LANDFILL GAS REGULATION

INTENTIONS PAPER

SUMMARY OF PUBLIC COMMENT

Prepared for: Ministry of Environment

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Landfill Gas Regulation – Intentions Paper

Summary of Public Comment

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Summary of Public Comment – Landfill Gas Regulation

1. Introduction

The Ministry of Environment (ministry) intends to introduce a Landfill Gas Regulation under the *Environmental Management Act (EMA Act)* to support fulfillment of the provincial government's commitment to reduce British Columbia's greenhouse gases by at least 33per cent below current levels by 2020. [1] The proposed Landfill Gas Regulation will set out requirements for the capture of landfill gas and constituent greenhouse gases at applicable landfills under provincial jurisdiction.

This report provides a summary of stakeholder comments received as part of the consultation process for development of the regulation.

1.1 Background to the consultation process

An intentions paper was posted for public review and comment on the ministry's website (www.env.gov.bc.ca/air/climate) from May through September of 2008. The intentions paper provided background information regarding landfill and greenhouse gases, a summary of related government goals and objectives, a discussion of the ministry's intentions for development of the regulation, and a description of the process for providing comment to the ministry. A separate response form for providing comments or suggestions to the ministry was also posted on the website.

1.2 Purpose and format of the *Summary of Public Comment* document

This document has been prepared for the Ministry of Environment by C. Rankin & Associates, contracted by the ministry to independently receive, compile and review comment on the ministry's intentions for development of the regulation. The summary does not reflect the ministry's position on any issue. It provides a synopsis of the responses that are being considered by the ministry in preparing the regulation – without specific attribution, except to the extent required to provide context for the comments. This summary of public comment does not included all detailed comments, rather it attempts to capture the tenor and content of comments through summarization and specific excerpts from representative submissions.

The complete set of responses received through the consultation process has been compiled and passed to the ministry for detailed review and consideration. All comments and references submitted through this process, through independent submissions and through direct consultations with stakeholders, will be reviewed and carefully considered by the ministry in developing the regulation.

The summary of responses is arranged by topic as presented in the intentions paper. Direct excerpts from submissions are included in quotation marks (" "). Square brackets ([ ]) indicate inferred or contextual terms.

[1] B.C. Legislature Speech from the Throne, February 13, 2007. See: www.leg.bc.ca/38th3rd/4-8-38-3.htm

1.3 Description of responses received

Over 30 responses to the intentions paper were received (by e-mail, fax and attached file), and have been reviewed for this summary of stakeholder comments. About a third of the responses were from professional associations or individual professionals (e.g., engineers). About half worked for a regional district or municipal government. Other respondents who identified their background included individuals (e.g., "residents"), business owners and representatives of public interest groups. Many of the responses included substantive comments or submissions to supplement responses to discussion topics set out in the intentions paper.

Ministry Intentions

The objectives for the proposed regulation (see intentions paper section 2) are to facilitate recognition of greenhouse gas emission reduction in a manner that: ensures integrity and maintains credibility, consistency and transparency; is administratively simple and minimizes uncertainty; is consistent with other climate action programs adopted by the province; builds on experience gained from other systems; and maximizes scope, timeliness and cost effectiveness.

The purpose of the Landfill Gas Regulation (see intentions paper section 2) is to set out requirements for the regulation of the discharge of landfill gas "to foster the capture and conversions of emissions into clean energy" as part of the government's efforts to safeguard the environment and tackle climate change.

1. Ministry's objectives for the proposed regulation

The ministry's objectives for the Landfill Gas Regulation (see intentions paper section 2) are to: Maximize reductions in landfill gas emissions, in support of an initial target of reducing B.C.'s greenhouse gas emissions by 33% by 2020; introduce the regulation in a manner that recognizes and addresses economic and technical feasibility of requirements and associated implications for landfill owners; and implement the regulation in a manner that supports and promotes compliance.

Response Form Question 1.1: **Do you have any comments or suggestions regarding the ministry's objectives in relation to the proposed Landfill Gas Regulation?**

Most respondents who commented on this question "supported" the ministry's general objectives or "recognized the environmental necessity of reducing greenhouse gases". Many respondents however, continued with a comment that the ministry's objectives for the regulation should include reduction of landfill gas production – rather than focus on landfill gas capture. Respondents commonly commented, for example, that the regulation "should provide incentives for a landfill to reduce the amount of gas generated through organics diversion, waste stabilization or other means – reducing the gas generated is much more effective than collection/flaring, particularly if the collected gas is not utilized for beneficial purpose".

