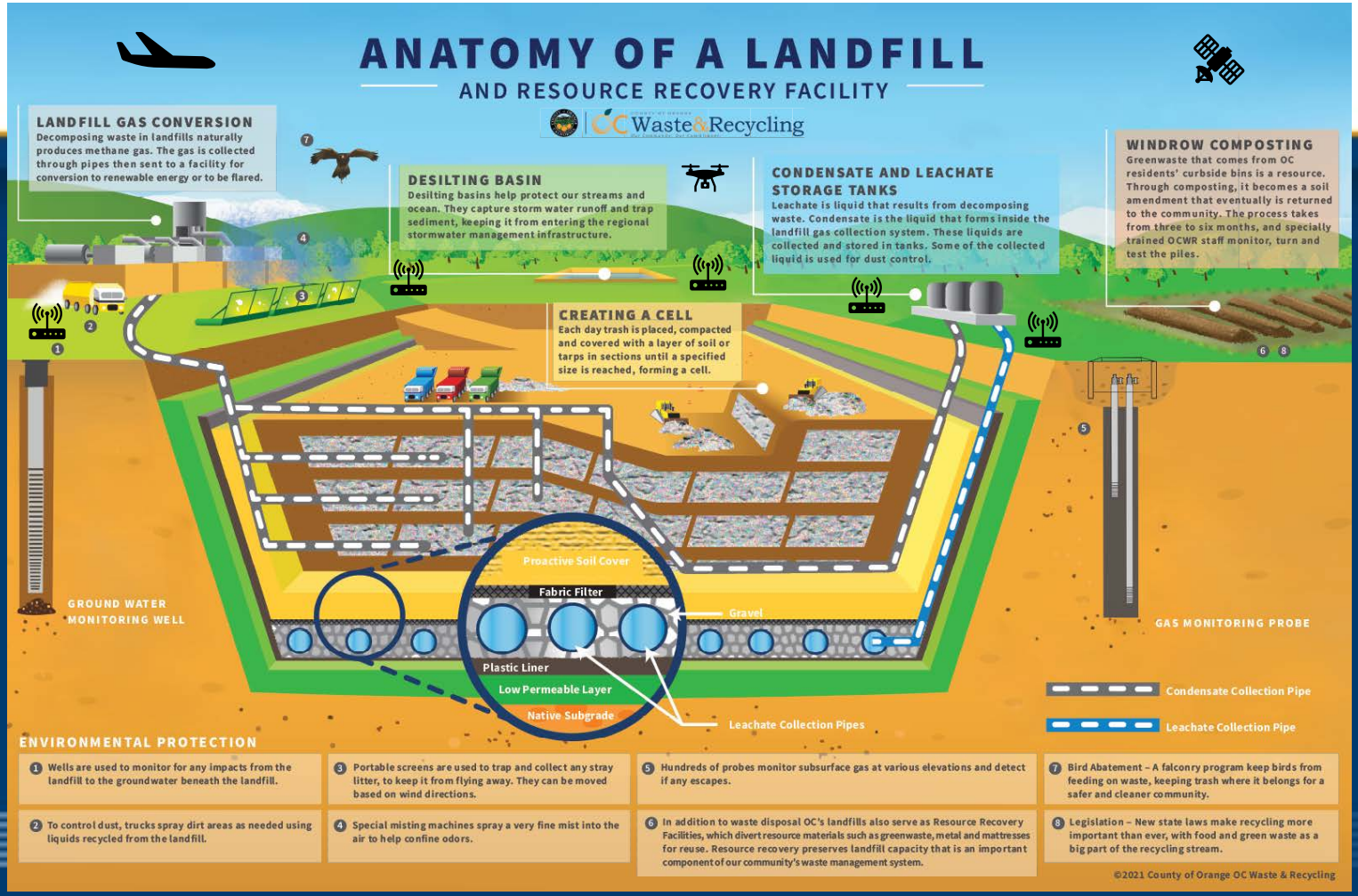
USEPA White Paper Update on Landfill Emission Clearing the Air: Latest on Landfills Passing Gas.



