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To:	Rochelle Owen, B.Sc., MES, LEED GA Executive Director, Office of Sustainability Dalhousie University	From:	Catherine MacFarlane, M.A.Sc. Environmental Scientist Stantec Consulting Ltd.
File:	121812830	Date:	January 31, 2018

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**Reference: Greenhouse Gas Advisory Services – Review of Greenhouse Gas Calculations and Report**

## INTRODUCTION

Stantec Consulting Ltd. (Stantec) is pleased to provide this memo regarding our review of the GHG calculations and GHG Inventory Report (the report) created by Dalhousie University (Dal) for the 2016/2017 fiscal year. The GHG inventory includes emissions from the following categories:

- Scope 1 – direct GHG emissions (from sources such as fuels combusted in stationary and mobile equipment, refrigerant use, and emissions from biomass combustion<sup>1</sup>);
- Scope 2 – indirect energy GHG emissions (from sources that are owned or controlled by another entity, such as the use of purchased electricity and steam); and
- Scope 3 – Other indirect emissions (such as business travel, the extraction and production of purchased materials and fuels, and other outsourced activities).

Dal has selected an “operational control” approach for reporting Scope 1 and Scope 2 emissions, which means they account for the GHG emissions over which they have direct operational control. Dal’s reported Scope 3 emissions are limited to those from students and employees travelling to and from the university. Other Scope 3 emissions are excluded. Dal reported that other excluded Scope 3 sources include upstream emissions from the transportation of purchased materials or goods, and that in future years, other sources of Scope 3 emissions may be reported.

## PROCEDURES

The following areas of the calculation spreadsheets were checked by Stantec against the most recent versions of The Climate Registry’s (TCR) General Reporting Protocol and General Verification Protocol, as well as the ISO 14064:1 principles of accuracy, completeness, transparency, consistency, and relevance:

- Potential for calculation errors;
- Methodologies;
- Referenced values (e.g., natural gas emission factor);
- Assumptions inherent to the calculations; and
- Documentation of assumptions or explanations.

Stantec reviewed and checked the calculation spreadsheet. Stantec also reviewed the report, focusing on the sections that relate to the calculation spreadsheets. The raw data spreadsheets that were used to populate the calculation spreadsheets were not checked against supporting invoices or other official supporting documents.

## FINDINGS AND RECOMMENDATIONS

In relation to transparency, there are some improvements that could be made. The spreadsheets do not document all of the assumptions that were used or provide explanations for all of the calculations performed. The transparency of the

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<sup>1</sup> Carbon dioxide (CO<sub>2</sub>) emissions from biomass are reported separately from Scope 1 emissions

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spreadsheets could be improved by adding a sheet with notes on data sources, unit conversions, assumptions, and calculation methodologies. Complete reference lists for the citations that are listed in the spreadsheets could be added as well, including the source, year and website links wherever possible. An example of this would be including the full reference for the Linde Industrial Gases global warming potential (GWP) for RS52 refrigerant.

The report does not contain information about how the raw data is collected, stored, managed, or any quality assurance/quality controls that are in place. Including this information would enhance the transparency of the data collection and management process.

The calculations for annual Scope 1, Scope 2 and Scope 3 emissions are performed correctly in the spreadsheets, and the methodologies used for the calculations are appropriate. However, the incorrect emission factor (EF) is used for natural gas CH<sub>4</sub> and N<sub>2</sub>O emissions calculations, and the incorrect GWP is used for R437A refrigerant. These values, and the values that should have been used, are presented in Table 1.

**Table 1 Corrected Values to be Used in Emissions Calculations**

Spreadsheet Name	Parameter	Incorrect value used in the spreadsheet	Correct value to be used	EF/GWP Reference
Fuels FY 2017.xlsx	Natural Gas	<ul style="list-style-type: none"> <li>0.95 g CH<sub>4</sub> / MMBtu EF for both CH<sub>4</sub> and N<sub>2</sub>O emissions calculations</li> </ul>	<ul style="list-style-type: none"> <li>0.037 g CH<sub>4</sub> / m<sup>3</sup></li> <li>0.035 g N<sub>2</sub>O / m<sup>3</sup></li> </ul>	TCR 2017 Default Emission Factors, Table 12.4
Refrigerant FY 2017.xlsx	R437A	<ul style="list-style-type: none"> <li>1,369 GWP for emissions calculations</li> </ul>	<ul style="list-style-type: none"> <li>1,639</li> </ul>	TCR General Reporting Protocol (version 2.1), Appendix B: Global Warming Potentials

Stantec also noted that some incorrect EFs were used for calculating GHG emissions from fleet vehicles (in the spreadsheet titled “Fleet FY 2017.xlsx”). These values, and the values that should have been used, are presented in Table 2.

