

# Centre for Addiction and Mental Health (CAMH)

## Energy Conservation and Demand Management Plan 2019 - 2024

### In Transition to Sustainable Infrastructure

The Centre for Addiction and Mental Health is in the midst of a massive redevelopment of its Queen Street West campus, which is transforming its facilities into green, sustainable infrastructure.

This plan presents the energy performance of its existing facilities and identifies how they will be selectively improved for immediate efficiency gains and longer-term integration with the new buildings.



This document was prepared in accordance with Ontario's Regulation 507/18 for the Centre for Addiction and Mental Health facilities.

For additional information regarding this document, please contact:

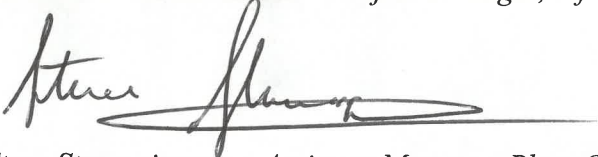
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## 1.0 Executive Summary

On January 1, 2019, the Government of Ontario replaced the Green Energy Act Regulation 397/11 with Ontario Regulation 507/18. This legislation requires broader public sector organizations to develop and publish a five-year Energy Conservation and Demand Management (ECDM) plan by July 1, 2019.

As part of the Green Energy Act Regulation 397/11, CAMH developed and published its first ECDM plan on July 1, 2014. The plan provided an overview of the 2014 – 2019 energy plan and targets. With the introduction of the Ontario Regulation 507/18, a new revised plan has been created for release to the public on July 1, 2019. The revised plan provides a summary of the results achieved since 2014, compares performance against the 2013 energy use, and outlines an updated energy plan for 2019 - 2024

The Centre for Addiction and Mental Health operates multiple facilities that span up to 1,785,841 square feet which are undergoing through renovation and expansion. The Queen Street West campus in particular is in the midst of a massive redevelopment, construction of new buildings and demolition of existing buildings, as part of Phase 1C project. As a result of this redevelopment, the revised plan will focus on the buildings that will remain part of CAMH long term infrastructure plan.

Through past conservation and demand initiatives, 2014 – 2018, CAMH decreased its electrical and natural gas consumption by **14,740,664 kWh** and **3,778,699 m<sup>3</sup>** respectively. This corresponds to reduction of **\$3,345,258 in utility bills** and **7,692 tons in Green House Gas emissions** which is equivalent of **836,314 planted trees**. The revised 2019 – 2024 plan will build on this success and continue to implement capital projects and perform operational reviews.

Based on CAMH 2018 energy assessment and benchmark, performed by Greening Health Care (GHC), along with the assets Facility Condition Index (FCIs), CAMH developed a total of 14 Energy Conservation Measures (ECMs) for implementation over the next 5 years. These initiatives revolve around technical upgrades, organizational and behavioral measures. CAMH forecasts that ECMs, 2019 – 2024, will require and achieve the following results in comparison to 2018 energy baseline:

- Total budget of **\$4,065,702** for implementation
- Annual energy savings of **\$514,748**
  - Equivalent to **128,687 planted trees**
- Annual reduction in Green House Gas emissions (GHGs) of **1,123 tonnes**
  - Equivalent to **10,208 trees** to offset the carbon emissions

CAMH acknowledges that key to reach and maintain their sustainability goals requires continuous improvement. As a result, CAMH will continue to strive towards operational excellence and enhance their knowledge about operational best practices and lessons learned.


## 2.0 Introduction

### 2.1 CAMH History

The Centre for Addiction and Mental Health (CAMH) is Canada's largest mental health teaching hospital and one of the world's leading research centers in its field. CAMH is fully affiliated with the University of Toronto and is a Pan American Health Organization/World Health Organization Collaborating Centre.

With a dedicated staff of more than 3,000 physicians, clinicians, researchers, educators and support staff, CAMH offers outstanding clinical care to more than 34,000 patients each year. The organization conducts groundbreaking research, provides expert training to health care professionals and scientists, develops innovative health promotion and prevention strategies, and advocates on public policy issues at all levels of government. And through our Foundation, we're working to raise tens of millions of additional dollars to fund new programs and research and augment services.

**Our history**



**1850** – Provincial Lunatic Asylum opens – 211 patients, 250 beds

**1861** – Wall construction fully encloses Queen Street Site

**1925** – Toronto Psych. Hospital (*forerunner to the Clarke Institute*)

**1945** – Dr. Gordon Bell founds **Donwood Institute**

**1949** – Archibald's alcoholism study spurs **creation of Addiction Research Foundation**

**1966** – **Clarke Institute of Psychiatry opens** following calls for a modern facility for allied care, research and teaching

**1972-74** – Queen Street Mental Health Centre Units 1 - 4, Community Centre open

**1976** – Original 1850 asylum building is demolished.





**1998** – Restructuring merger of four organizations creates CAMH

**2001** – Vision for Queen Street Redevelopment Project announced

**2008** – Four new buildings of Phase 1A of Queen Street Redevelopment open on White Squirrel Way

**June 2012** – Phase 1B Grand Opening

**2017** – Phase 1C Groundbreaking



### 2.2 CAMH Goals

CAMH overarching goal is to achieve an integrated, sustainable and highly energy efficient facilities which reflect its leadership role and values in 21<sup>st</sup> century of a sustainable healthcare service delivery.

Additionally, CAMH will be looking to become one of the top energy performing healthcare facilities in Ontario and support Province Green House Gas initiative by reducing overall carbon footprint

## 2.3 CAMH Objectives

The objectives for the duration of this plan are to operate the existing buildings in the most energy efficient and cost effective way, while ensuring that the new buildings meet the required standard of energy performance excellence. Furthermore, improve energy awareness and education to nurture an environmentally sustainable culture.

## 2.4 Purpose of the Plan

The purpose of CAMH energy conservation and demand management plan is to promote good stewardship of our environment and community resources. In keeping with our core values of efficiency, concern for the environment, and financial responsibility, CAMH energy conservation and demand management program will assist in reducing the overall energy consumption, operating costs, and greenhouse gas emissions. The plan will:

1. Provide an overview of the existing facilities energy performance compared to 2013 energy use
2. Analyze energy savings potential and identify improvement initiatives
3. Undertake measures to achieve operational excellence to align with the top 25% performance standards of healthcare facilities based on Greening Healthcare (GHC) reporting

The existing CAMH facilities span across multiple sites which compromise of:

1. 1001 Queen Street West – CAMH Retained Buildings:
  - a. Unit 1, 2, 3 and 4 (Treatment Units)
  - b. Maintenance Building
  - c. Community Centre
  - d. West Wing
2. 1001 Queen Street West – Phase 1A
  - a. 30 White Squirrel Way
  - b. 40 White Squirrel Way
  - c. 50 White Squirrel Way
  - d. 60 White Squirrel Way
3. 1001 Queen Street West – Phase 1B
  - a. 100 Stokes Street
  - b. 101 Stokes Street
  - c. 80 Workman Way
4. 250 College Street
5. 33 Russell Street

## 2.5 Site Redevelopment Overview

CAMH is in the midst of a massive redevelopment of its Queen Street West campus, which involve the expansion of the Central Utility Plant (CUP) at 101 Stokes Street and demolition of multiple buildings, as part of the Phase 1C redevelopment. (Refer to Figure 1 for post Phase 1B site redevelopment and Figure 2 for post Phase 1C site redevelopment on Page 8)

- Units 2 and 4, along with the Maintenance Building (which houses the existing CUP for CAMH Retained Building) will be demolished by 2019 and; therefore, they were not included in this plan
- Unit 1, Unit 3, West Wing and the Community Centre will remain in service and integrated into the new campus in 2019.
- 101 Stokes St (Phase 1B CUP), opened in 2012, will be expanded to include new boiler and chiller systems to feed the heating and cooling demands of the two new Phase 1C buildings (B1 and D1) along with the heating demands of Unit 1 and Unit 3
- 1025 (B1) and 1051 (D1) Queen Street West, will only reach substantial completion in 2020; and therefore, they were not included in this plan
- 30, 40, 50 and 60 White Squirrel Way make up the Phase 1A development, opened in 2008, will see no modifications and were included in this plan
- 250 College Street and 33 Russell Street are two independent buildings at a different site that will not be impacted by Phase 1C redevelopment, were included in this plan

This plan addresses energy efficiency improvements to the infrastructure that will allow CAMH to achieve longer term sustainability benefits and measures which can yield positive financial returns. Additionally, there will be huge emphasis on team collaboration and operational review as a result of the significant changes that will occur at Queen Street campus.