A number of respondents also commented that it is important for the regulation to "address the economic and technical feasibility of requirements". Specific comments or recommendations in

this respect included: "[communities should have the potential to] qualify for carbon offsets or to reach carbon neutrality"; "[it is] imperative that this regulation be crafted in such a manner that it is politically acceptable and financially obtainable to local governments"; "a targeted 75% efficiency in the regulation is un-enforceable within the context of the regulation"; and "the cost of requirements should have an environmental lifecycle assessment compared to non-LFG reductions options".

Additional specific comments or recommendations included:

- "The steps outlined in the intentions paper are consistent with [our Regional District's] goals of reducing corporate greenhouse gas emissions";
- "The province should mandate a specific reduction target for landfill gas in the province with a clear timeframe, which would allow better tracking of the program's success in the future";
- "This regulatory regime is in synch with other progressive jurisdictions of North America and the world and places B.C. in a stronger position to adapt to and compete in an increasingly carbon constrained world"; and
- "A LFG system at 75% efficiency is not cost effective to reduce GHG emissions – the target rate of 75% efficiency does not seem technically feasible given the existing B.C. gas systems were determined to have efficiencies ranging from 9 to 36% - the largest 6 landfills account for 80% of landfill gas emissions – it is excessive to pursue landfill gas systems in an additional 29 landfills to capture only an additional 10% of the gas emissions".

2. Scope of the proposed regulation

The proposed regulation will apply to existing and new municipal solid waste landfills under provincial jurisdiction. At this time, the regulation would not apply to : woodwaste (or other industrial) landfills; landfills that have been closed in accordance with current requirements as of December 31, 2007; or landfills that contain only inert solid waste or hazardous waste (see intentions paper section 4.1).

Response Form Question 2.1: **Do you have any comments or suggestions regarding the scope of the proposed regulation?**

Respondents provided comments on a number of aspects of this topic, including inclusion of wood or other industrial waste landfills, application to closed landfills and application to different size classes of landfills.

Several respondents expressed support for a broad application of the proposed regulation commenting, for example, that "the regulation should be consistently applied to all active or new landfills including wood waste facilities that meet the waste discharge and gas emission thresholds, not just MSW [municipal solid waste] landfills". One respondent noted that "there is considerably less methane generating material in a demolition and construction waste landfill (concrete, masonry, asphalt roofing, fibreglass, carpeting, plastic, etc.) than in a woodwaste landfill". Another respondent recommended "clear definition" of wood or other industrial waste landfills for inclusion in the regulation, as landfilling "some wood materials [that are]

moist and fine in particle size... [such as] sawdust, wood shavings, bark [and] sludge" can generate significant methane gas".

Most respondents who commented on the potential application of the regulation to closed landfills, recommended including them within the regulation's scope, with comments such as "I do not see any justification for exempting closed landfills – my understanding is that LFG generation continues for many years – I understand too, that capture is more efficient from closed cells than from active ones". In contrast to these comments, some respondents felt that "it is fair to exempt landfills that have been closed in accordance with current requirements as of December 31, 2007"; or that "with no means of earning revenue or covering costs other than through taxes, [landfills in the process of closing] should be exempt from the regulation or the initiative [should] be crafted in such a manner to allow local governments the ability to access funding for the implementation of GHG abatement/ collection systems either through carbon credits/offsets, private sector partnerships or provincial funding".

Additional specific comments included:

- "There would be merit for the province to fund a field study to confirm actual gas generation rates";
- "The regulation needs to clarify the definitions of landfill versus cells – landfill closure occurs progressively over a long period of time – I believe the regulation speaks to cells not landfill closure";
- "Regulating gas generation from MSW landfills is perhaps one of the only ways that smaller government organizations will be able to justify capital and operational costs associated with LFG reduction – the problem is the focus on capture and collection; neither should be required";
- "The need for continued possibility for carbon credits... is fundamental to developing partnerships with the private sector and for reducing civic landfill infrastructure costs";
- "It is our recommendation to adjust the scope of the regulation to allow small and medium-sized landfills to install gas capture and destruction technologies under a voluntary regime"; and
- "Landfilling is a vastly out of date way to handle municipal solid waste... attempting to capture and constructively utilize existing landfill gases is obviously a good idea but this proposed legislation seems late in coming – how many other existing landfills are there in the province that don't already have the basic leachate and gas trapping systems in place?" and
- "If inert landfills are to be exempted than the regulation should clearly define what consititutes an inert landfill – alternatively, the regulation could reference an appropriate definiton from another regulation or Act".

