sanitary sewerage treatment facilities, including Duffin Creek WPCP. However, reporting to the MOECC is not required unless the facility's annual GHG emissions surpass 10,000 tonnes CO₂e for the year (emissions above 25,000 tonnes CO₂e would require verification and would have a compliance obligation for its emissions).
- 4.7 While Duffin Creek WPCP represents the largest single emitter among all reporting entities with emissions mainly attributed to biosolids incineration and fuel combustion, there are no Regional facilities (except DYEC) which reported emissions greater than the 10,000 tonnes CO₂e threshold for the 2016 year of emissions (as reported June 1, 2017). However, should the reporting and/or verification/compliance thresholds be lowered or approved methodologies be modified in the future (i.e. quantification of eligible biomass which is not included in reporting thresholds), large emitters such as Duffin Creek WPCP may also be subject to reporting and/or other compliance obligations under the cap and trade program and revised emissions reporting framework and guidelines.

5. Climate Change Legislative Framework in Ontario

- 5.1 The Province has taken a proactive approach to climate change mitigation and adaptation. Ontario has established aggressive GHG emission reduction targets – 15 per cent below 1990 levels by 2020 and 80 per cent below 1990 levels by 2050 – and has now put into place its legislative and regulatory framework and underlying Action Plan to determine where reductions are to be achieved and where reinvestments are expected to take place to help facilitate the Province's transition to a "low-carbon economy".
- 5.2 With the cap-and-trade program having commenced on January 1, 2017, a wide range of impacts, direct and indirect, financially or otherwise, have been felt by a wide range of stakeholders including direct emitters as well as end-use consumers of energy such as residents/households, business and broad public sector entities such as municipalities.

Direct Compliance under Cap and Trade: Durham York Energy Centre

- 5.3 As per Part IV of Ontario Regulation 144/16 under the *Climate Change Mitigation and Low-carbon Economy Act, 2016*, the DYEC is classified as a mandatory participant under the program and has been registered within the Compliance Instrument Tracking System Service (CITSS) as required under Section 15(1) of the Act (the first compliance period runs from January 1, 2017 to December 31, 2020).

- 5.4 Mandatory emitters such as the DYEC have a compliance obligation and are required to remit a total number of emission allowances or related equivalent compliance instruments equal to the CO₂e emissions created during the compliance period. Eligible entities such as the DYEC can apply to the Province for free emission allowances to be used towards meeting their respective compliance obligations. In August 2016, on behalf of the DYEC, the Region applied for free allowances for the 2017 allocation based on 2015 emissions and received allowances equal to 57,884 tonnes of CO₂e with an estimated value of \$1.1 million (reflected net of biomass and equal to the Region's full requested amount).² As of the date of this report, while still undertaking final verification, the reported 2016 emissions for the DYEC under the regulation was 150,866 tonnes of CO₂e (gross) and just under 76,273 tonnes of CO₂e net of biomass (almost 32 per cent increase from 2015 reported values).³
- 5.5 While the material year-over-year increase in GHG emissions coincides with the facility moving towards steady-state operations, a "typical" year of emissions is still unknown given varying components including, steam generated and related natural gas combustion as well as biogenic composition of municipal solid waste processed.
- 5.6 Given free allowance allocations for a given year are based on historical emissions reported, should facility emissions continue to increase over time, the free allowances allocated to the DYEC may be deemed insufficient to cover the full compliance obligation at the end of the first compliance period and additional allowances may be needed to true-up in late-2021 (for the 2017 to 2020 compliance period). Acquisition of necessary compliance instruments to match emissions within the period can be done through either the auction process, Strategic Reserve purchase, secondary market purchase or creation (in case of offset credits). Should the Region be successful in the application for free allowances for the DYEC for its 2018 allocation, along with previously-approved 2017 allocation, the total implied value of allowances held for DYEC would equate to approximately \$2.5 million.⁴ Staff will continue to monitor DYEC facility performance and related GHG emissions implications and provide updates to Regional Council accordingly.

Indirect Cost Implications of Cap & Trade Program on Energy

- 5.7 Indirect cost impacts are also being incurred as the costs of compliance are being passed through to end-use customers. Since 2016, the Region has been incorporating projected impacts of carbon pricing into its business planning and budget process.

² Implied based on 2017 emission allowance allocation and auction settlement price of \$18.72 CAD/tonne from Ontario's June 2017 cap and trade program auction.

³ Reported 2016 emissions are subject to final verification.

⁴ Implied based on 2017 emission allowance allocation and estimated 2018 emission allowance allocation as well as auction settlement price of \$18.72 CAD/tonne from Ontario's June 2017 cap and trade program auction.

- 5.8 The Region spends over \$43 million annually on energy-related expenditures for its various operations, including Regional facility and operation electricity and natural gas usage and fleet and equipment fuels.⁵ Approximately 67 per cent of the total is attributed to electricity consumption across Regional operations while over 26 per cent is fuels for facilities (non-natural gas) and fleet operations. The remaining seven per cent is natural gas consumption across Regional facilities including both DRLHC family unit and multi-residential properties.
- 5.9 While material financial impacts are not being seen by electricity end-use customers as a direct result of cap and trade (given the already relatively low carbon intensity of Ontario-sourced electricity generation), the Region is already incurring additional costs for more carbon-intensive fuels, including gasoline, diesel and fuel oils (i.e. propane, diesel dye, furnace oil) and natural gas as regulated distributors are passing on the costs of compliance with cap and trade. Excluding natural gas, aggregate annual cost impacts for fuel are estimated at \$0.6 million (based on 2016 volumes).⁶
- 5.10 The Region consumes just under nine million cubic metres (m³) of natural gas per year across all Regional operations with 41 per cent attributed to water supply and sanitary sewerage operations including Duffin Creek WPCP.⁷ The regulation of natural gas distributors, including Enbridge Gas, has placed additional volumetric-based costs on customer invoicing (included in delivery charges) to recover costs associated with the acquisition of emission allowances. Aggregate annual cost impacts are estimated at \$0.3 million (based on Enbridge recovery rate and 2016 volumes, including gross volumes for Duffin Creek WPCP).
- 5.11 The Province has proposed a number of actions for enhancing energy efficiency and lowering GHG emission reductions, including use of cap-and-trade program proceeds through the Province's proposed Greenhouse Gas Reduction Account (GGRA) to invest in further GHG emission reduction initiatives across impacted sectors. The expected increase in carbon pricing over time is anticipated to result in continued budget pressures across Regional operational areas. Given the anticipated cost impacts under the cap-and-trade emissions trading program, the Region's corporate mitigation initiatives and energy conservation efforts will be of greater importance to lessen the potential cost impacts across Departmental programs and delivery of services.

5 Based on 2016 gross estimated values, including applicable taxes and York Region share of Duffin Creek WPCP. Does not include energy related costs as part of DYEC operating agreement with operator.

6 Based on approximate emission intensity of fuels with costs implied based on cost of carbon per results of Ontario's June 2017 cap and trade program auction.

7 Gross values include York Region share of Duffin Creek WPCP and exclude DYEC.

- 5.12 As with the numerous energy conservation and demand side management activities undertaken by the Region to date, including those outlined within the Region's Corporate Energy Conservation and Demand Management Plan (CDM Plan - Report #2014-J-17), participation in proposed initiatives may further the Region's progress in achieving its climate change goals and objectives outlined across operational areas. Programs will be considered through the Region's business and asset management planning processes. Furthermore, uptake in GGRA-funded offerings available to both residential and non-residential sectors may further assist with achievement of the Region's community-based sustainability initiatives as outlined in the Durham Region Strategic Plan and Community Climate Change Action Plan.
- 5.13 As an example, on August 24, 2017, the Province announced it will be investing up to \$657 million from carbon market proceeds for the purposes of repairing and retrofitting social housing apartments. The initiatives, including measures such as window replacements, energy efficient heating and enhanced insulation for social housing buildings, will be phased over five years, contingent on availability of program funds through the cap and trade program.
- 5.14 Regional staff continue to seek out energy efficiency programs and associated funding opportunities to assist with the advancement and implementation of energy conservation, GHG emission reducing initiatives and renewable energy generation opportunities, wherever possible. Continued support by senior levels of government and local electrical and natural gas utilities through various program offerings, incentive programs and technical expertise and resources, in addition to possible funding program funds available through cap and trade program proceeds through the GGRA, will assist the Region in achieving its climate change mitigation and energy conservation objectives both at the corporate and community level.

Carbon Offset Registry and Protocol Development

- 5.15 Carbon offsets can generally be described as credits generated through projects and initiatives which reduce GHG emissions which are not included within regulated sectors. Offsets often provide added flexibility to markets by lowering overall costs of compliance (depending on emission program/jurisdiction). The Province is proposing to allow up to eight per cent of an emitter's compliance requirement to be met through the use of offset credits.
- 5.16 As noted, as part of the initial review of potential cap and trade program design options, the Province proposed the allowance for carbon offsets using Ontario-approved carbon offset protocols, which would define verifiable, validated, enforceable and permanent offsets. On November 15, 2016, the MOECC posted a carbon offsets regulatory proposal (EBR Posting #012-9078) outlining the proposed framework for the carbon offsets component of the Province's cap and trade program.