Figure 1: CAMH Queen Street Site, post Phase 1B redevelopment

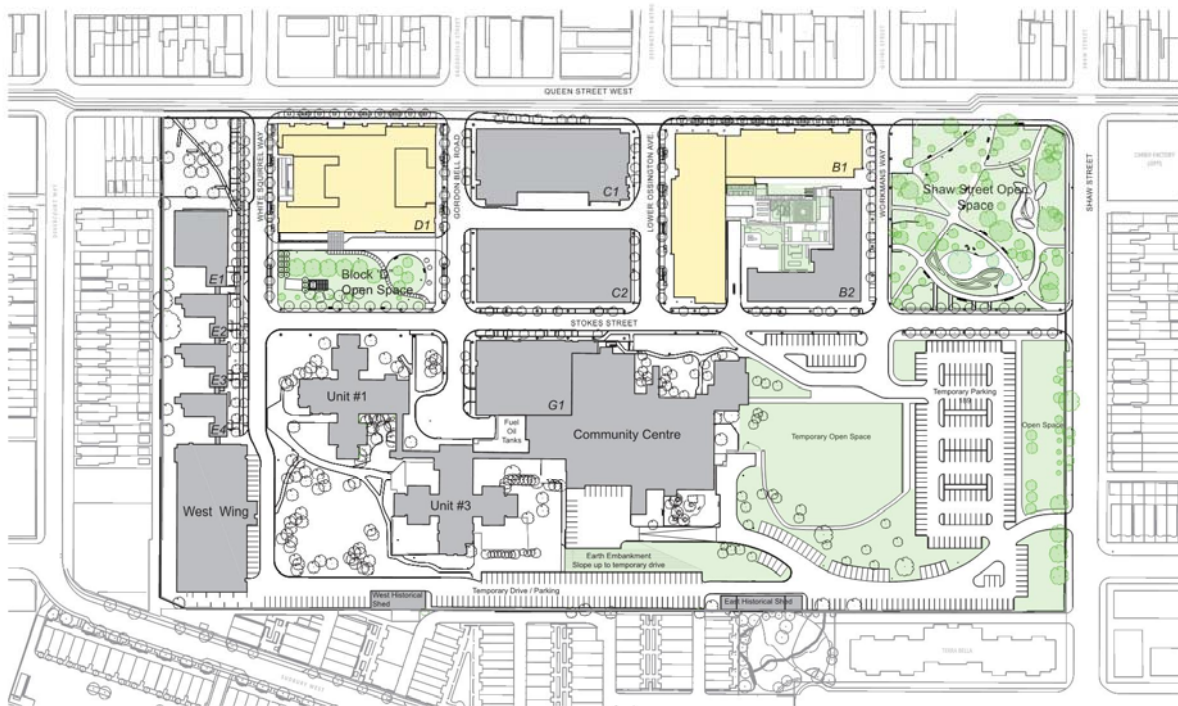


Figure 2: CAMH Queen Street Site, post Phase 1C redevelopment

## 3.0 2014 – 2019 Energy Conservation Measures

### 3.1 Approach

In July 2014, CAMH developed goals and devised energy savings initiatives structured to reduce the annual energy consumption and resulting greenhouse gas emissions of their facilities. The activities, completed between 2014 and 2019, were associated with managing overall energy consumption and lowering annual operating costs resulting in decreased greenhouse gas emissions.

CAMH took a strategic top-down approach to realize energy savings by utilizing two streams, Capital Projects and Operational Review. These two streams had a significant impact on the building energy consumption that helped CAMH realize quick wins and take a step forward towards their long term sustainability goals.

1. Capital Projects (Implemented through available government funding and internal capital funds)
  - a. Replacement of assets that are not energy efficient due to age and deterioration
  - b. Introduction of new proven technology with reasonable return on investment
2. Operational Review (Implemented through collaboration with Plant Operations and Maintenance)
  - a. Sequence of operation (equipment start-up, shutdown, and utilization)
  - b. Temperature set points and BAS Alarms

It is important to note that the biggest contribution to consistent improvements in overall energy performance has been the active and thoughtful operation of building systems in spite of recent facilities expansions and additions. Management and staff have adjusted operating schedules and temperature set-points, shut down redundant equipment and upgraded controls. As a result of, CAMH were able to progressively reduce their energy consumption on annual basis for all of their retained facilities.

### 3.2 Results

Through past conservation and demand initiatives, 2014 – 2018, CAMH has achieved the following results in comparison to 2013 energy baseline:

- ✓ \$3,345,258 saved from reduction in total energy consumption (Electricity and Natural Gas)
  - Equivalent to 836,314 planted trees
- ✓ 14,740,664 kWh decrease in electricity consumption
  - 8.03% average reduction in annual electrical usage
- ✓ 3,778,699 m<sup>3</sup> decrease in natural gas consumption
  - 25.34% average reduction in annual natural gas usage
- ✓ 7,692 tons reduction in carbon dioxide equivalent (tCO<sub>2</sub>e) emissions
  - Equivalent to 69,921 trees to offset the carbon emissions

### 3.3 2017 Energy Performance

Today, utility and energy related costs are a significant part of overall operating costs. CAMH annual energy consumption and related costs/emissions for 2017 were:

- Utility costs were \$6,180,647 (Electricity and Natural Gas)
  - Equates to an energy consumption per square foot (Energy Use Index - EUI) of 17.1 ekWh/ft<sup>2</sup> for electricity and 19.4 ekWh/ft<sup>2</sup> for natural gas
  - This is in line with the EUI Benchmark for Peer Ontario Hospitals
    - 15.0 ekWh/ft<sup>2</sup> for electricity
    - 17.3 ekWh/ft<sup>2</sup> for natural gas
- Energy related emissions for 2017 equaled 7,886 tCO<sub>2</sub>e

Table 1 provides a summary of the Energy Consumption and Greenhouse Gas Emissions for CAMH operations for 2017 in accordance with section 5.6 of Ontario's Regulation 507/18

| Facilities   |                          |   |                          |            | Utilities (2017)  |                               |   |   |
|--------------|--------------------------|---|--------------------------|------------|-------------------|-------------------------------|---|---|
| Site Name    | Address                  | Operation                                     | Total Floor Area (Sq Ft) | Avg hrs/wk | Consumption       |                               | Greenhouse Gas Emissions                |   |
|              |                          |   |                          |            | Electricity (kWh) | Natural Gas (m <sup>3</sup> ) | GHG - Electricity (Kg CO <sub>2</sub> ) | GHG - Natural Gas (Kg CO <sub>2</sub> ) |
| Queen Site   | 1001 Queen St West       | Facilities used for hospital purposes         | 662,752                  | 168        | 8,642,530         | 1,409,381                     | 302,489                                 | 2,676,415                               |
| Phase 1A     | 30-60 White Squirrel Way | Administrative offices and related facilities | 88,740                   | 168        | 1,261,597         | 109,881                       | 44,156                                  | 208,664                                 |
| Phase 1B     | 100 Stokes Street        | Administrative offices and related facilities | 216,953                  | 100        | 3,793,893         | 6,537                         | 132,786                                 | 12,414                                  |
| Phase 1B     | 101 Stokes Street        | Facilities used for hospital purposes         | 171,992                  | 65         | 2,627,705         | 1,097,103                     | 91,970                                  | 2,083,399                               |
| Phase 1B     | 80 Workman Way           | Facilities used for hospital purposes         | 148,031                  | 168        | 1,722,129         | 0                             | 60,275                                  | 0                                       |
| College Site | 250 College              | Administrative offices and related facilities | 273,197                  | 168        | 6,915,256         | 698,478                       | 242,034                                 | 1,326,410                               |
| Russell Site | 33 Russell street        | Administrative offices and related facilities | 224,176                  | 65         | 3,944,104         | 298,430                       | 138,044                                 | 566,719                                 |

Table 1: CAMH energy consumption and emissions in 2017

## 4.0 Summary of 2014 – 2019 Energy Saving Initiatives

### 4.1 Cooling Plant Upgrades and Modifications

#### 4.1.1 Queen Street Site – CAMH Retained Buildings

Each unit (1, 2, 3 and 4) has its own dedicated chiller plant that provides the required cooling during summer operations.