3. Assessment of greenhouse gas generated by a "qualified professional"

Landfills that currently have in excess of 100,000 tonnes of waste in place (i.e., in the landfill) and/or a waste discharge rate exceeding 10,000 tonnes per year will be required under the proposed regulation to undertake an "assessment" of landfill gas and its constituent components generated (and captured, if an existing landfill gas capture system is in place) from each appli-

cable landfill. The ministry will be developing guidelines that address the expected/desired content and conduct of an assessment report – with relevant technical and professional input, and in consultation with landfill operators (see intentions paper section 4.2).

Response Form Question 3.1: **Do you have any comments regarding the proposed requirement for an assessment by a "qualified professional" of landfill gas from each applicable landfill?**

Most respondents who commented on this question supported "appropriate" involvement of suitably qualified professionals in the assessment process, "provided that the professional is free to utilize whatever generally accepted methodologies he/she feels is most appropriate for assessing landfill gas generation". Some respondents suggested that the definition of qualified professional requires additional specification, for example, "specify a minimum of 10 years of engineering experience in the solid waste industry dealing with landfill gas systems"; and "the professional should have demonstrated experience in LFG design/construction and operations".

Several respondents expressed concern regarding "the first order kinetic methane generation model used in the Ministry's inventory of greenhouse gas generation from landfills in B.C....[as] the proposed model overestimates landfill gas generation", commenting, for example, that "[our membership] would object strenuously to a requirement to use this model's parameters to assess gas generation from their landfills".

Respondents also provided a number of specific comments on different aspects of the proposed regulation, including:

- "The ministry should consider raising the filling rate threshold from 10,000 tonnes of waste landfilled to 50,000 tonnes per year which is more consistent with similar regulations in other areas";
- "Note that this [assessment by a qualified professional] can already be required through an Operational Certificate"; and
- "Local governments/landfill owners will need the ministry to provide sufficient information concerning 'recognized procedures and guidelines' for conducting the assessment so as to enable local governments to establish budgets for this work – this information will be needed for the 2009 budget process (January – March 2009) in support of staff's request for funding for this purpose".

Response Form Question 3.2: **Do you have any comments regarding development and/or content of guidelines that would address the expected/desired content and conduct of an assessment report?**

Many respondents reiterated their "concern regarding the use of the first order kinetic methane generation model...to assess landfill gas generation... [because the model] overestimates landfill gas generation". Respondents recommended methane generation thresholds based on "actual [field] measurements...as opposed to a methane generation threshold determined by a model",

commenting for example, that "techniques such as flux chamber analysis, tracer or optical remote sensing methods and other approved measures provide considerably more accurate measurement data".

Additional comments included:

- "New information on reduction of methane from methanotrophic bacteria in the soil cover is emerging in scientific literature – the ministry should investigate and assess the implications of methane oxidation in the soil cover as it applies to the reduction of methane – the US EPA is now using a default value of 10% oxidation of methane due to methanotrophic bacteria in the soil cover";
- "Flexibility in the model should be considered as well as its limitations and lack of input variables that may affect methane generation as well as methane emissions";
- "Methane generated = Methane recovered + Methane emitted + Methane migrated + Methane oxidized + methane stored...[all of these] variables should be considered when calculating LFG emission rates";
- "The regulation (or supporting guidance documents) should specify... acceptable methodologies as there are many out there... [also] the regulation should require the ministry to respond within 30 days not 90 days";
- "All assessments will need to follow a clearly defined methodology in order to ensure the results for different landfills are comparable";
- "It is important that the appropriate guidelines are in place well ahead of the January 1, 2010 deadline";
- "The "recognized procedures and guidelines" should be... flexible enough to allow for the use of similar LFG assessments recently completed by local governments/landfill owners";
- "Landfills with existing collection infrastructure that meet the requirements of the regulation should not be required to conduct an assessment of alternate methods of capturing landfill gas – if the ministry does not intend to require beneficial use of landfill gas then the regulation should not require an assessment of and recommendations for beneficial use"; and
- "If guidelines for measurement were developed by the Ministry, a consistent, accurate database of landfill emissions would be developed – those landfills that exceed the emissions threshold would be required to put in place an active collection system, and those that do not exceed the emissions threshold would be encouraged to implement gas collection systems that would allow for greater innovation by landfill owners and provide opportunity for Certified Emission Reductions".