5.17 The carbon offset regulatory proposal outlined the framework for the creation and issuance of carbon offset credits in addition to the overall process and administrative requirements which would be associated with the recognition and registration of carbon offset projects and initiatives. Carbon offsets will represent one tonne of CO₂e reduced, avoided or removed from the earth's atmosphere attributable to the project or initiative undertaken and can be utilized as compliance instruments within the cap and trade program and can be sold and/or traded within the secondary market.

5.18 The MOECC is also adapting protocols under the carbon offset regulatory framework, which will set project rules to determine eligibility for carbon offset creation. The Province awarded a tender to the California-based Climate Action Reserve to assist with adapting of 13 protocols, consisting of:

- Landfill gas capture and destruction;
- Mine methane capture and destruction;
- Ozone-depleting substances capture and destruction;
- Nitrous Oxide (N₂O) reductions from fertilizer management;
- Organic waste digestion;
- Organic waste management;
- Emission reductions from livestock;
- Afforestation;
- Forest project (i.e. reforestation, avoided conversion);
- Urban forest project;
- Conservation cropping;
- Grassland; and
- Refrigeration systems.

5.19 The offset regulation and protocols under the cap-and-trade program may provide opportunities to the Region where created offset credits could potentially be used to achieve compliance obligations (up to 8 per cent through use of carbon offsets) and reduce direct costs of compliance, where needed, and/or sold to market and serve as an alternative source of revenue. It is anticipated that the carbon offset protocols may provide opportunities in areas including organics waste management and organics waste digestion both on the solid waste management and wastewater treatment side of Regional operations.

5.20 As the Climate Action Reserve continues to work with its consulting team, the Provinces (Ontario and Quebec) and other stakeholders for the drafting of final protocols, Regional staff will continue to monitor program development, and provide feedback through public review and comment periods, where appropriate. Regional staff will continue to monitor and report back to Regional Council on potential implications related to the cap and trade system and related carbon offset regulatory framework and related protocols as additional information around program design are made available.

5.21 Furthermore, program impacts including opportunities for participation in carbon offset creation will also be evaluated and considered further by department staff with future reporting, including annual Servicing and Financing Studies across major program areas, where applicable.

Ontario Organics Action Plan

5.22 The MOECC is in the process of developing a comprehensive Organics Action Plan which is considering, among other initiatives, a disposal ban for organic waste in landfill sites that would serve to reduce methane emissions.

5.23 The province's Climate Change Action Plan (CCAP) outlines initiatives aimed at reducing emissions from waste and moving the Province to a circular economy. It is anticipated that the Organics Action Plan will focus on beneficial uses of organic wastes including opportunities for the generation of renewable natural gas (RNG) where the CCAP has noted establishment of renewable content requirements for natural gas to promote such low-carbon energy supply options.

Municipal GHG Challenge Fund

5.24 As outlined in the Province's CCAP, to further support municipal and other stakeholder climate mitigation activities, the Province proposed the establishment of a Challenge Fund or Program to support GHG emission reduction projects proposed by municipalities that already have supporting plans and/or climate policies (with GHG inventories) in place. The CCAP suggested that, the proposed funding would be in the range of \$250 to \$300 million funded through cap and trade program proceeds through the GGRA.

5.25 On August 14, 2017, the Province announced the new Municipal Challenge Fund with \$100 million in program proceeds to be made available for 2017/18. Program details include, but are not limited to:

- A) Municipalities can request up to \$10 million per project through the competitive application-based program. Funds can cover up to 100 per cent of eligible project costs;
- B) Municipal projects that aim to reduce GHG emissions in either the water, waste or organics sectors as well as buildings, transportation or energy supply sectors are eligible. If a project is already underway it is only eligible if initiated after June 1, 2016 and all projects must start by March 2019;
- C) Municipalities with a community-wide GHG emissions inventory, target for reductions and community emissions reduction strategy as well as 5-year plan per O.Reg 397/11 and annual energy reporting are eligible to apply. Preference (through application scoring) is given to municipalities that have GHG emission reduction plans that are equal to, or surpass the Province's targets;
- D) Municipalities are encouraged to partner with other municipalities or other community organizations to implement a proposed initiative;
- E) There must be a commitment to the proposed project from municipal council and letter of commitment from other project funders (if applicable); and

- F) Small municipalities with population less than 10,000 that do not have supporting GHG emissions inventories, plans or related reduction targets can apply under a Very Small Municipalities Stream

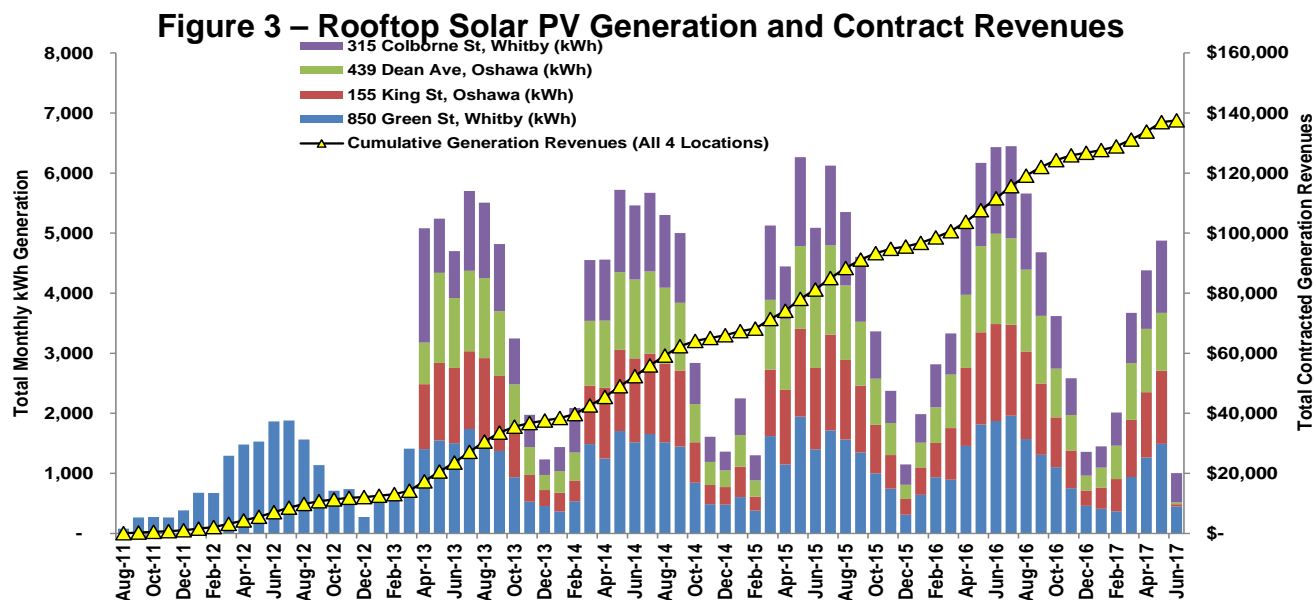
5.26 The Region will be able to meet the requirements of program eligibility by virtue of having completed a community GHG emissions inventory, having established community GHG emission reduction targets (reductions of 5 per cent, 20 per cent and 80 per cent by 2015, 2020 and 2050, respectively) and a Community Climate Change Local Action Plan as well as having a Corporate CDM Plan and updated annual energy usage reporting.

5.27 With additional program information webinars scheduled for early-September 2017, and the application deadline for November 14, 2017 (successful applicants will be notified by February 2018), Regional staff will be working collaboratively to determine Regional GHG emissions reduction initiatives which are eligible to apply to the Municipal Challenge Fund.

6. Energy – Related Incentives

Electricity Generation Initiatives

6.1 The Region currently has four operational rooftop solar photovoltaic (PV) installations at DRLHC sites in the City of Oshawa and the Town of Whitby. All projects are operating with all generated electricity sold back to the Ontario power grid under 20-year microFIT contracts. As shown in Figure 3, since 2011 the solar applications have generated a cumulative 0.2 million kWh of emission-free electricity to the grid while generating approximately \$0.14 million in total microFIT contract revenues. The solar PV projects continue to be monitored by Regional staff with performance and related feedback assisting in the assessment of potential future projects.



6.2 In considering similar technologies and applications for other Regional locations, structural enhancements to the Fairview Lodge Long-Term Care Home and Clarington Police Complex buildings were undertaken to ensure future solar PV installation capability. As noted within the Region’s CDM Plan, solar options and related technologies are assessed on a case-by-case basis as part of new build design, including technical and financial considerations and available generation contract program opportunities through the Independent Electricity System Operator (IESO).

6.3 A significant amount of electricity is also generated through the combustion of waste at the DYEC. As of the end of July 2017, the facility has provided net cumulative generation of over 170 million kWh to the grid and site load requirements are also largely accommodated through electricity generated on site. Electricity sold under Power Purchase Agreement (PPA) with the IESO provides annually-indexed power generation revenues significantly greater than prevailing market rates where cumulative revenues as of end of July 2017 total approximately \$12 million since start-up of the facility (just under \$7.4 million for 2016).

Energy Conservation and Incentives

6.4 The Region works collaboratively with its respective electricity and natural gas local distribution companies (LDCs) to leverage available programs, technical resources and incentives to assist with project implementation and validation of energy savings to help manage energy costs. Numerous programs provide support and incentives for various initiatives including:

- A) Funding for energy audits, building commissioning and/or re-commissioning;
- B) Technical support and resources to assist with identifying energy efficiency opportunities, project evaluation and measurement and verification of energy savings; and
- C) Energy efficient new building construction, major renovation projects and capital upgrades, energy management and monitoring.