- Replacement of the existing chillers, cooling towers, and pumps with new high efficiency equipment in Unit 1 and Unit 3
  - o The cooling plant in Unit 2 and Unit 4 were not replaced as they are scheduled for demolition in 2020 as part of Phase 1C Redevelopment Project
- Upgrading the BAS controls strategies to include resetting chilled and condenser water temperatures according to actual cooling loads, limiting chiller demand, and optimizing cooling tower fan operation

#### 4.1.2 College Street Site

The existing cooling plant design featured two older chillers which have been de-rated due to refrigerant change-out, with series evaporator configuration which is inherently less efficient than parallel flow.

- Replacement of the existing two chillers, two cooling towers, and pumps with new high efficiency equipment
- Upgrading the BAS controls strategies to include resetting chilled and condenser water temperatures according to actual cooling loads, limiting chiller demand, and optimizing cooling tower fan operation

### 4.2 Heating Plant Upgrades and Modifications

#### 4.2.1 Queen Street Site – CAMH Retained Buildings

CAMH retained buildings have a dedicated Central Utility Plant (CUP) that provides the required loads for heating, domestic water, and pool operations during the summer and winter operations.

- Installation of a dedicated hot water boiler to the required pool heating
- Replacement of the two 150 HP summer steam boilers with two 75 HP steam boilers to provide the dedicated domestic hot water requirement due to reduced operational demands as result of new hot water boiler installation
- Upgrade and optimization of controls for steam to hot water heat exchanger to minimize energy losses through the distribution system
- Deregulated steam pressure through the deaerator from 50 PSI to 15 PSI

#### 4.2.2 College Street Site

The existing heating plant design featured two old heating boilers and five hot water tanks for domestic water. Due to the age of the plant, the system was in-efficient.

- Replacement of the existing heating plant with four new high efficiency condensing boilers
- Updating the BAS controls and optimizing the sequence of operations

### 4.3 Lighting Retrofit

Depending on the age of the building, CAMH infrastructure was equipped with T8 and T12 fluorescent light fixtures.

#### 4.3.1 Queen Street Site – CAMH Retained Buildings

- LED retrofit the existing fluorescent light fixtures in Unit 2, Unit 3, certain areas in the community center and corridors of the underground tunnel
  - o Unit 4 was not included in the retrofit as it is scheduled for demolition in 2020 as part of Phase 1C Redevelopment Project
- Replacement of remaining T12 lighting with T8 fixtures as they burn out in Unit 1

#### 4.3.2 College Street Site

- LED retrofit the existing fluorescent light fixtures

#### 4.3.3 Russell Street Site

- LED retrofit the existing fluorescent light fixtures

### 4.4 HVAC Upgrades and Optimization

Each building has its own dedicated ventilation system that provides the required heating and cooling throughout the year.

#### 4.4.1 Queen Street Site – CAMH Retained Buildings

- Replacement of the four gas-fired Roof Top Units (RTUs) with high efficiency gas-fired units in the West Wing
- Modifications and optimization of Air Handling Units (AHUs) fan schedule

#### 4.4.2 College Street Site

- Addition of new energy efficient research RTU that includes VFDs and heat recovery as a result of program expansion
- Replacement of constant flow AHU that serves basement and ground floor with new variable airflow AHUs that includes VFDs
- Operational changes to fans operation based on static pressure

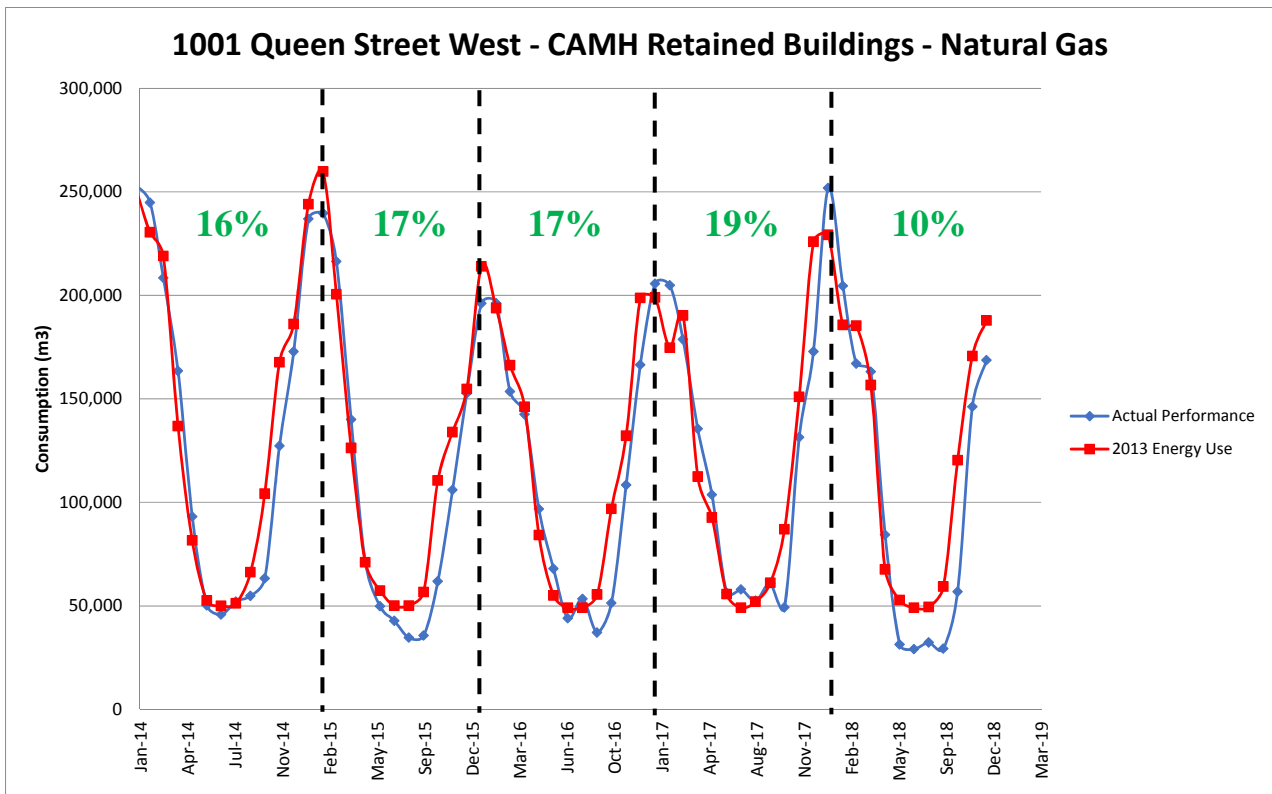
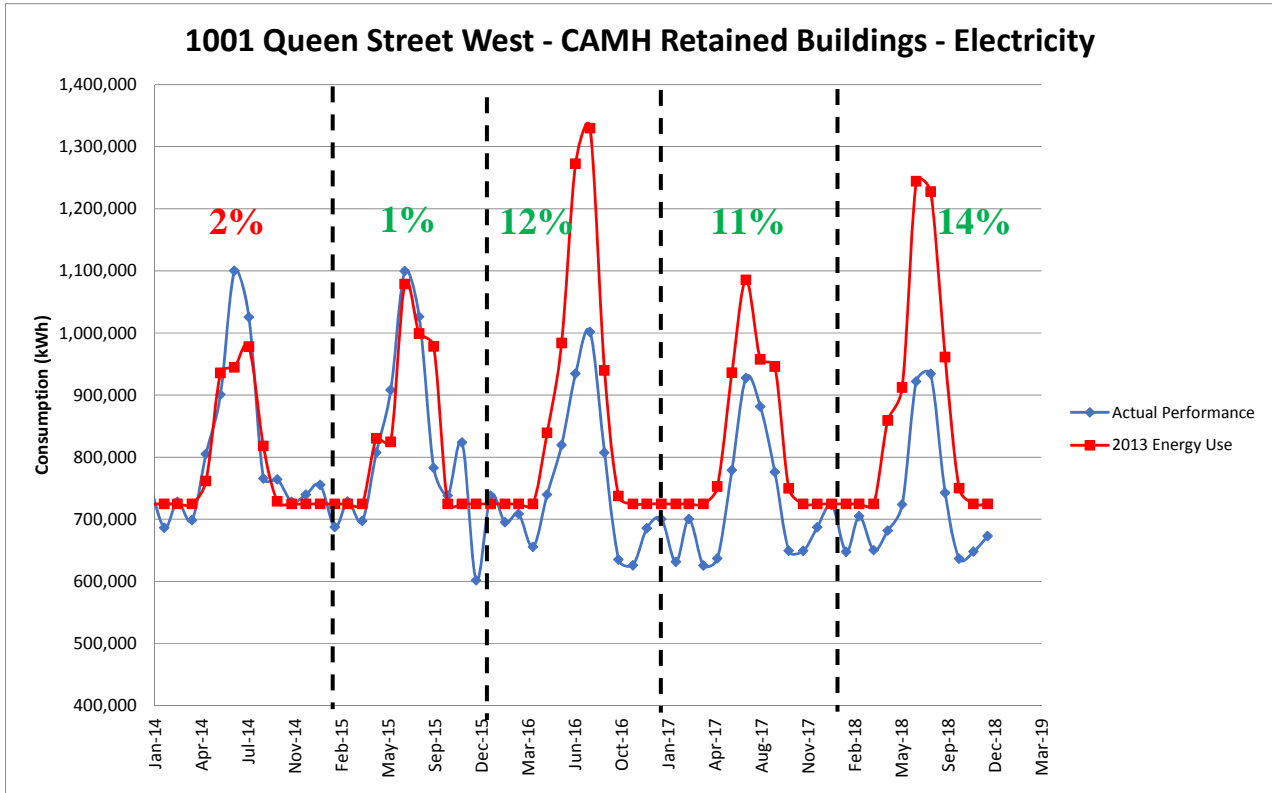
#### 4.4.3 Russell Street Site