Tom Koutroulis

March 19, 2025

What should we expect?

EPA Launches Biggest Deregulatory Action in U.S. History
Administrator Zeldin Announces 31 Historic Actions to Power the Great American Comeback
March 12, 2025

WASTEDIVE

”EPA Administrator Lee Zeldin said the agency was giving power back to the states in a short video address, also released Wednesday.”

EPA revisiting dozens of climate, environment rules in ‘day of deregulation’
Jacob Wallace, Editor Published March 12, 2025

EREF

”When the fed puts down their pen, the states picks their pen up.”
Anne M. Germain, Chief Technical & Regulatory Affairs
National Waste & Recycling Association
March 4th, 2025 EREF Summit on Landfill Emissions

Fenceline Monitoring for Landfills

➔ **Recommendations:**

➔ Implement fenceline monitoring for early detection of emissions such as methane and hydrogen sulfide.

➔ Use passive sorbent tube sampling (similar to petroleum refineries) to continuously track emissions.

➔ Establish action levels to trigger corrective actions when emissions exceed regulatory thresholds.

➔ Utilize optical gas imaging and EPA Method 21 to identify and repair fugitive emission sources.

➔ Install monitoring stations at strategic locations, especially near active landfill areas and adjacent communities.

➔ Provide public access to monitoring data to improve transparency and build trust with local communities.

➔ **Expected Benefits:**

➔ Earlier identification and mitigation of landfill gas leaks.

➔ Reduction in hazardous air pollutants and community exposure.

➔ Improved regulatory compliance and community relations.

Use of Unmannded Aircraft Systems (Drones) for Methane Monitoring

➔ **Recommendations:**

➔ Consider integrating Unmanned Aircraft Systems (UAS) with onboard methane sensors for surface emission monitoring.

➔ Utilize EPA-approved ALT-150 method to detect methane "hot spots" and confirm leaks using ground-based verification.

➔ Explore the potential of downward-facing laser UAS technology for path-integrated methane measurements.

➔ Compare drone-based data with manual EPA Method 21 readings for accuracy and regulatory compliance.

➔ **Expected Benefits:**

➔ Increased efficiency and safety by reducing the need for manual inspections on hazardous terrain.

➔ Faster identification and response to methane leaks.

➔ Cost-effective and scalable monitoring solution for large landfill sites.

Review & Compare US & Canadian Regulations

➔ **Recommendations:**

➔ Align federal NSPS/EG standards with more stringent state and Canadian regulations on landfill gas emissions.

➔ Lower landfill size and emission thresholds for mandatory installation **of gas collection and control systems (GCCS).**

➔ Implement stricter surface methane limits **(e.g., 200 ppmv vs. 500 ppmv in current EPA rules).**

➔ Prohibit open flaring of landfill gas, instead **requiring enclosed flares or energy recovery**.

➔ Require **more frequent emissions monitoring** and shorter response times for repairs with mandatory methane recovery for landfills over 100,000 Mg waste-in-place.

➔ **California, Washington, and Maryland have stricter methane control regulations than federal NSPS/EG.**

➔ **Expected Benefits:**

➔ Improved landfill gas capture rates (target 70% by 2030).

➔ Stronger compliance with methane reduction goals under the U.S. Methane Emissions Reduction Action Plan.

➔ Minimized greenhouse gas emissions and local air pollution.

➔ *California – leading indicator for landfill management for USEPA*

Environment and Climate Change Canada

Organic Waste Diversion for Methane Reduction

➔ **Recommendations:**

➔ Encourage diversion of organic waste (food scraps, yard trimmings) to reduce methane emissions.

➔ Support composting, anaerobic digestion, and waste-to-energy solutions as alternatives to landfilling.

➔ Consider state and local mandates for organic waste separation and recycling.

➔ Improve public awareness and infrastructure for organic waste collection.

➔ **Expected Benefits:**

➔ Reduced landfill methane emissions (food waste accounts for ~58% of fugitive methane).