4. Submission of a gas collection system design plan

The ministry is considering setting a methane generation threshold that will be no higher than 1000 tonnes/year. If the assessment accepted by the ministry indicates that a landfill generates methane gas in excess of this generation threshold, the landfill operator will be required to submit an appropriate gas collection system design plan developed by a recognized "qualified professional" to the ministry before January 1, 2012 (see intentions paper section 4.3).

Response Form Question 4.1: **Do you have any comments or suggestions regarding the proposed requirements for submission of a gas collection system design plan for applicable landfills?**

Many respondents reiterated comments made in response to previous questions – concern regarding the proposed model for estimating landfill gas generation (recommending instead actual field measurements), the proposed threshold (of 1 000 tonnes/year) being "very tight" and inappropriate, and consideration of diversion or other landfill gas emission reduction programs (rather than a capture only approach to regulation). Several respondents recommended consideration of "biocovers/biofilters" to reduce the oxidation of methane, and one respondent suggested that the regulation "require methane abatement plans rather than gas collection plans".

Specific comments from respondents included:

- "A mechanism for funding must be made available to Local Governments.... regardless of the reduction method there must be consideration given to attaching value either through credits/offsets or provincial funding for bio-covers, diversion programs and the like";
- "It is recognized that verification of biocovers performance would be required – the UK and other jurisdictions have developed guidelines and it is recommended that a B.C. task force could be initiated the same thing by developing protocols";
- "What is the intention of the requirement? Will MOE staff be providing comments or changes to the design? Will landfills have to wait for MOE approval of the design? If so will the regulation address timelines for MOE responses"; and
- "An additional benefit of attaching value to GHG reductions it may be found that landfills that currently have less than 100,000 MT in place and receives less than 10,000 MT per annum may find it advantageous to assess current and potential emissions as a potential revenue source".

5. Installation and maintenance of gas capture equipment

By January 1, 2016, all landfills that generate methane in excess of the generation threshold will be required to have installed (and to ensure proper operation of) gas capture equipment with a capture efficiency target of at least 75% of generated gas (see intentions paper section 4.4).

Response Form Question 5.1: **Do you have any comments or suggestions regarding the proposed requirements for installation and operation of landfill gas equipment at applicable landfills?**

Many respondents commented that the proposed capture efficiency target of at least 75% of generated gas is "unrealistic", with a number of respondents providing detailed background information to reinforce their concerns. Several respondents, for example, pointed to "the data presented in the Inventory of Greenhouse Gas Generation from Landfills in B.C. carried out by Golder Associates.... [which] suggests that either a capture rate of 30 - 35 % is more realistic or that the model for estimating the quantity of gas generated produces results that are 2-2½ times above the actual – the confidence level of the model estimates is far too low to serve as the

criteria for investing large sums of taxpayer dollars in an expensive gas collection/utilization system". Another respondent commented that "setting the threshold at this level [75% of generated gas] will result in a significant loss of potential GHG emission reduction credits" and recommended "consideration of a minimum reduction in emission intensity set (similar to Alberta) such that any reduction in excess of the minimum would not be subject to the regulation and could still qualify as an emission credit... [as well as] extension of the 2016 implementation deadline [to] widen the potential for GHG emission reduction credits". Several respondents also recommended "capture targets based on site specific LFG assessments conducted by the qualified professional [rather than mandating one capture target for all landfills]".

Questions from respondents for consideration by the ministry included:

- "How will the regulation address old unlined landfills where some methods of collection are not practical? Many landfills used clay as intermediate cover, this operational practice will decrease the potential efficiency, how will the regulation address this?";
- "Will air permits be required? If so, would they pose any restrictions/conditions that would affect the system? Will other permitting requirements be addressed in the regulation (e.g., air and hazardous or special waste handling)?"; and
- "How will the regulation allow management of the water produced from the collection system? Will standards for chemical concentrations be included to establish treatment/disposal options? Will leachate/condensate recirculation be allowed in landfills that are unlined with a geomembrane?".