- Updating controls and installation of CO<sub>2</sub> sensors to modulate the cooling tower fans which are partially used as an exhaust for the parking garage

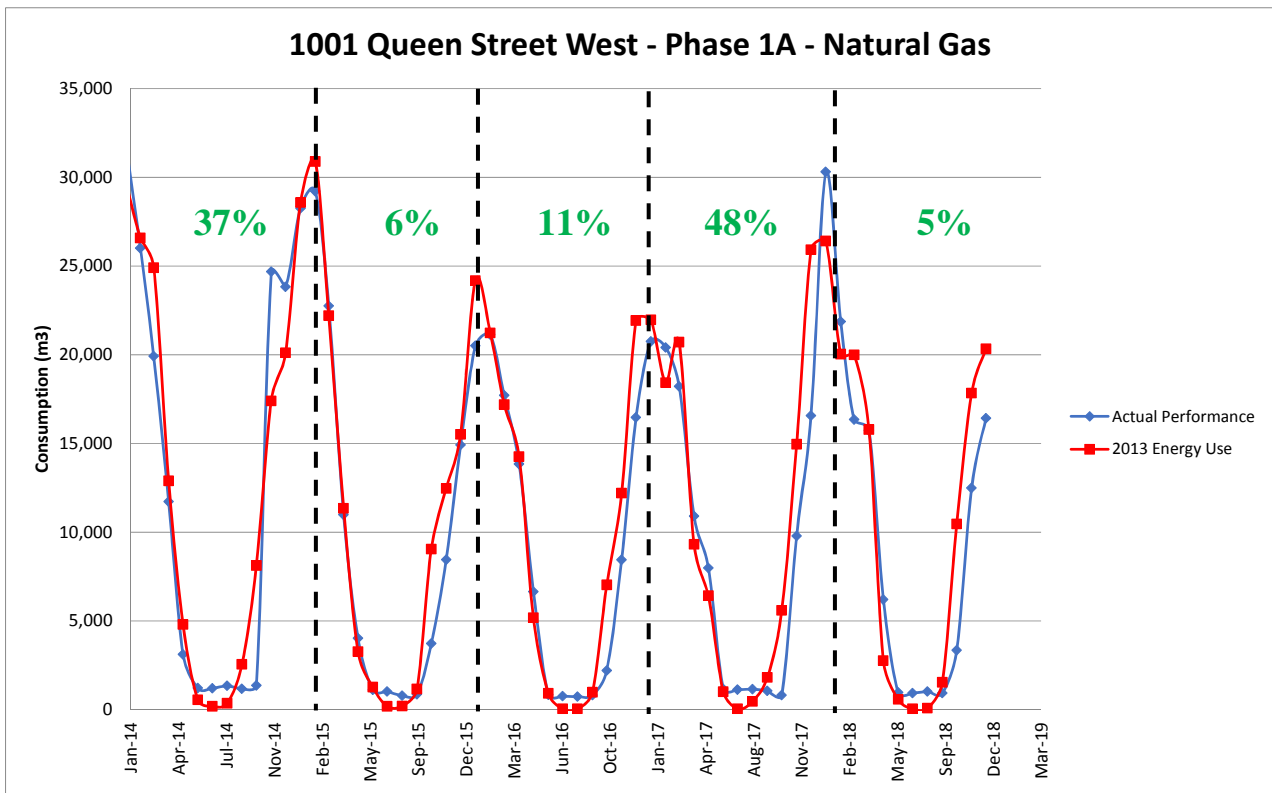
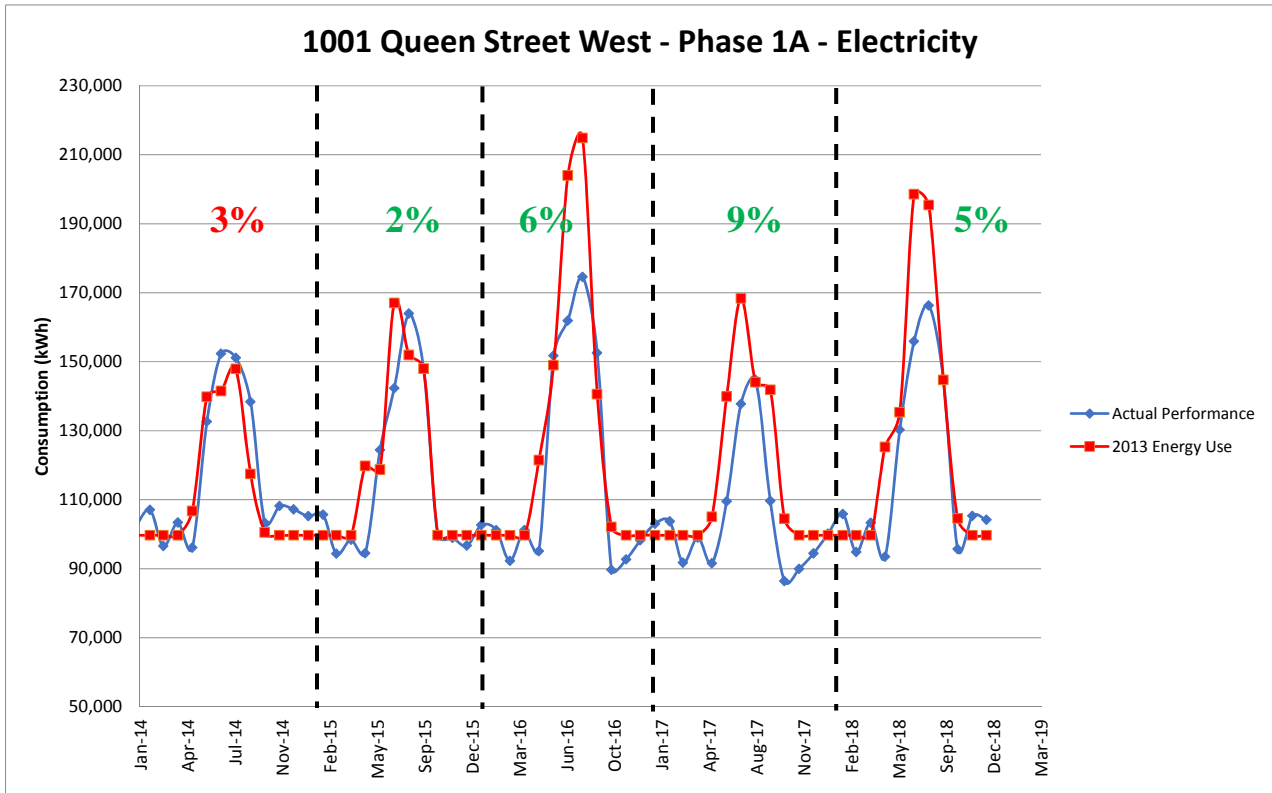
## 5.0 Energy Performance 2014 – 2018