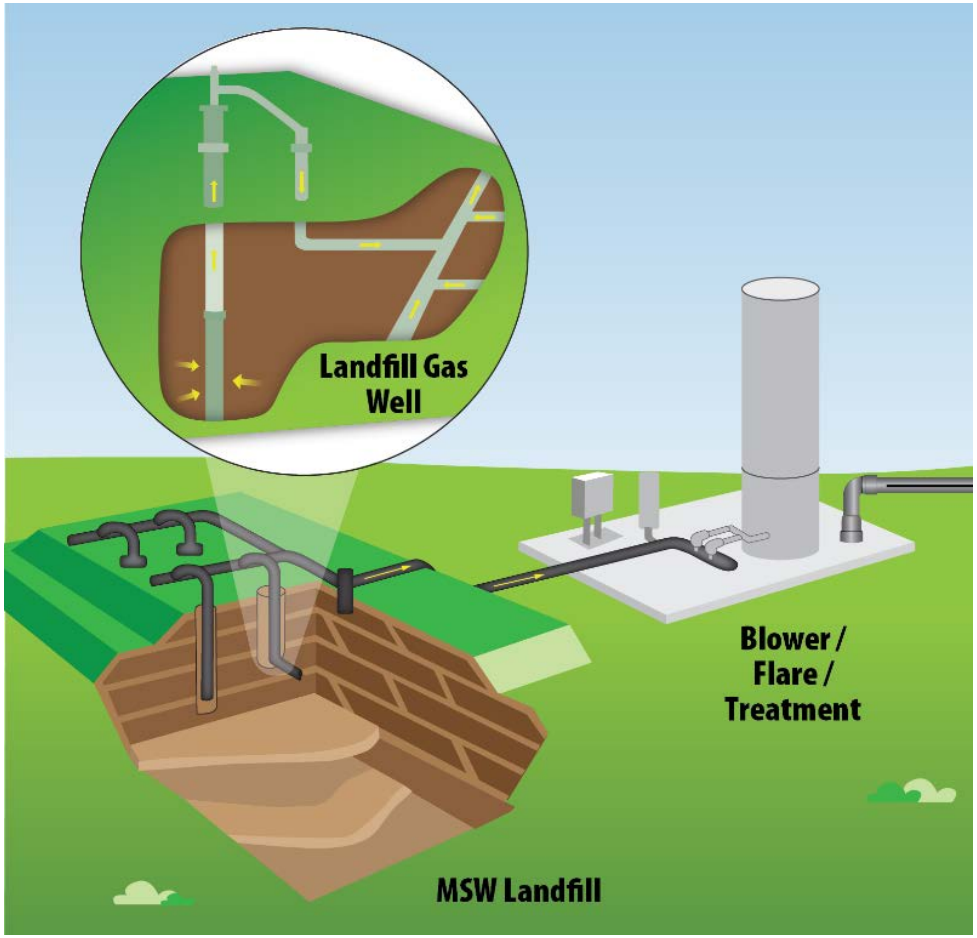
➔ Lower landfill volume, extending operational lifespan.

➔ Enhanced waste management sustainability.

Reduce Lag Time for GCCS

- **Recommendations:**
- Reduce the 30-month timeframe for GCCS installation after emissions exceed EPA thresholds.
- Require earlier landfill gas collection system deployment in new active areas.
- Increase destruction efficiency of GCCS from NMOC-based to methane-based criteria.

- **Expected Benefits:**
- Faster mitigation of methane emissions from rapidly degrading waste.
- Improved compliance with the U.S. Methane Emissions Reduction Action Plan.
- Better alignment with state and Canadian regulations.



Lower Landfill Size Threshold for GCCS

➔ **Recommendations:**

➔ Reduce the minimum landfill size requirement (currently 2.5 million Mg/m³) for regulatory compliance.

➔ Adopt methane-based emissions thresholds instead of NMOC-based criteria.

➔ Require smaller landfills to report emissions earlier and install GCCS sooner.

➔ **Expected Benefits:**

➔ Expands methane mitigation requirements to more landfills.

➔ Captures uncontrolled methane emissions before they become significant.

➔ Aligns with stricter state regulations (e.g., California, Washington, Maryland).

