



**CONESTOGA-ROVERS  
& ASSOCIATES**

1195 Stellar Drive, Unit 1, Newmarket, Ontario L3Y 7B8  
Telephone: (905) 830-5656 Fax: (905) 830-0176  
[www.CRAworld.com](http://www.CRAworld.com)

April 2, 2015

Reference No. 084692

Mr. Ray Copes  
Chief, Environmental and Occupational Health  
480 University Avenue  
Toronto, Ontario  
M5G 1V2

Dear Mr. Copes:

Re: Response to Technical Advice Document from Public Health Ontario, Commissioned by  
Hamilton's Medical Officer of Health and Hamilton Public Health Services, on the Human  
Health Risk Assessment Report  
Port Fuels and Materials Services, Inc.  
Environmental Screening

---

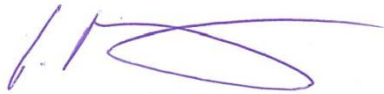
Port Fuels and Materials Services, Inc. (PFMSI) and Conestoga-Rovers & Associates (CRA) have reviewed the Public Health Ontario (PHO) technical advice document, received via email on March 19, 2015 from Garrod Pickfield LLP, providing comments from PHO to Hamilton's Medical Officer of Health and Hamilton Public Health Services (HPS), on the Human Health Risk Assessment Report prepared and appended to the Environment Screening Report (ESR), completed as part of the Environmental Screening Process. The attached responds to all of the commentary identified in the PHO letter.

We trust that if there are any further questions with respect to our responses, that there continue to be an exchange of information and discussions between HPS, PHO and PFMSI/CRA prior to finalizing the HPS report to Hamilton City Council.

If a meeting is required, we are able to meet next week at your convenience to discuss the responses provided. Should you have any additional questions, please do not hesitate to contact me or Mr. Bob Clark of PFMSI.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

A handwritten signature in purple ink, consisting of a stylized 'G' followed by a horizontal line and a loop.

Gordon Reusing, P. Eng.

BS/mg/1

Encl.

cc: Matthew Lawson, Manager, Health Hazards Program, Hamilton PHS  
Bob Clark, Port Fuels and Materials Services, Inc.

**Response to Public Health Ontario Comments**  
**Human Health Risk Assessment Report**



**CONESTOGA-ROVERS  
& ASSOCIATES**

651 Colby Drive, Waterloo, Ontario, N2V 1C2  
Telephone: (519) 884-0510 Fax: (519) 884-0525  
[www.CRAworld.com](http://www.CRAworld.com)

April 2, 2015

Reference No. 084692

## **Response to Public Health Ontario Comments Human Health Risk Assessment Report**

Hamilton Public Health Services requested Public Health Ontario to assist with the review and interpretation of the Human Health Risk Assessment Report (HHRA Report), dated December 2014, and prepared by Conestoga-Rovers & Associates (CRA) on behalf of Port Fuels & Materials Services, Inc. (PFMSI). CRA has issued this correspondence to respond to comments raised by Public Health Ontario regarding the HHRA Report. The Public Health Ontario comments are reproduced below and a Response is provided following each comment.

### **Public Health Ontario Comment 1 Human Health Risk Assessment Methodology**

#### ***Comment 1a:***

***The methodology of the human health risk assessment (HHRA) prepared by Conestoga-Rovers & Associates for the proposed GasPlasma facility in Hamilton was reviewed by Public Health Ontario (PHO), to determine if the assessment followed generally best acceptable practices (as described by regulatory guidance from the Ministry of Environment and Climate Change (MOECC), Health Canada and the United States Environmental Protection Agency (US EPA)) to describe and estimate potential human health risks from the proposed facility.***

***The report prepared by Conestoga-Rovers & Associates follows the framework for an HHRA and is in general accordance with guidance from the MOECC, Health Canada and the US EPA.***

#### ***CRA Response:***

CRA concurs with the above comment.

#### ***Comment 1b:***

***The inputs and fate and transport modelling were not reviewed by PHO, and therefore the results of the HHRA have not been validated.***

**CRA Response:**

The atmospheric dispersion and deposition modelling work has undergone peer reviews by others and CRA has responded separately to the comments stemming from those reviews. There have been no comments from the peer reviews that would significantly change the results and conclusions of the HHRA.

