

June 13, 2023



Director Laura Watson  
Department of Ecology  
300 Desmond Drive SE  
Lacey, WA 98503

**RE: Rulemaking - Informal Comment for Chapter 173-408 WAC, Landfill Methane Emissions**

Dear Director Watson,

Thank you for the opportunity to provide input during the informal comment period for Chapter 173-408 WAC, Landfill Methane Emissions. This rulemaking to create a new chapter in the Washington Administrative Code is a critical and unique opportunity for the state to realize the stated purpose of HB1663 (2022), which is to reduce methane emissions from landfills. To that end, the purpose of our initial comments are to flag key approaches that we believe should be included in the rulemaking to ensure lower landfill emissions.

As stated in HB1663, “The rules adopted by the department must be informed by landfill methane regulations adopted by the California air resources board, the Oregon environmental quality commission, and the United States environmental protection agency.” In many ways, California and Oregon’s rules have stronger requirements, which should in turn be reflected in Washington’s rule. Furthermore, Oregon’s more recent rule contains some parameters that are more protective than California’s. Beyond this approach of replicating other state’s more stringent standards, we believe significant and lasting reductions in methane emissions will not occur without Ecology including the following parameters in its rule:

- Requirements which ensure comprehensive, accurate emissions monitoring;
- Landfill cover timing, quality and thickness adequate to minimize emission leaks;
- Rigorous and updated gas collection and control system design and operational requirements;
- Reporting requirements that build on Oregon’s; and
- Technology control requirements that maximize methane leak detection and capture.

*Background*

Landfills settle, shift and leak. The intricate set of pipes and cover associated with landfills are subject to changing weather conditions, water accumulation, age, impacts of unique composition of waste, settling, and earthquakes, among other issues. That conditions are always changing means constant attention is required to manage and limit emissions - which starts with an effective and comprehensive emissions monitoring program.

Research findings heighten the urgency to be successful in methane leak detection. For example, a California Air Resources Board [multi year study](#) overflew 270,000 facilities multiple times including oil wells, compressor stations at natural gas storage facilities, dairy manure management, wastewater treatment plants and landfills. That study found that when landfills have big methane plumes, they are, on average, larger than oil and gas fields, dairy, and energy industry sources. In fact, all sectors had the majority of detected emissions with a rate between 10-100 kg/ hour *except* for landfills. For the landfills that had detected emissions, the

majority had rates that were well above 100 kg/hour, and many detected emission rates were above 1,000kg an hour - a finding significant considering EPA's draft oil and gas emission rule proposes to define "super emitters" as having an emission rate of greater than 100 kg/hour.

### *Specific Comments*

1. **Ecology should require monitoring which is conducted bimonthly, conducted only when barometric pressure is "normal," and uses remote sensing technology.** Per HB1663, Oregon's and California's emissions monitoring requirements should be the Department's starting point as they are more comprehensive than EPA's. We recommend that Ecology's rulemaking around instantaneous and integrated monitoring should consider the following:
  - Like California and Oregon, Ecology should require surface emissions monitoring that actually covers more of the surface of the landfill that is under surface emissions monitoring (SEM) requirements, using a walking pattern of 25-foot intervals or less.
  - Rules should also ensure that monitoring is conducted only when barometric pressure is representative of normal site conditions, as abnormal pressure can skew results. As part of their SEM reporting, landfill operators should submit the range of barometric pressure associated with their monitoring, and the specific barometric pressure at the site at each sample site.
  - Ecology should require bimonthly emissions monitoring. Quarterly monitoring is simply not frequent enough to catch methane leaks as they occur, particularly considering the potential for super-emitter events.
  - As is being considered by the California Air Resources Board for a similar rulemaking, Ecology should require the incorporation of drones as a supplement to current surface emissions monitoring, to survey the whole area of the landfill subject to monitoring requirements. Drones can act as 'reconnaissance', comprehensively identifying major leaks, followed up by confirmation monitoring by a field person. EPA's method 21/grid pattern monitoring inevitably misses methane leaks as it is a walking pattern that by design only covers a portion of the landfill surface area under gas capture that must be monitored. It is also subject to limitations such as weather, safety issues, human error and gaps in monitoring due to human safety concerns. Fortunately, there is [advanced technology – i.e., drone remote sensing](#) - that is widely available that can fill that gap, with the ability to *scan the entire landfill surface area more comprehensively than human-held probes. An added advantage is that the use of drones can help reduce risks to humans walking the landfill site.*
  - Ecology should evaluate and incorporate the use of methane remote sensing data from third parties into the rule. Aerial surveys have revealed super-emitter activity at landfills across the United States, providing valuable data to pinpoint and quantify landfill methane emissions. Satellite and aerial data providers can alert operators, as [California](#) and [Pennsylvania](#) have done with their voluntary programs that involve landfill operators, who can then follow-up with prompt local monitoring to confirm the leak.