Increase Landfill Gas Collection Efficiency

➔ **Recommendations:**

➔ Optimize well placement and vacuum systems to maximize gas collection.

➔ Improve monitoring of gas wells for leaks and inefficiencies.

➔ Address leachate buildup in gas collection wells, which reduces efficiency.

➔ Adapt to changing atmospheric conditions that affect landfill gas emissions.

➔ **Expected Benefits:**

➔ Higher methane capture rates, reducing greenhouse gas impact.

➔ Enhanced gas-to-energy conversion for renewable energy projects.

➔ Improved regulatory compliance and operational efficiency.

Improve Daily Cover & Working Face Mgmt

➔ **Recommendations:**

➔ Minimize the active working face to reduce emissions from exposed waste.

➔ Use alternative daily cover materials (e.g., tarps, foams, biodegradable mats) to enhance gas containment.

➔ Install horizontal gas collection trenches under active waste areas for better methane capture.

➔ Monitor high-emission zones with advanced tracking technologies.

➔ **Expected Benefits:**

➔ Reduced surface methane emissions from working face areas.

➔ Lower odor and pest problems in landfill operations.

➔ Enhanced long-term landfill stability and regulatory compliance.

Improve Intermediate & Final Cover

- **Recommendations:**
- Implement engineered landfill covers to enhance methane oxidation.
- Use biocovers with methanotrophic bacteria to convert methane into CO_2.
- Improve barrier materials to reduce gas leakage.

- **Expected Benefits:**
- Increases methane oxidation and capture efficiency.
- Reduces methane emissions through better cover management.
- Enhances long-term landfill stability.

Utilize Aerial Monitoring for Methane Detection

➔ **Recommendations:**

➔ Integrate airborne and satellite-based methane monitoring for emissions tracking.

➔ Use remote sensing technologies (e.g., drones, aircraft, satellites) to detect methane leaks.

➔ Develop regulatory frameworks for aerial data inclusion in compliance programs.