**Comment 1c:**

***Upon review of the HHRA methodology, the following are a list of limitations/and or gaps in the assessment:***

- ***Baseline conditions only accounted for ambient air; baseline soil and vegetation conditions were not measured or qualitatively assessed in the HHRA. Information about the baseline conditions in these media is needed for an understanding of the potential health risks discussed for all the given scenarios and receptors evaluated in the HHRA.***

**CRA Response**

The modeled soil and vegetation concentrations will be compared to background soil and vegetation concentrations as available in publically accessible documents and reports. Baseline soil concentrations are available in the Durham-York HHRA, Plastimet Inc. Fire report prepared by the Ontario Ministry of the Environment and Climate Change, and Ontario Background Site Condition Standards. Baseline vegetation concentrations are available in the Durham-York HHRA and the Plastimet Inc. Fire report. Predicted COC concentrations in soil and vegetation due to emissions from the proposed PFMSI Facility for the normal and bypass operating conditions are less than 1 percent of the baseline soil and vegetation concentrations. This demonstrates that Facility will result in a negligible increase in soil and vegetation concentrations above baseline conditions. These comparisons will provide context and understanding for the modelled soil and produce concentrations evaluated in the HHRA.

**Comment 1d:**

- ***The HHRA does not quantitatively or qualitatively discuss emissions from the waste delivery trucks to and from the proposed facility, and other traffic that may be related to the operations of the proposed facility.***

### ***CRA Response***

Tailpipe emissions that occur on site from waste delivery trucks and other vehicles are very minor sources of particulate, nitrogen oxides and carbon monoxide emissions relative to the stationary sources of these emissions. Tailpipe emissions account for less than 1% of the Facility emissions.

On an airshed basis, the Facility is actually expected to reduce the travel distances and related emissions of off-site waste delivery trucks because local waste would normally be trucked further distances to other waste disposal facilities. This should result in a net decrease in the airshed tailpipe emissions.

We have added the on-site vehicle traffic to the air emissions estimates and can confirm that there were no significant changes to the results or conclusions of the HHRA.

### ***Comment 1e:***

- ***The HHRA does not discuss or evaluate the following scenarios:***
  - ***An operation upset scenario, where the facility may malfunction or not work as intended;***
  - ***Future case scenario, where the facility emissions and future and existing facilities are assessed to illustrate the overall impact to the local air shed.***

### ***CRA Response***

One of the scenarios that was modeled and assessed in the HHRA was a bypass of all syngas to the thermal oxidizer in the event of a malfunction or upset with the engines that would normally use the syngas as a fuel. This is the only realistic upset scenario and has been modeled in the worst case with all syngas going to the oxidizer. The oxidizer is on continuous standby so that in the event of any upset or malfunction, the syngas will immediately be directed to the oxidizer.

The scenarios modeled and included in the HHRA are the worst case future operations of the proposed Facility. The existing facilities in the local airshed, such as the steel mills and other industries, have been considered through the inclusion of three years of background ambient air monitoring data from the existing HAMN air monitoring network into the HHRA. The future

operations of the harbor area industries has not been evaluated, however it is reasonable to assume that the harbor area emissions will generally decrease due to the reduced operations of US Steel facility, a major source of emissions in the area.

**Comment 1f:**

- ***It would be useful to provide a plain language summary of the HHRA, so that the assessment objectives, methodology and results can be understood and interpreted by a wider audience (i.e., members of the community).***

**CRA Response**

The Executive Summary of the HHRA Report provides a plain language summary of the HHRA that outlines the assessment objectives, methodology, and results.

**Public Health Ontario Comment 2  
Extrapolating From the Swindon Pilot**

**Comment 2a:**

***Pilot studies may be used to meet several objectives including site-specific optimization of operations, trouble shooting, experimenting with new processes, estimating costs, efficiency and efficacy of operations. The full scale plant will process up to 200 times more waste than the pilot (the pilot consumed up to 100 kg per hour of solid waste). The pilot has operated for a limited amount of time: over 3000 hours. The proposed facility is the first full scale system to combine gasification and plasma conversion. It is not clear what the longest continuous operational period was during the pilot, nor how this may effect predictions of the costs of operation, operational stability and efficiency, including estimates of emissions quality. Emissions from the Swindon pilot exceeded Ontario's Guideline A7. As a result, the design proposed for Hamilton includes additional pollution abatement technology such as scrubbers and catalytic oxidizers that were not specifically evaluated with the pilot.***

**CRA Response**

As stated Section 4.4.1 of the Design and Operations Report, the maximum continuous load rate of the fluidized bed gasifier in the Gasplasma system will be approximately 15 tonnes per

hour. Thus, this is equivalent to 150 times more waste than the pilot, and not 200 times more waste as stated in the above comment.