2. **Ecology should include requirements to limit the landfill working face, limit the concentration of wet waste, and speed up installation of intermediate cover.** The type and quality of landfill cover is critical for managing methane emissions and, thus, should be comprehensively addressed in rulemaking. A Cal Poly [field investigation of methane gas emissions](#) from a representative set of California landfills analyzed all operational parameters at landfills and emissions measured on the ground. The researchers found that the type of cover on a landfill was the most significant factor that influenced the flux of emissions. Specifically, they found higher methane emissions with the use of intermediate and daily covers, and lower methane emissions as the percentage of the landfill area with final cover increased. The report recommended limiting the working face and concentration of wet waste as much as possible, and, because daily cover had the most emissions potential, that intermediate cover should be installed within days, not weeks, of waste placement.

A separate [study](#), the California Methane Survey, did overflights using Next Generation Airborne Visible/Infrared Imaging Spectrometer, (AVIRIS-NG) over 270 landfills and 166 organic waste facilities repeatedly over the time period of 2016 to 2018 and found significant emissions from the active face (which lacks final cover). For example, at the Potrero Hills Landfill, they estimated that active face emissions represented 11%–21% of the landfill emissions during the study period. As EPA and current state regulations have no monitoring or gas capture requirements on the active face, cover and amount of active face become particularly important to adequately control methane emissions.

We recommend that Ecology consider the following:

- **Minimize active face/daily cover and avoid concentrations of wet waste:** Because cover type is the most significant operational factor affecting surface methane emissions, California Air Resources Board is now seeking feedback on how to best minimize the area and duration of daily cover to further reduce methane emissions, and Ecology should do the same. Similarly, per the Cal Poly research, Ecology should seek feedback on reasonable operational practices that would avoid concentration of wet waste or organic sludges.
- **Ensure cover integrity:** The rule should also address gaps in current EPA regulations, which include a reference to a “cover integrity” program, by providing more specificity as to actions that will ensure cover integrity is maintained. The rulemaking should specify that every month the landfill operators must visually inspect the entirety of the landfill cover - interim and final. The rule should further specify that surface emissions monitoring should be conducted wherever there are visual observations indicating elevated concentrations of landfill gas including but not limited to cover penetrations, distressed vegetation, cracks or seeps in the cover. Finally, the rulemaking should denote the procedures and minimum actions the landfill operator or owner must undertake to repair the cover.
- **Include clear definitions related to the working face:** Broad definitions or no definitions of working face and no parameters for what is in or outside of the definition are a recipe for unabated methane emissions. The longer a cell with a working face continues to receive waste - which currently could be years - the greater the risk of unabated methane emissions. Therefore, the rule’s definition of working face should include clear definitions for what is a working face, and address the time period the working face may be under intermediate cover,

with the goal of ensuring as much of the landfill as feasible is under final cover in a timely manner.

3. **Ecology should include robust and responsive gas control system monitoring and equipment parameter requirements:** Ecology should both draw upon California's and Oregon's rules, and in some cases, such as where technology and practices have advanced or are now available, Ecology should adopt more up-to-date and effective requirements.

We recommend requiring:

- Biweekly monitoring. California and Oregon require component leak detection in their landfill methane regulation, with quarterly monitoring. More frequent monitoring, however, will identify point sources or broader surface area emissions from equipment. Therefore, GCCS components under positive pressure should be monitored every 14 days for leaks and leaks repaired within 10 days.
- Water/liquid buildup. Landfill gas collection wells are susceptible [to flooding](#), rendering them less effective at drawing out gas. Therefore, Ecology should include as a requirement regular monitoring for water/liquid buildup in wells, and a corrective measure to remove the liquid.
- Standards for pressure, temperature and oxygen as performance requirements for system wellheads are important parameters to ensure the system is functioning, that there is no air intrusion and their use will aid in the detection and prevention of fires. Ecology should include the negative pressure requirements from the EPA's 2016 EG's , the temperature limit of 131 Fahrenheit from EPA's current CAA regulations and the 5% oxygen standard from EPA's 1996 NSPS. Every 14 days (an upgrade from the EPA's monthly requirement), operators should monitor wellhead gauge pressure, with a corrective action requirement. If elevated parameters are measured, it should trigger a requirement to monitor more frequently.