The following graphs represent the monthly performance of each facility with respect to the weather normalized 2013 energy baseline. The annual percentage represents the savings realized with green representing a decrease and red representing an increase.

## 5.1 1001 Queen Street West – CAMH Retained Buildings

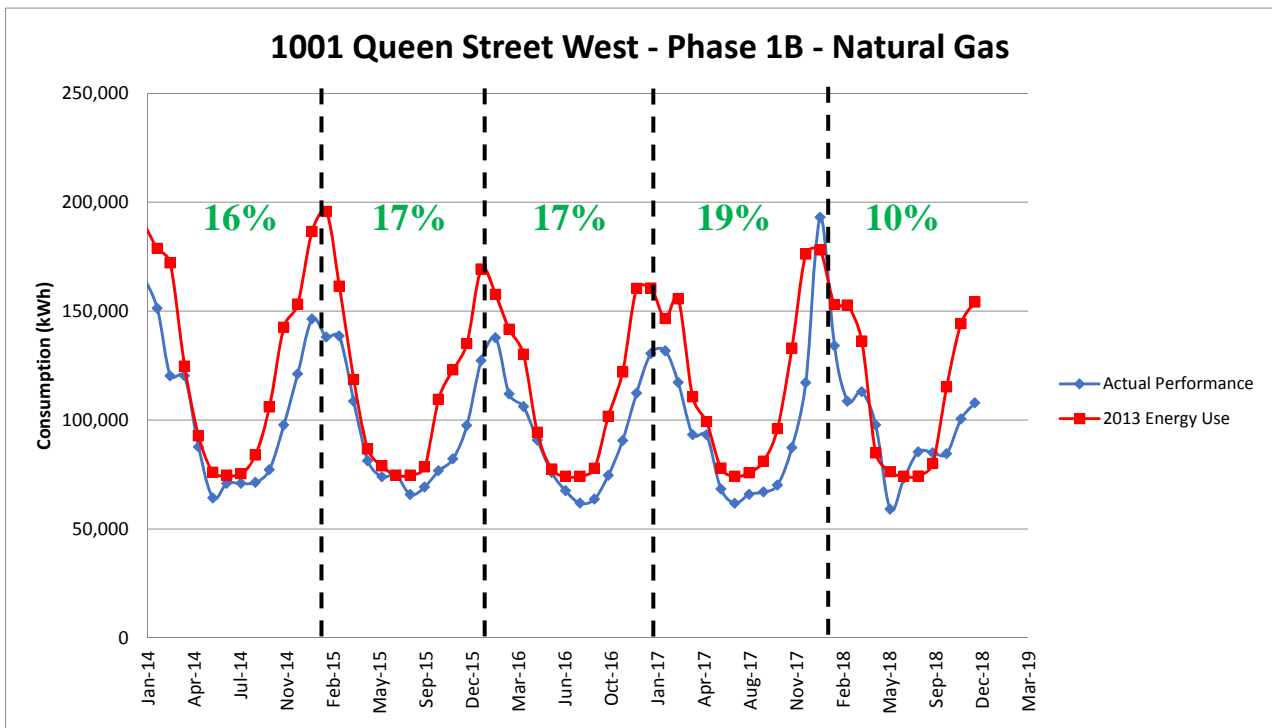
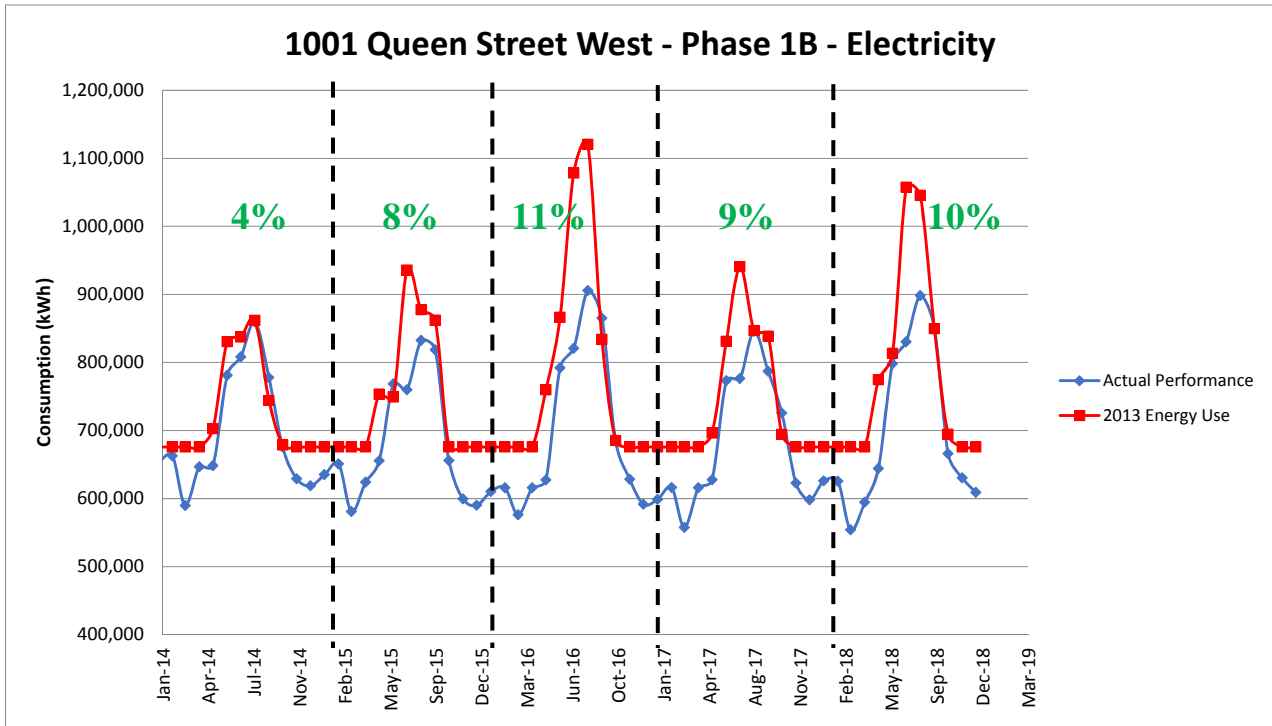


