Kampmeier & Knutsen, PLLC on behalf of Industrious Labs and Zero Waste Washington

Please see attached. Thank you!

KAMPMEIER & KNUTSEN PLLC

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December 12, 2023

Mr. Bill Flagg
Washington State Department of Ecology
300 Desmond Dr. SE
Lacey, Washington 98503

RE: Comments on Washington's proposed rule for landfill methane emissions implementing Chapter 70A.540 RCW

Dear Mr. Flagg,

Our law firm represents Industrious Labs and Zero Waste Washington. On behalf of these organizations, this letter provides comments on the proposed Chapter 173-408 WAC, Landfill Methane Emissions rule.

Methane is the second most abundant anthropogenic greenhouse gas with about eighty times more heat-trapping capacity than carbon dioxide over 20 years.[1] In fact, methane from Washington municipal solid waste ("MSW") landfills in 2021 equaled one million passenger cars driven for a year on a 20-year warming potential.[2] In 2022, EPA inspections at three Washington landfills discovered excessive and, in one instance, explosive levels of methane.[3] These exceedances were not communicated to the public and only uncovered via public records requests.

Methane also contributes to ozone and particulate matter pollution, harming respiratory, reproductive, and cardiovascular health.[4] Accordingly, methane from MSW landfills poses a sinister threat to Washington communities—particularly its most vulnerable members—and the global climate.

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[1] *See generally* Eduardo P. Olaguer et al., 13 ATMOSPHERE 983 (2022).

[2] *Landfill Methane Emissions in Washington Municipal Solid Waste (MSW)*, DON'T WASTE OUR FUTURE, https://dontwasteourfuture.org/washington-dashboard (last visited Dec. 4, 2023).

[3] Joseph Winters, *Landfills in Washington and Oregon Leaked 'Explosive' Levels of Methane Last Year*, GRIST (Oct. 26, 2023) https://grist.org/accountability/landfills-in-washington-and-oregon-leaked-explosive-levels-of-methane-last-year/.

[4] Env't Def. Fund, *How Methane Impacts Health*, GLOBAL CLEAN AIR, https://globalcleanair.org/methane-and-health/#:~:text=Methane's%20health%20impacts&text=Exposure%20to%20ozone%20and%20particulate,mortality%2C%20and%20heightens%20stroke%20risk (last visited Dec. 4, 2023).

We appreciate the efforts made by the Department of Ecology ("Ecology") to remedy our concerns with the draft rule. However, the rule still fails to provide for monitoring using improved technology and fails to leverage third party data that pinpoints large methane point sources. It further fails to include measures to increase the effectiveness of gas collection and control systems ("GCCS"), including earlier installation and effective operational practices. Lastly, the rule lacks important requirements for public reporting and transparency. We respectfully urge Ecology to clarify and strengthen its final rule in the following ways:

I. The final rule should be driven by the emissions reduction goal contemplated by the enabling statute—not seek to replicate or create more lenient requirements.

The authorizing statute, Chapter 70A.540, states, "The department must adopt rules to implement this chapter. 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."[5] Ecology is thus empowered by the statute to achieve the Washington legislature's goal: "reducing methane emissions from landfills."[6]

While state and federal regulations may "inform" Ecology's efforts to this end, there is no statutory requirement that its rules must be identical to or less stringent than those of California, Oregon, or EPA. Where the state and federal regulations can be improved upon through rapidly improving technology, additional community input, localized needs, and lessons learned from implementation, Ecology can and should do so.

II. The final rule should require earlier design and installation of GCCS to better address how quickly food waste decays in landfills.

A recent EPA report found that "an estimated 61 percent of methane generated by landfilled food waste is not captured by landfill gas collection systems and is released to the atmosphere. Because food waste decays relatively quickly, its emissions often occur before landfill gas collection systems are installed or expanded."[7] The report further estimates that fifty percent of the carbon in food waste degrades into landfill gas within just 3.6 years.[8]

Under EPA regulations, active landfills do not have to expand their GCCS until the solid waste has been in place for five years.[9] Ecology should improve upon this framework, reducing the time between installation or expansion of GCCS and the event triggering required installation

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[5] RCW 70A.540.020(3).

[6] *HB 1663 – 2021-22*, WASH. STATE LEG., https://app.leg.wa.gov/billsummary?BillNumber=1663&Year=2021 (last visited Dec. 11, 2023).

[7] Max Krause et al., *Quantifying Methane Emissions from Landfilled Food Waste*, U.S. ENV'T PROT. AGENCY (Oct. 2023) https://www.epa.gov/system/files/documents/2023-10/food-waste-landfill-methane-10-8-23-final_508-compliant.pdf.

[8] *Id.*

[9] 40 C.F.R. § 60.34f(a), 60.763(a).

or expansion. Importantly, Ecology must further incorporate requirements so that operators plan new landfills and expansions with gas capture in mind from the initial design phase.

As Environmental Integrity Project ("EIP") stated in its Petition for Rulemaking ("Petition") to the U.S. Environmental Protection Agency ("EPA") this year, "it is feasible to install and expand GCCS earlier than required under EPA's current regulations and EPA's consultants have previously found early expansion of GCCS to be cost-effective in a range far below the threshold that EPA proposed to find reasonable in its recent draft rule for the oil and gas industry."[10] In the Petition, EIP noted the EPA's own conclusion that "'early' LFG collection can be implemented within a few months of waste placement."[11]

EIP further pointed out that EPA's consultant, ERG, concluded in its 2019 Technology Review Memo that it was technologically feasible to reduce these "lag times" between system installation/expansion and the event triggering the duty to do so, though certain technology (such as horizontal collectors or passive flares) may be necessary for earlier installation.[12] ERG even identified examples where the agency required shorter lag times: the Central Landfill in Rhode Island (Permit and Gas Management Plan) was required to install a GCCS within 4 to 12 months after "filling of the new phase," when measurable quantities of gas develop;[13] in Washington, the permit for the Cowlitz County landfill, "bottom-liner horizontal collectors and horizontal interim collectors" must be installed "initially when possible";[14] in Michigan, a 2022 Consent Decree Gas between the Michigan Department of the Environment, Great Lakes, and Energy and Arbor Hills Landfill, Inc. required that collection infrastructure be installed within 6 months of "initial waste placement" in future landfill cells.[15] Expanding GCCS earlier is also cost-effective, according to ERG which calculated a $127.46/metric ton of methane after 2 years and $149.42/metric ton of methane after 3 years.[16]

Early installation and expansion of GCCS significantly reduces methane emissions. A study modeling landfill operational scenarios with varying waste composition, organic waste reduction, and landfill gas recovery timing (applying a basic gas generation model following the United Nations Intergovernmental Panel on Climate Change ("IPCC") recommendations) found

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[10] Leah Kelly et al., *Petition for Rulemaking to Revise the New Source Performance Standards and Emission Guidelines for Municipal Solid Waste Landfills*, ENV'T INTEGRITY PROJECT (June 22, 2023) https://environmentalintegrity.org/wp-content/uploads/2023/06/FINAL-Petition-for-Rulemaking-CAA-111-Landfills.pdf.

[11] *Landfill Gas Energy Project Development Handbook: Best Practices for Landfill Gas Collection System Design and Installation*, U.S. ENV'T PROT. AGENCY (July 2021), https://www.epa.gov/lmop/landfill-gas-energy-project-development-handbook.

[12] Kelly et al., *supra* note 10; Memorandum from E. Rsch. Grp., Inc. on Clean Air Act Section 112 (d)(6) Tech. Rev. for Mun. Solid Waste Landfills to Allison Costa and Andy Sheppard 29–30, 31–32, 36–41, 44–45 (June 25, 2019) (on file with author) (hereinafter, "2019 Technology Review Memo").

[13] Kelly et al., *supra* note 10.

[14] *Id.*

[15] *Id.*

[16] *Id.*

two options that "stand out as being the most effective methane mitigation measures in a wide range of conditions throughout the world: (a) early gas recovery and (b) reduction of the amount of biodegradable organic waste accepted in a landfill."[17] The below table from EIP's petition further illustrates that analysis[18]:

Table 2: Reduction and Cost-Effectiveness Summary of Earlier GCCS Expansion*				
Scenario	**Reduction in tons methane**	**$/metric ton Methane**	**$/metric ton CO2e GWP: 25**	**$/metric ton CO2e GWP: 79.7**
Expansion After 1 Year (Recommended)*	400,000	$140	$5.6	$1.8
Expansion After 2 Years*	300,000	$130	$5.2	$1.6
Expansion After 3 Years	120,000	$150	$5.9	$1.9

*Estimates for 1 year time frame calculated by Environmental Integrity Project (EIP).[135] Estimates for 2 and 3 year time frames from 2019 ERG Technology Review.[136]

Accordingly, the final rule should add the following language to the identified sections:

WAC 173-408-080:

- **"Each owner or operator of a MSW landfill with a gas collection and control system must: (a) Operate the gas collection and control system such that gas is collected from each area, cell, or group of cells in the MSW landfill in which solid waste has been in place for: (1) One year or more if active."**

WAC 173-408-080(2)(a)

- **"(xvii) The owner or operator must estimate when the landfill will reach the thresholds identified in WAC 173-408-070(4) requiring installation of gas collection and control system and install a gas collection and control system no more than 12 months after that estimated date."**
- **"(xviii) The design plan must provide for whether other measures to control gas—including, *inter alia*, horizontal collectors, connections to the leachate control system, and electric systems that will eventually connect to control device(s), the vacuum system, and other gas collection and control system elements—can be installed before the full gas collection and control system is required."**

III. The final rule should revise surface emissions monitoring protocols to include advanced remote sensing technologies, ensuring accurate detection of methane exceedances.