Additional comments from respondents included:

- "[Our Regional District} Board's primary concern is the costs associated with undertaking a project of this magnitude – based on the planning, approval & design process; and the preliminary price estimates for the installation of this type of systems from the report produced for the Province; [we are] looking at a cost of over $1,000,000 (or approximately $0.25/$1000 of assessed value) [for our landfill] – these fees will have to be recovered from taxes or increased tipping fees";
- "[If] emission reduction credits are generated according to sophisticated monitoring equipment that determines exactly how much gas has been captured and destroyed... every tonne of gas that escapes the infrastructure and is released to the atmosphere is lost revenue – for this reason, [landfill gas capture] projects [that generate carbon offsets] are guaranteed to maximize both capture and destruction efficiencies"; and
- "There is also concern about the costs of implementing landfill gas collection for small landfills at the expense of pursuing more vigorous waste diversion programs".

Response Form Question 5.2: **Do you have any comments or suggestions regarding appropriate security requirements for post-closure operation and monitoring of landfill gas capture systems?**

Respondents generally commented that security requirements should cover all aspects of post closure operation and monitoring – and additional security requirements specifically for landfill gas capture systems are not warranted. Almost all respondents who commented on this ques-

tion felt that "security features would [and should] be required for all aspects of post closure work" and/or that "the ministry should ensure that the landfill owner maintains sufficient security for post closure operation and monitoring". One respondent noted that "some landfills utilize the practice of progressive closure and gas capture as the landfill is built and the regulation should therefore address such practices".

6. Beneficial use of landfill gas

Although the proposed regulation would not require "beneficial use" of captured gas, other than consideration and review in the assessment, the ministry is supportive of effort that could reduce greenhouse gas emissions (see intentions paper section 4.5)

Response Form Question 6.1: **Do you have any comments or suggestions regarding appropriate incentives to encourage beneficial use of captured landfill gas?**

Respondents commented most commonly that the regulation should support reduction and, ultimately, elimination of landfill gas rather than focus on capture and beneficial use. A significant number of respondents commented that "as beneficial use of captured landfill gas [may entail] significant costs... the province [should] provide financial incentives to encourage beneficial use". Respondents suggested that if carbon credits were available for sale local governments would be able to form partnerships with the private sector to "install systems that use methane beneficially (instead of just flaring)". Other suggested incentives included: "tax credits, grants, funding, shorter processing times for permitting LFG-to-Energy (LFGTE) projects... [for] LFG collection systems, as well as beneficial use"; "[extending] incentives currently in place for renewable energy projects [to capture and use of landfill gas]"; "reduced taxes for landfill operators or access to reasonable financing rates so even small landfill operators can viably access/purchase technology like micro-turbines"; and "agreements... with the Federal government to allow carbon offsets to still be available from landfill gas collection projects even though emissions are regulated".

Other comments included:

- "Guidelines... for the measurement of fugitive methane emissions and oxidization in the cover soil in concert with the development of protocols for certifiable emissions levels to open the door for CERs"; and
- "There should be strong encouragement (through carbon credits and other regulatory mechanisms) to use this landfill gas as the precious resource that it is... as a chemical feedstock (methane and carbon dioxide) or as an energy source – in the interests of efficiency and environmental protection, it is very important to divert as much as possible from the landfill (batteries, construction materials, mattresses, etc.), while maximizing the amount of gas producing organic material – we should also encourage as much gas production as possible if this gas is being used in a productive manner – this encouragement could take the form of improved landfill sealing or even landfill wetting, depending on the circumstances".

7. Monitoring, review and reporting requirements

Reporting requirements associated with the proposed regulation will be based on the size of the landfill (using waste in place and waste discharge rate values) and the amount of methane gas generated. All landfill operators within the scope of the regulation will be required to maintain monitoring records and to submit an annual report to the ministry of quantity and quality of waste received (tonnage, sources, composition, projections) and nature of any organic diversion programs. Landfills above the specified size or with methane gas generation that exceed the specified level will be subject to additional monitoring, review and reporting provisions (see intentions paper section 4.6).

Response Form Question 7.1: **Do you have any comments for the ministry regarding the monitoring, review and reporting requirements in the proposed regulation, or suggestions for improving the effectiveness of monitoring and reporting of landfill gas generation and capture under the regulation?**

Several respondents noted that "reporting requirements are already part of an Operational Certificate or Permit and this would be a redundant and time consuming requirement for local governments" and suggested that any additional specific reporting requirements be incorporated into these existing procedures. One respondent suggested that "a panel of industry professionals" could review reporting requirements with ministry staff "to ensure that the data requirements are practical". Another respondent noted that "all projects that our company develops are extensively monitored and these results are reported to the local government authority... local authorities could submit these reports to the Ministry voluntarily with minimal additional effort or expense". Respondents also commented on: the difficulty of "accurately estimating the true composition of the waste stream in the field"; the need for "an agreed methodology...for reporting LFG collection system efficiencies"; and the potential utility of data from diversion programs for "providing the desired information".