## 5.2 1001 Queen Street West – Phase 1A

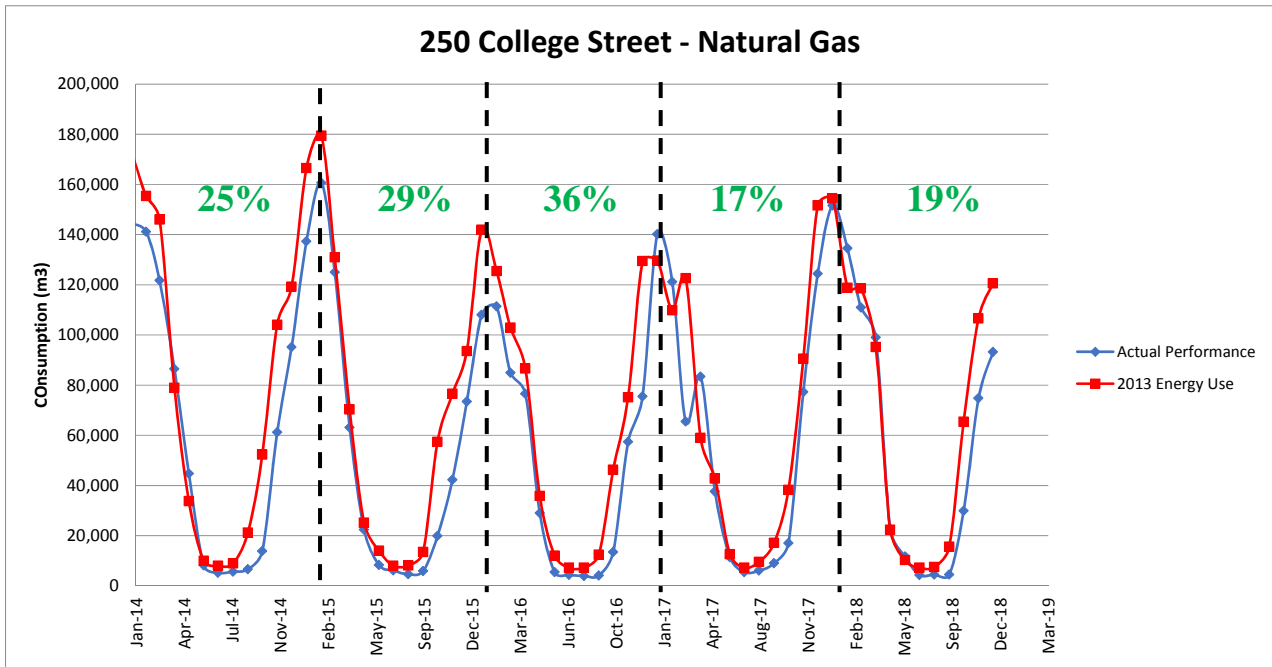
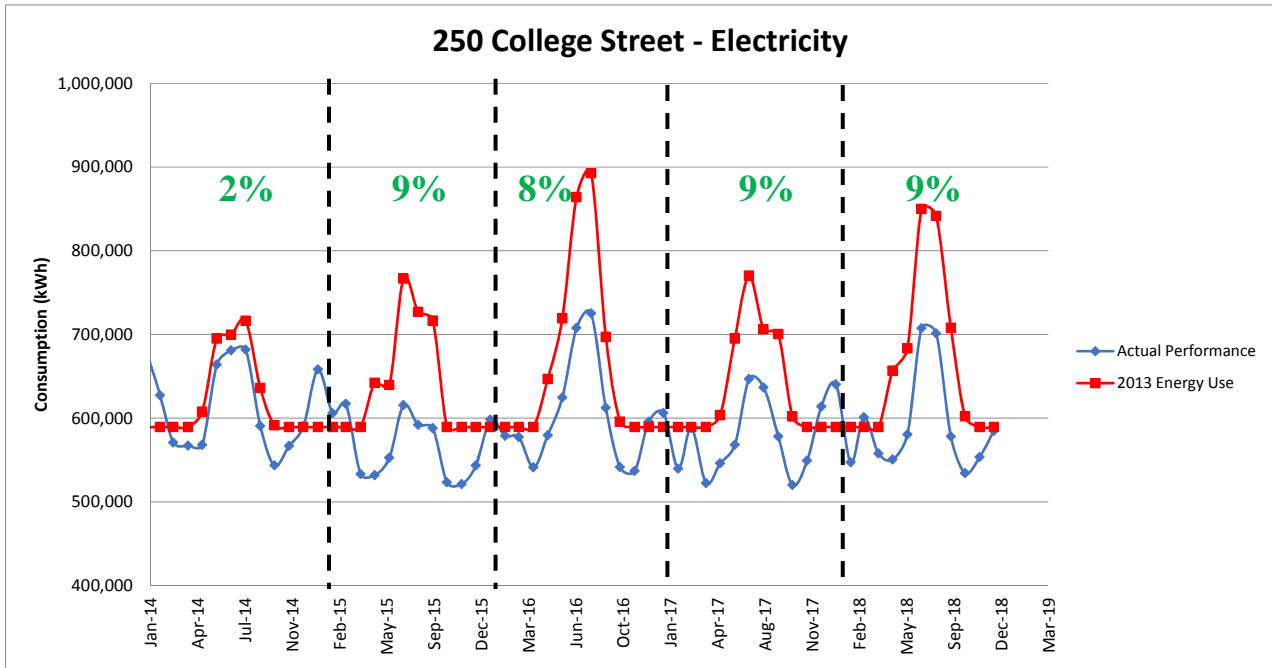




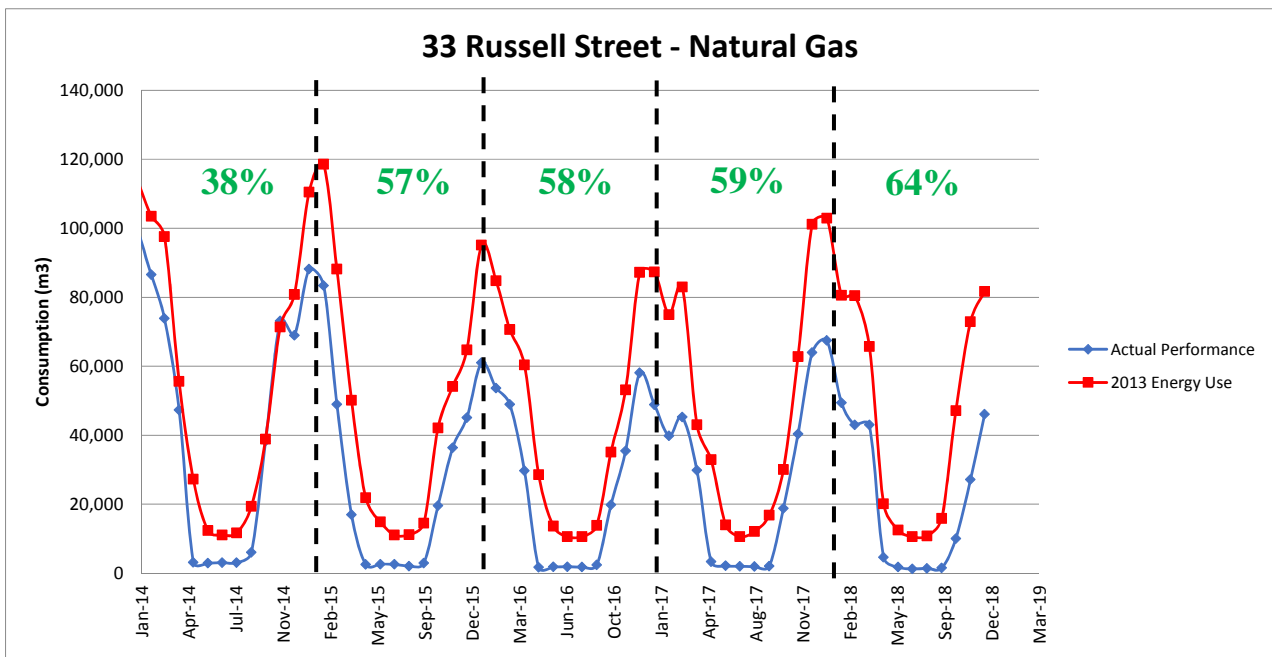
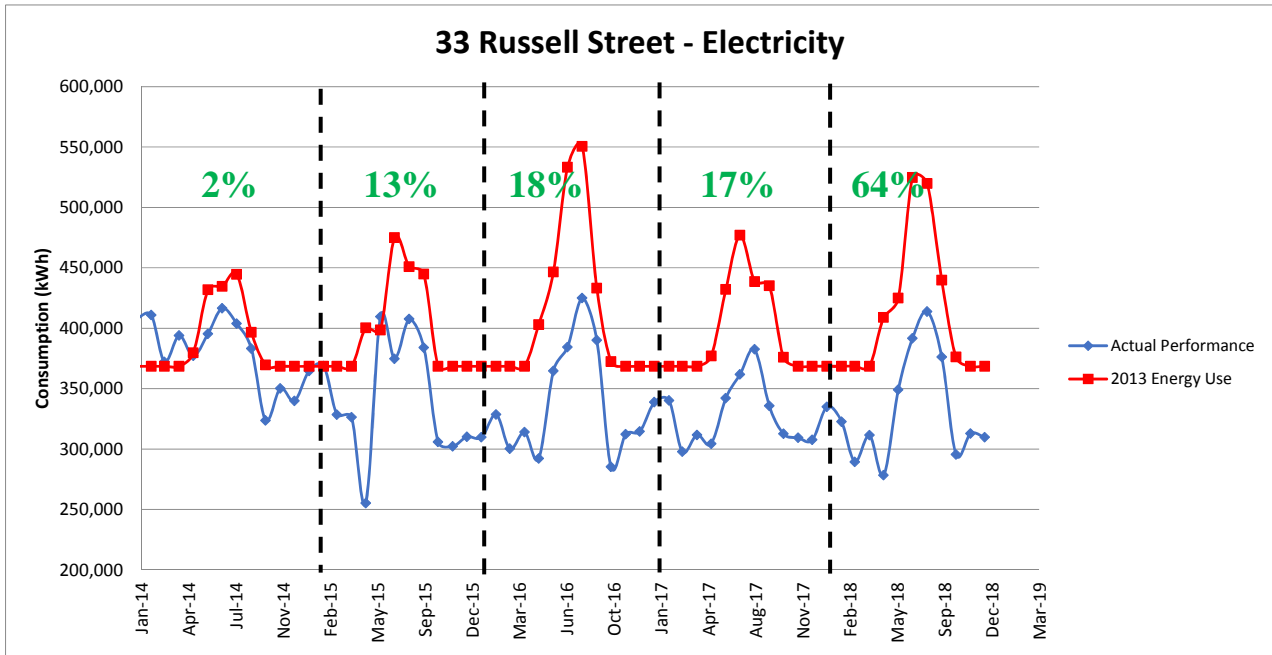
### 5.3 1001 Queen Street West – Phase 1B