The current rule requires the landfill to monitor for exceedances along a grid pattern using hydrocarbon detection (a type of surface emission monitoring, or "SEM") inches above the ground. WAC 173-408-120(3)(a)(i) states, "Testing must be performed by holding the

[17] Heijo Scharff et al., *The Impact of Landfill Management Approaches on Methane Emissions*, 41 WASTE MGMT. & RSCH. 12 (2023).
[18] Kelly et al., *supra* note 10.

hydrocarbon detector's probe within 3 inches of the landfill surface while traversing the grid." This provision, as well as similar ones elsewhere in the rule, prevents use of advanced remote technologies. Today, there are available advanced sensing technologies that do not include a probe several inches from the ground but that would complement ground monitoring. These technologies—which include drones and continuous sensors —are currently used by landfill operators and will likely play a growing role in methane monitoring in years to come.

Walking survey grid pattern monitoring is insufficient to detect leaks. The White House National Strategy to Advance an Integrated U.S. Greenhouse Gas Measurement, Monitoring, and Information System, published in November 2023, states:

> [R]ecent airborne methane surveys suggest that emissions may be higher and more persistent than previously expected. Emissions of landfill gas to the air are determined in part by the design and operation of the gas collection and control system and the operational characteristics of the site. Factors such as flooded collection wells, cover integrity issues, planned maintenance activities, and equipment failures can result in elevated emissions compared to reported GHGRP estimates and can persist for extended periods of time. In many cases, the presence of preventable excess emissions that may require action cannot be known without some form of methane emissions measurement. Walking survey surface emissions measurements (SEM) required quarterly by Clean Air Act regulations are not able to detect all anomalous emissions at a landfill that occur over a large footprint, some extending for hundreds of acres.[19]

EPA inspection reports at the LRI 304th Street Landfill near Tacoma Washington detected explosive concentrations of methane, despite the landfill's failure to detect the same.[20] Concerns outlined in the inspection report include the following:[21]

- "EPA, again, detected significantly more exceedances of the surface methane standard than past reported SEM surveys on site, even with minimal surveying of Cell 6, no surveying of Cell 3, and the restoration of gas collection in areas that had none during the September inspection.
- "The northeast corner (Cell 1) is an area lacking gas collection devices, with repeated points of exceedance.
- "The tarped area around the meeting of Cells 2B, 3A, 5, and 6 appeared to be visibly inflated with landfill gas, with explosive levels of gas being measured coming out of it, indicating both an environmental concern and a safety hazard.
- "It was not clear how Waste Connections is ensuring sufficient density / adequate

[19] NATIONAL STRATEGY TO ADVANCE AN INTEGRATED U.S. GREENHOUSE GAS MEASUREMENT, MONITORING AND INFORMATION SYSTEM, THE WHITE HOUSE 50 (2023).
[20] *CLEAN AIR ACT INSPECTION REPORT Waste Connections LRI-304th St Landfill, Graham, WA*, U.S. ENV'T PROT. AGENCY (2022).
[21] *Id*. at 7.

coverage in its gas collection system."

The Roosevelt Landfill in Washington reported no methane exceedances, while EPA reported sixteen, many significantly higher than the limit.[22] As the EPA inspection report states, "despite Republic having never found any SEM exceedances in its past 5 years of quarterly monitoring, including a full year of checking all penetration points, EPA identified sixteen points in exceedance of 500 ppm, including five points above 10,000 ppm, indicating potential concerns with Republic's SEM/Method 21 procedures.[23]

In Illinois close to the Iowa border, at an EPA inspection of the Prairie Hill Landfill, the well technician present during the inspection relayed that the Facility's quarterly surface emissions monitoring ("SEM") found few to no exceedances. However, during comparative surface emissions monitoring conducted by EPA, 51 SEM exceedances above 500 ppm were found. The report states that, "large areas of concern and with exceedances include the whole toe of the Landfill by GW-23. The entire side of the slope south of the active area by GW-406 had elevated SEM measurements, exceedance hits, leachate seeps, and exposed waste."[24] Audible bubbling liquid was heard and observed in liquid-filled holes. Strong gas odors were detected in areas with SEM exceedances, especially in areas with elevated levels of methane.[25] An EPA inspection of Countryside Landfill in Grayslake, Illinois documented a total of 33 exceedances. The report states, "Waste Management has a third party, Environment Management Technologies (EMT), perform surface emissions monitoring at the Landfill. Waste Management told EPA that they average 2-3 hits per year during routine SEM."[26]

At the Coffin Butte landfill in Oregon, an EPA inspection found that "despite Republic having seen no more than 6 exceedances in the recent SEM reports supplied ahead of the inspection that included penetration monitoring, including reports with 0 exceedances, the EPA identified 61 points in exceedance of 500 ppm, including 21 points above 10,000 ppm."[27] Flag #51 was by a broad area where the tarp was visibly inflated with gas. "Along the top of this section of tarp, from flag #52 to #54, every post or tarp hole Daniel Heins monitored exceeded the surface methane standard, with readings of up to 7% shown before the instrument maxed out."[28] The inspection report stated, "Daniel Heins expressed concerns with the areas of tarp that were inflated with and leaking out landfill gas, as detected during the SEM, noting that in addition to compliance concerns with the surface methane standard that such an accumulation of

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[22] CLEAN AIR ACT INSPECTION REPORT REPUBLIC SERVICES ROOSEVELT REGIONAL LANDFILL, ROOSEVELT, WA, U.S. ENV'T PROT. AGENCY 6 (July 11, 2022).
[23] *Id*. at 6.
[24] CLEAN AIR ACT INSPECTION REPORT WASTE MANAGEMENT – PRAIRIE HILL LANDFILL, MORRISON, ILLINOIS, U.S. ENV'T PROT. AGENCY 4 (Aug. 16, 2021).
[25] *Id*. at 5.
[26] *Id*. at 3.
[27] *Clean Air Act Inspection Report Republic Services Coffin Butte Landfill, Corvallis, OR*, U.S. ENV'T PROT. AGENCY 8 (Sept. 19, 2022).
[28] *Id*. at 4.

flammable gas creates a potential safety concern."[29] The Coffin Butte inspection report further documented Republic's approach to monitoring:[30]

> Phil Caruso did not dispute any of the readings, though noted that he would not have checked many of the exceedance locations, that he would have spent less time monitoring, or that he would have considered a higher location to be "the ground" when placing his probe 5 to 10 centimeters (cm) above the ground per the SEM regulations.
>
> At an exceedance (flag #1) with a hole in the ground from an animal burrow, Phil Caruso stated that he would have considered the "ground" to be where the ground would have been if an animal didn't dig a hole into it at that location, rather than the ground at the base of the hole, and thus measured from a significantly higher location than Daniel Heins.
>
> At an exceedance (flag #2) between overlapped tarp material, with one piece of tarp raised above the other with a gap of air in between, Phil Caruso stated that he would have monitored with his probe above the upper tarp, rather than measuring the 5 to 10 cm from the tarp against the ground.
>
> When Daniel Heins was monitoring a cluster of decommissioned wells with a patch of distressed soil (flag #3), Phil Caruso stated that he would have moved on after not directly getting above 500 ppm within twice his instrument response time even if there was an increase in reading, rather than moving around the penetration points slowly to find maximum reading point and then waiting twice the response time at this maximum reading location.
>
> When Daniel Heins was monitoring at leachate cleanouts, Phil Caruso stated that he does not monitor at these and that they are not fully penetrating the cover. Daniel Heins responded that it was likely that many of these ultimately did penetrate the cover, especially in areas of thinner intermediate cover, and that regardless he recommended checking these as they were proving to be repeated sources of extremely elevated emissions, many over an order of magnitude above the surface methane standard. Phil Caruso stated that he was not required to monitor these. Daniel Heins and Phil Caruso had a similar discussion at the valve box dug into the cover with a reading of 4% methane (flag #37), with Phil Caruso stating that this was not a penetration and thus he did not have to monitor this.

[29] *Id*. at 8.
[30] *Id*. at 4–5.

> When Daniel Heins was monitoring at a horizontal penetration of the cover associated with a well (flag #16), Phil Caruso stated that he would not have monitored this as a penetration.
>
> Phil Caruso stated that he would not have monitored the Cell 5 leachate riser that Daniel Heins measured multiple exceedances at, as it was outside of the waste mass.
> For cover integrity monitoring, Republic stated that they look for holes and cracks in the soils and wind damage on the tarps, but that there was no set answer for what degree of tarp damage would necessitate repair.

As these examples from EPA inspections show, part of the reason for the disparity in monitoring results is that landfills have extensive surface area, while grid pattern monitoring covers only a small pathway and is prone to human error and subjectivity. EPA addressed this issue in communications with Sniffer Robotics (ultimately resulting in EPA's approval of ALT-150 as an alternative method to conduct SEM):

> Considering an average landfill size requiring the SEM is 100 acres, an operator will end up walking about 15 miles in varying environmental and weather conditions (snow/ice/rain/extreme temperatures) over varying terrain with steep slopes and dense vegetation. You note there are many slip, trip, and fall hazards as well as wild animals (e.g., snakes, dogs, alligators, rats) and dangerous/nuisance vectors (e.g., ticks, scorpions) as well as exposure to landfill gases. An operator must monitor the output of the detector while maintaining the traverse path (typically using a GPS device) and ensuring that the probe nozzle position is at the proper height above the landfill surface. A typical SEM quarterly inspection requires two technicians due to the physical demands. You also note that the Federal landfill regulations do not necessarily mandate that the SEM be performed by an operator while walking.[31]

That letter also noted further issues with SEM, including "potential injury, lost time, and increased costs caused by the safety and health concerns detailed above," omission of landfill surface area from monitoring due to "steep slopes and other safety concerns," a "high degree of subjectivity in the current SEM procedures due to inherent biases and preferences of the SEM operators," and a "high degree of variability in conducting the SEM scan, therefore, results may not always represent actual conditions; for example, the SEM walking path is imprecise resulting in significant gaps in the 30-meter spacing."[32]

