STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Regional Office • 3190 160th Avenue SE • Bellevue, Washington 98008-5452 • (425) 649-7000

September 8, 2011

Mr. Carl Bach
The Boeing Company
PO Box 3707, M/C 1W-12
Seattle, WA 98124-2207

Re: Opinion pursuant to WAC 173-340-515(5) on Proposed Gas Extraction System Modifications for the following Hazardous Waste Site:

- Name: Eastgate Landfill
- Address: 2805 160th Avenue SE, Bellevue, WA 98008
- Facility/Site No.: 2017
- VCP No.: NW0471

Dear Mr. Bach:

Thank you for submitting documents regarding your proposed remedial action for the Eastgate Landfill facility (Site) for review by the Washington State Department of Ecology (Ecology) under the Voluntary Cleanup Program (VCP). Ecology appreciates your initiative in pursuing this administrative option for cleaning up hazardous waste sites under the Model Toxics Control Act (MTCA), Chapter 70.105D RCW.

This letter constitutes an advisory opinion regarding whether your proposed remedial action is likely to be sufficient to meet the specific substantive requirements of MTCA and its implementing regulations, Chapter 70.105D RCW and Chapter 173-340 WAC, for characterizing and addressing the following release(s) at the Site:

- Methane, benzene, vinyl chloride, and dichlorofluoromethane in Air
- Benzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and dieldrin in Landfill Refuse
- Arsenic, iron, manganese, benzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene and dieldrin in Soil and Ground Water

Ecology is providing this advisory opinion under the specific authority of RCW 70.105D.030(1)(i) and WAC 173-340-515(5).

This opinion does not resolve a person's liability to the state under MTCA or protect a person from contribution claims by third parties for matters addressed by the opinion. The state does not have the authority to settle with any person potentially liable under MTCA except in accordance with RCW 70.105D.040(4). The opinion is advisory only and not binding on Ecology.

Ecology's Toxics Cleanup Program has reviewed the following information regarding your proposed remedial action(s):

1. August 29, 2011. *Subject: Response to Opinion on Proposed Gas Extraction System Modifications at the Eastgate Landfill, Bellevue, Washington,* letter from SCS Engineers

2. July 26, 2011. *Re: Opinion pursuant to WAC 173-340-515(5) on Proposed Gas Extraction System Modifications for the following Hazardous Waste Site: Name: Eastgate Landfill.* letter from Mark Adams, Washington State Department of Ecology, to Carl Bach, The Boeing Company

The reports listed above will be kept in the Central Files of the Northwest Regional Office of Ecology (NWRO) for review by appointment only. Appointments can be made by calling the NWRO resource contact, Sally Perkins, at 425 649-7190.

The Site is defined by the extent of contamination caused by the following release(s):

- Methane, benzene, vinyl chloride, and dichlorofluoromethane in Air
- Benzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and dieldrin in Landfill Refuse
- Arsenic, iron, manganese, benzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene and dieldrin in Soil and Ground Water

Based on a review of supporting documentation listed above, pursuant to **requirements contained in MTCA and its implementing regulations, Chapter 70.105D RCW and Chapter 173-340 WAC, for characterizing and addressing the following release(s) at the Site, Ecology has determined:**

Background: Gas collection system data obtained during 2009, 2010, and 2011 has shown two problems with the current system. One is that too little methane is being produced by the landfill as a whole to maintain combustion at the existing LFG flare. The other problem is that methane gas concentrations in excess of the lower explosive limit have been consistently detected in some probes outside the perimeter of the landfill. These two issues and the City of Bellevue's (Bellevue) proposed remediation approach to each are discussed below.

Issue 1: Too Little Methane: As the landfill ages, methane production has declined. Current gas production rates are estimated to be slightly more than 1% of the peak LFG rate in 1965. The gas collection system has also aged and been subject to the effects of differential settlement. These factors have resulted in areas of the collection system being blocked with water or gas system condensate, particularly during the wet season between November and April. The blockage has, in turn, reduced the overall capacity of

the system to deliver gas to the LFG flare. The combination of lower gas production rates and partial collection system blockages has made it so that the flare can operate for only short periods of time, and must be supplied with supplemental propane to maintain ignition. In 2010, the flare operated for an average of only 30 hours per month, or slightly more than 2 full-time days in 30.

Bellevue has proposed addressing this issue by: (1) Modifying the existing blower, (2) Replacing the existing flare with a vent stack/carbon filter or a smaller "candlestick" flare, and (3) Implementing an enhanced monitoring/corrective program for system blockage. The blower and flare modifications would allow them to operate for longer periods at lower flow rates, thus providing more gas removal from the within and outside the landfill. The enhanced monitoring/corrective program will reduce pipe blockage during the wet season, and thus allow more gas to reach the flare. Ecology **accepts** the proposal as follows:

- The proposed modification will increase gas extraction through more frequent and longer operating hours. The operational schedule will be field-optimized to enable as much gas extraction as possible, while minimizing the risk of subsurface fires or accelerated landfill settlement.