6.5 Energy conservation program incentives and resources are explored and evaluated for all of the Region's identified energy conservation initiatives as they are brought forward even at the earliest stages of project identification and evaluation. To date, the Region has experienced notable success in participation with the LDCs. Total incentives and implemented measures made available through the LDCs have totaled close to \$1 million to-date. The Green Municipal Fund (GMF) as made available through the Federation of Canadian Municipalities (FCM) is also considered where project eligibility permits.

7. Climate Mitigation

- 7.1 The most recent Corporate Climate Change Update (Report #2016-COW-21) outlined numerous mitigation initiatives underway across Regional program areas. Over the last year, additional initiatives have been completed or are in the process of being completed as the 2017 Business Planning and Budget Process approved a number of additional measures which result in energy efficiency. The initiatives as outlined in Attachment #1 provide a sample of the projects budgeted, underway or under review for possible implementation.
- 7.2 The initiatives outlined, in addition to those previously completed and reported, are essential to the success of the Region's CDM Plan. Considerations are made for energy efficiency for initial design of facilities and replacement or upgrade of equipment including Regional vehicles. As an example, considerations of latest technologies and fuel efficiency are made for fleet vehicle purchases which considers the life cycle of the assets and factors such as maintenance needs over life of asset, operating reliability, nature of service and upfront costs. Hybrid and electric vehicle (EV) technologies along with other technology types are continuously being evaluated and considered for implementation where appropriate. As noted within the Region's CDM Plan, energy conservation remains central to the Region's culture and best-practice decision-making, reporting and approvals processes going forward. CDM Plan costs, benefits, and risks are considered annually, and monitored and reported within the broader long-term planning and management process with the goal of continuous improvement.
- 7.3 Included in the list of major initiatives underway is the continued participation of the Embedded Energy Manager (EEM) program at Duffin Creek WPCP (position now made permanent) as well as the successful application for a new EEM dedicated to Social Services. This new resource will aim to build on the notable successes in energy efficiency and conservation across Social Services facilities, such as the numerous lighting retrofits, building automation system (BAS) enhancements and

variable frequency drive (VFD) technology– related measures across the Region’s Long-Term Care (LTC) facilities and the participation in Enbridge’s Home Winterproofing Program for DRLHC family units in Oshawa. The new EEM will further add to corporate energy expertise with a focus on LTC and child care facilities, Social Services administrative office and DRLHC multi-residential buildings in addition to Regional Headquarters.

8. Corporate Climate Adaptation

8.1 The vision guiding Regional program-based climate adaptation work is to become more adaptive to the changing climate by:

- A) Ensuring the ongoing monitoring of an effective and forward looking Corporate Adaptation Plan; and,
- B) Enhancing the Region’s ability to moderate potential damages, take advantage of opportunities, and enhance its ability to cope with consequences through the integration of climate adaptation considerations into annual risk management, asset management and business planning processes (Report #2014-J-1).

8.2 In 2014, the approved Corporate Climate Adaptation Plan also sought to:

- A) Establish Durham Region as a municipal adaptation leader;
- B) Fully integrate climate adaptation and mitigation initiatives into business planning, budgets, risk management and asset management programs, studies, processes and reporting;
- C) Make climate adaptation a regular consideration in decision making processes;
- D) Implement the greatest value-added initiatives based on cost-effectiveness and demonstrated results (performance measurement);
- E) Increase opportunities to achieve climate mitigation co-benefits with increased resiliencies;
- F) Ensure the Regional Corporation’s adaptive capacity is measurably improved by 2017; and,
- G) Ensure effective reporting to Regional Council, the DRRCC and the public.

Climate Resiliency: A Regional Program Priority

8.3 Senior management continues to support integration, information sharing and collaboration across program areas to support a fulsome and multidisciplinary approach to climate resiliency and ensure:

- A) Implementation of climate adaptation initiatives with the greatest benefits to long-term sustainability (environmental, technical and financial);
- B) Improved corporate resiliency (operational and infrastructure-related);
- C) Coordination and effective communication of adaptation-related initiatives to Regional Council, DRRCC and the public; and,
- D) Continuous monitoring and review of potential vulnerabilities related to Regional climate impacts to infrastructure and service delivery.

- 8.4 In consultation with senior management, the multidisciplinary Corporate Climate Change Staff Working Group (CCSWG) and its adaptation sub-committee coordinate with the asset management and risk management staff teams to ensure:
- A) Review and assessment of available research and analysis of anticipated local climate change projections and impacts (e.g. the April 2014 SENES Study “Durham Region’s Future Climate (2040-2049);
 - B) Vulnerability and risk reviews and updates, including periodic staff workshops across program areas and asset classes to consider potential operational and infrastructure risks and potential business continuity impacts;
 - C) Support for individual program areas in considering climate adaptation requirements as part of annual business plans, servicing and financing and planning studies;
 - D) Initiatives to communicate climate change research, regulations and potential implications to Regional program areas (adaptation webinars and climate change presentations have also been conducted or shared outside the organization, including with Durham Region insurance pool members and local municipal treasurers and staff); and,
 - E) Consolidated adaptation-related performance measures and benchmarks to monitor and review progress and improvements throughout the annual business planning process.
- 8.5 Regional asset management plans have been reported annually since 2004 and as noted by the Province will be key to the establishment of a long-term and effective corporate response to climate change and to ensuring long-term sustainability.

Corporate Adaptation Plan: Regional Program Progress

- 8.6 Since the first Corporate Adaptation Plan was approved in 2014 (Report #2014-J-1), Regional Council has implemented what were deemed to be the most credible, aggressive and economically viable options for the Region to adapt to climate changes and identified risks.
- 8.7 A number of plans, improvements, capacity expansions and infrastructure initiatives, have significantly enhanced the Region’s resiliency and capacity to adapt to the changing climate. Additional initiatives and studies are also anticipated for the 2018 to 2022 forecast period.
- 8.8 The asset management team, in consultation with staff from across all program areas continue to refine climate risk assessments, including workshops held through 2016. Re-evaluation of potential climate impacts include consideration of consequences, probabilities and the adequacy of current risk mitigation controls already in place at the Region.

- 8.9 Recent risk re-assessments identified various concerns for further analysis and adaptation update. These will be further investigated from a climate change perspective within 2018 business planning with updates provided for go-forward climate adaptation goals, objectives, strategic 2018 to 2022 actions and performance measures. Staff will investigate the following identified risks, to determine any gaps in controls and mitigation strategies:
- A) Potential disruptions to water supply;
 - B) Loss of external utilities or fuel supply;
 - C) Potential for major facility system failures;
 - D) Sanitary sewerage inflow and infiltration; and,
 - E) Potential disruption to sanitary sewerage collection.
- 8.10 Significant annual expenditures are made for climate resiliency. Detailed information on climate adaptation goals, objectives actions and approved expenditures are provided within Attachment #2 for the years 2015 through 2017. Attachment #3 provides a description of select implemented or ongoing initiatives which enhance corporate resiliency and address identified issues.
- 8.11 Going forward, identified strategic actions (2018 to 2022) related to climate adaptation and enhanced resiliency include the following which will be reviewed and prioritized through the 2018 Business Planning Cycle:
- A) The Water Supply and Sanitary Sewerage Master Planning Study has recently commenced (Request-for-Proposals to be issued in the fall) to update service level goals and objectives of the water supply and sanitary sewerage systems and refine applicable performance measures. The scope of work includes assessment of growth and the existing and planned water supply and sanitary sewerage systems and assessment of system performance considering extreme weather events to address climate risk.
 - B) Continuation of condition assessment strategies including all creek crossings;
 - C) More frequent inspections at higher risk locations with prioritization of annual remediation work implemented through business planning and asset management;
 - D) The water and sewer operations preventative maintenance program;
 - E) Implementation of hydrant meters to accurately manage the drawing of water;
 - F) Analysis of algae study and recommendations;
 - G) Regional Works, Health and Planning and Economic Development Departments continue to implement the policies of the four Source Protection Plans affecting Durham Region which have been approved by the MOECC. This includes managing existing and future threats to the quantity or quality of municipal drinking water sources in Durham Region through updates to Official Plan policies, education and outreach and development of risk management plans. Examples of significant drinking water threats include fuel storage, agricultural activities (such as fertilizer and pesticide application) and handling of dense non-aqueous phase liquids (toxic chemicals). Works will be updating the regional groundwater model to re-delineate Wellhead Protection Areas for all of

our municipal drinking water wells.

- H) Completion of I/I studies for the northern municipalities (initial study has commenced in Cannington) designed to identify sources of water entering the sanitary sewerage system that do not require treatment (i.e. cross connections and downspouts connecting to sanitary sewers).
- I) Proposed improvements, capacity expansions and other infrastructure initiatives to further enhance resilience/adaptive capacity which were approved within 2017 budgets and/or included in the forecast period for consideration in 2018 business planning include:
- Improvements at Whitby WSP including new standby power for emergency control and power supply (additional \$3.5 million by 2023);
 - Construction of plate settling tanks at Whitby WSP to reduce risk to water quality and quantity and equipment due to higher surface water temperatures and higher precipitation (approved design funding of \$0.5 million and a total estimated project cost of \$10.8 million by 2023);
 - Ajax WSP plant supervisory control and data acquisition (SCADA) upgrades to reduce risk by linking plants north and east to the Ajax SCADA system which controls southern operational areas. Full implementation will also improve operational efficiency and compliance monitoring (estimated total costs of \$28.7 million with \$7.2 million proposed for 2018-2019);
 - A new diesel generator at Ajax WSP to ensure continued system operation to be implemented with the Ajax WSP expansion; and
 - An EA and engineering study to identify a suitable new water source for the Port Perry system and improve water quality (estimated \$21.5 million in 2018, including \$3.0 million of approved funding).