Response Form Question 7.2: **Do you have any comments or recommendations regarding appropriate information for posting and public information?**

The limited number of respondents who commented on this question noted, for example, that "all data should be public and presented in an easily understandable format". Respondents commented that "if MOE does post information, it should ensure that the information is accurate and comparable" and that the ministry "should consult with the municipalities [prior to posting information and]... state what the data's weaknesses are and [the] accuracy of the information to avoid confusion by the press and the public". Another respondent advised the ministry to "ensure that all published data obtained from different jurisdictions can be fairly compared and contrasted".

8. Implementation

The ministry is seeking comments and suggestions on an appropriate timeframe, and suitable guidance for, implementation of the landfill gas assessment and collection measures called for under the regulation (see intentions paper section 4.7).

Response Form Question 8.1: **Do you have any comments or suggestions regarding appropriate timeframe and guidance for implementation of regulatory measures for landfill gas assessment and collection?**

Several respondents commented that "a reasonable and sufficient time span" should be allowed for landfill owners to comply with the requirements of the regulation, with one respondent, for example, suggesting that the "implementation dates... need to be increased by a minimum of three months for each category". A number of other respondents however, commented "that the timeframe does not appear unreasonable". Other suggestions from respondents included: "[the ministry consider providing] additional time for more public consultation/presentation... in order to obtain buy in and formulate and fine tune the regulation" and "[the ministry could] convene a committee (involving the ministry and stakeholders)... to assist in establishing methodologies, best management practices, threshold points and what is achievable".

A number of respondents reiterated the comment that "if nothing else in this response is supported, please consider increasing the filling rate threshold from 10,000 tonnes per year to 50,000 tonnes per year to help avoid the impracticalities and inefficiencies of the proposed requirements".

Additional comments with respect to implementation included:

- "A specified regulatory deadline for the installation of a collection system does not take into consideration operational restrictions... another approach is to describe the timing in relationship to the operations, such as when final elevation is reached then the installation of the wells can occur";
- "Emission capture and destruction will occur much sooner if small and medium-sized landfills are allowed to harness market mechanisms through public-private partnerships"; and
- "The timeframes are reasonable however collection should not be required".

9. Best Management Practices

The ministry intends to prepare and disseminate additional guidance for government agencies and stakeholders to further clarify intentions and emerging "best management practices" in guidelines that will complement the regulation. The first priority for the ministry would be to confirm expected standards and current best practices for assessments – including assessment methodology appropriate for use in British Columbia, assessment of gas capture efficiency and technologies for maximizing the efficiency of gas capture (see intentions paper section 4.8).

Response Form Question 9.1: **Do you have any comments or suggestions for the ministry regarding the development of best management practices associated with the proposed Landfill Gas Regulation?**

Specific comments in response to this question included:

- "The greatest concern is with the method used to estimate the quantity of gas generated – guidelines for 'best management practices' should include considerable flexibility because a lot of research and investigative work is being carried out all over the world and 'best practices' could be quickly out of date";
- "The best means for information dissemination is by e-mail with e-mail distribution lists which refer the receiver to the Ministry's webpage for additional information – training at several levels will be critical to success and should range from technical design to hands on operation – certification of landfill operators should be required for those sites where operators are required to operate landfill gas systems to ensure public safety... compiling a stakeholder group may be worthwhile to develop and shape this process;"
- "Best practices must include policy development initiatives and policy implementation rather than focus on engineering, construction and operations & maintenance of gas collection systems, which should be just one option for LFG reduction amongst a suite of tools and should not be required";
- "Will the Best Management Practices become mandatory?"; and
- "Consider developing 'Best Management Practices' guidelines for the design, implementation, and operation of landfill gas capture/flaring systems in addition to programs centered on organics diversion, recycling and reuse initiatives, and zero waste – then base compliance on these performance measures rather than measuring compliance with LFG capture efficiency".

10. Additional considerations not explicitly addressed in the proposed regulation

The proposed regulation does not, at this time, explicitly address organic waste diversion programs, emission credits or non-methane organic compounds (odours and air quality). The ministry is interested in receiving comments and suggestions related to potential actions to support waste reduction and/or reduction of greenhouse gas emissions, or opportunities for improving air quality associated with landfill emissions (see intentions paper section 4.9).