## 5.4 250 College Street



## 5.5 33 Russell Street



## 6.0 Current Initiatives

CAMH staff is visibly committed to energy conservation action, tracking performance, responding to variances and operating and maintaining their facilities to a good performance standard. Adjustments to operating schedules and set-points continue to be assessed and reviewed on a regular basis. The 5-year capital plan for these buildings includes ongoing renewal of aging plant and equipment with new, more energy efficient technology. CAMH is also an active member of the Greening Health Care program, continuously seeking new ideas for improving operations while sharing their own experiences with other hospitals.

Additionally, in light of rising energy costs, aging infrastructure and the diverse energy needs to provide patient care, administrative and research operations; CAMH hired a full-time energy manager in 2018. The energy manager would support the plant managers in reducing the energy consumption and overall carbon footprint across CAMH facilities.

## 7.0 Organizational Commitment

CAMH's commitment to sustainability is grounded in the culture and values of its staff, which are reflected in management and operations, and in inter-departmental initiatives. Facilities, housekeeping and security staff are actively involved in conservation and environmental efforts. The focus on monitoring energy use, as well as systems and operations, can be seen in the improved energy performance compared to 2013 baseline and relative to comparable facilities.

## 8.0 Building on Success – The 5-Year Plan (2019 – 2024)

### 8.1 Energy Performance in 2018

An annual assessment of CAMH energy savings potential is developed by Greening Healthcare (GHC) to identify quick wins and areas for improvement. The assessment provided a summary of the energy saving potential for each site based on a good standard of energy performance. The target is based on the top 25% performance standard from similar hospital types. Targets are adjusted for site-specific variables including heating and cooling sources, laundry and research space. CAMH 2018 assessment is provided below. *Note: Energy Savings Potential serves as an indicator for areas of improvement and are not an exact measure of actual target savings*

| Hospital                  | Electricity (kWh/ft2) |        |         |        | Thermal (ekWh/ft2) |        |         |        | Total Energy (ekWh/ft2) |        | Energy Savings Potential |           |
|---------------------------|-----------------------|--------|---------|--------|--------------------|--------|---------|--------|-------------------------|--------|--------------------------|-----------|
|                           | Base                  |        | Cooling |        | Base               |        | Heating |        | 2018                    | Target | %                        | \$/year   |
|                           | 2018                  | Target | 2018    | Target | 2018               | Target | 2018    | Target |                         |        |                          |           |
| College Site              | 22.5                  | 21.4   | 2.6     | 2.5    | 2.0                | 2.0    | 23.6    | 11.1   | 50.7                    | 37.0   | 27%                      | \$157,841 |
| Queen Site                | 11.2                  | 11.2   | 1.6     | 1.2    | 5.7                | 5.7    | 15.2    | 10.5   | 33.7                    | 28.5   | 15%                      | \$144,646 |
| Queen New Site - Phase 1B | 18.2                  | 14.6   | 2.9     | 1.2    | 24.6               | 7.8    | 9.8     | 10.5   | 55.6                    | 34.1   | 39%                      | \$510,774 |
| Russell Site              | 15.2                  | 15.2   | 2.1     | 2.1    | 0.8                | 0.8    | 13.3    | 11.1   | 31.3                    | 29.1   | 7%                       | \$15,500  |

Table 2: CAMH 2018 energy assessment

*Base Electricity refers to fan power, operation of lights and equipment*

*Cooling Electricity refers to cooling plant and ventilation system controls*

*Base Thermal refers to domestic hot water heating*

*Heating Thermal refers to boiler plant & ventilation system controls*

The variance between 2018 performance and targets, for both electricity and thermal, serves as a baseline to identify where the energy saving opportunities are. Coupled with the condition, age, and Facility Condition Index (FCI) of the assets a list of Energy Conservation Measures (ECMs) is developed for future implementation.

## 8.2 Energy Conservation Measures (ECMs)

Based on the results and lessons learned from the consumption analysis, CAMH developed and identified energy saving initiatives for the 2019 – 2024, shown in Table 3. The ECMs listed below will be measured and validated through a monthly comparison of the energy consumption of the facility compared to last year’s performance.

CAMH will work with engineering firms, contractors, and their procurement team to design and execute the ECMs. Once ECMs are completed, there will be transition phase for handover to the maintenance and operations team.

ECMs related to Phase 1B will involve a collaborative effort, with the service provider, and undergo a variation process to identify the impact on the service contract over the concession period due to the nature of the Public Private Partnership (P3) contract.

| #            | Site           | Description                               | Priority (L, M, H) | Budget Implementation Cost (\$) | Annual Savings (\$/year) | Simple Payback (years) |
|--------------|----------------|---|--------------------|---------------------------------|--------------------------|------------------------|
| 1            | Queen          | Unit 3 – HVAC Upgrades                    | H                  | 1,470,000                       | 81,272                   | 18.1                   |
| 2            | Queen          | Solar Energy Feasibility Study            | L                  | 3,500                           | -                        | -                      |
| 3            | Queen          | Steam Traps Audit and Repair              | M                  | 2,500                           | 3,632                    | 0.7                    |
| 4            | Queen          | Plant Operational Review and Optimization | M                  | -                               | 5,447                    | -                      |
| 5            | Phase 1A - WSW | Energy Performance Audit                  | L                  | -                               | -                        | -                      |
| 6            | Phase 1A - WSW | Lighting System Improvements              | H                  | 107,500                         | 25,421                   | 4.2                    |
| 7            | Phase 1B       | Lighting System Improvements              | H                  | 804,496                         | 150,000                  | 5.4                    |
| 8            | Phase 1B       | Heating Plant Upgrades                    | M                  | 196,500                         | 39,531                   | 5.0                    |
| 9            | Phase 1B       | Plant Operational Review and Optimization | L                  | -                               | 14,526                   | -                      |
| 10           | College        | HVAC Rationalization                      | H                  | 1,038,750                       | 98,219                   | 10.6                   |
| 11           | College        | Washrooms Renovation                      | M                  | 442,456                         | 58,570                   | 7.6                    |
| 12           | College        | Plant Operational Review and Optimization | M                  | -                               | 5,447                    | -                      |
| 13           | Russell        | Plant Operational Review and Optimization | L                  | -                               | 3,632                    | -                      |
| 14           | All Sites      | Staff training + engagement               | H                  | -                               | 29,052                   | -                      |
| <b>Total</b> |                |   |                    | <b>4,065,702</b>                | <b>514,748</b>           | <b>7.9</b>             |