4. **Ecology should incorporate Oregon's standards for reporting requirements, and in addition require reporting of cover-related parameters. California Air Resources Board may have additional improvements that should be considered.**

- Oregon's standards for waste in place, landfill reporting requirements, records maintenance and reporting requirements related to GCCS and monitoring are the most comprehensive and should be adopted.
- Because of the importance of cover in slowing methane emissions, reporting on operations related to cover will be critical in understanding emissions. Therefore, Ecology should consider requiring semi-annual reporting on such as elements as: the type of face and percentage of face used, timing of final cover installation on each cell, the dates of intermediate and final cover installation, and the annual amount of methane gas collected from the waste under intermediate and daily cover. It can also require reporting the amount of time landfill cover is removed for activities under RCW 70A.540.050, and report the methane concentration levels on the cover that is reinstalled.

- Finally, Ecology should consider incorporating the improvements to reporting that California Air Resources Board is considering. In a [May 18 public workshop](#), California Air Resources Board noted common reporting errors, misinterpretations, omissions and overreporting in Annual Landfill Methane Rule Reports. Ecology staff can work with the California Air Resources Board to identify potential clarifications and incorporate the latest thinking in your rule.

**5. Building from California and Oregon’s rules, Ecology should ensure key technology requirements, such as gas collection and control systems efficiency, gas leak limits and hydrocarbon devices, maximize methane capture.**

- Include 99% capture of methane as the methane leak rate limit for treatment systems that process routed gas, per California and Oregon’s rules.
- Adopt [Oregon’s rules](#) which require the landfill operator to “operate, maintain and expand the gas collection system in accordance with the procedures and schedules in the approved Design Plan.”
- The authorizing legislation, HB1663, states, “The gas collection and control system must handle the expected gas generation flow rate from the entire area of the municipal solid waste landfill and must collect gas at an extraction rate to comply with the surface methane emission limits set forth in section 5 of this act and the department's implementing rules.” The “entire area” would include the working or active face. Ecology should require a gas collection and control system that will collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of 6 months or more if active; or 3 months or more if closed or at final grade. There is extensive evidence of landfill methane emissions occurring before the installation timeframes for GCCS required by the final NSPS and EG. In particular, [Barlaz et al. \(2009\)](#) assess different k values and find that, for a decay rate of 0.07, as much as 45% of total methane generated from an NSPS compliant landfill will not be subject to gas capture.
- California’s rule includes specifications for the annular space and well hole. Ecology can incorporate those specifications, and require that GCCS systems should be designed such that all vertical wells are proactively linked to base-level leachate drainage systems.
- Ecology should adopt California’s requirement that enclosed flares must achieve a 99% destruction rate of methane, which is directly related to methane, as opposed to EPA’s NMOC control standards.
- For gas collection and control systems that use an open flare, requirements should follow California’s rule as much as the authorizing statute allows, and, for enclosed flares, establish a stronger destruction efficiency standard based on methane destruction rather than NMOC reduction.
- Ecology should review remote sensing devices such as drones as eligible hydrocarbon devices that are able to survey the *entire* surface area of the landfill and require this type of comprehensive monitoring as a complement to surface emissions monitoring with a sniffer. To help determine appropriate alternative technologies, the Department can draw from the oil and gas regulations that EPA proposed in November 2022.

In this critical decade, this is a once-in-a-lifetime opportunity for Washington to ensure a comprehensive, effective rule that mitigates emissions from waste in place.

Thank you for consideration of our comments. I can be reached at [heather@zerowastewashington.org](mailto:heather@zerowastewashington.org) or (206) 441-1790.

Sincerely,

A handwritten signature in black ink, appearing to read "Heather Trim", with a long, sweeping underline.

Heather Trim  
Executive Director