- Samples obtained at the Site showed detectable benzene, vinyl chloride, dichlorodifluoromethane (Freon), and a chlorinated ethane in the landfill gas. The benzene, vinyl chloride, and Freon concentrations were all above MTCA Method B carcinogen cleanup levels (0.32, 0.28, and 91 $ug.m^3$, respectively). The concentrations of these compounds in the gas system discharge ultimately need to be below MTCA air cleanup levels or Acceptable Source Impact Levels (ASILs), whichever are lower. Both the proposed carbon filter and the candlestick flare should allow the discharge to meet the air cleanup levels. A discharge confirmation monitoring program must be developed and submitted to Ecology for approval.

- System blockage with water or condensate will be addressed by monitoring water levels in the condensate traps (the low points in the gas piping system). Condensate will be removed as necessary to maintain gas flow through the piping. If flow can not be maintained, Bellevue will evaluate other alternatives for correcting the situation.

Issue 2: Elevated Methane Concentrations Outside Landfill: The gas collection system was modified in 2006 and 2007 during the construction of three new office towers at the south end of the landfill. The gas system modifications included the removal and replacement of extraction wells and monitoring probes, along with new header piping. Gas probe monitoring since then in 2009 and 2010 showed gas

pressures relatively close to atmospheric pressure, but methane concentrations in excess of 5% in a broad zone adjoining the new buildings (as measured at MW-2, MW-3, and MW-4), and in a single well on the east side of the landfill (MW-15). The maximum concentration recorded was 57% methane by volume in probe MW-2M. These high concentrations indicate LFG was continuing to move outward in the subsurface beyond the landfill boundaries, and that the extraction system was not effective in maintaining the soil vapor concentrations below an explosive level (methane is explosive between 5 and 15 % by volume).

Beginning in early 2011, gas extraction rates were increased by operating the system more frequently and for longer periods of time. Large amounts of propane were required to supplement the methane and keep the flare lit. The result was a significant drop in methane concentrations in most of the affected probes. The methane concentration in MW-2M was 60% in March and had dropped to 0.1 % in June. In the same time period, MW-4M methane concentrations dropped from 12.0% to 0%. However, methane concentrations in MW-3M dropped only slightly and are still above the lower explosive limit.

Bellevue proposes to address this issue by implementing the modification discussed above under Issue 1, and continuing to maintain the higher gas extraction rates begun earlier in 2011. Ecology **does not accept** the proposal for the following reason:

- Results from gas probe MW-3M indicate the increased gas extraction rates are not uniformly effective in reducing methane concentrations. This is a particular concern for MW-3M because it is within about 40 feet of the easternmost building, and potentially represents conditions along 100 to 150 feet of the building front. Ecology recommends Bellevue implement other means to continue to reduce gas in this area. These other means should be implemented as soon as possible, and could include installing one or more new extraction wells, further modifications to the extraction program, or other engineering solutions. Ecology also recommends inspecting methane monitors within the office towers to make sure they are operating, and testing for methane concentrations within the buildings and in subsurface structures such as manholes or vaults.

Environmental Covenant: Ecology does not believe it will be necessary to update the existing environmental covenant to encompass the proposed gas system modifications. In Ecology's view, these improvements are not "a proposal to use the site in a manner that is inconsistent with the restrictive covenant." (WAC 173-340-440 (9)(f)).

This opinion does not represent a determination by Ecology that a proposed remedial action will be sufficient to characterize and address the specified contamination at the Site or that no further remedial action will be required at the Site upon completion of the proposed remedial action. To obtain either of these opinions, you must submit appropriate documentation to Ecology and request such an opinion under the VCP. **This letter also does not provide an opinion regarding the sufficiency of any other remedial action proposed for or conducted at the Site.**

Please note that this opinion is based solely on the information contained in the documents listed above. Therefore, if any of the information contained in those documents is materially false or misleading, then this opinion will automatically be rendered null and void.

The state, Ecology, and its officers and employees make no guarantees or assurances by providing this opinion, and no cause of action against the state, Ecology, its officers or employees may arise from any act or omission in providing this opinion.

Again, Ecology appreciates your initiative in conducting independent remedial action and requesting technical consultation under the VCP. As the cleanup of the Site progresses, you may request additional consultative services under the VCP, including assistance in identifying applicable regulatory requirements and opinions regarding whether remedial actions proposed for or conducted at the Site meet those requirements.

If you have any questions regarding this opinion, please contact me at 425 649-7107.

Sincerely,

Mark Adams
NWRO Toxics Cleanup Program

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cc: Pam Fehrman, City of Bellevue, via email
Ted Massart, SCS Engineers, via email
Eric Sonsthagen, SCS Engineers, via email