8.12 Since the first Corporate Climate Adaptation Plan was approved in 2014, the Health Department implemented a Heat Warning Information System (HWIS) pilot which has become a permanent program. Using meteorological data services from Environment Canada, early notification of extreme heat events is provided to community partners through an email subscription service, allowing partners to prepare for extreme heat in advance. The general public is alerted through media release and the Durham website.

8.13 The Health Department identifies the following priority strategic actions for the forecast period (2018 to 2022):

- A) Implementation of a new Cold Warning Information System (CWIS) for the Region;
- B) Complete approximately 1,000 property inspections of private sewage systems under contracts with the Townships of Brock and Uxbridge by the end of 2020;
- C) Complete contract negotiations with the Township of Scugog for the private sewage systems maintenance inspection program;
- D) Meet the increased demand for services related to the assessment and monitoring of the prevalence and risks from VBD, including Lyme disease (tick surveillance services), West-Nile Virus, Zika virus, Powassan virus, Eastern

- Equine Encephalitis and others, including on-going surveillance programs and incidence reporting;
- E) Increase awareness and promotional activities aimed at improving community awareness of risks and personal and proactive measures e.g. against tick exposure, mosquitoes, etc.;
 - F) Reduce the availability of larval mosquito breeding sites (e.g. roadside catch basin monitoring, larvaciding program, and adult mosquitoes' surveillance program) and implement the principles of Integrated Mosquito Management to reduce the risk that vector mosquitoes pose to humans;
 - G) Respond to public inquiries and provide information on environmental health issues;
 - H) Promote the Environmental Health Line and website as resources on environmental health issues;
 - I) Communicate effectively with Source Protection Committees on Regional drinking water supplies;
 - J) Consult with stakeholders and provide information to the community and priority populations on extreme heat and cold exposure, air pollution exposure, including promotion of the Air Quality Health Index; and
 - K) Provide accurate and timely information to health professionals, the public and the media.

8.14 The corporate asset management program has identified strategic actions (2018 to 2022) related to climate adaptation and enhanced Regional resiliency including:

- A) Prudent and proactive investments in preventative maintenance, rehabilitation and capital replacements to address climate related vulnerabilities in consultation with risk management and the CCSWG and its adaptation sub-committee;
- B) Proactive operational strategies that help to prevent adverse impacts to roads, water pipes and transit facilities/stops due to more frequent freeze-thaw events;
- C) Addressing structure requirements through a sustainable long-term rehabilitation and replacement strategy;
- D) Prioritizing condition audits of facilities, systems and sites, including consideration of excessive erosion and/or damages and quality of life considerations for occupants (e.g. drainage and mould issues);
- E) Continuing to prioritize the Regional Road Rehabilitation and Replacement and Bridge and Structure Rehabilitation and Replacement Programs to address asset deficiencies identified through the asset management planning process;
- F) Completion of the strategic road safety program and action planning process in collaboration with Risk Management to set direction for road safety investments;
- G) Transportation system risks continue to be monitored and assessed. For example, in 2016, Traffic Control Uninterrupted Power Supply (UPS) installation and retro-fitting began to ensure adequate backup power for key intersections.
- H) Considering planned capital repairs, replacements and system upgrades to 2022 within the current 2018 business planning cycle, including:
 - Standby generation upgrades to mitigate against power failure risk at Carruthers Creek SSPS (Ajax) and Madawaska SSPS (Oshawa) totaling

approximately \$2.9 million and proposed for 2018;

- Duffin Creek WPCP projects to enhance resiliency and security including:
 - solids handling facility reactor replacements by 2024 (approximate \$46.4 million Durham share);
 - Rehabilitation of York-Durham sanitary sewer (Finch Avenue to WPCP), including Closed Circuit Television inspections, minor repairs and rehabilitation work to 2026 (\$1.5 million Durham share); and,
 - Twinning of the primary trunk sanitary sewer (Finch Avenue to WPCP) by 2024 (estimated \$47.9 million Durham share including the EA).

8.15 As recommended, the 2018 business planning cycle will include a detailed review of climate adaptation initiatives, including those currently within the Region's five year operational and 10-year capital forecasts, as well as those highlighted within the 2016 Durham Community Climate Adaptation Plan "Towards Resilience."

8.16 Community programs recommended for Regional participation include:

A) Cross-sectoral programs:

- Protect our outside workers; and,
- Social infrastructure for emergency resilience.

B) Building Sector Programs:

- The Durham climate resilience standard for new buildings; and,
- Building retrofit for climate resilience.

C) Electrical sector programs:

- Asset protection against flooding;
- Vegetation management; and,
- Asset design and service life management program.

D) Flooding sector programs:

- Address urban flooding;
- Redefine flood hazards considering climate change;
- Improve flood forecasting, warning and emergency response; and,
- Address riverine flooding.

E) Human health sector programs:

- Extreme weather alert and response (EWAR) system;
- Property standards by-laws for maximum temperature allowed in apartments; and,
- "Cool Durham" heat reduction program.

F) Roads sector programs:

- Resilient asphalt program;
- Road embankment program; and,
- Adaptive culverts and bridges.

G) Natural environment sector program:

- Achieving resilience in the natural environment.

8.17 In addition to addressing its own jurisdiction of responsibility through existing policies and processes, the Region through the Office of the Regional Chair and CAO will also be monitoring the progress of various responsible agencies on behalf of the Durham community.

9. Conclusion and Next Steps

9.1 The 2018 to 2022 Climate Adaptation Strategy will be developed through the 2018 Business Planning process, including further analysis within the Servicing and Financing studies completed for major program areas and the 2018 Asset Management Plan. Regional asset management plans have been reported annually since 2004 and, as noted by the Province, will be key to the establishment of a long-term and effective response to climate change and to ensuring long-term sustainability.

9.2 Direct and indirect cap and trade program implications including direct compliance (DYEC), possible reporting (non-DYEC facilities) and direct cost impacts will continue to be monitored and reported back to Council, where required. In addition, Climate Change Action Plan (CCAP) initiatives and programs and additional regulatory proposals (i.e. carbon offset framework) which impact Regional operations or allow for possible Regional participation will also be monitored.

9.3 Corporate mitigation initiatives will continue to be considered through the business planning process along with collaboration with the Region's electrical and natural gas distribution companies for the purposes of measuring and verifying savings and leveraging available program opportunities, where applicable. Updates on successfully implemented measures and the implementation of the Region's Energy Conservation and Demand Management (CDM) Plan, will be provided through future reporting.

9.4 It is recommended that this report be forwarded to the Durham Region Roundtable on Climate Change for information.

9.5 This report has been prepared with the assistance of all Regional Departments, DRT and DRPS.

10. Attachments

Attachment #1: Summary of Sample Climate Mitigation Initiatives by Region of Durham

Attachment #2: Climate Adaptation Program Expenditures

Attachment #3: Ongoing Climate Adaptation Initiatives

Respectfully submitted,

Original Signed By

R.J. Clapp, CPA, CA
Commissioner of Finance

Recommended for Presentation to Committee

Original Signed By

G.H. Cubitt, MSW
Chief Administrative Officer

List of Acronyms

AD	Anaerobic Digestion
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BAS	Building Automation System
CAO	Chief Administrative Officer
CCAP	Climate Change Action Plan
CCSWG	Corporate Climate Change Staff Working Group
CCTV	Closed Circuit Television Inspection
CDM	Conservation and Demand Management
CHP	Combined Heat and Power
CITSS	Compliance Instrument Tracking System Service
COW	Committee of the Whole
DEMO	Durham Emergency Management Office
DRLHC	Durham Regional Local Housing Corporation
DRPS	Durham Regional Police Service
DRRCC	Durham Region Roundtable Climate Change
DRT	Durham Region Transit
DSRs	Dam Safety Reviews
DYEC	Durham York Energy Centre
EV	Electric Vehicle
EA	Environmental Assessment
EIS	Environmental Impact Studies
EEM	Embedded Energy Manager
EFW	Energy from Waste
EMMS	Enterprise Maintenance Management System
EWAR	Extreme Weather Alert and Response
EWRB	Energy and Water Reporting and Benchmarking
FCM	Federation of Canadian Municipalities
GMF	Green Municipal Fund
GGRA	Greenhouse Gas Reduction Account
GHG	Greenhouse Gas
HVAC	Heating, Ventilation and Air Conditioning
HWIS	Heat Warning Information System
I/I	Inflow and Infiltration
ICI	Industrial Conservation Initiative
IESO	Independent Electricity System Operator
IPS	Influent Pumping Station
IRR	Integrated Resource Recovery
KWh	Kilowatt-Hour Equivalent
LDCs	Local Distribution Companies
LED	Light Emitting Diode
LEED	Leadership in Energy and Environmental Design
LTC	Long Term Care
M	Metres
MOECC	Ministry of the Environment and Climate Change
N ₂ O	Nitrous Oxide
OMBI	Ontario Municipal Benchmarking Initiative
OPUC	Oshawa Power and Utilities Corporation
P2	Pollution Prevention