Table 3: CAMH 2019 – 2024 energy saving initiatives

Note: Project Priorities were based on the condition of the asset and projected energy savings

### 8.2.1 Queen Street – Unit 3 HVAC Upgrades

Unit 3 is equipped three constant flow Air Handling Units (AHUs) which supply’s air to different areas in the building. The existing AHUs are constant volume (CV) units which are more than 30 years old. As a result, CAMH will be looking to maintain the overall system architecture and upgrade the AHUs to variable air volume (VAV) system through installation of variable frequency drives (VFDs). Furthermore, a heat recovery system will be installed to reuse the thermal energy rejected from the exhaust air stream to temper the incoming ventilation air. This will allow CAMH to realize improved energy consumption through:

- Improved electric motors efficiency
- Outdoor air setback during night/unoccupied hours
- Thermal energy recovery

ECM Effective Life: This measure will replace old technology and continue in effect for 20 years or until the units have been replaced with a newer technology

### *8.2.2 Queen Street – Solar Energy Feasibility Study*

A solar energy feasibility study will be performed to assess the existing roof space and utilization factor realized through installation of Solar Photovoltaic panels.

ECM Effective Life: This measure will continue in effect for 15 years or until the units have been replaced with a newer technology, if implemented.

### *8.2.3 Queen Street – Steam Traps Audit and Repair*

As steam generation is used to heat the air during the winter and provide domestic hot water throughout the year, a steam trap audit will be performed to ensure there are no leaks in the system. In event faulty steam traps are found, they will be repair to enhance the system performance.

ECM Effective Life: This measure will continue in effect for 3 years

### *8.2.4 Queen Street – Plant Operational Review and Optimization*

A review of the plant operations will be performed with CAMH plant managers to identify areas for improvement and potential energy savings. This will include but not limited to:

- Equipment scheduling
- Zone temperature set points
- Sequence of operations optimization

ECM Effective Life: This measure will continue in effect throughout the building systems life or until the units have been replaced with a newer technology that warrants a new sequence of operations

### *8.2.5 Phase 1A – WSW – Energy Performance Audit*

Perform an energy audit to identify major energy consuming building systems and develop energy conservation opportunities that would improve utility consumption and reduce GHG

### *8.2.6 Phase 1A – WSW – Lighting System Improvements*

30, 40, 50 and 60 WSW are currently equipped with high power fluorescent light fixtures. CAMH will be looking to replace them with low power LED lights that will provide a similar light output.

ECM Effective Life: This measure will replace old technology and standardize products in use, and will continue in effect for 10 years or until the fixtures have been replaced with a newer technology

### *8.2.7 Phase 1B – Lighting System Improvements*

100 Stokes Street, 101 Stokes Street and 80 Workman Way are currently equipped with high power fluorescent light fixtures. CAMH will be looking to replace them with low power LED lights that will provide a similar light output.

ECM Effective Life: This measure will replace old technology and standardize products in use, and will continue in effect for 10 years or until the fixtures have been replaced with a newer technology

### *8.2.8 Phase 1B – Heating Plant Upgrade*

The existing heating plant set up does not allow for proper reuse of the condensate created as a result of a steam heating system. The following measures will be assessed to optimize the energy utilization of the heating plant.

- Review existing boiler plant operation and look at the opportunity of installing an active combustion efficiency optimization controls.
- Reuse the thermal energy from condensate through installation of heat recovery for feed water make up from blow down and de-aerator bleed.
- Perform steam traps audit

ECM Effective Life: This measure will continue in effect for 20 years or until the units have been replaced with a newer technology

### *8.2.9 Phase 1B – Plant Operational Review and Optimization*

A review of the plant operations will be performed with CAMH plant managers to identify areas for improvement and potential energy savings. This may include but not limited to:

- Hot water boiler temperature reset
- Isolate sections of the steam system during summer season through component lay-up to reduce in steam losses during non- heating season
- Review set-points and optimize where possible within the PSOS parameters.
- Recommission control sequences

ECM Effective Life: This measure will continue in effect throughout the building systems life or until the units have been replaced with a newer technology that warrants a new sequence of operations



### *8.2.10 College Street – HVAC Rationalization*

A ventilation study will be performed at 250 College Street to assess the economic feasibility of replacing and upgrading the constant flow Roof Top Units (RTUs) /Air Handling Units (AHUs) to a variable air volume (VAV) system through installation of variable frequency drives (VFDs). CAMH's current capital plan has three RTUs scheduled for replacement in 2019. This will allow CAMH to improve energy consumption through:

- Improved electric motors efficiency
- Outdoor air setback during night/unoccupied hours
- ECM Effective Life: This measure will replace old technology and continue in effect for 20 years or until the units have been replaced with a newer technology

### *8.2.11 College Street – Washrooms Renovation*

The existing washrooms at 250 College Street did not have a major renovation since building inception and currently utilize old technology. CAMH will be looking to renovate and upgrade the washroom fixtures for selected washrooms. These upgrades will include but are not limited to:

- Low flow toilet seats
- New showerheads
- Sensor operated faucets

ECM Effective Life: This measure will replace old technology and continue in effect for 15 years or until the units have been replaced with a newer technology

### *8.2.12 College Street – Plant Operational Review and Optimization*

A review of the plant operations will be performed with CAMH plant managers to identify areas for improvement and potential energy savings. This will include but not limited to:

- Equipment scheduling
- Zone temperature set points
- Sequence of operations optimization

ECM Effective Life: This measure will continue in effect throughout the building systems life or until the units have been replaced with a newer technology that warrants a new sequence of operations

### 8.2.13 Russell Street – Plant Operational Review and Optimization

A review of the plant operations will be performed with CAMH plant managers to identify areas for improvement and potential energy savings. This will include but not limited to:

- Equipment scheduling
- Zone temperature set points
- Sequence of operations optimization

ECM Effective Life: This measure will continue in effect throughout the building systems life or until the units have been replaced with a newer technology that warrants a new sequence of operations

### 8.2.14 All Sites – Staff Training + Engagement

There will be a huge emphasis on team collaboration and workshops between CAMH maintenance team, Phase 1B service provider, and Phase 1C service provider to allow for smooth transition into the new CUP and adjust to operational changes. Additionally, use of lighting, along with IT and other equipment used by hospital staff, account for a significant portion of electricity use and costs. Broader departmental engagement in switching off lights and equipment when not in use can also contribute to energy and cost savings. This campaign will help reinforce the CAMH conservation culture, and make everyone part of the energy improvement initiatives.

ECM Effective Life: This measure will set the stage for continuing, active departmental involvement in raising energy performance

## 9.0 Implementation

The ECMs listed in section 8.2 require capital expenditures and will be targeted for implementation over the duration of this plan. Some of these initiatives have already been accounted and budgeted for in CAMH's capital plan.

The next stage of the work involves a review of the existing systems to create a detailed scope of work and develop an in-depth project cost estimate and savings potential. Approved projects will then be designed, tendered and monitored to ensure the efficiency gains are realized. The implementation budget will include project management, contract administration, measurement and verification of savings and reporting on results.

CAMH will continue to closely monitor ongoing energy performance and savings through the Greening Health Care online energy management system to:

- Identify and rectify anomalies in energy consumption
- Ensure continuous operational excellence relative to other healthcare facilities
- Enhance their knowledge about operational best practices and lessons learned