The Swindon pilot plant has extensive testing, with over 3000 hours of operation. Testing was conducted by accredited stack testing companies using standard stack testing methodologies. Independent studies including one by the US Army have been carried out to assess the pilot plant data and the performance of the Gasplasma system. The extensive data collected from the pilot plant has demonstrated the successful operation of the Gasplasma technology.

The gas engine in the Swindon plant has been converted from a dual fuel engine to run on syngas and has a relatively coarse engine management system. This engine operates on a fixed air/fuel ratio control, which limits the ability of the engine to adjust the mix of fuel and air entering the cylinder as the fuel varies. This means the engine is operated sub-optimally and at a relatively low temperature making the Swindon engine significantly less efficient than the proposed full scale, state-of-the-art PFMSI engines. The gas engines proposed for the PFMSI Facility are much larger and have a sophisticated engine management system, which includes automated fuel air ratio control whereby these are managed to give an optimum temperature within each cylinder. Additionally the engines for Hamilton will be fitted with an SCR and oxidation catalyst, which cannot be fitted to the Swindon engine because its operating temperature is too low.

Therefore, the use of the Swindon emissions data is considered a very conservative approach when applied to the full scale engine flows. The Facility will meet all Ontario regulatory limits including the Guideline A-7 limits. This will be a legal requirement of the Environmental Compliance Approval for the Facility. Continuous emissions monitoring and stack testing will be used to demonstrate compliance with the A-7 limits.

**Comment 2b:**

***The proponent discusses emission calculations and both the data sources and data quality in Appendix A: Supporting Calculations, of the Emission Summary and Dispersion Modelling of Appendix F: Air Quality Assessment Report.***

***When considering the issue of the validity of the use of pilot results to forecast expected concentrations of chemicals at the full scale, several factors are relevant:***



- 1. Two modes of operation were weighted differently for the HHRA: 95 % of time in "Normal" and 5% of time in "Bypass" modes, each with an array of emission sources. The various sources considered include the waste and fuel preparation exhaust, the Refuse Derived Fuel (RDF) Drier exhaust, the GasPlasma local exhaust hood, the GasPlasma maintenance local exhaust hood, exhaust from the bypass thermal oxidizer, in hot standby mode as well as in syngas combustion mode, the power generation exhaust, and the direct plasma exhaust.***

#### **CRA Response**

The above statement is not correct. The normal and bypass operating conditions were weighted equally in the HHRA. Exposure point concentrations predicted for both the normal and bypass operating conditions were assumed constant over the lifetime exposure duration evaluated in the HHRA. The bypass operating condition would occur only for a short duration and evaluating health risks/hazards due to a lifetime exposure duration to emissions from this operating condition is a highly conservative approach.

#### **Comment 2c:**

- 2. The data quality for emissions modelling is described variously as "Marginal," "Uncertain data quality," "Average," "Un-validated Source Testing," and "Highest." The methods of deriving data vary through "un-validated source testing," "engineering calculation," "emission factors," and "engineering estimates."***

#### **CRA Response**

CRA considers the stack test data used for the emissions estimates to be of high quality. The assessment of data quality for the emissions estimates was completed based on the Ministry of Environment and Climate Change (MOECC) guidance and in accordance with the requirements of subparagraph 7iii of s.26(1) of Ontario Regulation 419/05. Therefore, the MOECC definitions for data quality, as presented in Ontario Guideline A-10 "Procedure for Preparing an Emission Summary and Dispersion Modelling Report," dated March 2009, were applied to the data used for the emissions assessment. Within Guideline A-10 the MOECC defines source testing that has not been validated by the regulatory agency as Uncertain or Marginal Data Quality.

The Swindon stack testing has been conducted voluntarily as part of the pilot plant operations testing programs and was not required by the UK environmental agency. While the Swindon

source test data is considered invalidated, or of marginal quality, due to the lack of Agency pre-test approval or post-test evaluation, the test data itself is in fact considered as high quality. The concentrations used for the prediction of emissions for the PFMSI facility were obtained through source testing completed by an accredited third party UK stack testing company using appropriate stack testing methods. The reports also have been reviewed and supported by credible third parties such as the US Department of Defense.

**Comment 2d:**

- 3. *Where emission data from the Swindon pilot plant is employed, it is based on the average of the results from three groups of pilot results labelled July 2011, July 2012, and December 2013.***

**CRA Response**

Correct. As noted above the use of the Swindon pilot plant engine data is considered to be conservative when applied to a full-scale, sophisticated engine that will be used for the PFMSI Facility.

