

November 9, 2025

**To: California Air Resources Board (CARB)
Sacramento, CA**

**Re: TrelliSense Comment on CARB's Proposed Amendments to the Regulation
on Methane Emissions from Municipal Solid Waste Landfills**

Dear CARB Review Team,

TrelliSense appreciates the opportunity to provide feedback on CARB's Proposed Amendments to the Regulation on Methane Emissions from Municipal Solid Waste Landfills. As a company specializing in precise methane monitoring using continuous optical sensors and data analytics, TrelliSense supports state and federal efforts to enhance the accuracy and transparency of methane emissions reporting at landfills, which are some of the largest single methane emissions sources in the world.

TrelliSense's methane monitoring platform leverages long-range, low-cost and continuous optical sensors to provide detection, localization and quantification of methane from sites of all shapes and sizes. Our sensor package includes a dynamic-path model that uses the sun as a spectroscopic light source; by tracking the sun's path across the sky, the sensors can measure methane concentrations across large areas on a daily basis. In addition, we have developed a fixed-path sensor that uses an eye-safe, non-visible laser to measure methane concentrations continuously over fixed paths of up to 400 meters, which is long enough to traverse most landfill working faces. Importantly, we are capable of pairing one sensor with multiple laser retroreflectors to create a multi-path grid over which we can continuously cycle our sensor and take thousands of methane concentration readings per day with a fractional precision well within 1%.

By strategically positioning sensor units (i.e. sun-tracking sensors and fixed-path sensors) across landfills, we can continuously monitor more critical areas (e.g. working faces and wellfields) while slowly scanning over larger and lower-emitting areas (e.g. closed areas and perimeters) on a daily basis.

Importantly, our sensors are small and portable, weighing less than 20 lbs each and powered by solar panels with onboard batteries so that we can outfit sites in 2-3 days. Due to our sensors' long optical range we can monitor critical equipment and emissions sources without the need for unsafe or obstructive placement; our only placement restriction is ensuring line-of-sight to the relevant light source (e.g. retroreflective mirrors or the sun). Finally, all of our units have wind speed & direction sensors onboard, aiding in localization and quantification of detected anomalies.

Thank you for your review and consideration of TrelliSense's comments below.

TrelliSense's Position on Landfill Methane Management

Managing landfills is not an easy business. On a daily basis, landfill managers have to balance operations, safety, permitting, environmental compliance and hazards, personnel management, variable weather, gas collection, vendor needs and challenges, public relations, odor management, and planning - not to mention economics. And, of course, no two landfills are the same. It is critical to recognize the complexities and competing demands placed on landfill owners/operators when designing new regulations, especially those with the potential to increase compliance costs.

For this reason, TrelliSense's primary comment as described further below is to **better enable, through regulatory design and language, the practice of using fixed, continuous technologies to monitor methane emissions and optimize gas collection.** Continuous methane measurement platforms like TrelliSense have the potential to reduce landfills' long-term monitoring costs, mitigate safety hazards by reducing manual surveys, minimize false positives, and maximize emissions abatement and odor control through proactive and prompt discovery and management of methane emissions events.

Commendation and Support for CARB's Forward-Looking Approach

TrelliSense would like to commend CARB for the overall thoughtfully designed updates proposed under the *Landfill Methane Regulation (LMR)*. The new rule represents a meaningful step toward aligning landfill operations with California's broader greenhouse gas reduction goals. In particular, the integration of remote emissions plume detection and expanded monitoring flexibility demonstrates CARB's commitment to data-driven regulation and supporting innovation in methane abatement.

Continuous and Remote Monitoring: A Constructive Path Forward

TrelliSense is particularly supportive of CARB's inclusion of flexible remote sensing allowances including continuous monitoring technologies. Continuous monitoring has the potential to transform the accuracy and timeliness of methane management, offering a clear pathway toward measurable and verifiable emissions reductions.

TrelliSense believes that continuous monitoring should become a desirable and common practice across landfill operations. Therefore, it is our primary recommendation that CARB ensure the rule avoids any unintended disincentives for this practice. Specifically, operators who deploy continuous measurement systems should not face disproportionate compliance burdens for follow-up actions based on temporary exceedances that might otherwise go undetected with a quarterly survey practice.

TrelliSense encourages CARB to consider defining exceedances in a way that emphasizes temporal persistence (e.g., emissions that last beyond a defined period) rather than instantaneous readings. This approach would help promote the adoption of continuous

monitoring while maintaining regulatory integrity, and focusing site operator efforts on managing the leaks that truly matter - those that are not just large, but sustained.

