

SCHEDULE F – PROJECT COMPLETION REPORT

VERY IMPORTANT:

Timing: You need to email a report, to your GMF project officer (contact info is in Schedule C), on the dates indicated in Schedule C or whenever FCM asks for such a report.

Copyright: Before you submit a report to FCM, make sure you hold the copyright for the report. If you're hiring a consultant to prepare the report, please make sure to get the copyright (see FCM's copyright tips document), or else FCM will not be able to disburse the Grant Amount.

Accessibility for people with disabilities: Please do not change the format, font, layout, etc. of this report. This template has been specially designed, following FCM's Accessibility Guidelines, in order to be accessible to people with disabilities.

Confidentiality: If your report contains any Confidential Information that you would prefer not be made available to the public (e.g. through a case study or other materials produced by FCM that relate to your Project), please submit two versions of the report:

1. **Complete report including Confidential Information:** Please clearly label this report with the word "**Confidential**" or similar wording and FCM will treat it as confidential.
2. **Abridged report excluding Confidential Information:** This report may be posted on the FCM website and otherwise made available to interested third parties, to help FCM meet its knowledge sharing objectives.

Please contact your project officer to receive an electronic copy of the Completion Report Template.

Upon completion of the project, a copy of the Final Deliverable must be submitted along with this Completion Report.

FCM will post your report on the [Green Municipal Fund™ \(GMF\) website](#). This is because one of FCM's mandates is to help municipal governments share their knowledge and expertise regarding municipal environmental projects, plans and studies.

How to complete the Completion Report

The purpose of the Completion Report is to share the story of your community's experience in undertaking your project with others seeking to address similar issues in their own communities.

Please write the report in plain language that can be understood by people who are not specialists on the subject. A Completion Report is typically in the range of 5–10 pages, but may be longer or shorter, depending on the complexity of the project.

GMF grant recipients must enclose **final** copies of the Completion Report and the Final Deliverable with their final Request for Contribution. The reports, including all attachments and appendices, must be submitted in PDF format with searchable text functionality. Reports that are not clearly identifiable as final reports, such as those displaying headers, footers, titles or watermarks containing terms like "draft" or "for internal use only," will not be accepted by GMF. Additionally, reports must be dated. If you have questions about completing this report, please consult GMF staff.

GMF number	16826
Name of lead applicant (municipality or other partner)	City of Brampton
Name, title, full address, phone, fax and e-mail address of lead technical contact for this study	Name: Chun Liang, Title: Supervisor – Energy Management, Address: 2 Wellington St W, Brampton, ON Phone: 905-874-3598 Email: Chun.Liang@brampton.ca
Date of the report	July 23 rd 2021

1. Introduction

- a) Who was involved in doing the Feasibility Study, and what are their affiliations? Please include name, title and contact information. Those involved could include municipal staff, engineers and other consultants, a representative from a non-governmental organization, and others.

The feasibility study was commissioned by the Energy Management team within the Facilities, Operations and Maintenance division in the City. The study was completed with MCW as the City's 3rd party consultant.

The feasibility study project team included the following individuals:

Name	Association	Title	Role within Study	Contact Information
Simon Van Wonderen	MCW Custom Energy Solutions Ltd.	Partner	Roadmapping & Workshop Team Leadership	SvanWonderen@mcw.com
Steve Burton	MCW Custom Energy Solutions Ltd.	Associate	Project Manager & ASHRAE Level III Auditor	SBurton@mcw.com
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Jessica Malta	MCW Custom Energy Solutions Ltd.	Associate	Workshop Facilitator	JMalta@mcw.com
Samantha Duff	MCW Custom Energy Solutions Ltd.	Energy Specialist	Utility Analysis & Benchmarking	Sduff@mcw.com
David Turner	MCW Custom Energy Solutions Ltd.	Energy Engineer – Lighting	Lighting ECM Development	dturner@mcw.com