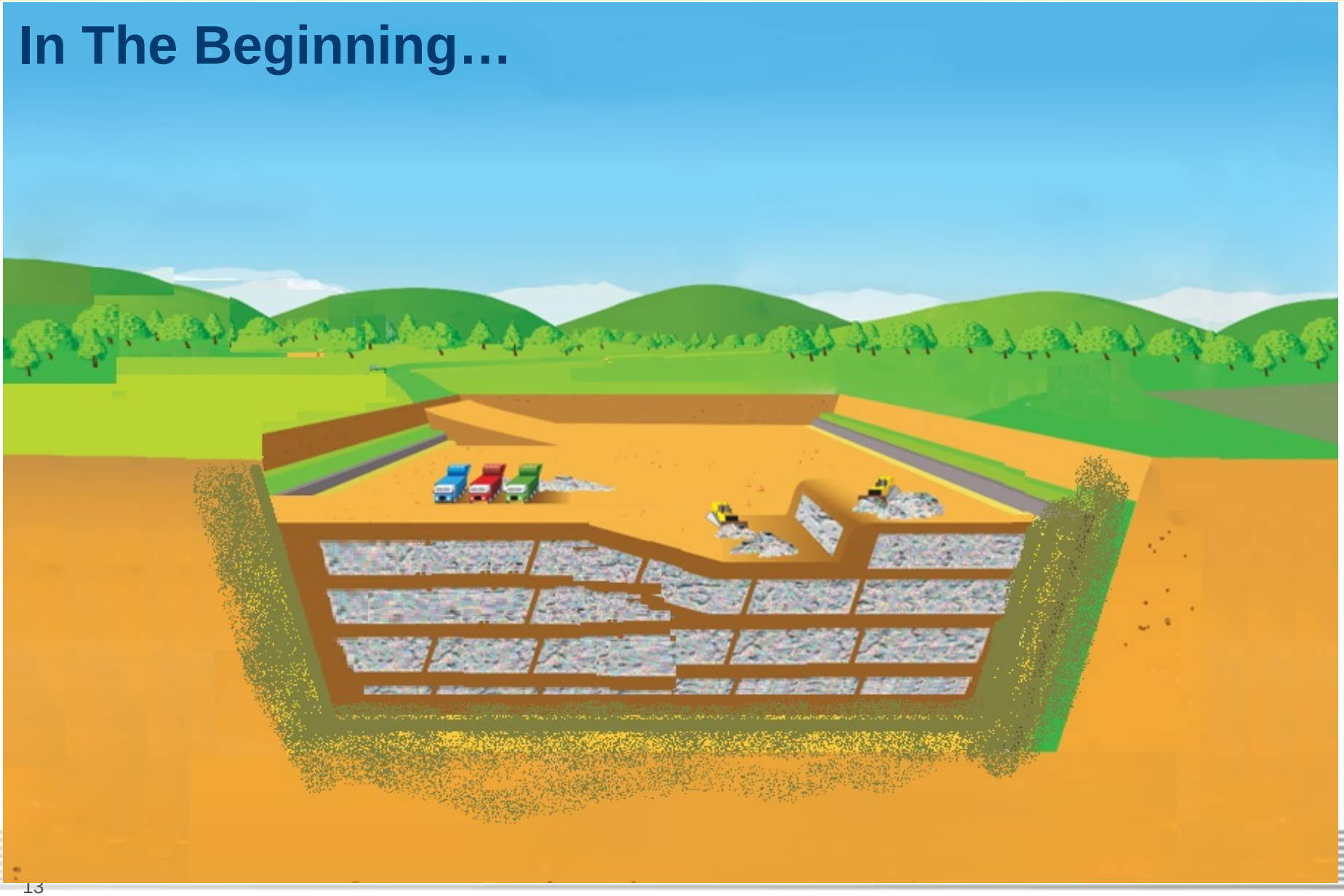
➔ **Expected Benefits:**

➔ Faster detection and mitigation of landfill