Response Form Question 10.1: **Do you have any comments regarding organic waste diversion programs or suggestions for actions in support of waste reduction and reduction of landfill gas emissions?**

Many respondents commenting on this question noted the importance of organic waste diversion programs, with recommendations such as: "the main contributor of methane, and resultant carbon dioxide generation is the continued uncontrolled landfilling of compostable matter";

"first turn off the tap of organics by focusing attention on the sustainable management of valuable organic stream"; and "the ultimate goal [of the ministry should be] the elimination of landfill gas production".

Respondents also commonly recommended provision of "carbon credits for waste diversion programs that reduce the landfilling of materials with high gas generation potential" noting that "these credits could be applied in some way to increase the threshold level for requiring a collection or treatment system".

Additional comments included:

- "The product value really depends on the size and constituency of the organics stream – the determination whether to turn the organics into gas in an in-vessel system or into a soil amendment would depend on local conditions – regardless of the process chosen or the per unit value of the final product, landfill gas escape is best eliminated by diversion";
- "With a small organics stream, the best solution might be low-tech composting, because there would be very low gas generation potential";
- "Local governments should be required to address the diversion of organic wastes in their corresponding Solid Waste Management Plans with the development of strategies which will lead to 100% diversion of organics";
- "Diversion of organics may eliminate the need for an expensive LFG extraction system";
- "A business case approach – pilot or model – should be completed by the MOE to determine cost and benefits for specific size landfills in specific locations – organic waste diversion is not without its shortfalls such as other fleets collecting the organics for composting";
- "[Our Regional District] has studied the significant benefits possible through diverting organic waste from landfills and is targeting this category in efforts to reach 70% diversion under the region's Zero Waste Challenge – analyses by [our] staff indicate that greater reductions in GHGs are possible through diversion of organics and treatment of residual waste prior to landfilling;"
- "We are appreciative that the provincial government is thinking about trying to resolve the problem of landfill gas escaping from B.C. landfills, but we would prefer the more preventative measure of banning organics in landfills"; and
- "Government effort to encourage neighbourhood-based composting as a means of reducing the burden of biodegradable garbage in our land-fill waste disposal system...is ultimately more cost-effective and sustainable than simply trying to vent methane from the ever-growing landfills".

Response Form Question 10.2: **Do you have any comments or suggestions regarding credits or other potential actions to support reduction of greenhouse gas emissions associated with landfills?**

Respondents who commented on this question almost universally expressed support for the use of carbon (or other) credits to support reduction of greenhouse gas emissions associated with landfills. Several respondents noted that credits would be particularly important for landfills

that are "too small" or are "soon to be closed" and have no funding source for installing a collection and utilization system. One respondent recommended that "the [government also] should... ensure that credits are used only within the Province in order to meet emission targets". Another respondent noted that "emission credits can provide incentives that will reward earlier implementation".

Response Form Question 10.3: **Do you have any comments regarding non-methane organic (i.e., odour generating) compounds and opportunities for improving air quality associated with landfill emissions – that might be addresses in the proposed Landfill Gas Regulation?**

A limited set of comments were received in response to this question, including:

- "This can be an... update to the B.C. Landfill Criteria, as this ties implementation of controls to NMOC emissions and is a Criteria only";
- "There are several non-methane compounds that have the potential to cause landfill emissions/odor releases – is it necessary or useful to consider/include inorganics like hydrogen sulfide and ammonia?";
- "A properly designed bio-filter oxidize and neutralize methane emissions, [as well as] mitigate or eliminate other organic odours – this is another important reason to consider diversion and mitigation as a preferable option to LFG capture and collection in certain situations"; and
- "Thresholds for NMOC should be left at the current value".

11. Protection of human health and the environment

Response Form Question 11.1: **Are there any aspects of the regulation and management of landfill gas that could significantly affect human health or the environment that are not, in your view, sufficiently addressed in the proposed regulation?**

Response Form Question 11.2: **Do you have any other comments or suggestions for the ministry?**

Respondents frequently reinforced comments or concerns outlined in response to previous questions (such as the importance of encouraging organic waste diversion, the impacts of including "small landfills" within the scope of the regulation and the importance of eligibility for carbon credits). Several respondents listed a set of potential "tools" that could be used to achieve the objectives of the proposed regulation without resorting to new legislation, including: permits or operational certificates under the *Environmental Management Act*; requiring revisions to operational and closure plans; requiring assessments of emissions at specified landfills; updating landfill criteria to set guidelines for landfill owners to meet targets for emissions (that don't preclude eligibility for offsets or carbon credits); developing best management practice guidelines; and updating criteria in solid waste management plans.