James Gray	MCW Custom Energy Solutions Ltd.	Associate	Controls ECM Development	jgray@mcw.com
Liam Connell	MCW Custom Energy Solutions Ltd.	Energy Engineer	Mechanical ECM Development	lconnell@mcw.com
Glen Hultzer	AW Hooker Associates Ltd	Partner	Cost Consulting	ghultzer@awhooker.com
Deroy Destang	AW Hooker Associates Ltd	Senior Quantity Surveyor	Cost Consulting	ddestang@awhooker.com
Chun Liang	City of Brampton	Supervisor – Energy Management	Oversight and Energy Model Reviewer	Chun.Liang@brampton.ca
Junaid Iqbal	City of Brampton	Project Coordinator – Energy Management	Project Manager	Junaid.Iqbal@brampton.ca
Rajdeep Dhothar	City of Brampton	Project Coordinator – Energy Management	Stakeholder Engagement Workshop Coordinator	Rajdeep.Dhothar@brampton.ca
Stefan Bedard	City of Brampton	Project Coordinator – Energy Management	BAS Management	N/A – no longer with City of Brampton

The stakeholders from the City included the following individuals:

Staff Members	Association	Contact Information
Ali Shabram Valentin Popescu Nicola Reid	Building Design & Construction	Ali.Shabram@brampton.ca Valentin.Popescu@brampton.ca N/A – no longer with City
Mike Medeiros Adam Nugent	Facility Operational Staff	Mike.Medeiros@brampton.ca Adam.Nugent@brampton.ca
Kanagasabai Balakanthan Rajkaran Chhina	Asset Management Capital Planning	Kanagasabai.Balakanthan@brampton.ca Rajkaran.Chhina@brampton.ca
Michael Hoy	Environmental Planning	Michael.Hoy@brampton.ca

2. The Feasibility Study

- a) Describe the process that you undertook to make this feasibility study a reality, from concept, to council approval, to RFP, to final deliverable.

The Energy Management Team published its **Energy & Emissions Management Plan 2019-2014: A Zero Carbon Transition** in 2019 and as part of this plan an action item was included to develop a deep retrofit program seeking to deliver zero carbon or high performance. To support the GHG emissions reduction targets in this plan, the Energy Management team conducted a portfolio analysis and identified that the top 30 GHG emitting facilities are responsible for 85% of the City's emissions from City owned and managed facilities, and recreational facilities account for nearly 50% of the City's emissions.

Energy Management identified the Susan Fennell Sportsplex (formerly South Fletcher's Sportsplex) as one of the City's top five GHG emitters. This facility is also one of the City's largest multi-use recreational facilities and most of the major building systems are at the end of their useful life. As such, the Susan Fennell Sportsplex (formerly South Fletcher's Sportsplex) provides an opportunity to undertake retrofit options that will transform the City asset into a zero-carbon facility. Once this facility was identified as the optimal facility to move forward with a deep energy retrofit feasibility study, the City conducted a competitive procurement process to secure the services of a consultant for this study. The study was awarded to MCW upon selection of the consultant from the RFP evaluation team.

b) What were the objectives of the Feasibility Study (what was it seeking to determine)?

The objective of this study was to complete a comprehensive technical and financial analysis of GHG reduction options (50%, 80%, and 100% reduction) and determine the best approach to reduce the building's carbon footprint. The Carbon Neutral Study identified opportunities to significantly reduce the building's energy consumption and resulting greenhouse gas (GHG) emissions.

c) What approach (or methodology) was used in the Feasibility Study to meet these objectives?