[31] Letter from Stefan Johnson, Group Leader, Measurement Tech. Group, to David Barron, Chief Tech. Officer, Sniffer Robotics, LLC (Dec. 15, 2022) (on file with author).
[32] *Id.*

Currently, the EPA recognizes ALT-150, an unmanned aerial system ("UAS")-based application as an alternative method to conduct SEM. The ALT-50 includes "a longer probe to reach from the ground to the UAV and a specially designed weighted ground level sampling system to ensure contact with the ground and that the distal end of the nozzle (or inlet) is within 10 cm of the landfill surface."[33] Sniffer Robotics conducted SEM Alternative Method Adequacy Testing, the results of which are detailed in the U.S EPA approval letter and depicted in the table below:[34]

Table 5. Comparison of Projected Exceedance Detection for UAV-Based Alternative Method and Actual Exceedances Determined for Existing SEM Method at Four Landfills

Run	Site ID	Surveys Using UAV-based Alternative Method Date of Test	UAS based method Increased Meter Readings (≥500ppm)	UAS based method Increased Meter Readings (≤500ppm)	UAS based Method Nominal Projected Exceedances	Surveys Using Existing SEM Compliance Method Date of Test	SEM Compliance Method Reported Exceedances	Difference (Projected Exceedances from UAV Method – Reported Exceedances from Existing SEM Method)
1	A	2/19/2020	46	41	58	3/11/2020	3	+55
2	B	3/3/2020	15	41	31	3/10/2020	10	+21
3	B	5/11/2020	1	11	6	6/17/2020	28	-21
4	A	6/13/2020	1	35	17	6/11/2020	2	+145
5	B	8/7/2020	16	44	33	9/15/2020	11	+22
6	A	9/25/2020	3	23	13	9/22/2020	4	+9
7	A	11/23/2020	12	39	28	11/11/2020	4	+35
8	B	4/22/2021	4	83	41	5/5/2021	15	+26
9	C	5/12/2021	15	36	29	6/16/2021	5	+24
10	D	5/10/2021	3	9	7	5/12/2021	0	+7
11	B	7/15/2021	3	16	10	8/24/2021	22	-14
12	B	9/1/2021	9	18	16	8/24/2021	22	-8
		Totals	128	396	287	Totals	126	

This tethered drone is an alternative technology, not a required technology as part of the EPA NSPS/EG SEM requirements. EPA has approved Alternative Test Method ("ATM") 150 for SEM procedures required under the current Clean Air Act requirements for MSW landfills.[35] Therefore, landfill operators can continue to use human walking SEM, and ATM-150 use only applies to specific permits. This creates a piecemeal inconsistency.

[33] *Id.*

[34] *Id.*

[35] Emission Guidelines (40 C.F.R. 60 Subpart Cf), New Source Performance Standards (40 C.F.R. 60 Subpart WWW), the Federal Implementation Plan (40 C.F.R. 60 Subpart OOO), and the National Emission Standards for Hazardous Air Pollutants (40 C.F.R. 363 Subpart AAAA); Recent Postings of Broadly Applicable Alternative Test Methods, 88 Fed. Reg. 3408, 3409 (Jan. 19, 2023).

There are readily available technologies that can detect and pinpoint methane leaks at landfills, as illustrated in EPA's Landfill Methane Emissions Workshop in April 2021, EPA's Methane Detection Workshop in August 2021, CARB's Public Workshop on Landfill Methane Emissions in California in December 2022, and EPA's LMOP Webinar on Detecting Landfill Methane Emissions with Drones in September 2023. A 2023 research study conducted at a closed landfill in Ontario, Canada tested 17 different methane detection technologies used in monitoring landfill methane emissions, including satellite, aircraft, truck, drone, and tripod-based systems.[36] Technology providers with drone surveying capabilities at landfills, include ABB, Aerometrix, Bridger Photonics, Project Canary, Scientific Aviation, SeekOps, and SnifferDrone, among others.

Other agencies are incorporating advanced monitoring methods such as remote sensing. Environment and Climate Change Canada ("Environment Canada") issued a draft landfill regulatory framework including path-integrated monitoring using drone-based downward facing methane detectors for measuring surface emissions. [37] The method measures concentration of methane in the atmosphere between the drone and the surface of the landfill and is less labor-intensive, safer, and more comprehensive than ground monitoring. Environment Canada notes that operators can conduct drone surveys in areas that "include[] the working face" of the landfill, and that drone monitoring can expedite the creation of SEM monitoring reports that include locations where samples were taken.[38]

Drone-based surveys required under Environment Canada's rule would be flown over all areas of the landfill under intermediate and final cover at a height of 5 m and on serpentine pattern with spacing of no more than 15 m.[39] The rule would further require that an initial survey of methane emissions be conducted using this drone-based methodology. Where exceedances of the path-integrated methane concentration thresholds are identified, ground-based surface methane concentration measurement methods may be used to verify if the area exceeds specified thresholds. Areas with measurements below the proposed thresholds would not require ground-level verification.[40] The regulations would define a leak as "any landfill surface or landfill gas recovery system component location where the measured methane concentration exceeds 500 ppmv using a hand-held methane detector; in the case of methane emissions measured as a path-integrated methane concentration, a location where the measured path-integrated concentration exceeds 500 ppm. Where exceedances are detected using drone-based detectors, monitoring at the surface of the landfill using a hand-held detector may be conducted to verify the detection of

[36] https://www.linkedin.com/posts/fluxlab-stfx_methane-landfill-waste-activity-7130597595571228674-xB25/?utm_source=share&utm_medium=member_desktop

[37] *Reducing Canada's Landfill Methane Emissions: Proposed Regulatory Framework*, GOV. CANADA (June 14, 2023) https://www.canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/publications/reducing-landfill-methane-emissions.html.

[38] *Id.*

[39] *Id.*

[40] *Id.*

a leak."[41] "Drone-based monitoring of surface methane concentrations would be required three times per year (spring, summer and fall), with not less than 90 days between monitoring events. This monitoring would be required above all areas of the landfill surface under intermediate or final cover (including above all surface penetrations, accessible leachate control system components (manholes, drains, wells) and side slopes). Only areas inaccessible due to active landfilling operations are exempt from requirement for surface emission monitoring."[42]

Recognizing the value of remote monitoring technologies, the California Air Resources Board ("CARB") has proposed, as part of the state Landfill Methane Rule ("LMR") update, creating a process to "evaluate and approve the use of new technologies such as drones to supplement surface emissions monitoring."[43]

The authorizing statute Chapter 70A.540 reads, "Any instrument used for the measurement of methane must be a hydrocarbon detector or other equivalent instrument approved by the department or local authority based on standards adopted by the department that address calibration, specifications, and performance criteria."[44] There is no prohibition nor restriction on remote sensing technology in the authorizing statute. Recognizing that EPA Method 21 authorized technology does not include advanced sensing technology outside of ALT-150 at this time, we propose creating a pathway such that drones or other advanced sensing technology are used as a supplemental method of detection.

Accordingly, the rule should be changed as follows (new language **bolded**):

WAC 173-408-120(3)(a)

- "(i) Testing must be performed by holding the hydrocarbon detector's probe within 3 inches of the landfill surface while traversing the grid**, except where the testing technology has been approved by Ecology and does not operate as a device held within 3 inches of the landfill surface**."
- **"(iii) Ecology must evaluate and approve the use of advanced sensing methane monitoring technology for surface emissions monitoring by January 1, 2025."**
- **"(iv) Advanced remote sensing monitoring of surface methane concentrations will be required three times per year in Q1, Q2 and Q3 with not less than 90 days between monitoring events. This monitoring would be required above all areas of the landfill surface under intermediate or final cover (including above all surface penetrations, accessible leachate control system components (manholes, drains, wells) and side slopes). Exceedances identified must be remediated under WAC 173-408-110 (c)."**

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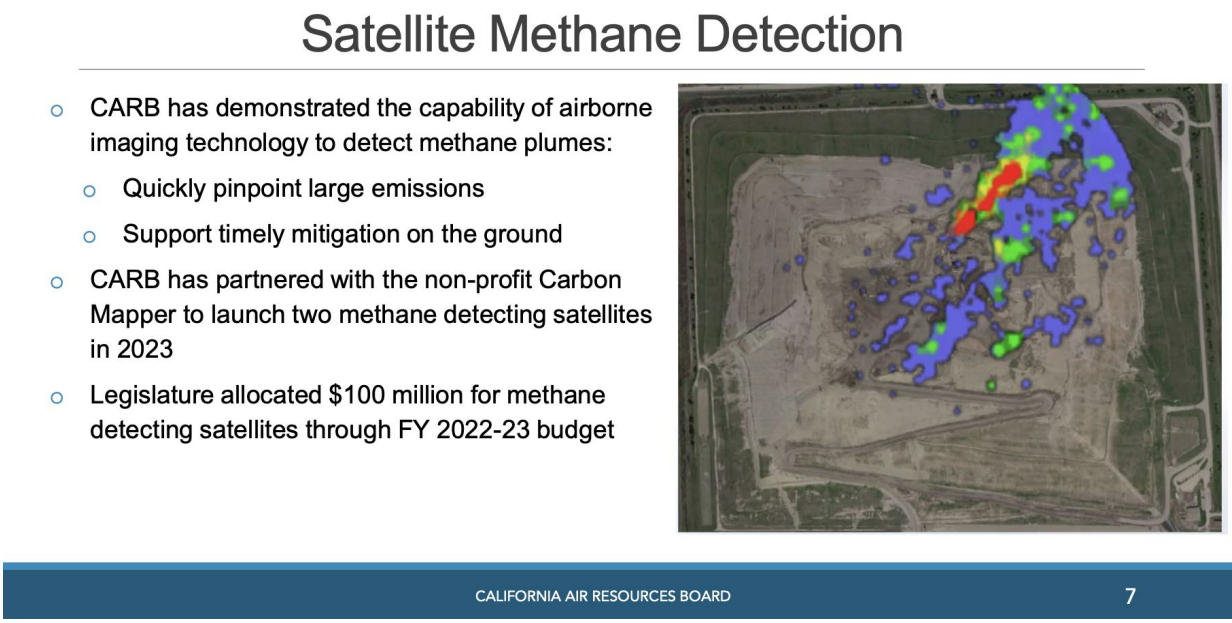
[41] *Id.*
[42] *Id.*
[43] *Preliminary Concepts for Potential Improvements to Landfill Methane Regulation*, CAL. AIR RES. BD. (May 18, 2023) https://ww2.arb.ca.gov/sites/default/files/2023-05/LMR-workshop_05-18-2023.pdf.
[44] RCW 70A.540.080.