Specific comments included:

- "There is little reference to landfill emissions other than GHG";
- "Safety concerns (explosive limits) with LFG migration [are not referenced in the intentions paper, the regulation] could reference the B.C. Landfill Criteria";
- "Little is mentioned to address other non-methanogenic compounds";
- "Additional consultation should be conducted once the regulation has been drafted";
- "Although health and safety is not the mandate of the ministry, there are considerable risks posed by LFG to landfill staff and the public as well as the site itself, including risk of oxygen deficiency, LEL and H_2S and potentially dangerous landfill fires – the ministry should include a requirement for a site-specific LFG Health and Safety Plan to be developed by a qualified professional";
- "There are risks to human health from compounds produced during flaring and combustion of LFG – these can and should be minimized through pollution prevention approach that prohibits the disposal of organics to landfill and supports source separated collection and treatment";
- "An opportunity should be provided to comment on the actual draft regulation before it is put forward for approval";
- "Concerns – unanticipated consequences... there is the potential for this type of regulation to result in the design of intentionally small landfills... this would result in a decentralization of waste disposal facilities with potentially undesirably environmental impacts... there is [also] the potential for this type of regulation to result in greater consolidation of landfill sites (to avoid having to install and operate multiple LFG systems) resulting in the creation of more transfer stations and increasing the dependence on trucking thus creating additional GHG emissions";
- "The proposed regulation is not consistent with the provinces direction with regards to Integrated Community Sustainability Planning (Smart Planning for Communities) or long term Solid Waste Management Planning as it is not systems based, broad in scope, or designed to foster long term solutions – if minimizing GHGs is the objective, why not mandate a performance based approach whereby an overall GHG reduction target is set for solid waste management as a whole and then allow communities to choose how best to meet the targets within their respective communities";
- "Base the regulation on performance not prescription – let us know what targets we have to meet and accept a plan, prepared by a QP, that demonstrates how compliance can be achieved";
- "[Our Regional District] supports the B.C. Climate Action Team's recommendation: 'By 2020, B.C. end its growing dependency on disposing municipal solid waste in landfills both here and the United States, through a strategy that is based on requiring that the pollution prevention hierarchy (reduce, reuse, recycle, recover, residuals management) be considered in waste-management planning and requiring the management of waste as close to the source as possible' ";
- "The regulation in its current form... does not include any specific measures to mandate and fund organics diversion programs in the future – because such programs can reduce GHG

emissions at a lower cost than a landfill gas capture system, organics diversion should form the backbone of the province's landfill emissions reduction plan"; and

- "As reducing, reusing and recycling can save many more times GHGs (as well as other environmental impacts) than any waste technologies can, the first goal should be to reduce waste (period, not just to landfills) – to this end, any landfill gas regulation need to ensure that the 3Rs are encouraged and not disincented due to unintended consequences of restrictive legislation".

Appendix A: Acronyms and Abbreviations

Acronym or Abbreviation	Definition
ABL	Accelerated Bioreactor Landfill
B.C.	British Columbia
BMPs	Best Management Practices
cfm	Cubic Feet Per Minute
CER	Certified Emission Reduction
CH_4	Methane
EPAS	Environmental Plastics Advisory Service
EU	European Union
GGRTA	*Greenhouse Gas Reductions Target Act*
GHG	Greenhouse Gas
H_2S	Hydrogen sulphide
k	Decay Rate
LEL	Lower Explosive Limit
LFG	Landfill Gas
LFGTE	Landfill Gas to Energy (Projects)
LMOP	Landfill Methane Outreach Program
Lo	Methane Gas Potential
MOE	Ministry of Environment
MSW	Municipal Solid Waste
MT	Metric Ton
NMOC	Non-Methane Organic Compound
NSPS	New Source Performance Standards
OC	Operational Certificate
P3s	Public Private Partnerships
QP	Qualified Professional
RCBC	Recycling Council of British Columbia
RDCO	Regional District of Central Okanagan
RDNO	Regional District of North Okanagan
SCRD	Sunshine Coast Regional District
SWANA	Solid Waste Association of North America
UK	United Kingdom
US EPA	United States Environmental Protection Agency