PCI	Pavement Condition Index
PMCVI	Periodic Mandatory Commercial Vehicle Inspection
PPA	Power Purchase Agreement
PV	Photovoltaic
RDPS	Region of Durham Paramedic Services
RFI	Request for Information
REM	Roving Energy Manager
RNG	Renewable Natural Gas
SCADA	Supervisory Control and Data Acquisition
SSPS	Sanitary Sewer Pumping Station
UPS	Uninterrupted Power Source
VBD	Vector Borne Diseases
VFD	Variable Frequency Drive
WPCP	Water Pollution Control Plant
WSP	Water Supply Plant

Attachment #1 - Summary of Sample Climate Mitigation Initiatives by Region of Durham

Operational Area	Initiative	Description
RDPS - Fleet	Use of ECO idle reduction system for fleet	Enhanced fuel vehicle consumption, reduce noise pollution and GHG emissions
DRPS - Fleet	Use of 4 cylinder and hybrid vehicles in non-patrol fleet functions (~15 per cent of fleet). 2018 Plan to include 5 hybrid patrol cars to replace 6-cylinder models	Improved fuel vehicle consumption, less engine idling
	Installation of inverter generators on public order and forensic identification scene vehicles	Reduced diesel generator requirements through use of battery power to operate lighting
DRT - Fleet	Enhanced engine technology through ongoing fleet replacement	Improved fuel vehicle consumption
DRPS West Division facility	Building automation system (BAS) upgrades	Collaboration continues with Veridian Connections for CDM program participation and measurement and verification of energy savings. Project set to go to tender in 2018.
DRPS North Division facility	Upgrades	Collaboration continues with Hydro One Networks for CDM program participation and measurement and verification of energy savings. Project currently in tender process and to be awarded for 2017 completion.
DRPS Centre East facility	LED parking lot lighting retrofit	Project currently underway with completion anticipated in Fall 2017. Project will leverage available CDM programs available through Oshawa PUC

Hillsdale Estates LTC Home	Implementation of various natural gas conservation measures	Natural gas savings through implementation of measures recommended through Enbridge Gas site assessment (targeting 5 per cent reduction from baseline) and monitoring through the Enbridge <i>RunitRight Program</i>
Hillsdale Estates LTC Home	Implementation of up to 13 variable frequency drives (VFD) for air handling units (AHU)	With implementation expected over several years, with three VFD projects completed to-date underway, in collaboration with OPUC, cumulative annual electricity savings estimated at over 230,000 kWh with program incentives combining for just under \$25,000 (including taxes). Work continues with Enbridge Gas to determine natural gas savings impacts with potential to leverage additional program opportunities
	LED lighting retrofit	Project completed and will leverage available CDM programs through Oshawa PUC. Estimated electricity savings of 9,200 kWh per year and estimated incentive of over \$1,100 (including taxes)
Hillsdale Terraces	Interior Lighting Retrofit and BAS Upgrades	Recently completed initiative included LED retrofit of all interior 4' tube fluorescent lamps. Initiative expected to result in electricity savings of over 150,000 kWh per year and 17.6 kW in peak demand. Estimated program incentive of almost \$7,300 (including taxes). BAS system upgrades set to commence following award of tender. Initiative will enhance supervisory controlling of the system for the facility.
Lakeview Manor	Lighting Retrofit	Project planned for 2017 and will look to leverage available CDM programs through Veridian.
Fairview Lodge	LED Lighting Retrofit	Project currently being scoped and will look to leverage available CDM programs through Whitby Hydro.

Social Services (various locations)	On-site, full-time staffing position dedicated to energy management	Participation in EEM initiative for one year term with targeted savings of 2 million kWh. Resource to be dedicated to identifying and assisting with implementation for LTC, child care, social services administrative buildings, DRLHC multi-residential buildings as well as Regional HQ. Application has been approved and program to be delivered through Veridian in collaboration with Oshawa PUC and Whitby Hydro
RDPS Headquarters Facility	Exterior lighting retrofit	Project completed and post-project submission underway to leverage available CDM programs through Whitby Hydro.
Ajax RDPS Facility	LED lighting retrofit	Project underway. Estimated annual electricity savings of 5,459 kWh and 1.2 kW and incentive of just under \$1,700 (including taxes).
Regional facilities (various locations)	Pump refurbishments and other efficiency improvements	Numerous pumping station refurbishments and other efficiency improvements (i.e. VFD replacement) planned for various locations including Ajax WSP low lift, Taunton Rd PS (Oshawa), Waverly Rd PS (Oshawa), Hortop Rd PS (Oshawa), Liverpool Rd SSPS (Pickering) and Madawaska SSPS (Oshawa). Where possible, projects will leverage available CDM programs through LDCs.
Regional facilities (various locations)	Water and Sanitary Sewerage Plant Upgrades	Numerous plant equipment upgrades including new boiler system for Oshawa WSP, blower upgrade for Harmony Creek WPCP, process study to examine aeration retrofit for Lake Simcoe WPCP and proposed mechanical and electrical upgrades for lab building at Duffin Creek WPCP. Where possible, projects will leverage available CDM programs through LDCs.
DRT Raleigh Maintenance Facility	Lighting retrofit	Project being tendered with project implementation expected for Fall 2017 and will leverage available CDM programs through Oshawa PUC.

Courtice WPCP	Study of integrated resource recovery (IRR) options	Recently-completed study examined options and technical solutions to derive value from plant waste and minimize overall plant inputs and work to achieve full or partial energy neutrality. Through the examination of infrastructure and plant treatment processes and exploration of possible synergies with alternative external sources (i.e. solid waste streams, DYEC), the study has outlined options which will maximize resource recovery from water, energy and heat from waste streams and nutrients (materials). A Phase 2 study has been launched to further examine short-listed options to determine most viable options for implementation.
Duffin Creek WPCP	On-site, full-time staffing position dedicated to energy management	Continued participation in EEM initiative for 2017 with targeted savings of 2 million kWh. EEM position has now been made permanent. Participation in the Embedded Energy Manager (EEM) program over a two term period from April 2014 to end of 2015 saw total in-service energy reductions 6.2 million kWh and peak demand reductions of 761 kW, representing \$0.74 million cumulative avoided electricity costs over the period.
Duffin Creek WPCP (Pickering)	Stage 1 & 2 and Stage 3 Influent Pumping Station (IPS) Optimization Measures	Given it is similar to the Stage 3 IPS (operational since May 2017), the optimization measures identified from Stage 3 IPS Optimization Study (including low cost control measures) are estimated to yield approximately 0.5 million kWh in annual energy savings for the new Stage 1 & 2 IPS. Recommendations from the study that have been implemented are estimated to have yielded in excess of 1 million kWh in annual energy savings (Stage 3 operational since April 2014).

Duffin Creek WPCP (Pickering)	Various energy conservation and demand management initiatives	Numerous measures in the process of implementation, have recently been implemented or are being investigated further through the EEM initiative including but not limited to, HVAC system optimization, facility area repurposing, load reduction of centrifuges and compressor audits and upgrades. Where possible, all programs will leverage available CDM programs through Veridian. Duffin Creek WPCP is also being examined for combined-heat and-power (CHP) options which could utilize digester gas to generate electricity.
Duffin Creek WPCP (Pickering) and Ajax Maintenance Depot	System upgrades	Completed initiatives currently working with Veridian for post-project submission. Combined energy savings, determined with the assistance of Veridian Connections' Roving Energy Manager (REM), are currently projected at 149,000 kWh and 19.4 kW of peak demand reductions with total program incentives totalling almost \$18,000 (including taxes)
DRLHC facilities (various locations)	Building insulation and weatherproofing	Staff working with Enbridge Gas and Windfall Ecology Centre in its participation in the Home Winterproofing Program for DRLHC family units. The program provides new insulation (i.e. basement, attic) and draft-proofing measures at no cost to eligible participants with potential for up to 30 per cent in energy savings. Following initial site assessments, audits are scheduled to commence late-August for Malaga, Carleton and Cedar properties.
460 Normandy Ave and 439 Dean Ave, Oshawa (DRLHC)	Site Assessments	Facility site assessments undertaken in late 2016 with the assistance of Oshawa PUC and Burman Energy to identify potential CDM opportunities for further examination and/or implementation
327 Kellett Ave, Port Perry (DRLHC)	Lighting Retrofit	Project currently being scoped with implementation planned for late-2017. Project will leverage available CDM programs through Veridian.