IV. The final rule should leverage advances in emissions monitoring technologies to quickly pinpoint large methane sources and mitigate leaks.

Satellites or airplanes using precision visible-infrared imaging spectrometers technology can detect large methane plumes and should be incorporated into the rule. As CARB stated, we can "leverage advances in emissions monitoring technologies to quickly pinpoint large methane sources and mitigate leaks."[45]

While considering super-emitting detecting technology in a future rule update, CARB outlined the capabilities of satellite and airborne methane detection in its May 18, 2023 Public Workshop on Preliminary Concepts for Potential Improvement to the Landfill Methane Rule, noting airborne technology can "quickly pinpoint large emissions" and "support timely mitigation on the ground":[46]



CARB further stated that, in its upcoming LMR update, **"staff is considering requiring ground monitoring and mitigation when an operator is notified that a leak has been detected using technologies such as satellites."**[47]

Timely and effective detection of large methane emissions through satellite or airflights remote flyovers holds the potential for exponentially more effective methane mitigation. For example, two California state agencies contracted with NASA to fly remote sensing equipment over portions of the state.[48] This California Methane Survey identified hundreds of methane

[45] *Preliminary Concepts*, *supra* note 42.
[46] CAL. AIR RES. BD., *supra* note 28.
[47] *Id.*
[48] Duren, R.M. et al., *California's Methane Super-Emitters*, 575 NATURE 180–184 (2019).

point sources but found that just ten percent of the point sources emitted nearly half the total methane emissions detected.[49] CARB noted the survey's importance, stating, "Methane is invisible to the human eye, but can be detected by NASA's Airborne Visible InfraRed Imaging Spectrometer - Next Generation (AVIRIS-NG)."[50] The sophisticated imaging equipment, carried by a twin-engine aircraft, identifies gases by analyzing sunlight passing through molecules in the atmosphere.

In 2017, 2017, and 2018, this advanced detection technology was employed by JPL crews, who conducted dozens of flights over 10,000 square miles and identified more than 550 point sources emitting plumes of highly concentrated methane. Landfills accounted for 41 percent of point source emissions, manure management accounted for 26 percent and oil and gas accounted for 26 percent."[51] Further, as detailed in the CARB Summary of 2020 and 2021 Airborne Methane Plume Mapping Studies CARB partnered with the University of Arizona and in 2021 partnered with Carbon Mapper to conduct plume mapping flights over the state, resulting in the detection of 213 methane plumes from oil and gas and landfills.[52] CARB shared the findings with operators in the form of "incidence reports," and operators were asked to follow-up and identify the source of emissions, if possible, and report their findings to CARB.[53] The report noted that operators were generally responsive, but that the response time was slow—particularly for landfills.[54] The report states, "Additional regulatory language could address operator response rate, response speed, and response quality as well as consider if there are additional sources that need to be covered."[55] CARB further states:

> Finally, there are co-benefits of using this technology to initiate leak repairs. In addition to methane, which is non-toxic, oil and gas developments and landfills are known to emit hazardous air pollutants (HAPs), which can cause acute and chronic health problems. Furthermore, exposure to these emissions is not equally shared by all people; indeed, disadvantaged communities often suffer from higher exposures to these co-emitted pollutants. Therefore, using this technology to initiate rapid repair of high-emitting sources can have a co-benefit of reducing pollutant exposure for affected communities.[56]

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[49] *Id*.
[50] *Id*.
[51] *Aerial methane survey finds a fraction of point sources responsible for more than a third of California's methane emissions,* CAL. AIR RES. BD., https://ww2.arb.ca.gov/news/aerial-methane-survey-finds-fraction-point-sources-responsible-more-third-californias-methane (last accessed Dec. 12, 2023).
[52] *Summary of 2020 and 2021 Airborne Methane Plume Mapping Studies*, CAL. AIR RES. BD. (May 2023) https://ww2.arb.ca.gov/sites/default/files/2023-05/Published%20Summary%20Report%20_1.pdf.
[53] *Id*.
[54] *Id*.
[55] *Id*. at 23.
[56] *Id*.

The state of Pennsylvania sponsored satellite overflights which detected methane leaks, resulting in significant emissions reductions at participating landfills—the biggest percentage reduction of any participating sector.[57] The Pennsylvania Department of Environmental Protection ("DEP") detailed the results in the "Pennsylvania Methane Overflight Study Final Report," stating:

> Through partnership with Carbon Mapper and the U.S. Climate Alliance, DEP successfully achieved its main research objective to detect, measure, and abate methane-emitting point sources. This was accomplished through a series of overflight campaigns that employed airborne imaging spectrometer technology to identify methane emissions above the 100 kg/hr threshold for subsequent on-the-ground investigation. DEP gained invaluable insights into the inventory of methane emitters across multiple industry sectors and the relative emission levels between them, achieved real-world, meaningful methane reductions, and inspired the development and implementation of several best practices across multiple industries. As a result, methane emissions were reduced between 37.2 and 39.5 percent in the MSW landfill sector and 10.5 to 13.7 percent in the oil and gas sector, depending on the calculation method used.[58]

DEP further noted that, "because many high methane-emitting sources are also highly variable, intermittent, and prevalent across diverse emission sectors, accurate quantification and effective mitigation of these emissions requires frequent, repeated sampling of large geographic areas. Therefore, employing satellites with enough sensitivity, spatial coverage, and revisit frequency could supplement, and perhaps eventually supplant, airborne and surface observations to address these challenges moving forward."[59] The DEP report provides an appendix with observations, an example of which is reproduced below:[60]

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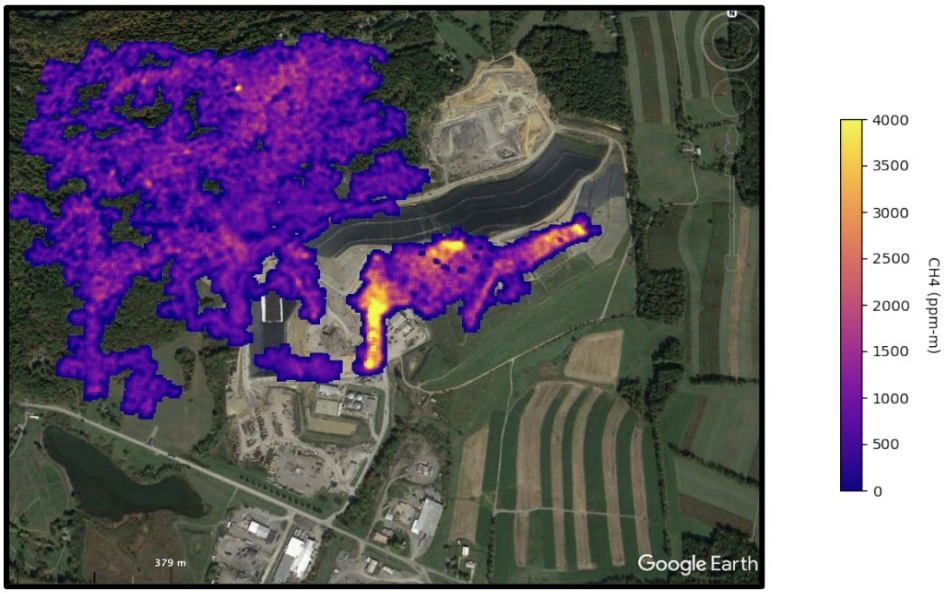
[57] Ad Crable, *Satellites, Drones Join Fight Against Air Pollution in Pennsylvania*, BAY JOURNAL (June 12, 2023) https://www.bayjournal.com/news/pollution/satellites-drones-join-fight-against-air-pollution-in-pennsylvania/article_7e7f004a-045f-11ee-b4a8-3b952abf5cb3.html.

[58] *Pennsylvania Methane Overflight Study Final Report*, PENN. DEP. OF ENV'T PROT. (Dec. 2022) https://www.depgreenport.state.pa.us/elibrary/GetDocument?DocName=PENNSYLVANIA%20METHANE%20OVERFLIGHT%20STUDY%20FINAL%20REPORT.PDF%20%20%3Cspan%20style%3D%22color%3Agreen%3B%22%3E%3C%2Fspan%3E%20%3Cspan%20style%3D%22color%3Ablue%3B%22%3E%3C%2Fspan%3E&docId=5424315.

[59] *Id*.

[60] *Id*.

Aerial methane emissions from municipal solid waste facilities:



Emission Rate: 671 +/- 524 kg/hr

The draft Ecology rule relies on self-monitoring by the landfill owner or operator, without the benefit of third-party surveys. As the many examples from EPA inspections provided in this letter show, self-monitoring using human-based monitoring of a small portion of the landfill area has significant limitations. Therefore, independent detection from qualified parties is necessary to achieve the core objective of the rule—reducing methane emissions from landfills.