Comments on Specific Sections

- **§95464(a)(3)(B) – Prohibition on venting landfill gas to the ambient air**
TrelliSense suggests clarifying the applicable penalty framework and/or corrective actions for (a) unintentional venting or (b) brief operational releases during maintenance, especially if different. Guidance on enforcement discretion or thresholds for material releases would provide helpful certainty to operators.
- **§95464(a)(6) – Cover Monitoring Plan**
TrelliSense recommends allowing operators to perform cover integrity monitoring “*monthly or more frequently*” to meet the standard. Explicitly allowing daily or continuous monitoring here, rather than specifically requiring monthly surveys, could incentivize proactive site management while aligning with the capabilities of new monitoring technologies and methods that may operate continuously.
- **§95465(a)(2) – Average Concentration Limits**
TrelliSense strongly recommends time-restricting and/or raising the specified average concentration limit of 25 ppmv. TrelliSense’s sensors on landfills (including in California) regularly observe path-averaged methane concentrations well into the 100s of ppmv, although such high levels are typically only observed at night when methane tends to “pool” during periods of falling atmospheric pressure and when the winds tend to be calmer. Therefore, as written, we expect that this provision will be regularly violated by any landfill with 24/7 data collection, even those with normal and otherwise compliant operations. TrelliSense hopes that CARB agrees that it is important to avoid placing this barrier to the adoption of continuous monitoring. Our specific suggestions are as follows:
 - TrelliSense suggests calling an exception for sites with continuous 24/7 monitoring by (a) raising the average limit to 50 ppmv, (b) excluding measurements taken outside of site operating hours, and (c) allowing a full operating day’s worth of data to be included in average calculations (i.e. expanding temporal bounds). TrelliSense believes that any truly problematic leaks will still violate such a limit, fulfilling the intent of this regulation by helping to identify and rectify issues promptly, while reducing “false positive” actions required of landfill operators.
 - In fact, Section §95469(e)(8)(a) contains language on wellhead parameters which provides a useful structural analogy for limiting pertinent observations subject to triggering violations when monitored more frequently than weekly. TrelliSense recommends applying this precedent language to surface emissions monitoring, with the parameters suggested above (or similar) so as to avoid disincentivizing continuous monitoring.

- **§95469(a)(4)(B) – Surface Emissions Monitoring Frequency**
TrelliSense recommends allowing operators to perform surface emissions monitoring “*monthly or more frequently*” to meet the standard. Explicitly allowing daily or continuous monitoring here, rather than specifically requiring monthly surveys, could incentivize proactive site management while aligning with the capabilities of new monitoring technologies and methods that may operate continuously.
- **§95469(a) – Re-Monitoring**
TrelliSense suggests clarification of what constitutes “re-monitoring”. We believe that a continuous monitoring system should qualify as a re-monitoring method. If CARB agrees, we recommend including this allowance in this section. Allowing landfill operators to focus resources on corrective actions rather than manual re-monitoring efforts will both help ease the burden of compliance with this rule and facilitate effective corrective action.
- **§95469(b)(1) – Remotely Detected Emissions Plumes**
TrelliSense recommends defining what constitutes a “methane emission plume”, either in terms of ppmv observed or kg/hr estimated. Defining this threshold will help guide operators towards meeting such a standard and avoiding violations.
- **§95469(e) – Wellhead Monitoring Frequency**
TrelliSense recommends allowing operators to perform wellhead monitoring “*monthly or more frequently*” to meet the standard. Explicitly allowing daily or continuous monitoring here, rather than specifically requiring a monthly frequency, could incentivize proactive site management while aligning with fixed and continuous wellhead controls technologies.
- **§95471(c)(1)(A) – Monitoring Area**
TrelliSense supports the 180-day exclusion for working face monitoring, but suggests assuring landfill operators that these grid cells will not be subject to remote plume detection violations during this grace period. This will require the use of remote detection technologies that are proven capable of distinguishing between 50,000-square-foot-grids.

Conclusion

TrelliSense believes that methane quantification technologies with both spatial (i.e. optical) and temporal (i.e. continuous) coverage are essential for improving methane reporting accuracy, and, more importantly, effective landfill emissions management. We hope that our response has helped the reviewing committee better design the proposed rule to anticipate further rapid improvements in accurate and low-cost quantification methods beyond what is available today, to make compliance easier on landfill operators while effectively and efficiently abating methane across California’s subject landfills. We hope that CARB’s LMR updates are designed to be nimble and accommodating in

anticipation of rapid emissions measurement technology improvements in the coming years, and we look forward to continued collaboration with CARB to refine standards and protocols that enhance methane emission accountability and contribute to state climate mitigation efforts.

CARB's proposed rule is an important milestone in advancing the state of the art of landfill methane mitigation, and TrelliSense appreciates the agency's collaborative engagement and evidence-based approach. We look forward to supporting CARB in the implementation phase and contributing to the broader adoption of continuous monitoring technologies that balance compliance assurance, emissions reductions, and operational feasibility.

Sincerely,

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