Solid Waste Management	Study of anaerobic digestion (AD) options	To further the Region's diversion efforts through expanded organics capacity, the Region is retaining consulting expertise to examine and determine suitable anaerobic digestion (AD) options for the Region with consideration of appropriate service delivery models, regulatory and market requirements and project and cost risks. As noted in staff Report #2017-COW-180, a preliminary business case and service delivery model review has been undertaken with recommendations to initiate a Request for Information (RFI) to identify potential organics management proposals and work towards an updated business case in 2017.
Traffic Signals (various locations)	LED Lighting Retrofit	As part of a proposed five year annual replacement program, a tender is being finalized and to be issued for the supply, installation and replacement of traffic signal heads, LED signal head indications, mounting hardware and related equipment at over 80 traffic signal locations. Given the change in size to larger indications and variations in wattage across vendor products, energy savings potential is still to be determined. Staff are working to with OPUC, Hydro One and Veridian for the purposes of determining potential project savings and for determining whether CDM program opportunities can be leveraged.
Regional facilities (various locations)	Lighting upgrades	Work underway with LDCs regarding the enhanced and re-launched <i>saveONenergy</i> Small Business Lighting program for facility accounts of 100kW or less. Several site assessments have been undertaken at various Social Services-related facilities to determine savings opportunities with additional locations to be evaluated and considered

Regional facilities (various locations)	Demand management initiatives through Industrial Conservation Initiative (ICI)	With the expanded ICI program to consist of facilities of 1MW or more, the Region's largest nine accounts are included in the program (effective July 1, 2017). Regional coordination of demand curtailment efforts during peak system hours assists with system reliability and deferring need for peak generation resources while also significantly reducing facility electricity costs through lower Global Adjustment charges.
Regional facilities (various locations)	IESO Performance Based Program	Pay for performance program provides \$0.04/kWh of sustained energy savings for every year up to 4 years and available to Commercial and Institutional facilities located in multiple LDCs. Staff currently consulting with IESO to examine potential opportunities for Regional facilities including synergies with participation in other programs (i.e. EEM program)

**Attachment 2: 2016 and 2017 Approved Construction of Municipal Services (CMS) Budgets
and the 2018 to 2026 Capital Forecast (subject to future Council approvals)**

Adaptation Goal	Adaptation Objectives	Priority Adaptation Related Actions	Gross Approved Capital Budgets*				
			2016 Budget	2017 Approved Budget	Forecast 2018-2021	2022-2026	Total 2017-2026
1 Reduce the infiltration of groundwater or storm water into the sanitary sewer collection system.	a. Address sanitary sewer pipe capital repair and replacement requirements.	i. Replace identified deficient linear sanitary sewerage infrastructure	6,380,000	7,900,000	32,506,000	45,800,000	86,206,000
		ii. Existing Linear asset twinning (to enhance system security)	200,000	4,100,000	7,160,000	49,740,000	61,000,000
		iii. Inflow/infiltration studies and remedial works in various locations	500,000	400,000	2,000,000	2,500,000	4,900,000
	b. Comprehensive assessment of sewer system capacity to accommodate extreme precipitation, frequency and intensity.	iv. Asset condition assessments, planning and engineering studies.	150,000	198,000	2,000,000	2,500,000	4,698,000
2 Continue to improve the quality of sanitary sewerage effluent through treatment process improvements and water pollution control plant upgrades/replacements	a. Process improvements	i. New lagoon (Sunderland), Corbett WPCP headworks	900,000	-	4,660,000	-	4,660,000
		ii Pringle Creek WPCP - demolition and greensite restoration	2,000,000	-	-	-	-
	b. WPCP and sanitary sewerage system upgrades	iii. P2 Upgrades at Harmony Creek WPCP	3,441,800	-	-	-	-
		iv. Duffin Creek WPCP					
		- Digester mixing improvements	1,310,000	-	1,650,600	-	1,650,600
		- Replacement of Reactor 1 & 2	-	3,668,000	22,401,000	20,043,000	46,112,000
		- Modifications to receiving station	250,000	250,000	-	-	250,000
c. WPCP Optimization and phosphorous reduction studies	v. Water St. SSPS upgrades	508,350	-	6,303,000	-	6,303,000	
	vi. Uxbridge WPCP optimization study (2015) and phosphorous reduction studies (north)			2,200,000	-	2,200,000	
3 Maintain effective and up-to-date emergency plans for natural and human-cause emergencies.	a. New Standby Power and replacements	i. Liverpool Road SSPS and Madawaska SSPS	-	2,600,000	1,050,000	-	3,650,000
		ii. Ajax WSP Diesel Generator (to be incorporated with the Ajax WSP expansion)				2,200,000	2,200,000
		iii. Installation of standby power at Whitby water supply plant			-	3,200,000	3,200,000
	b. Improved alerts, response, communication and control e.g. SCADA systems	iv. SCADA improvements (water/sewer TCA)	580,000	-	7,240,000	-	7,240,000

**Attachment 2: 2016 and 2017 Approved Construction of Municipal Services (CMS) Budgets
and the 2018 to 2026 Capital Forecast (subject to future Council approvals)**

			Gross Approved Capital Budgets*					
Adaptation Goal	Adaptation Objectives	Priority Adaptation Related Actions	2016 Budget	2017 Approved Budget	Forecast 2018-2021	2022-2026	Total 2017-2026	
4	Protect water quality, prevent water losses and implement Source Water Protection Plans for the region, including proposed policies/actions to mitigate drinking water threats.	c. Emergency planning	v. Works Department Emergency Planning Update	-	-	300,000	-	300,000
		a. Source Water Protection and wellhead protection	i. Well interference works and wellhead protection	1,200,000	1,200,000	5,400,000	9,000,000	15,600,000
			b. Pipe failure mitigation	ii. Water linear asset rehabilitations and replacements (includes meters, valves and hydrants)	13,159,480	22,185,000	49,884,000	59,315,000
		iii. Polybutylene connection replacement program		14,500,000	20,027,600	53,800,000	-	73,827,600
		c. Improvements to enhance system security	iv. Feedermain in Newcastle to provide looping and security to system	-	-	985,000	-	985,000
			v. Watermain in Whitby to provide looping and security to the system	-	780,000	-	-	780,000
			vi. New water storage facilities to provide security (Ajax Zone 1 / Uxbridge / Brock / Port Perry)	500,000	-	16,800,000	11,170,000	27,970,000
			vii. New well and pumphouse for system security - Cannington & Sunderland	-	-	8,700,000	-	8,700,000
			viii. Valve replacement at Oshawa WSP for Interconnection Capabilities	-	-	650,000	-	650,000
			ix. Automatic bulk water dispensing system	-	600,000	1,480,000	600,000	2,680,000
4	Protect water quality, prevent water losses and implement Source Water Protection Plans for the region, including proposed policies/actions to mitigate drinking water threats. CONTINUED	d. Water Supply Plant algae risk mitigation	xi. Algae Plate Settling Tanks at Whitby WSP	-	-	-	10,250,000	10,250,000
		e. Source new water supplies	xii. New well and pumphouse (Uxbridge)	-	-	3,500,000	-	3,500,000
			xiii. New Water Supply Source - Port Perry	-	-	18,500,000	-	18,500,000
			f. Comprehensive water supply system studies and condition assessments	xiv. Water supply system assessments and studies	150,000	-	2,600,000	3,250,000

**Attachment 2: 2016 and 2017 Approved Construction of Municipal Services (CMS) Budgets
and the 2018 to 2026 Capital Forecast (subject to future Council approvals)**

Adaptation Goal	Adaptation Objectives	Priority Adaptation Related Actions	Gross Approved Capital Budgets*				
			2016 Budget	2017 Approved Budget	Forecast 2018-2021	2022-2026	Total 2017-2026
5	Formally expand asset management planning to consider and address risk, including climate & optimize asset life-cycles ensuring Regional facilities, sites, fleets, equipment and transportation, water supply and sanitary sewerage systems continue to operate safely and effectively.	a. Invest proactively in preventative maintenance and rehabilitation when most beneficial					
		i. Regional Road Rehabilitation (non-growth related)	23,729,000	23,484,000	140,000,000	190,000,000	353,484,000
		ii. Bridges, CSP Culvert Invert Lining Rehabilitation, miscellaneous Spall Repair and Deck Waterproofing Projects, Expansion Joint Replacement Program & Concrete Head Walls Program	5,495,000	6,110,000	33,090,000	34,050,000	73,250,000
		iii. Bridge Deck Condition Surveys Program	45,000	-	-	-	-
		iv. Miscellaneous Road and Storm Sewer Reconstruction	420,000	350,000	1,600,000	2,000,000	3,950,000
	v. Traffic Signals installation and modernization	2,300,000	2,950,000	10,155,000	13,310,000	26,415,000	
ADAPTATION-RELATED CONSTRUCTION OF MUNICIPAL SERVICES (CMS)			77,718,630	96,802,600	436,614,600	458,928,000	992,345,200

* All costs are presented as approved gross capital costs which address climate risks in some capacity. Climate adaptation-related costs may only represent a share of the gross total cost presented .

Attachment #3: Ongoing Climate Adaptation Initiatives

1. Overview

1.1 Specific asset management initiatives which enhance corporate resiliency and address identified climate risks since 2014 include:

- A) Asset condition assessments, planning, optimization and engineering studies to inform asset requirements, including requirements to address climate change;
- B) Updating contingency plans and implementing business continuity planning solutions;
- C) Implementing an Enterprise Maintenance Management System (EMMS) to enhance data collection and improve analysis to support life-cycle decisions;
- D) Implementing an asset management plan for Duffin Creek WPCP in conjunction with facility partner York Region;
- E) Sanitary collection system inflow and infiltration (I/I) studies and remedial works being undertaken in various locations; and,
- F) Capital repairs, replacements and system upgrades to:
 - Reduce the infiltration of ground and stormwater into the sanitary sewer collection system to reduce flooding risk in vulnerable areas;
 - Implement standby power and ensure timely replacements of existing standby power systems;
 - Implement fuel storage improvements;
 - Improve the quality of sanitary sewerage effluent;
 - Improve alerts, responses, communication and control infrastructure across program areas;
 - Implement source water protection and wellhead protection programs;
 - Improve system security, capacity and redundancies;
 - Implement asset rehabilitation strategies, considering risk and resiliency; and,
 - Invest proactively in priority preventative maintenance and capital replacements when most beneficial to do so based on asset life-cycle reviews and potential changes due to climate change.