Further, the EPA's oil and gas rule framework can be applied to landfills to target large emissions more efficiently and accomplish greater reductions. The EPA has established a super emitter program in its final Oil and Gas Rule, requiring owners and operators to investigate exceptionally large emissions events upon EPA notifies the emitter of a certified entity's discovery of the emissions.[61] Following investigation, EPA may further require the owner or operator to take additional mitigation measures.[62] EPA certifies these third-party monitors. Ecology, however, could create a framework by which certain third parties automatically qualify, reducing agency workload.

The benefits of incorporating credible third-party data pinpointing large methane sources are significant and would be available at no cost to landfill operators. In its final rule, the EPA noted that it developed the program "in response to recent studies, which indicate that a small portion of sources contribute almost 50 percent of the methane emissions in the oil and gas sector."[63]

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[61] 40 C.F.R. § 60.
[62] *Id.*
[63] *Id.*

Accordingly, the final rule should establish a super emitter monitoring and mitigation program with the following parameters:

- The landfill owner or operator must conduct surface emissions monitoring at the identified location and conduct mitigation activities pursuant to the requirements in WAC 173-408-110 when notified that a super emitter event has been detected by the landfill owner or operator or by a qualified third-party.
- "Super emitter event" means emissions of 100 kilograms (220.5 pounds) of methane per hour or larger.
- A qualification process for third-party notifiers.
- Pre-qualification requirements for third-party notifiers including:
    - Automatic approval for EPA-approved third-party monitors
    - A publicly available checklist of requirements for pre-qualification.
        - The checklist should clearly explain what would render third-party monitoring data invalid (e.g., monitoring results obtained while trespassing)
    - Third-party notifiers should be able to apply and demonstrate their technical expertise in the specific technologies and methodologies
    - Third-party notifiers should create a monitoring plan approved by Ecology
- Ecology should also require that notification to operators also be copied to Ecology, in part for Ecology to help ensure that the correct contact person/facility has been notified

IV. The final rule should be at least as stringent as federal standards for determining exceedances.

The final rule's definition of exceedance should not set a lower standard than EPA's Method 21. The draft rule defines "exceedance" to mean "concentration of methane measured within three inches above the landfill surface that exceeds 500 ppmv, other than 'nonrepeatable, momentary readings,' as defined in this section, as determined by instantaneous surface emissions monitoring; or the average methane concentration measurements that exceed 25 ppmv, as determined by integrated surface emissions monitoring." "Nonrepeatable, momentary readings" are then defined as "indications of the presence of methane, which persist for less than five seconds and do not recur when the sampling probe of a portable gas detector is placed in the same location." The final rule definitions should match that used by the EPA Method 21 8.3.1 Type I—Leak Definition: "Based on Concentration. Place the probe inlet at the surface of the component interface where leakage could occur. Move the probe along the interface periphery while observing the instrument readout. If an increased meter reading is observed, slowly sample the interface where leakage is indicated until the maximum meter reading is obtained. Leave the probe inlet at this maximum reading location for approximately two times the instrument response time. If the maximum observed meter reading is greater than the leak definition in the applicable regulation, record and report the results as specified in the regulation reporting

requirements"[64] The EPA framework has no exception for fleeting readings and instead sets a clear and unambiguous requirement to record the maximum reading above the leak definition. Recording methane exceedances is a core duty of the landfill rule, and the draft rule as written greatly risks impeding that. Accordingly, Ecology should revise the rule as follows (new language **bolded**):

WAC 173-408-020

- Delete "nonrepeatable momentary reading" definition.
- **"Exceedance" means the concentration of methane measured within three inches above the landfill surface that exceeds 500 ppmv as defined in this section, as determined by instantaneous surface emissions monitoring; or the average methane concentration measurements that exceed 25 ppmv, as determined by integrated surface emissions monitoring.**

V. The final rule should eliminate overly broad exemptions from surface emissions monitoring, allowing large areas to avoid monitoring for methane leaks.

These exemptions fail to precisely limit the exempt activities by timeframe and other parameters, unlike Oregon's rule. Accordingly, the final rule should read (new language **bolded**):

WAC 173-408-100

- "(4) The requirements of this section do not apply to: (a) The working face of the landfill; (b) Areas of the landfill surface where the landfill cover material has been removed for the purpose of installing, expanding, replacing, or repairing components of the landfill cover system, the landfill gas collection and control system, the leachate collection and removal system, or a landfill gas condensate collection and removal system; (c) Areas of the landfill in which the owner or operator, or a designee, which is a person or entity that has express, written permission from the owner or operator, is engaged in active mining for minerals or metals; or (d) Areas of the landfill surface where the landfill cover material has been removed for law enforcement activities requiring excavation**, as long as these areas are kept to the smallest size and for the shortest duration possible**."

VI. The final rule should not allow for decreased monitoring as a result of remediating an exceedance.

The draft rule allows closed landfills to monitor only once annually if exceedances are remediated within 10 days: "Any exceedances of the limit specified in WAC 173-408-100 (2)(a) detected during the annual monitoring that cannot be remediated within 10 calendar days will result in a return to quarterly monitoring of the landfill." But this logic is faulty. The occurrence

[64] *Method 21*, U.S. ENV'T PROT. AGENCY (Aug. 3, 2017) https://www.epa.gov/sites/default/files/2017-08/documents/method_21.pdf.

of any leak, whether remediated or not, only bolsters the argument for more frequent monitoring. There is no evidence that remediation within 10 days will reduce methane exceedances in the future, especially where lessened monitoring fails to reveal leaks. Such an allowance also fails to meet federal standards in 40 CFR 63.1961(f) requiring a return to quarterly monitoring for any exceedance, regardless of correction. Accordingly, the final rule should read as follows (new language **bolded**):

WAC 173-408-110(1)(c)(iii), WAC 173-408-110(d)(iii), WAC 173-408-110(e)

- **"Any exceedances of the limit specified in WAC 173-408-100 (2)(a) detected during the annual monitoring will result in a return to quarterly monitoring of the landfill."**

VII. The final rule should require both instantaneous and integrated surface monitoring to ensure comprehensive, varied monitoring with no extra labor.

The draft rule states, "(1) Surface emissions monitoring: The owner or operator of a MSW landfill with a gas collection and control system must conduct quarterly instantaneous or integrated surface monitoring of the landfill surface according to this subsection and the procedures specified in WAC 173-408-120." California, Maryland, and Oregon rules all require both instantaneous and integrated monitoring:

- California: "§ 95469. Monitoring Requirements (a) Surface Emissions Monitoring Requirements: Any owner or operator of a MSW landfill with a gas collection and control system must conduct instantaneous and integrated surface monitoring of the landfill surface quarterly using the procedures specified in section 95471(c)."
- Oregon: "340-239-0600 Monitoring Requirements - When required as provided in OAR 340-239-0100 through 340-239-0800, the owner or operator of a landfill must comply with the monitoring requirements in this rule. (1) Surface Emissions Monitoring Requirements. The owner or operator of a landfill with a gas collection and control system must conduct quarterly instantaneous and integrated surface monitoring of the landfill surface using the procedures specified in OAR 340-239-0800(3)."
- Maryland: ".09 Monitoring Requirements and Corrective Actions. A. Surface Emissions Monitoring Requirements. The owner or operator of a MSW landfill shall conduct instantaneous and integrated surface emissions monitoring of the landfill surface on a quarterly basis in accordance with the procedures specified in Regulation .11F of this chapter."

Accordingly, the final rule should read as follows (new language **bolded**):

WAC 173-408-110(1)

- "(1) Surface emissions monitoring: The owner or operator of a MSW landfill with a gas collection and control system must conduct quarterly instantaneous **and** integrated surface monitoring of the landfill surface according to this subsection and the procedures specified in WAC 173-408-120(3)."

VIII. The final rule should ensure landfill operators submit monitoring reports with details on how they conducted monitoring.

Given the risk of human error and discrepancies in surface emissions monitoring, a thorough monitoring record is essential to the rule. Importantly, the hydrocarbon detectors currently used for SEM are already equipped with Bluetooth technology capable of transmitting data electronically, streamlining detailed reporting.

Accordingly, the rule should require the landfill owner or operator to provide surface emissions monitoring reports that include all measured surface emissions of methane with the map traversed clearly identifying each reading's location. The rule should add the following (new language **bolded**):

WAC 173-408-100(3), WAC 173-408-110(c), WAC 173-408-110(d), WAC 173-408-170(6)

- "(3) **All readings must be reported and recorded.** Any reading exceeding the applicable limit set forth in subsection (2) of this section must be recorded **and reported** as an exceedance**. The** following actions must **also** be taken: (a) The owner or operator must record the date, location, and value of each **reading**, along with retest dates and results **if applicable**. The location of each **reading** must be clearly marked and identified on a topographic map, at a minimum, of the MSW landfill, drawn to scale, with the location of both the monitoring grids and the gas collection system clearly identified."
- "(c) Instantaneous surface monitoring: **All readings must be reported and recorded**. Any reading exceeding the limit specified in WAC 173-408-100 (2)(a) must be recorded and reported as an exceedance. **The** following actions must **also** be taken: (i) The owner or operator must record the date, location, and value of each **reading**, along with retest dates and results **if applicable**. The location of each **reading** must be clearly marked and identified on a topographic map, at a minimum, of the MSW landfill, drawn to scale with the location of both the grids and the gas collection system clearly identified."
- "(d) Integrated surface monitoring: **All readings must be reported and recorded.** Any reading exceeding the limit specified in WAC 173-408-100 (2)(b) must be recorded and reported as an exceedance. **The** following actions must **also** be taken: (i) The owner or operator must record the average surface methane concentration measured for each grid along with retest dates and results. The location of the grids and the gas collection system must be clearly marked and identified on a topographic map, at a minimum, of the MSW landfill drawn to scale."
- "(6) Surface emissions monitoring report: Any owner or operator who conducts surface emissions monitoring pursuant to WAC 173-408-110 must include the following information in the annual report required by subsection (3) of this section: (a) Date(s) of monitoring. (b) Location of the monitoring grid coordinates **and of each reading**, as well as coordinates of areas exempted from monitoring on a topographic map. (c) Measured concentration of methane in ppmv **for each reading**, exceedances, and all corrective actions taken."