methane emissions.

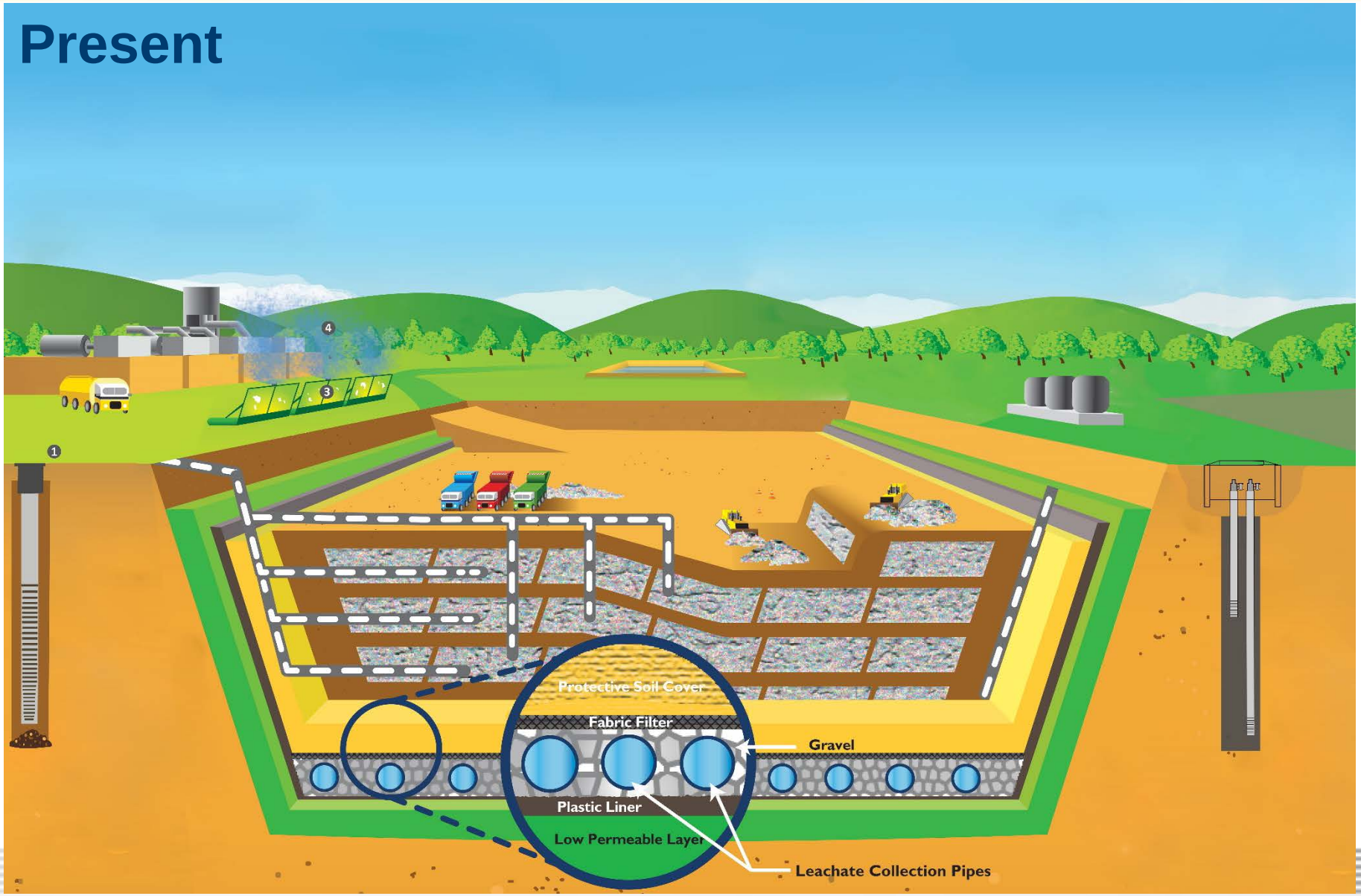
➔ Enhances data accuracy for regulatory compliance.