The feasibility study included multiple steps/phases to meet the objectives of the study. The following methodology steps were used in the Feasibility Study to meet these objectives:

1. ASHRAE Level III Energy Audit & Energy Modelling of Existing Base Case Facility
2. Utility Bill Analysis
3. Technical and Financial Measures Development for the following targets, and a total of 9 scenarios:
 - a. 50% GHG Reduction – 3 options
 - b. 80% GHG Reduction – 3 options
 - c. 100% GHG Reduction – 3 options
4. Workshops for Measures Selection & Feedback from Key Stakeholders
5. Energy Modelling & Parametric Analysis of Bundled Energy Conservation Measures
6. Development of final 9 bundled options, SWOT analysis, and life cycle costing including operations and maintenance costing
7. Final Reporting

d) Please describe any public consultations conducted as part of the Feasibility Study and their impact on the Study.

This study did not include public consultation. The project team prioritized engagement and collaboration with organizational and building-level stakeholders, beginning with developing a communications framework to encourage stakeholder engagement throughout the study.

The engagement objective was to communicate project goals, solidify carbon reduction targets, seek input on potential impacts to building end users, address concerns, and build trust and acceptance of retrofit plans. To accomplish this, the study scope requested engagement workshops at 70% (Workshop 1), and 90% (Workshop 2) study milestones. Added workshops include Workshop 0 (~33%) and a pre-Workshop 2 Alignment Session. Workshops originally planned as full-day exercises were split to reflect the projects virtual transition in response to the COVID-19 Pandemic.

User groups solicited included Operations, Community Library, Building Design & Construction, Asset Management, Environmental Planning, and Energy Management Group. While the broader community was not engaged directly, several of the stakeholder groups acted as a stand in to voice the potential concerns of community members who often patronize the facility.

3. Feasibility Study Findings and Recommendations

- a) What were the environmental findings related to the options explored in the Feasibility Study? Please provide quantitative results and summary tables of these results (or the page numbers from the Feasibility Study report).

The following table provides a summary of the GHG reduction findings related to the options explored in the feasibility study:

Design Option	Implementation Cost	Annual Energy Cost	Life Cycle Cost	Annual GHG Emissions	Annual GHG Reduction		Cost/GHG Reduction
					[Tonnes eCO2]	[%]	
Option 0	-	\$846,500	\$22,380,000	1781	-		-
Option 1 50% A	\$4,414,000	\$445,200	\$14,630,000	716	1,065	60%	\$4,143
Option 2 50% B	\$4,496,000	\$422,200	\$14,340,000	895	886	50%	\$5,601
Option 3 50% C	\$8,830,000	\$409,900	\$17,900,000	635	1,146	64%	\$7,705
Option 4 80% A	\$12,710,000	\$345,500	\$19,400,000	373	1,408	79%	\$9,028
Option 5 80% B	\$12,870,000	\$339,800	\$19,300,000	375	1,406	79%	\$9,153
Option 6 80% C	\$13,250,000	\$354,200	\$19,260,000	361	1,420	80%	\$9,331
Option 7 100% A	\$29,230,000	\$275,400	\$31,430,000	53	1,728	97%	\$16,991
Option 8 100% B	\$28,930,000	\$274,400	\$31,190,000	52	1,729	97%	\$16,737
Option 9 100% C	\$20,840,000	\$301,200	\$25,870,000	57	1,724	97%	\$12,091

- b) What were the financial findings related to the options explored in the Feasibility Study (for example, results of a cost-benefit analysis, financial savings identified, and so on)? Please provide

quantitative results and summary tables of these results (or the page numbers from the Feasibility Study report).

Please see table above, which includes a summary of financial findings (implementation costs and lifecycle costs).

Additional supporting figures for the financial findings are provided in pages 11-13 of the executive summary of the Feasibility Study report.

c) Based on the environmental and financial findings above, what does the Feasibility Study recommend?

The feasibility study provided a summary of nine (9) scenario options that would meet targets of 50%, 80%, and 100% GHG emissions reduction for the facility.

Major measures identified in the study include but are not limited to the implementation of:

- Battery Energy Storage
- Ground Source Heating and Cooling
- HVAC Equipment Replacement
- Automation and Control Measures
- High Efficiency Ice Plant with Heat Recovery
- Solar PV – Rooftop
- Carbon Offsets

Recommendations for measures to implement under each of these options vary and a scenario measures scope matrix is provided on page 8 of the executive summary for further information and reference.