IX. The final rule should adopt Oregon's rule language (340-239-0700)[65] to ensure owners and operators timely provide results of surface emission monitoring.

Accordingly, the rule should read:

WAC 173-408-170(6)

- "Surface emissions monitoring report: **A landfill owner or operator conducting surface emission monitoring pursuant to WAC 173-408-110 must submit an Instantaneous Surface Monitoring Report within 30 days after the fourth consecutive quarter of monitoring if no exceedances are detected, or 30 days after a measured concentration of methane of 200 ppmv or greater, whichever is first.** Any owner or operator who conducts surface emissions monitoring pursuant to WAC 173-408-110 must include the following information in the annual report required by subsection (3) of this section . . . ."

X. The final rule should address an important operational factor affecting surface methane emissions: Cover.

EIP cited research in its petition to the EPA that found "cover can boost the collection efficiency of a GCCS by reducing the amount of gas that escapes into the air instead of entering the collection system. A final cover results in the highest collection efficiency, followed by intermediate cover, followed by daily cover, which yields the lowest collection efficiency.[66] Studies have found that landfills with a well-designed final cover liner, and GCCS can have a collection efficiency as high or over 90%."[67] The final rule should outline specific required actions to ensure cover integrity maintenance, such that every month the landfill operators must visually inspect the entirety of the landfill cover, both interim and final. Where visual investigations indicate elevated concentrations of landfill gas (including, *inter alia*, cover penetrations, distressed vegetation, and cracks or seeps in the cover), the owner or operator should conduct surface emissions monitoring. The rule should further specify procedures and minimum actions the landfill operator or owner must undertake to repair the cover.

Recognizing the significance of cover in minimizing methane emissions, CARB is currently evaluating requirements for minimizing the area and duration of daily cover in revising

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[65] "A landfill owner or operator conducting surface emission monitoring pursuant to OAR 340-239-0100(6)(b) must submit an Instantaneous Surface Monitoring Report within 30 days after the fourth consecutive quarter or monitoring if no exceedances are detected, or 30 days after a measured concentration of methane of 200 ppmv or greater, whichever is first." O.A.R. 340-239-0700(l)(A).

[66] *See* Kurt Spokas, et al., *Methane Mass Balance at Three Landfill Sites: What is the Efficiency of Capture by Gas Collection Systems?*, 26 WASTE MGMT. 516 (2006); R. Huitric et al., MEASURING LANDFILL GAS COLLECTION EFFICIENCIES USING SURFACE METHANE CONCENTRATIONS, SOLID WASTE ASS'N OF N.A. 30TH LANDFILL GAS SYMPOSIUM (2006).

[67] 2019 Technology Review Memo, *supra* note 12, at 29 (quoting *Solid Waste Industry for Climate Solutions (SWICS), Current MSW Industry Position and State-of-the-Practice on LFG Collection Efficiency, Methane Oxidation, and Carbon Sequestration in Landfills, Version 2.2*, SCS ENGINEERS (Jan. 2009) https://www.scsengineers.com/wpcontent/uploads/2015/03/Sullivan SWICS White Paper Version 2.2 Final.pdf.).

its regulatory framework.[68] For example, 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.[69] The researchers found that the type of cover on a landfill was the most significant factor impacting the flux of emissions.[70] 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.[71] 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.[72] Specific recommendations included:[73]

> (1) for daily cover: minimize the area and duration of coverage and install intermediate cover within days—not weeks—of waste placement;
> (2) for intermediate cover: increase thickness up to 1 meter (about 3 feet) with fines content over 30%, and minimize area; and
> (3) for final cover: thickness of over 150 cm (about 4.9 feet), fines over 60%, clay over 12%, and plasticity over 20%.

Moreover, cover cracks were the most frequent incidence emission cause specific to landfills, as summarized by CARB in this table:[74]

[68] *Preliminary Concepts for Potential Improvements to Landfill Methane Regulation*, CAL. AIR RES. BD. (May 18, 2023) https://ww2.arb.ca.gov/sites/default/files/2023-05/LMR-workshop_05-18-2023.pdf.
[69] *Greenhouse Gas and Criteria Air Pollutant Emissions and Gas Collection System Efficiencies at California Landfills*, CAL. AIR RES. BD. (Dec. 5, 2022) https://ww2.arb.ca.gov/sites/default/files/2022-12/Landfill%20GHG%20VOC%20and%20GCCS_0.pdf.
[70] *Id*.
[71] *Id*.
[72] *Id*.
[73] *Greenhouse Gas and Criteria Air Pollutant Emissions*, *supra* note 68.
[74] *Summary of 2020 and 2021 Airborne Methane Plume Mapping Studies*, *supra* note 51.

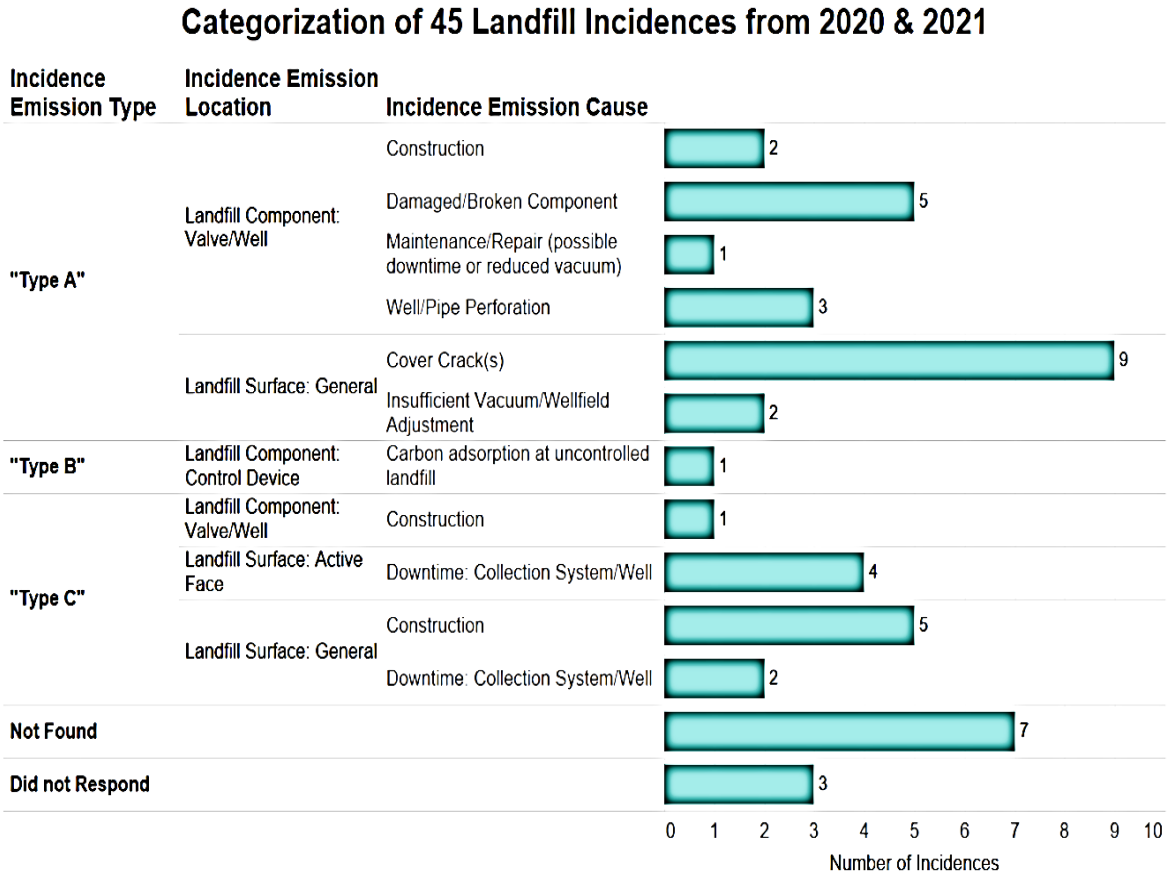


Figure 8. A graphic depicting the results of landfill operator feedback from the 2020 and 2021 airborne campaigns. Note that the Incidence classifications (Emission Type, Emission Location, and Emission Cause) were assigned by CARB staff based on operator responses.

Similarly, Oregon requires intermediate cover where no waste will be placed for at least 2 months.[75] Maryland requires that, "weather permitting," intermediate cover must be placed within one month of completion of a lift of waste.[76] Even federal RCRA rules require daily cover to be a minimum of six inches of earthen materials unless alternative cover is approved.[77]

Yet Ecology's draft rule does not impose any requirements for type or timing of cover. Moreover, the draft rule language related to monitoring of cover provides unchecked discretion by the owner or operator: "(iii) The landfill surface areas with cover penetrations, distressed vegetation, cracks, or seeps must also be inspected visually and with a hydrocarbon detector that

[75] Oregon DEQ, Solid Waste Landfill Guidance: Section 9 (Operations) 9-10, https://www.oregon.gov/deq/FilterDocs/SWGuidance09.pdf.
[76] COMAR 26.04.07.10(c)).
[77] 40 C.F.R. § 258.21.

meets the requirements of subsection (1) of this section. Exceedances of a methane concentration limit of 500 ppmv must be marked and remediated . . . ."

Accordingly, final rule should include the following (new language **bolded**):

WAC 173-408-080

- Gas collection and control systems: **(2) Weather permitting, a uniform compacted layer of cover material consisting of soils that promote oxidation and permeability suitable for being in place for extended periods of time not less than 1 foot in depth shall be placed over each portion of a lift not later than 1 month following completion of that lift.**

WAC 173-408-120

- (b) Instantaneous surface emissions monitoring procedures: (iii) The **entirety of** landfill surface areas with cover penetrations, distressed vegetation, cracks, or seeps must also be, **on a monthly basis,** inspected visually and with a hydrocarbon detector that meets the requirements of subsection (1) of this section. Exceedances of a methane concentration limit of 500 ppmv must be marked and remediated pursuant to WAC 173-408-110 (1)(b) and (c)."