**Table 2 Corrected Valued to be Used in Emissions Calculations**

Vehicle Year	Vehicle Make and Model	Incorrect value used in the spreadsheet	Correct value to be used	Reason for the change	EF/GWP Reference
2011	Dodge Ram 2500	<ul style="list-style-type: none"> <li>0.0163 g CH<sub>4</sub> / mile</li> </ul>	<ul style="list-style-type: none"> <li>0.0010 g CH<sub>4</sub> / mile</li> </ul>	The EF used is for gasoline vehicles, and this vehicle runs on diesel fuel	TCR 2017 Default Emission Factors, Table 13.5
2002	Chev Silverado 2500HD 4X4	<ul style="list-style-type: none"> <li>0.0159 g CH<sub>4</sub> / mile</li> <li>0.0089 g N<sub>2</sub>O / mile</li> </ul>	<ul style="list-style-type: none"> <li>0.0178 g CH<sub>4</sub> / mile</li> <li>0.0228 g N<sub>2</sub>O / mile</li> </ul>	The EFs used are not for the correct vehicle year	TCR 2017 Default Emission Factors, Table 13.5
2008	DODGE Ram 2500 Quad	<ul style="list-style-type: none"> <li>0.0161 g CH<sub>4</sub> / mile</li> <li>0.0079 g N<sub>2</sub>O / mile</li> </ul>	<ul style="list-style-type: none"> <li>0.0163 g CH<sub>4</sub> / mile</li> <li>0.0066 g N<sub>2</sub>O / mile</li> </ul>	The EFs used are not for the correct vehicle year	TCR 2017 Default Emission Factors, Table 13.5

The “Fleet FY 2017.xlsx” spreadsheet and the report include EFs representing tonnes of carbon dioxide equivalent (t CO<sub>2</sub>e) per unit of gasoline and diesel combusted by fleet vehicles. Stantec could not recalculate these EFs, and the calculation that is shown in both the spreadsheet and report (fuel consumption \* EF = total emissions) does not add up. Documentation of the assumptions and/or calculations that led to Dal’s EFs is recommended.

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Dal sells some of the steam it generates (by combusting natural gas) onsite to other buildings that are outside of Dal's operational control; these buildings are run by the University of King's College, the National Research Council, and the Halifax Law Courts. Dal subtracted these emissions from their GHG totals, which is incorrect; Dal owns the steam generating equipment, and is directly burning fuel to create the steam. These emissions are therefore Scope 1 emissions for Dal, and would be considered Scope 2 emissions for the buyers of the steam. Additionally, Dal has calculated these emissions to be 2,212 tCO<sub>2</sub>e in the fuels calculation spreadsheet (Fuels FY 2017.xlsx). Stantec could not recalculate this total. The spreadsheet should contain a clear, transparent calculation in support of this value, and a list of any assumptions that were made for the calculation.

The refrigerant spreadsheet includes calculations from R22. According to the TCR General Reporting Protocol (version 2.1), *“common refrigerants R-22, R-12 and R-11 are not part of the GHGs required to be reported to TCR because they are either HCFCs or chlorofluorocarbons (CFCs). The production of HCFCs and CFCs is being phased out under the Montreal Protocol and as a result, HCFCs and CFCs Quantifying Your Emissions 135 Part III are not defined as GHGs under the Kyoto Protocol. Emissions of non-Kyoto-defined GHGs must not be reported as emission sources or part of a facility totals grid in CRIS, regardless of the GWP of the gas. Members that opt to disclose emissions of these refrigerants must include that information in a supplemental document. TCR encourages members to optionally disclose these gases in a supplemental public document”*. Therefore, Dal should consider removing these refrigerants from the GHG inventory.

Other points for consideration:

- Improve consistency in the report by using one term to refer to the base year (rather than switching back and forth between base year, baseline, 2009 fiscal, 2009/2010, and 2009-2010). The same could be done for the current GHG inventory year.
- Many figures in the report have 2 titles, one that is embedded in the figure from Excel, and one that has been added below the figure. The report could be simplified by removing the figure name from Excel.

## CLOSURE

This memo has been prepared for the sole benefit of Dalhousie University. This memo may not be relied upon by any other person or entity without the express written consent of Stantec Consulting Ltd. (Stantec) and Dalhousie University. Any use of this report by a third party, or any reliance on decisions made based upon this report, are the responsibility of the third party. Stantec accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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This memo was prepared by Catherine MacFarlane, M.A.Sc. quality reviewed by Vicki Corning, P. Eng., and independently reviewed by Nicole Flanagan, M.A.Sc., P.Eng. We appreciate the opportunity to assist the University with your GHG inventory. If you have any questions regarding the contents of this memo, or require any additional information, please do not hesitate to contact the undersigned.

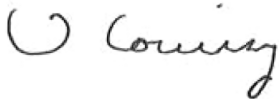
**STANTEC CONSULTING LTD.**



**Catherine MacFarlane, M.A.Sc.**  
Environmental Scientist  
Phone: (506) 634-2185  
Fax: (506) 634-8104  
Catherine.MacFarlane@Stantec.com



**Nicole Flanagan, M.A.Sc., P.Eng.**  
Independent Peer Reviewer  
Phone: (613) 738-6086  
Fax: (613) 722-2799  
Nicole.Flanagan@Stantec.com



**Vicki Corning, P.Eng.**  
Project Manager, Quality Reviewer  
Phone: (506) 452-7000  
Fax: (506) 452-0112  
Vicki.Corning@Stantec.com