4. Lead Applicant's Next Steps

a) Taking the Feasibility Study's recommendations into account, what next steps do you as the municipality plan to take? What potential benefits or internal municipal improvements would result from these next steps?

The City has taken the next steps of providing the recommendations of the report to City Council and on April 14th 2021 the design of the Zero Carbon Retrofit was approved. Based on council approval, the City is moving forward with a public procurement process to retain the services of an Energy Services Company (ESCO) to complete the design, implementation, measurement & verification and commissioning of a deep energy retrofit solution that would meet the target of achieving 100% GHG reductions for the facility.

Potential benefits that would result from these steps is a reduction to the City's overall portfolio of GHG emissions, which would help to meet the City's goal to reach a zero-carbon transition by 2050.

5. Lessons Learned

In answering the questions in this section, please consider all aspects of undertaking the Study — from the initial planning through each essential task until the Final Study was prepared.

a) What would you recommend to other municipalities interested in doing a similar Feasibility Study? What would you do differently if you were to do this again?

The City of Brampton would recommend other municipalities to first complete a portfolio analysis of the top GHG emitting facilities to identify the target facility for a feasibility study of this nature. For the completion of the feasibility study, we would recommend engaging a 3rd party consultant that has experience completing similar studies for other municipal organizations and with strong energy modelling qualifications. It is also important to engage key stakeholders within the municipality and to follow an integrated design process (IDP) to ensure feedback from these stakeholders is incorporated into the final results of the study.

For future studies, what the City may do differently is limit the scope for the number of options assessed. The City found that there was support to meet emissions reduction targets of 80% or greater, so in future, studies may remove options to meet a 50% GHG emissions reduction target.

- b) What barriers or challenges (if any) did you encounter in doing this Feasibility Study? How did you overcome them?

The COVID-19 pandemic was a challenge that was encountered during this study as the original plan was to complete the workshops in person, however this was not possible due to physical distancing guidelines. These barriers were overcome by using various tools to keep the stakeholders engaged such as video conferencing, shared whiteboards, and live online polling.

6. Knowledge Sharing

- a) Is there a website where more information about the Feasibility Study can be found? If so, please provide the relevant URL.

More information about the feasibility study can be found within the Council report linked here:

<https://pub-brampton.escribemeetings.com/filestream.ashx?DocumentId=20865>

- b) In addition to the Feasibility Study results, has your Feasibility Study led to other activities that could be of interest to another municipality (for example, a new policy for sustainable community development, a series of model by-laws, the design of a new operating practice, a manual on public consultation or a measurement tool to assess progress in moving toward greater sustainability)? If so, please list these outcomes, and include copies of the relevant documents (or website links).

Other activities that this feasibility study led to was the development of an ESCO pre-qualification process to provide turnkey deep energy retrofits for City owned and managed facilities. The link to the pre-qualification is provided below:

<https://brampton.bidsandtenders.ca/Module/Tenders/en/Tender/Detail/a00339fc-9b3e-4fe6-83ba-f7fb1f163bda>

Another activity was the development of a project delivery contract that incorporated key elements of retrofit construction, energy savings and emissions reduction targets with savings and targets incorporated into a performance guarantee. The RFP was released on July 20, 2021. See Bids&Tenders link provided below:

<https://brampton.bidsandtenders.ca/Module/Tenders/en/Tender/Detail/90934de7-f7eb-46a6-a39c-322c232e5990>

Climate adaptation modelling was included in the RFP for the feasibility study and the modelling using future weather data demonstrated a decrease in natural gas consumption and an increase in electricity consumption.

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This project was carried out with assistance from the Green Municipal Fund, a Fund financed by the Government of Canada and administered by the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.