WAC 173-408-170(6)

- **Surface emissions monitoring report: (d) deviation and malfunction reports for when the cover system malfunctions.**

WAC 173-408-160:

- **(xiii) Daily and interim cover operations and maintenance records:**
    - **Owner or operator must daily record the depth of cover applied and the materials used in a Daily Cover Log. The Daily Cover Log must also include:**
        - **The cells at which daily cover is applied;**
        - **Any repairs made to the cover;**
        - **Any odors noted;**
        - **Certification that peel-back was performed during waste disposal.**
    - **Owner or operator must maintain an Interim Cover Log and record the depth of cover applied and materials used. The Interim Cover Log must include:**
        - **The cells at which intermediate cover is applied;**
        - **Any repairs made to the cover;**
        - **Any odors noted; and**
        - **Certification that peel-back was performed during waste disposal.**

XI. The final rule should require leak detection in key GCCS system components.

Ecology's draft rule states that "components containing landfill gas must be monitored quarterly for leaks." It defines "Landfill gas" as "any untreated, raw gas derived through a natural process from the decomposition of organic waste deposited in a MSW landfill, from the evolution of volatile species in the waste, or from chemical reactions of substances in the waste." The draft rule defines "component" to mean any equipment that is part of a gas collection and control system and that contains landfill gas including, but not limited to, wells, pipes, flanges, fittings, valves, flame arrestors, knock-out drums, sampling ports, blowers, compressors, or connectors, and measurements from any vault must be taken within three inches above the surface of the vault exposed to the ambient air." Accordingly, the proposed standard is to monitor gas collection components for leaks only if they contain untreated landfill gas, essentially exempting the entire system after the initial compression, dewatering or filtering. This is in direct contradiction to when gas collection components are most in need of leak detection. The final rule should:

WAC 173-408-020

- Delete "untreated" from the definition of "landfill gas."
- The component leak language should refer to standard Method 21 as outlined under 8.3.1.

XII. The final rule should establish a clear time limit and protocol for temporary shutdowns.

The draft WAC 173-408-080(9)(b) omits any timeline for temporary shutdown of the GCCS and simply states, "Efforts to repair the collection or control system must be initiated and completed in a manner such that downtime is kept to a minimum, and the collection and control system must be returned to operation." Further, the draft language to "minimize emissions" is highly subjective. Under the proposed rule, for example, a site could turn off collection for a third of their facility for the purposes of cover construction activity and call it "minimizing emissions" simply by capping wells during the activity. The final rule should instead state the following (new language **bolded**):

WAC 173-408-080(9)(b)

- "Efforts to repair the collection or control system must be initiated and completed in a manner such that downtime is kept to a minimum, and the collection and control system must be returned to operation **no more than five days following initial shutdown**."

XIII. The final rule should affirm the obligation to collect gas in active areas.

The draft gas collection well extension language appears to delete the obligation to collect gas in active areas: "(8) Gas collection well casing extension: The requirements of subsections (3)(a) and (b) and (7) of this section do not apply to individual wells involved in well raising, provided the following conditions are met: (a) New fill is being added or compacted in the immediate vicinity around the well. (b) Once installed, a gas collection well extension is

sealed or capped until the raised well is reconnected to a vacuum source." This language contravenes the statutory goal of capturing gas from the largest sources of emissions. Neither California nor Oregon's regulatory frameworks contain this exemption language, and reasons for including it here in Washington are unclear. Ecology should thus revise the rule as follows:

- Delete "(8) Gas collection well casing extension: The requirements of subsections (3)(a) and (b) and (7) of this section do not apply to individual wells involved in well raising, provided the following conditions are met: (a)New fill is being added or compacted in the immediate vicinity around the well. (b) Once installed, a gas collection well extension is sealed or capped until the raised well is reconnected to a vacuum source."

XIV. The final rule should include sufficient enforcement mechanisms.

First, the draft rule has no enforcement mechanism where the GCCS is not installed. The current draft language states: "(xii) Any owner or operator of an active MSW landfill must install and operate a gas collection and control system within 18 months after approval of the design plan by the department or local authority, in accordance with the approved design plan." The rules lack clarity, such that there would be no repercussions where the state does not approve the plan, thus contravening federal requirements that the landfill should install/operate GCCS within 30 months of first report triggering applicability (40 CFR 63.1959(a)(2)(ii)(A)). Second, the draft rule is missing component leak evaluation and enforceability. Ecology should thus revise the rule as follows (new language **bolded**):

- Adopt Oregon's rule language in place of current language: "**The owner or operator must install and operate a gas collection and control system not later than 30 months after the date that the landfill is required to comply with this rule.**"
- Include the relevant language from Oregon's rule, 340-239-0600 Monitoring Requirements, the entirety of section (3).

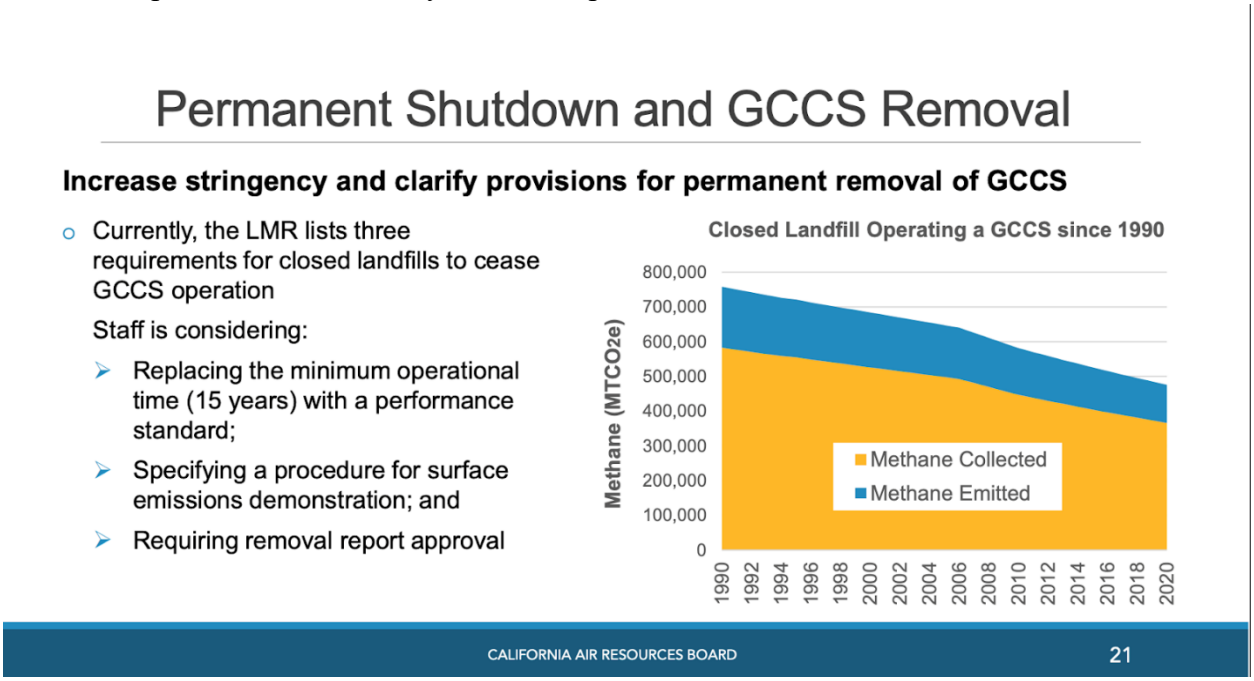
XV. The final rule should strengthen requirements for closed landfills.

There are over 30 closed municipal solid waste landfills in Washington.[78] A few of these already report estimated emissions to the EPA Greenhouse Gas Reporting Program: Cathcart LF (12,808.0), Cowlitz County LF, Fort Lewis LF #5, Hidden Valley LF, Olympic View Sanitary LF, Inc. (OVSL), and Tacoma City Solid Waste Facility.[79]

In its public presentation on May 18, 2023, CARB shared an example of a landfill that continued to release significant amounts of methane for thirty years following its closure and which CARB anticipated would require GCCS until 2060, seventy years post-closure.[80] Under

[78] *LMOP Database*, U.S. ENV'T PROT. AGENCY (Feb. 1, 2018) https://www.epa.gov/sites/default/files/2018-02/lmopdatawa.xlsx.
[79] *Id.*
[80] CAL. AIR RES. BD., *supra* note 43.

EPA regulations, closed landfills can remove their GCCS systems after operating them for 15 years after closure. In its rule revisions, CARB is now considering whether to replace the minimum operational time of 15 years with a performance standard:[81]



By contrast, the draft Ecology rule states, "The owner or operator of a closed MSW landfill may propose to the department or local authority that a gas collection and control system be decommissioned and removed provided the following requirements are met: (1) The gas collection and control system has been in operation for at least 15 years, or the owner or operator demonstrates to the satisfaction of the department or local authority that, due to declining methane production rates, the MSW landfill will be unable to operate the gas collection and control system for a 15-year period."

The 15-year operational period fails to specify in operation for 15 years after closure. Functionally, a closed landfill will likely be much older than 15 years, setting up a situation where the closed landfill could immediately opt to take out their gas collection and control system. Additionally, the draft rule allows any closed landfill to shut down their GCCS, while federal standards (40 CFR § 63.1959) include an NMOC calculation threshold ensuring the largest landfills with the greatest emissions potential continue GCCS. Accordingly, the final rule should be revised as follows (new language **bolded**):

WAC 173-408-090

- The landfill must meet the removal criteria set forth in 40 C.F.R. § 63.1957.

