

2

COMPARATIVE HEALTH RISKS OF LANDFILL AND INCINERATION

The Solid Waste Management Committee recommends the following:

- 1. The recommendation contained in the following report, March 28, 2007, from the Commissioner of Transportation and Works be adopted; and**
- 2. Staff provide a further report with an update on the new Ministry of Environment guidelines.**

1. RECOMMENDATION

It is recommended that the following report be received for information.

2. PURPOSE

The purpose of this report is to provide a summary of the key findings from a study conducted by the Ministry of the Environment on the environmental risks of municipal non-hazardous waste landfilling and incineration that was published in 1999.

3. BACKGROUND

In July, 1999, the Ministry of the Environment (MOE) issued a report on a series of technical risk assessments it conducted of two generic disposal facilities: a large scale incinerator and a modern landfill, with a similar disposal capacity of 6.6 million tonnes over 20 years or 330,000 tonnes/year. The Executive Summary of the MOE report is attached (*see Attachment 1*). The hypothetical incinerator used for the analyses is a state of the art facility with well operated, advanced pollution control equipment. It should be noted however that incinerators, at the time of the study, were not subject to the more stringent Ontario A-7 emission standards that are in place today.

The hypothetical landfill used for the analyses is a state of the art facility with advanced pollution control equipment, that is well operated and without any environmental failures. The incinerator analyses used the latest emission testing data from incinerators operated at the time of the study in Brampton, Ontario and Hartford, Connecticut. Both facilities burned municipal wastes, with the Hartford facility employing mass burn technology and the Brampton facility employing starved air technology, also known as "gasification". Potential emissions from these hypothetical facilities were assessed for their potential impacts on human health and on the environment. The report acknowledges the participation of at least 15 doctors, engineers, and scientists that were involved in the

research and preparation of the final document, which is over 500 pages in length. The technical report summary for the document is accessible on-line at www.ene.gov.on.ca/envision/techdoc/3795e01.pdf.

Staff has reviewed the report as it is relevant to the Environmental Assessment Study being conducted jointly by Durham and York Regions. A summary of the major findings of the MOE report are included in this report for the Solid Waste Committee.

4. ANALYSIS AND OPTIONS

The MOE maintains an extensive library of scientific, technical, and regulatory information on the environmental and human health effects associated with the disposal of municipal solid wastes. The MOE report includes hundreds of detailed bibliographies and references from the MOE library and other scientific sources. It is a highly technical and scientific document which includes the following:

- Detailed methodologies for assessing health risks.
- Ecological and biological risk assessment.
- Modelling of emission rates and air concentrations.
- Exposure assessment in air, soil, sediment, runoff, leachate, groundwater, surface water, vegetation, cattle, wildlife, birds, and earthworms.
- Characterization of municipal solid waste incinerator ash.
- Contributions to global warming.

4.1 Risk Assessments Conducted

The following risk assessments were conducted:

- Environmental fate of emissions.
- Effects on human health.
- Effects on the aquatic environment.
- Effects on the terrestrial environment.

4.2 Key Findings

The major findings of the report are as follows:

4.2.1 Effects on Human Health

The human health assessments show that no adverse health effects (including cancer, lung disease, nerve damage and reproductive effects) are expected to result from long term exposure to emissions from either type of facility. For the “reasonable worst case” exposure scenario for incineration, the main findings are as follows:

1. The combined cancer risk was 1 in 12 million. Almost all of the lifetime cancer risk was related to inhalation; other exposure routes added little to the risk.

2. Estimated exposure to emissions of non-carcinogenic chemicals was below generally accepted levels of concern.
3. The intake of dioxin was less than one percent of the recommended exposure limit. Dioxin intake was due mostly to indirect exposure from backyard garden produce and soil. The dispersion model used in the study was set to calculate annual average concentrations over a 20 km by 20 km area around the incinerator.

The report concluded that overall, chemical emissions from the incinerator would not adversely impact individuals or populations living around the facility. The authors of the report also concluded that their findings are consistent with other scientific studies which also predicted no adverse health effects from the operation of incinerators.

4.2.2 Effects on Aquatic Environment

Water and sediment quality around an appropriately designed and operated landfill or incinerator is expected to meet MOE guidelines for aquatic life.

In summary, both methods of waste disposal result in chemical emissions of different kinds, but local ecological impact is unlikely. On the basis of this comparative risk assessment, as it pertains to chemical effects on aquatic life, neither disposal method is expected to have a demonstrable local effect.

4.2.3 Effects on Terrestrial Environment

Estimated chemical emissions from either a landfill or an incinerator will not cause adverse effects on nearby vegetation, wildlife or other terrestrial biota. The risk of direct adverse effects to the terrestrial environment from chemicals emitted by properly functioning state of the art incinerators or landfills, operating under the design assumptions used in the assessment, is anticipated to be insignificant to populations of terrestrial receptor species.

The main findings of the assessment of terrestrial effects from incinerator emissions are as follows:

The exposure ratios and cancer risks were less than the levels of concern, except for mercury from the incinerator. The estimated levels of mercury in certain birds suggested there might be possible effect levels for some sensitive bird species. The estimated amounts of mercury in these birds were for a worst case exposure. Actual exposure levels are likely to be lower than the projected levels. Thus, significant measurable effects on bird populations are not expected. As a further test, the research team decided to run the sensitive bird exposure model for an incinerator that meets the Ontario A-7 guidelines, which are presently the emission standards for incinerators in the province of Ontario. The end result was that the effects of such an incinerator would be expected to be negligible where background soil mercury levels are low.

Incinerators emit more nitrogen oxides than do landfills. There is some evidence that upland hardwood forests in some parts of Ontario may already be under stress from

excess nitrogen oxide loadings. Such adverse effects, however, must be balanced against the benefits to nitrogen loving plants, such as many agricultural crops. It should be noted that the total emissions from incinerators would be a small fraction of the total emissions in Ontario. In addition, it should be noted that at the time of the study, neither of the incinerators on which much of the analysis was based employed nitrogen oxide controls or added activated carbon to the scrubber, which is used primarily to reduce mercury and dioxin/furan levels. As a result, the emissions and associated risks are higher than any new incinerator facility in Ontario which has to meet today's more stringent approval and operating standards.

A detailed comparative analysis of greenhouse gas emissions from landfills and incinerators was not within the scope of the report. However, when estimated emissions of CO₂ and methane are converted to greenhouse gas equivalents, and uncertainty associated with emission estimates are taken into consideration, both disposal methods are roughly equal with respect to the release of greenhouse gases.

5. FINANCIAL IMPLICATIONS

The Region will be undertaking generic and site specific health risk assessments as part of the Durham York Residual Waste Study.

6. LOCAL MUNICIPAL IMPACT

There are no local municipal implications for this report.

7. CONCLUSION

The risk assessments included in the MOE report show that properly designed and operated municipal waste incinerators and landfills should not have a significant effect on human health and the environment. This study was conducted in 1999 and since then, all new municipal waste incinerators are required to meet Ontario's stricter Guideline A-7 emission standards. Consequently, new incinerator facilities will be even safer than those identified in this report.

For more information on this report contact Angelos Bacopoulos, Senior Project Manager of the Solid Waste Management Branch at 905-806-5544 in the Transportation and Works Department.

The Senior Management Group has reviewed this report.

(The attachment referred to in this clause is included with this report.)