1.2 More details related to program-specific initiatives across operational areas are outlined in the following sections.

2. Maintenance Operations

2.1 Maintenance operations programs directly address climate adaptation through, including proactive measures to keep roads, facilities, parking and transit stops free of frost, snow and ice and maintenance of operational benchmarks which in the area of transportation include:

- Patching of potholes, ruts and depressions;
- Treatment of road shoulders, including liquid calcium chloride and liquid

asphalt to control dust and erosion and utilizing asphalt grindings (a by-product of road rehabilitation) to prevent shoulder erosion in higher risk areas;

- Maintenance of roadside visibility and safety, including tree removal and trimming;
- Cleaning/re-grading of ditches and catch basins and cleaning of entrance culverts (on a cost-recovery basis);
- Mowing of rural roadside grass and 85 hectares of urban boulevards;
- Repair of storm sewer maintenance holes, cleaning, installing and repair of storm sewer service connections within the road allowance;
- Visual and closed circuit camera inspection of maintenance holes and sewers; and,
- Tracking and recovery for services provided for storm sewer connections.

2.2 Several aspects of the water and sewer operations maintenance program also ensure climate resiliency including:

- Inspections and maintenance of watermains, hydrants, meters, line valves, chambers, sanitary sewers, maintenance holes;
- Watermain , sanitary sewer and syphon cleaning and repairs;
- Watermain flushing, testing and documentation of data;
- Leak detection program
- Cathodic protection of ferrous water mains to prevent corrosion, breaks and extend life; and
- Connection inspections, repairs and replacements.

3. Water Quantity and Quality

3.1 Previously identified climate risks included, but were not limited to, potential for water quantity and quality impacts due to reduced aquifer capacity, erosion at creek crossings potentially causing pipe failure and higher surface water temperatures which is one contributing factor to algae growth.

3.2 The following provides examples of specific initiatives successfully implemented since 2014 or are being implemented to mitigate risks to water quantity and quality.

- A) Protection of water and sewer assets at all creek crossings and establishment of an accurate database to forecast longer-term life-cycle requirements;
- B) Vertical facility condition assessments to establish consistent/accurate baseline condition and establish facility risk profiles;
- C) Regional Works, Health and Planning and Economic Development Departments continue to implement the policies of the four Source Protection Plans affecting Durham Region which have been approved by the MOECC. This includes managing existing and future threats to the quantity or quality of municipal drinking water sources in Durham Region through updates to Official Plan policies, education and outreach and development of risk management plans. Examples of significant drinking water threats include fuel

storage, agricultural activities (such as fertilizer and pesticide application) and handling of dense non-aqueous phase liquids (toxic chemicals). Works will be updating the regional groundwater model to re-delineate Wellhead Protection Areas for all of our municipal drinking water wells;

- D) Study completed to assess impacts of algae growth on water treatment equipment and water quality;
- E) Maintenance inspection program for private sewage systems was implemented within legislated timeframes;
- F) Reduced unauthorized drawing of water (including enforcement and bulk filling stations).
- G) Strategies prioritized through long-term business, financial and asset management plans included:
 - The 10-year polybutylene service connection replacement strategy to address risks to water quantity - the Region is in year six with close to 10,000 connections replaced and an estimated 7,100 remaining (an estimated remaining cost of approximately \$53.8 million);
 - 2017 approved funding to remediate Sunderland lagoon to enhance water quality;
 - Program prioritizations to protect watermains through preventative maintenance and replacements, including cement mortar lining and cathodic protection, to protect buried ferrous pipes, improve water quality and reduce main breaks (the watermain replacement strategy continues to reduce system breakages and water losses while contributing to efficiency, conservation and climate mitigation and adaptation goals); and,
 - The water meter repair and replacement strategy to ensure water protection and conservation, meter accuracy, cost-effectiveness and protection of user rate revenues (\$3.1 million approved in 2017). Overall program (year-end 2016) involved 171,923 meters with a total replacement value of \$29 million).

Support for Community Resilience

- 3.3 The Region partners with community stakeholders to promote community climate adaptation priorities and resilience as well. This is accomplished through stakeholder partnerships, including the work of the DRRCC, Regional responsibilities for emergency prevention and planning, planning and development approvals, and funding of Conservation Authorities who maintain jurisdiction over watershed planning and management, and flood mapping, hazards identification and early warning.

4. Inflow and Infiltration Program

- 4.1 Localized and intense rainfall activity has resulted in stormwater entering and overloading the sanitary collection system, putting a burden on the Region's sanitary sewer infrastructure and treatment facilities. The Region has taken significant steps to reduce inflow and infiltration (I/I) through the assessment of existing systems; gathering detailed information on the sanitary sewer system, and understanding the performance of the system under extreme storm events.
- 4.2 Regional I/I studies in various locations throughout the Region assist in ensuring continued understanding of where the Regional sanitary sewerage system may be at risk, and to implement appropriate plans to mitigate risks as part of the Region's overall long-term asset management strategy.
- 4.3 The Region has also installed additional flow monitoring equipment to gather data on sanitary sewage flows and analyse flows in conjunction with rain events. Tests have been performed, including smoke testing, closed circuit television (CCTV) inspections and dye testing to determine where I/I may be occurring.
- 4.4 Major capital upgrades totalling approximately \$15 million were completed or are being completed in 2017 within vulnerable areas in the Towns of Ajax and Whitby and the City of Pickering. An inflow and infiltration study for Cannington Sewage Conveyance System in the Township of Brock also commenced in 2017.

5. Environmental Health

- 5.1 The corporate adaptation plan approved in 2014 identified the risk of environmental health issues related to infectious disease, infestations and /or vector borne diseases (e.g. Lyme disease, West Nile Virus etc.) due to milder winters, higher summer temperatures and increased precipitation/storms.
- 5.2 On-going adaptation related activities of the Health Department include:
 - A) Safe Water:
 - Respond to adverse water reports on regulated drinking water systems;
 - Promote proper well maintenance for owners of private wells.
 - Conduct and maintain an inventory of private water systems and conduct periodic inspections.
 - Conduct inspections and assessments of public and private drinking water systems;
 - Respond to requests for interpreting water analysis results;
 - Sample water at public bathing beaches; and
 - Maintenance inspections of sewage systems under contract with local municipalities.

B) Infectious Diseases/Vector Borne Diseases (VBD):

- Assess storm water management ponds and other surface water breeding sites for mosquitoes related to West Nile Virus;
- Oversee preventative larvaciding of catch basins and surface water sites;
- Collect adult mosquitoes for laboratory testing;
- Review and implement the Durham Region West Nile Virus Response Plan;
- Conduct active and passive surveillance of Lyme disease e.g. tick dragging, identification and testing; and
- Provide media releases and information on VBD to the community.

C) Sewage Systems (Part 8 OBC):

- Conduct inspections and issue building permits;
- Complete geo-technical lot assessments on behalf of area municipalities; and
- Respond to inquiries and complaints regarding malfunctioning sewage systems.

D) Health Hazards:

- Conduct Investigations and risk assessments of environmental health hazards, including air quality.
- Response to public inquiries and provision of information on environmental health issues.
- Health hazard prevention and emergency preparedness programs, including development and education plans for health issues during emergencies.

E) Emergency Preparedness:

- Business continuity and contingency planning and assurance of reliable back-up power and or redundancies for critical systems.
- Procedures for extreme weather events.
- Prepare Pandemic Plan and Outbreak Plans detailing actions and resources required to maintain operations and essential services;
- Participate in emergency exercises to test and validate emergency response plans;
- Provide Regional Paramedic Services, in compliance with provincial legislation.
- Enter Ambulance Call Reports in database and conduct required reviews/audit all high priority calls;
- Participate in community and special events;
- Respond to all reported outbreaks; and,
- Produce population health and surveillance information products.

6. Transportation

6.1 In the area of transportation (Regional roads, Operations Maintenance and Durham Region Transit) climate risk and increased service demands are addressed through the following:

- A) Rehabilitation activities, as well as ongoing monitoring of the integrity of all assets, including facilities, roads, bridges and culverts;
- B) The asset management program which annually assesses the inventory, replacement value and condition of Regional assets and employs asset and financial strategies to ensure long-term sustainability and includes risk assessments conducted in consultation with asset and risk management teams.
- C) Maintenance of operational benchmarks;
- D) Proactive measures to keep roads, parking and transit stops free of frost, snow and ice;
- E) Use of state-of-the-art road weather information systems to monitor weather/pavement conditions (e.g. infrared road temperature sensors) and ensuring proper training to effectively utilize the technology and analyze results; and,
- F) Adequate ditch and road maintenance to reduce deterioration and increase drainage.

6.2 Costs for maintenance operations activities are influenced by:

- A) Higher precipitation (e.g. shoulder erosion, storm sewers);
- B) Temperatures more often occurring at or near zero degrees Celsius e.g. increased freeze-thaw events (pavement heaving);
- C) Summer drought (dust treatments)
- D) More extreme storms and more frequent storm events (cleaning, clearing vegetation and post-storm clean-up); and,
- E) A longer growing season (increased vegetation control).