WAC 173-408-090(1)

[81] *Id.*

- "The gas collection and control system has been in operation for at least 15 years **after an owner or operator has submitted a closure notification that has been approved**, or the owner or operator demonstrates to the satisfaction of the department or local authority that, due to declining methane production rates, the MSW landfill will be unable to operate the gas collection and control system for a 15-year period **after closure."**

XVI. The rule's recordkeeping and reporting requirements should include key record keeping requirements to align with Oregon's Landfill Emissions rule and to provide a public record that landfills are operating as required.

Since Ecology and the local air districts do not conduct their own emissions and gas component leak monitoring at landfills, landfill owners and operators must do so without oversight. Accordingly, robust record keeping is the principal means of tracking compliance. Therefore, the rule should include the following language (per Oregon's rule, Landfill Gas Emissions section 340-239-070):[82]

Record Keeping

(1) (v) should be changed to:

"Records of all instantaneous surface readings of 100 ppmv or greater; all exceedances of the limits in WAC 173-408-100(1), including the location of the leak (or affected grid), leak concentration in ppmv, date and time of measurement, the action taken to repair the leak, date of repair, any required re-monitoring and the re-monitored concentration in ppmv, and wind speed during surface sampling; and the installation date and location of each well installed as part of a gas collection system expansion"

(1) (vii) should be changed to the following: "Monthly solid waste acceptance rate, for active landfills or landfills that have accepted waste within the last five years and the current amount of waste-in-place including waste composition"

(1) (xiii): This section requires reporting on "non routine maintenance construction activity" - a term that is not defined and is not comprehensive. Instead, the rule should incorporate Oregon's reporting language: "Any construction activities pursuant to XXX. Records must contain the following information:

(i) A description of the actions being taken, the areas of the landfill that will be affected by these actions, the reason the actions are required, and any landfill gas collection system components that will be affected by these actions;

(ii) Construction start and finish dates, projected equipment installation dates, and projected shut down times for individual gas collection system components; and

(iii) A description of the mitigation measures taken to minimize methane emissions and other potential air quality impacts;"

[82] O.A.R. 340-239-0700.

XVII. The rule should clearly require comprehensive record keeping for open flares.

The draft rule omits open flares from the "Records of the equipment operating parameters" section, or (1) (xi), instead including it in a different section that requires reporting "*as measured during the initial source test or compliance determination*." The rule should incorporate Oregon's language as follows:[83]

- **"For open flares, continuous records of the flame or flare pilot flame monitoring, and up-to-date, readily accessible records of all periods of operation in which the flame or flare pilot flame is absent; and (E) The indication of flow to the control system and the indication of bypass flow or records of monthly inspections of car-seals or lock-and-key configurations used to seal bypass lines;"**

XVIII. The rule should clearly require comprehensive record keeping for open flares.

The draft rule omits recordkeeping requirements to document that the landfill operator is fulfilling the surface emissions requirements and gas control parameters. The final rule should therefore include the following language from Oregon's rule section 340-239-0700:

"(P) Landfill owners or operators demonstrating that site-specific surface methane emissions are below 200 ppmv by conducting surface emission monitoring under WAC 173-408-070 must keep for at least five years up-to-date, readily accessible records of all surface emissions monitoring and information related to monitoring instrument calibrations conducted according to sections 8 and 10 of Method 21 of appendix A of 40 C.F.R. Part 60, including all of the following items:

(i) Calibration records, including:

(I) Date of calibration and initials of operator performing the calibration;

(II) Calibration gas cylinder identification, certification date, and certified concentration;

(III) Instrument scale(s) used;

(IV) A description of any corrective action taken if the meter readout could not be adjusted to correspond to the calibration gas value; and

(V) If an owner or operator makes their own calibration gas, a description of the procedure(s) used;

(ii) Digital photographs of the instrument setup, including the wind barrier. The photographs must be accurately time and date-stamped and taken at the first sampling location prior to sampling and at the last sampling location after sampling at the end of each sampling day;

[83] *Id.*

(iii) Timestamp of each surface scan reading which must be detailed to the nearest second, based on when the sample collection begins and log for the length of time each sample was taken using a stopwatch (e.g., the time the probe was held over the area);

(iv) Location of each surface scan reading. The owner or operator must determine the coordinates using an instrument with an accuracy of at least four meters. Coordinates must be in decimal degrees with at least five decimal places;

(v) Monitored methane concentration (ppmv) of each reading;

(vi) Background methane concentration (ppmv) after each instrument calibration test;

(vii) For readings taken at each surface penetration, the unique identification location label matching the label specified in subparagraph XXX; and

(viii) Records of the operating hours of the gas collection system for each destruction device;

(R) The date of initial placement of waste in newly constructed landfill cells; and

(S) Documentation of any component leaks above 250 ppmv methane detected pursuant to WAC 173-408-070 and all repairs performed in response to any component leaks above 500 ppmv.

(T) The maximum design capacity of the landfill."

XIX. Please confirm that Ecology's draft rule, as written, conforms to applicable standards under Washington's authorizing statute and federal law.

Industrious Labs and Zero Waste Washington are concerned that Ecology's rule, as written, fails to comply with the mandates of Washington's authorizing statute, RCW 70A.540, and federal law. Please consider the concerns expressed in this letter and please explain how the final rule complies with state and federal law on the issues raised herein. Please also respond to these comments in writing so our clients and others can understand Ecology's views on these issues.

We appreciate the opportunity to comment on the proposed Chapter 173-408 WAC, Landfill Methane Emissions rule. Industrious Labs and Zero Waste Washington support Ecology's efforts to follow in the footsteps of California, Oregon, and the federal government in better regulating MSW landfill emissions. However, the rule must further optimize these frameworks in line with technological and scientific advancements. The rule *must* expressly create a pathway for the use of remote monitoring technologies, incorporate credible third-party super emitter detection, require earlier installation of GCCS, eliminate loopholes that weaken surface emissions monitoring and gas collection and control efficacy and incorporate stronger mechanisms for public reporting and transparency.

Thank you for taking the time to review and respond to these comments and questions. Please notify me, Industrious Labs, and Zero Waste Washington in writing of any subsequent action on this rule. Please also contact me with any questions or concerns about these comments or to meet with me or my clients to discuss them. You can reach me at the phone number or email address listed in the letterhead or by mail at Kampmeier & Knutsen PLLC, 705 Second Avenue, Suite 901, Seattle, Washington 98104.

Sincerely,

Kampmeier & Knutsen PLLC

By: 

Mariah Harrod

Attorneys for Industrious Labs & Zero Waste Washington

ATTACHMENTS (submitted under separate cover on December 11, 2023):

1. Memorandum from E. Rsch. Grp., Inc. on Clean Air Act Section 112 (d)(6) Tech. Rev. for Mun. Solid Waste Landfills to Allison Costa and Andy Sheppard, EPA, Off. of Air Quality Planning & Standards, at 29-30, 31-32, 36- 41, 44-45 (June 25, 2019).
2. Leah Kelly et al., *Petition for Rulemaking to Revise the New Source Performance Standards and Emission Guidelines for Municipal Solid Waste Landfills*, ENV'T INTEGRITY PROJECT (June 22, 2023).
3. U.S. Environmental Protection Agency, *Clean Air Act Inspection Report Waste Connections LRI-304th St Landfill, Graham,* WA, May 25, 2022.
4. U.S. Environmental Protection Agency, *Clean Air Act Inspection Report Republic Services Roosevelt Regional Landfill, Roosevelt,* WA, July 11, 2022.
5. U.S. Environmental Protection Agency, *Clean Air Act Inspection Report Waste Management – Prairie Hill Landfill, Morrison,* Illinois, August 16, 2021.
6. U.S. Environmental Protection Agency, *Clean Air Act Inspection Report Waste Management Countryside Landfill*, Grayslake, Illinois, December 2, 2021.
7. U.S. Environmental Protection Agency, *Clean Air Act Inspection Report Republic Services Coffin Butte Landfill*, Corvallis, OR, September 19, 2022.
8. Letter from Stefan Johnson, Group Leader, Measurement Tech. Group, to David Barron, Chief Tech. Officer, Sniffer Robotics, LLC (Dec. 15, 2022).
9. *Reducing Canada's Landfill Methane Emissions: Proposed Regulatory Framework*, GOV. CANADA (June 14, 2023) https://www.canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/publications/reducing-landfill-methane-emissions.html.
10. U.S. Environmental Protection Agency, "Quantifying from Landfilled Food Waste" October 2023, https://www.epa.gov/system/files/documents/2023-10/food-waste-landfill-methane-10-8-23-final_508-compliant.pdf.
11. *Preliminary Concepts for Potential Improvements to Landfill Methane Regulation*, CAL. AIR RES. BD. (May 18, 2023) https://ww2.arb.ca.gov/sites/default/files/2023-05/LMR-workshop_05-18-2023.pdf.
12. *Pennsylvania Methane Overflight Study Final Report*, Pennsylvania Department of Environmental Protection, December 2022, https://www.depgreenport.state.pa.us/elibrary/GetDocument?DocName=PENNSYLVANIA%20METHANE%20OVERFLIGHT%20STUDY%20FINAL%20REPORT.PDF%20%20%3Cspan%20style%3D%22color%3Agreen%3B%22%3E%3C%2Fspan%3E%20%3Cspan%20style%3D%22color%3Ablue%3B%22%3E%3C%2Fspan%3E&docId=5424315.
13. *Greenhouse Gas and Criteria Air Pollutant Emissions and Gas Collection System Efficiencies at California Landfills,* California Air Resources Board, December 5, 2022 https://ww2.arb.ca.gov/sites/default/files/2022-12/Landfill%20GHG%20VOC%20and%20GCCS_0.pdf.