➔ Reduces manual inspection costs and improves safety.

In The Beginning…



Present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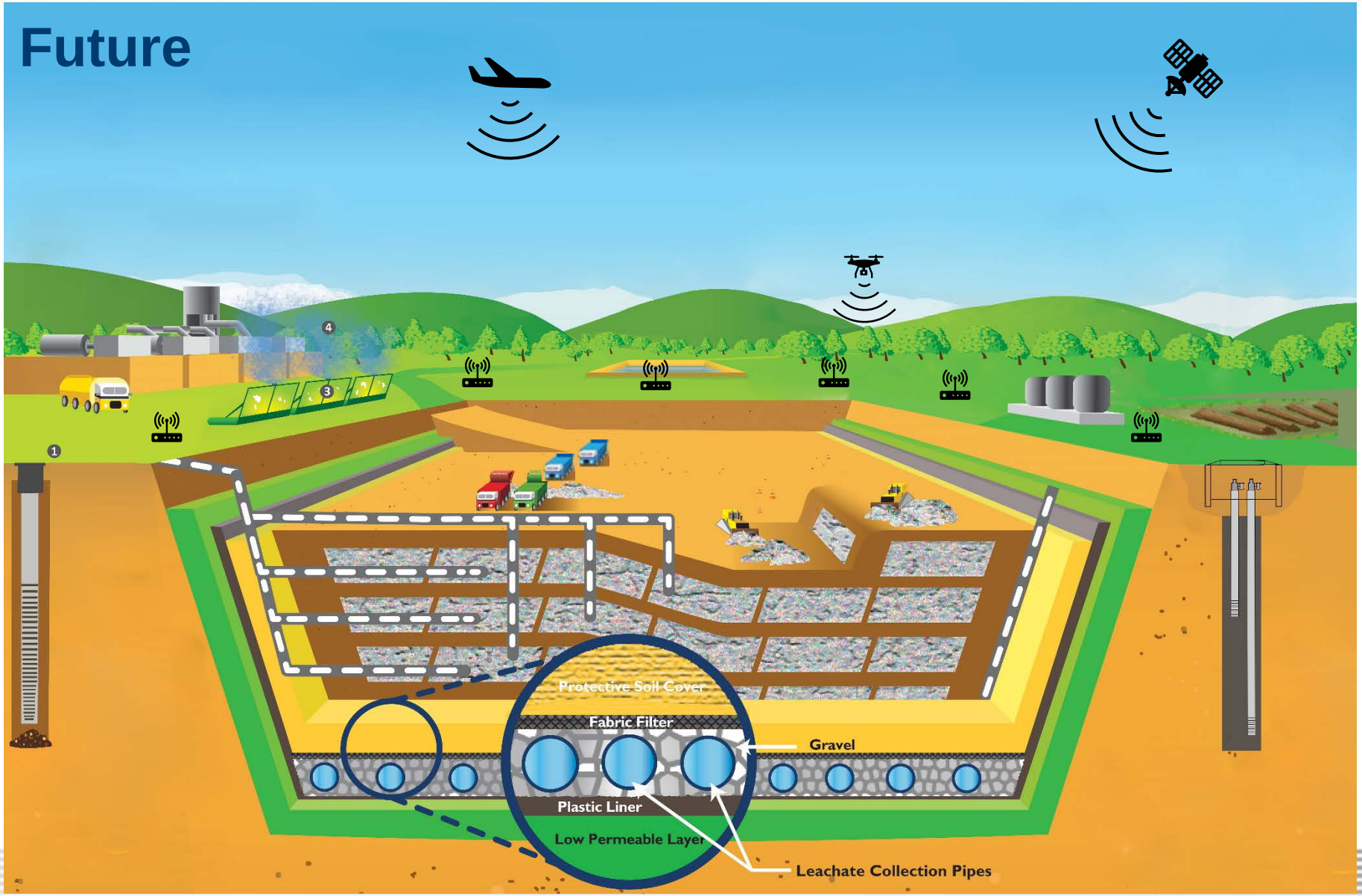
Protective Soil Cover
Fabric Filter
Gravel
Plastic Liner
Low Permeable Layer
Leachate Collection Pipes