**Comment 2e:**

- 4. *Some data from measurements of pilot chemical concentrations in emissions were adjusted downward before use in the dispersion models. The adjustments are intended to forecast or estimate the performance of pollution abatement technologies: "Emissions of carbon monoxide (CO), nitrogen oxides (NOx), polycyclic aromatic hydrocarbons (PAHs), and particulate matter (PM) were estimated assuming control efficiency obtained from the installation of oxidative catalysts on the gas engines at the PFMSI facility. There is no control installed on the engine at the Swindon plant. Control efficiencies of 90 percent for CO and total organic carbon, and PAHs, and 95 percent for NOx and PM were assumed. The control efficiencies are based on information provided to PFMSI from prominent local catalyst suppliers and are considered to be readily achievable for catalytic controls." The engines are expected to run leaner and at higher temperatures.***

### ***CRA Response***

The 90 percent emission reduction factor was applied to account for the presence of catalytic controls on the engines at the PFMSI facility. PFMSI has had meetings with several catalytic oxidation system suppliers. Based on the information provided to PFMSI, we have used readily achievable catalytic control removal efficiencies.

The CO in stack concentrations are also expected to be significantly lower than those for the Swindon facility as the engines at PFMSI will be full scale engines that will be operated at optimal load and temperature to ensure optimal combustion conditions are met. The Swindon facility is a demonstration facility that does not operate at conditions conducive for good combustion and therefore has very high CO emissions. As a conservative approach to assess emissions from the PFMSI Facility, additional reduction was not applied to the Swindon CO concentrations to account for the more efficient burning engines that will be present at the PFMSI Facility. Therefore, actual CO concentrations are expected to be significantly less than those estimated for the purposes of Ontario Regulation 419 compliance and the HHRA.

### ***Comment 2f:***

***5. Certain compounds typically included in assessments of emissions from thermal treatment facilities in Ontario, were not analysed during the pilot. Here the proponent used data from other thermal solid waste treatment facilities in Ontario that are expected to have higher emissions.***

### ***CRA Response***

The majority of the emissions of concern for the PFMSI Facility were based on the comprehensive source test reports from 2011, 2012, and 2013 for the Swindon demonstration facility. Some compounds that are typically included in an Ontario assessment of emissions from thermal treatment facilities were not analysed in the Swindon stack test programs. For those compounds, PFMSI has used data from other thermal treatment facilities in Ontario, primarily the Durham York incinerator (DYEC) and the Algonquin incinerator (Algonquin, now Emerald). The DYEC and Algonquin facilities are thermal incineration systems that are expected to have higher emissions than the PFMSI Gasplasma system. It is well understood that gasification and plasma thermal treatment technologies have inherently less emissions than mass incineration systems, therefore the use of the DYEC and Algonquin data to estimate emissions from the PFMSI Facility can be considered conservative.

**Comment 2g:**

- 6. Emission estimates for combustion gases, as well as some heavy metals and polycyclic aromatic hydrocarbons (PAHs) are based on the pilot.**

**CRA Response**

Correct.

**Comment 2h:**

***Overall the quality of the data does not provide a reliable basis for an assessment of public health impact. A more reliable basis for an assessment could be done with a facility in which the proponent is willing to be accountable for enforceable emission concentrations. This could be accomplished through conditions in legal instruments, such as a certificate of approval, in which in-stack standards match the dispersion model inputs.***

**CRA Response**

We request that the first sentence be revised. It is a very strong statement that is not substantiated. We have addressed specific comments above and will be happy to provide more information as needed to resolve any questions or concerns, and this must be considered before making such an overall conclusion on the reliability of the public health impact assessment in the HHRA. The air emissions estimates are based on reliable, third party stack testing data by accredited stack testing companies in the UK or Ontario. As explained above, the emissions from the pilot plant engine are expected to be very conservative estimates of the emissions from the full scale engines. Therefore the air emissions data used in the HHRA should be very reliable for a public health impact assessment. The actual emissions from the PFMSI Facility are expected to be less than estimated in the Air Study. PFMSI is committed to be accountable for emission concentrations as required by MOECC guidelines applicable to the Facility, including the stringent Ontario Guideline A-7 criteria. The Facility will also be equipped with a continuous emissions monitoring system that will ensure the Facility meets the Guideline A-7 limits.