6.3 The Region has implemented innovative programs including road patrol vehicles equipped with infrared road temperature sensors and plow and sander/salter units, which provide rapid response to developing road conditions (since 2007). New technologies are also identified within the Region's Salt Management Plan, including use of liquid salt brine for pre-wetting and anti-icing. The pre-wet salt application enables salt to work more efficiently. Anti-icing operations include hills, curves, bridges and sheltered areas prone to frost and "black ice" at intersections.

6.4 Many transportation strategies are undertaken not only in response to climate change, but also to achieve efficiency from an asset lifecycle cost perspective, or to increase safety, comfort and/or service continuity for network users including pedestrians, cyclists, transit riders, car and truck drivers, and emergency service providers.

- 6.5 Staff continually monitor developments, and perform research on climate change impacts on the performance of asphalt and concrete products used in the construction of Regional roads and structures. Findings of research and monitoring are used to adjust capital project specifications and maintenance practices to enhance asset performance in the face of climate change.

7. Facilities: Proactive Maintenance & Building Standards

- 7.1 The Region's Facilities Division has responsibilities which include:

- A) Operating, securing, maintaining, upgrading and repairing Regional facilities with a total estimated floor area exceeding 230,000m²;
- B) Facility site activities including salting, snow removal, backflow prevention and energy management; and,
- C) Facility design and construction, including consideration of climate adaptation as part of design development (e.g. energy and water efficiencies, green opportunities, stormwater management, erosion control, standby power management).

- 7.2 The Region's building standards ensure new facilities are built at a level comparable to or higher than Leadership in Energy and Environmental Design (LEED) Silver Certification, through construction to the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 90.1 (2007) Energy Standard. On a case by case basis, staff also consider elements of ASHRAE 189.1 (2009) for the design of new buildings. Within this approach the recently completed Fairview Lodge attained LEEDS Gold certification.

- 7.3 Recent construction projects, as well as major site and system renovations have incorporated significant features which improve facility and site climate resiliency including:

- A) On-site stormwater management systems and controls;
- B) Water recovery systems and water loss control plans;
- C) Green irrigation systems and water efficiency fixture replacements; and,
- D) Building envelope and site improvements which mitigate erosion and/or flooding risk.

8. Solid Waste Management: Protection of Water Resources

- 8.1 Solid Waste Management monitors, inspects, and remediates Regionally-owned closed landfill sites to ensure environmental protection. Adaptation related activities include: inspections; environmental monitoring and reporting; adjacent well water testing; and, repairs, improvements and remediation to protect groundwater and the environment.

- 8.2 A key goal is to maintain water quality through the prevention of rainfall infiltration and the prevention of leachate springs around Regional landfills, a risk which could rise with increased intense precipitation. A solid waste landfill closure/remediation plan has been recently implemented at Brock Landfill to control leachate and protect water resources and funding was approved to explore alternatives at the Oshawa Landfill. The capital forecast includes additional solid waste landfill closure/remediation plans under development for the Oshawa, Scott and Scugog landfills (estimated at approximately \$3 million).
- 8.3 During 2017, work continued to implement remediation (landfill mining) of the Blackstock landfill in the Township of Scugog as approved in 2015. The project is anticipated to be completed by 2018 (approximately \$1.0 million).

9. Project and Development Approvals

- 9.1 Municipal infrastructure projects such as extensions of sewers and the construction of water mains, roads and transit systems are subject to provincial Environmental Assessment (EA) requirements.
- 9.2 The Canadian Environmental Assessment Agency issued guidelines to incorporate climate change considerations into EAs, one of the first federal agencies in the world to do so.
- 9.3 The Durham Regional Official Plan also requires Environmental Impact Studies (EIS), as part of the evaluation of development proposals.
- 9.4 An EIS is required for all applications for development on land designated as a key natural heritage feature or key hydrologic feature. The EIS must evaluate adverse potential impacts and establish appropriate actions to mitigate those impacts.
- 9.5 The scope and process for a particular EIS will depend on the nature of the proposed development, its location, the extent and sensitivity of the site's environmental conditions, and applicable legislation.
- 9.6 EAs, EISs and other forms of environmental review consider climate changes, trends and specific localized risk factors.

10. Policy and Planning

- 10.1 The Durham Regional Official Plan is the principal planning instrument to guide the Region's growth and development. The Official Plan policies promote a more sustainable community design providing for more compact communities with increased densities, and a more efficient use of the transportation network.
- 10.2 Implementation will be achieved through area municipal planning instruments, including Official Plans, zoning bylaws, site plans and building permits.

10.3 Key elements of the Official Plan that will assist the Region in adapting to changes in climate include:

- A) An urban system with mixed-use centres and corridors that support transit use and pedestrian movements;
- B) Prime agricultural areas which help community food security;
- C) A transportation system that is efficient and reliable and supports all modes, including transit and active transportation; and,
- D) A greenland system that protects the areas highest concentration of significant ecological and hydrological features and functions.

10.4 The Official Plan protects ground and surface water resources through wellhead protection, high aquifer vulnerability areas, and stormwater management policies.

10.5 The Region implements the requirements of the four Source Protection Plans that apply to Durham. Source Protection Plans identify threats to the quality and quantity of municipal drinking water supplies and their associated designated vulnerable areas.

10.6 Policies regarding development restrictions in natural hazard areas help to protect people and property from damage caused by flooding. The Official Plan also encourages the development and retrofit of more energy efficient buildings and infrastructure.

10.7 The Region partners with outside agencies to implement the Clean Water Act and regulations, including Source Water Protection Plans and implementation of the Lake Simcoe Protection Plan and partner on studies and plans e.g. the York-Peel-Durham-Toronto Groundwater Study.

11. Conservation Authorities

11.1 The Region funds Conservation Authorities (2017 funding totaling \$7.5 million, excluding land securement funding totaling an additional \$0.9 million in 2017) who have flood management responsibilities at the watershed level to ensure community safety and resiliency.

11.2 Conservation Authority Funding by municipalities also provides for:

- A) Watershed monitoring (including fish species, aquatic habitat, algae, benthic invertebrates, West Nile Virus, surface water quality, base flow, stream flow, precipitation, groundwater, terrestrial natural heritage, water temperature and climate).
- B) Maintenance of a flood warning system.
- C) Dam Safety Reviews (DSRs) are conducted for all dams in our jurisdiction.
 - Watershed Specific Projects.
 - Natural Hazard Mapping.
 - Infrastructure / water budget modeling.

- Natural heritage.
- Meteorological information from climate stations, evaporation pans and instrumentation.
- Land securement funding is provided based on Regional greenland securement policy (2017 = \$0.9 million)

11.3 Lake Simcoe Conservation Authority manages Durham Regional Forest (607 acres), a resource management area valued for maintenance of water levels and stream flows, and prevention of erosion and floods.

12. Flood Control and Protection

12.1 Regional policy and by-laws, partnerships and funding, including Conservation Authority funding assist in keep development outside of floodplains.

12.2 Emergency management and planning reduces response times to reach people in flood-prone areas when a flood does occur.

12.3 Education programs inform the public on how they can protect themselves.

12.4 Based upon studies and capital plans, changes can also be made to the way water flows:

- A) Flood control dams, flood control channels and other structures (e.g. berms and dykes).

12.5 Conservation Authorities also employ asset management and flood risk management groups:

- A) Focus on planning, programming and building for improvement;
- B) Flood protection and capital works projects;
- C) Long term planning, inspection and maintenance activities;
- D) React to unplanned and emergency asset maintenance requirements; and,
- E) Flood Infrastructure projects and funding.

13. Business Continuity and Emergency Prevention and Preparedness

13.1 Durham Emergency Management maintains a strong community program to prepare for and respond to natural and/or human caused emergencies including:

- A) An effective and up-to-date emergency response structure;
- B) Coordinated emergency plans and procedures;
- C) Regular tests of communications and alerting systems;
- D) Annual Regional Control Group response training;
- E) An on-call Duty Officer on a 24/7 basis;
- F) A designated Emergency Information Officer;

- G) Emergency notifications to Regional staff;
- H) Operation of the Regional Emergency Operations Centre; Public education materials to promote preparedness;
- I) Up-dated emergency contact lists and databases;
- J) Courses for Regional employees; and,
- K) An annual Emergency Operations Centre exercise.

13.2 Regional programs together or individually are also involved in emergency planning and management including the following initiatives:

- A) Ensuring reliable back-up power for critical facilities and systems;
- B) Contingency and business continuity planning.

13.3 The Region is committed to maintaining effective emergency and business continuity plans for natural, technical and human-caused events. Departmental emergency response plans are developed within the general framework of the Durham Region Emergency Master Plan.

13.4 The Risk Management section of the Finance Department is also working in consultation with program areas and the Asset Management Group in regards to business continuity planning to: identify critical business functions and support services across program areas; rank criticality; and, address any gaps identified in level three critical functions (defined as those requiring restored availability within minutes to hours of an interruption).

13.5 Several asset-related initiatives have been budgeted or forecasted to maintain effective business continuity and response capabilities:

- A) Regional policies and procedures for extreme weather events;
- B) The Pandemic Plan detailing actions and resources required to maintain operations and essential services;
- C) The Contingency Plan detailing departmental responsibilities for services to be maintained in the event of work stoppage; and,
- D) Individual Departmental or program emergency planning documents and the broader Emergency Master Plan prepared for the Region by DEMO, prescribing the emergency organization and response management framework.