Future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COUNTY OF ORANGE
OC Waste&Recycling
Our Community. Our Commitment.

CEAC Resource Recovery & Waste Management Policy Committee

ANATOMY OF A LANDFILL
AND RESOURCE RECOVERY FACILITY
...IS CHANGING

OC Waste&Recycling

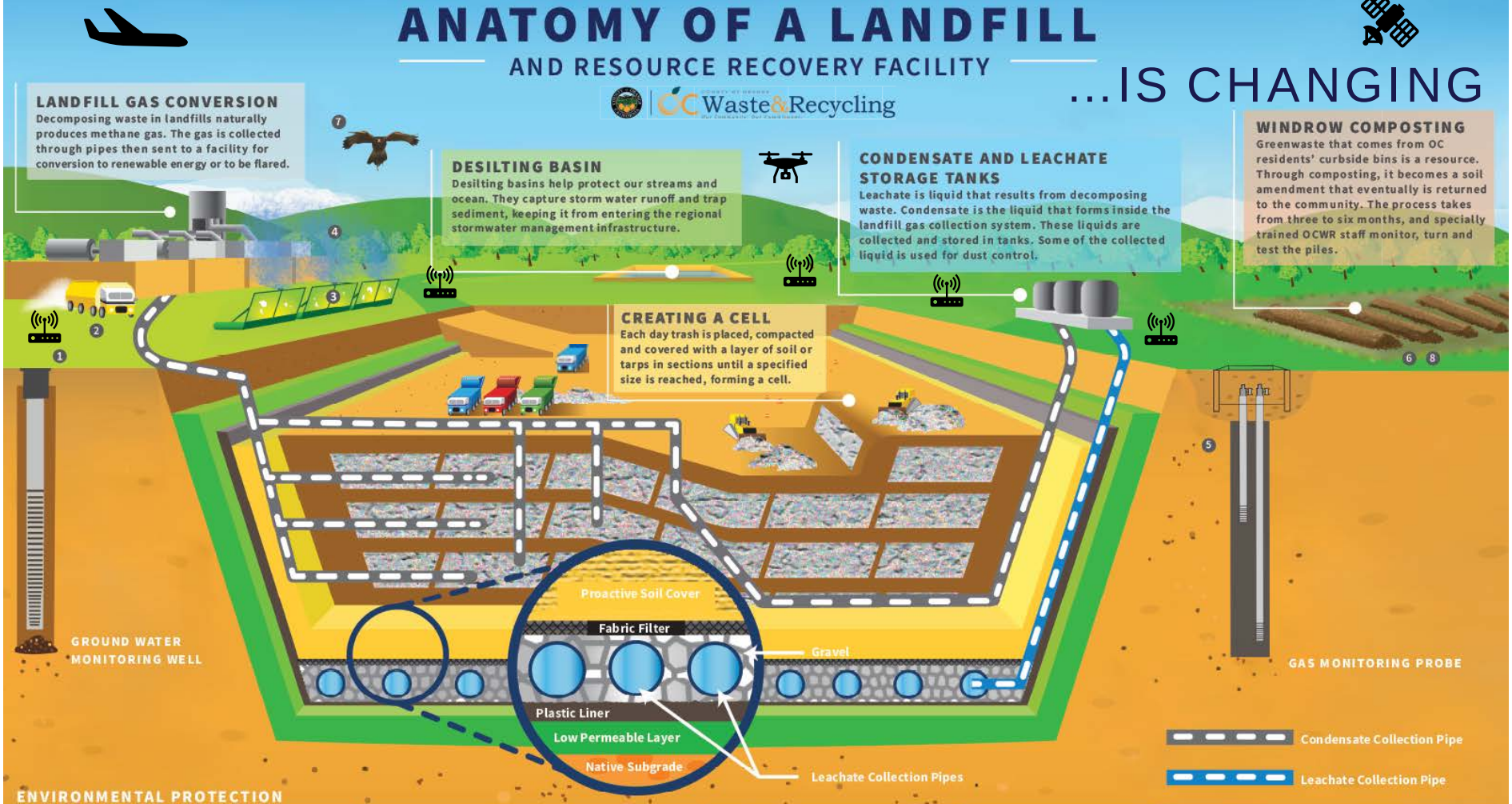
LANDFILL GAS CONVERSION
Decomposing waste in landfills naturally produces methane gas. The gas is collected through pipes then sent to a facility for conversion to renewable energy or to be flared.

DESILTING BASIN
Desilting basins help protect our streams and ocean. They capture storm water runoff and trap sediment, keeping it from entering the regional stormwater management infrastructure.

CONDENSATE AND LEACHATE STORAGE TANKS
Leachate is liquid that results from decomposing waste. Condensate is the liquid that forms inside the landfill gas collection system. These liquids are collected and stored in tanks. Some of the collected liquid is used for dust control.

WINDROW COMPOSTING
Greenwaste that comes from OC residents' curbside bins is a resource. Through composting, it becomes a soil amendment that eventually is returned to the community. The process takes from three to six months, and specially trained OCWR staff monitor, turn and test the piles.

CREATING A CELL
Each day trash is placed, compacted and covered with a layer of soil or tarps in sections until a specified size is reached, forming a cell.



ENVIRONMENTAL PROTECTION

1. Wells are used to monitor for any impacts from the landfill to the groundwater beneath the landfill.
2. To control dust, trucks spray dirt areas as needed using liquids recycled from the landfill.
3. Portable screens are used to trap and collect any stray litter, to keep it from flying away. They can be moved based on wind directions.
4. Special misting machines spray a very fine mist into the air to help confine odors.
5. Hundreds of probes monitor subsurface gas at various elevations and detect if any escapes.
6. In addition to waste disposal OC's landfills also serve as Resource Recovery Facilities, which divert resource materials such as greenwaste, metal and mattresses for reuse. Resource recovery preserves landfill capacity that is an important component of our community's waste management system.
7. Bird Abatement – A falconry program keep birds from feeding on waste, keeping trash where it belongs for a safer and cleaner community.
8. Legislation – New state laws make recycling more important than ever, with food and green waste as a big part of the recycling stream.

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