### **Public Health Ontario Comment 3 - Ozone**

*Cycles of ozone formation and destruction, accumulation transportation are complex. The precursors for ground level ozone formation, VOCs and NOx, are emitted from a broad range of sources, dispersed and carried in the atmosphere until conditions are right for the photo-chemical reactions to produce ozone. For this reason, the geographic areas of assessment for ground level ozone are broad. Any ozone formation resulting from NOx and VOC emissions from the facility is likely to occur some distance from the source; 10 to 100 km away from the source, dependent on climactic conditions, outside of the range of the HHRA. Mitigation of ground level ozone requires cooperation over large areas on reducing emissions of precursors, NOx and VOCs, both of which are typically monitored in-stack under Guideline A-7. The proponent's position articulates these points in Appendix F of the Environmental Screening Report (section 3 of the HHRA, "Identification of Chemicals of Concern").*

#### **CRA Response**

As stated in the above comment, the points raised in the Comment are addressed by Section 3.3 of the HHRA.

### **Public Health Ontario Comment 4 - Keith Neighbourhood**

*The HHRA evaluated the potential health risks from background concentrations of contaminants of concern using applicable human health benchmarks at each sensitive receptor location. The following volatile organic compounds: benzene, bromodichloromethane, ethylene dibromide, and chloroform were identified above the target risk level of 1E-06; however, the HHRA did not specifically take into account any underlying disease pattern in the population surrounding the proposed facility.*

*The Keith Neighbourhood has been identified as an area with higher levels of emergency rooms visits per 1,000 residents per year compared to the rest of the city<sup>1</sup> and has high rates*

<sup>1</sup> Social Planning and Research Council of Hamilton. Neighbourhood Profiles: Beasley, Crown Point, Jamesville, Keith, Landsdale, Mcquesten, Quigley Road, Riverdale, Rolston, South Sherman and Stinson. [http://www.sprc.hamilton.on.ca/wp-content/uploads/2012/03/2012-Report-Neighbourhood\\_Profiles\\_March.pdf](http://www.sprc.hamilton.on.ca/wp-content/uploads/2012/03/2012-Report-Neighbourhood_Profiles_March.pdf). March 2012.

***of respiratory and cardiovascular related emergency room visits<sup>2</sup>. However, it is unclear what symptoms and diagnoses are included in the terms “respiratory” and “cardiovascular” related emergency room visits. In addition, the contribution of behavioural and occupational risk factors relating to the number of emergency room visits by residents of Keith Neighbourhood has not been identified. Ambient air concentrations of VOCs in other areas of the city (where rates of respiratory and cardiovascular related emergency room visits are lower than observed in the Keith Neighbourhood) have not been measured.***

***The health effects of benzene, bromodichloromethane, ethylene dibromide, and chloroform were reviewed to determine if elevated ambient air concentrations of these VOCs, are adversely affecting the residents of the Keith Neighbourhood, who are presumed to be vulnerable to respiratory and cardiovascular symptoms as indicated by higher rates of emergency room visits. Chronic exposure via inhalation to benzene, bromodichloromethane, ethylene dibromide, and chloroform at the proposed background concentrations have not been linked to respiratory or cardiovascular effects<sup>3,4,5,6</sup>. Detailed information about the health effects associated with these chemicals are documented in the HHRA’s toxicology profiles (Attachment E).***

#### **CRA Response**

As stated in the above comment, chronic exposure via inhalation to benzene, bromodichloromethane, ethylene dibromide, and chloroform at the baseline concentrations applied in the HHRA have not been linked to respiratory or cardiovascular effects. The toxicological profiles for these parameters that support this conclusion are included in Appendix E of the HHRA.

<sup>2</sup> Code Red: Mapping the Health of Hamilton. [http://media.metroland.com/thespec.com/statistics\\_flash/](http://media.metroland.com/thespec.com/statistics_flash/). 2010.

<sup>3</sup> ATSDR. Toxicological Profile for Benzene. <http://www.atsdr.cdc.gov/toxprofiles/tp3.pdf>. August 2007.

<sup>4</sup> ATSDR. Toxicological Profile for Bromodichloromethane. <http://www.atsdr.cdc.gov/toxprofiles/tp129.pdf>. December 1989.

<sup>5</sup> ATSDR. Toxicological Profile for Ethylene Dibromide <http://www.atsdr.cdc.gov/toxprofiles/tp37.pdf>. July 1992.

<sup>6</sup> ATSDR. Toxicological Profile for Chloroform. <http://www.atsdr.cdc.gov/toxprofiles/tp6.pdf>. September 1997.