

Technical Comments on Bill 36-0232

Controlled Incineration of Vegetative Debris

Good morning Senator Avery L. Lewis, Chairman of the Committee on Government Operation, Veterans Affairs, and Consumer Protection, other committee members of the 36th Legislature of the Virgin Islands, and those in the audience.

My name is Greg Guannel, and I'm the Director of the Caribbean Green Technology Center at the University of the Virgin Islands. We develop and share knowledge on how infrastructure, ecosystems, and institutions interact in the U.S. Virgin Islands, with the goal of supporting more resilient and sustainable development.

Thank you for the opportunity to provide comments on Bill 36-0232. My goal in this testimony is to provide technical context on the proposed use of controlled incineration technologies for vegetative debris disposal. In preparing these comments, I reviewed information on how air-curtain incinerators operate, how they are used in other jurisdictions, and the operational considerations associated with their use. My comments focus on several topics: the technology itself and how it is typically used, potential air-quality considerations, the influence of weather and site location, operational and cost considerations, and how other jurisdictions, including Puerto Rico and several Caribbean islands, manage vegetative waste. I will also highlight several technical considerations in the bill related to monitoring, setbacks, and operational safeguards.

1 Purpose of the Bill

Bill 36-0232 proposes to amend Act 8018 to allow the Virgin Islands Waste Management Authority (WMA) and landfill operators to dispose of vegetative debris using controlled incineration technologies, including air-curtain incinerators (ACIs). The bill also states that other methods such as composting, mulching, and shredding remain permissible options.

Air-curtain incinerators are widely used in the United States to rapidly reduce large volumes of vegetative debris, particularly after storms and land-clearing operations.

The bill also allows private individuals to burn vegetative debris generated on their property with a permit from the Virgin Islands Fire Service.

Private burning must occur 50 ft from any structure, or 15 ft from any structure if using an approved closed-top burner.

Burning must be attended and conducted during favorable atmospheric conditions.

2 Description of Technology

An air-curtain incinerator burns vegetative debris in a trench or refractory chamber while a blower forces a high-velocity air curtain over the burn pit.

The air curtain pushes smoke and particles back into the flame, increasing combustion efficiency and reducing visible smoke compared with open pile burning.

Burning achieves 90–95% reduction in debris volume, and 90–95% reduction in particulate emissions compared with open burning

The burning of vegetative debris does generate emissions, especially fine particulate matter and Nitrogen Oxides (NO_x). Carbon monoxide and other gases are generally present at lower levels and are not usually the dominant air-quality concern for vegetative debris burning.

Burning produces ash equal to approximately 5–10% of the original debris mass, which must still be transported to a landfill for disposal.

3 Typical Uses of the Technology

Air-curtain burners are used in several U.S. states, including Florida and Texas, particularly for hurricane debris management, forestry debris, land-clearing waste. However, these states do not rely exclusively on burning for vegetative waste management. Municipal programs also use grinding, mulch production, or composting.

Burning is often used when debris volumes exceed grinding capacity, large woody material is difficult to process, or debris must be reduced quickly to maintain landfill capacity. This happens after, for example, hurricanes.

4 Air Quality Impacts

Air quality is the primary environmental issue associated with vegetative debris burning and often determines whether communities accept or oppose burn operations. Smoke plumes from debris burning can affect areas approximately 0.2 to over 1 mile downwind depending on wind speed and atmospheric conditions.

The most important pollutant associated with vegetative burning is fine particulate matter (PM_{2.5}). EPA has set some regulatory thresholds of 35 µg/m³ over 24 hours, and 9 µg/m³ annually.

Health impacts associated with PM_{2.5} exposure include:

- Short-term:
 - asthma attacks
 - respiratory irritation

- eye irritation
- increased emergency room visits
- Long-term:
 - cardiovascular disease
 - chronic respiratory disease
 - increased mortality risk
- Monitoring methods commonly include:
 - EPA Method 9 smoke-opacity monitoring (10–20% limits)
 - portable PM2.5 monitors downwind of burn sites

Vegetative burning also produces nitrogen oxides (NO_x) and volatile organic compounds (VOCs). In sunlight these gases can react to form ground-level ozone, which can be dangerous if they exceed certain EPA thresholds (EPA 8-hour ozone standard: 70 ppb). However, ozone formation typically occurs on regional scales, whereas PM2.5 exposure occurs locally near burn sites. For vegetative debris burning, PM2.5 is usually the dominant local air-quality concern.

Air-quality impacts depend strongly on wind speed and atmospheric stability. Lower wind speeds reduce pollutant dispersion and can increase smoke accumulation if burning occurs frequently. Typical debris-burn permits require a minimum wind speed of approximately 5 mph, and burning suspended if winds exceed 15–20 mph

Large states such as Texas and Florida often operate burn sites in rural areas with large buffer distances from homes. Wind observations in the territory frequently show very low wind speeds (<1 m/s) overnight and early morning, followed by stronger winds during the afternoon sea-breeze period. Furthermore, Caribbean trade winds weaken during August–October, which are also the hottest months of the year. So there may be a risk that burning during these months can create hazardous smoke conditions for people living near the burn pit.

5 Cost and Operational Considerations

Using this method to manage debris requires an initial capital cost, and maintenance costs.

Typical costs associated with air-curtain burning include equipment purchase (\$70,000 – \$300,000 per unit), operational costs (e.g., blower fuel, trained operators, maintenance) as well as insurance. Some programs have reported insurance premiums exceeding \$100,000 per year due to wildfire and liability classifications.

Furthermore, burn pits must be attended continuously during operation. Ash (5–10% of original debris mass) must still be transported to landfills.

6 Other Considerations

The bill establishes setback distances for private burning (50 ft from structures, 15 ft if using an approved closed-top burner). However, typical distances from other jurisdictions have more details, such as 50–100 ft. Furthermore, the bill does not currently define maximum pile size or burn volume for private burning. Other jurisdictions have typical guidelines of:

- maximum pile diameter: 3–8 ft
- maximum pile height: 3–6 ft
- maximum burn volume: <1 cubic yard
- burn duration limited to same-day burning

Also, I noted that the bill specifies vegetative debris but does not describe procedures to ensure burn material is free of non-vegetative contaminants. If vegetative debris becomes mixed with treated wood, plastics, painted materials, or household waste, combustion can release additional toxic pollutants including dioxins, and heavy metals.

It may also be important to clarify whether marine biomass such as sargassum is included in the definition of vegetative debris. Unlike terrestrial vegetation, sargassum can accumulate trace metals from seawater, particularly arsenic, with measured concentrations in Caribbean samples often ranging from 30–120 mg/kg (dry weight). When biomass containing metals is burned, these elements do not disappear but instead concentrate in the remaining ash or may be emitted in fine particulate matter. Sargassum also contains high levels of salt (sodium and chloride), which can affect combustion processes and increase corrosion in equipment. For these reasons, several Caribbean jurisdictions treat marine biomass separately from land-based vegetative debris when evaluating disposal or processing options.

Many jurisdictions therefore require debris inspection and separation procedures before burning.

Furthermore, the bill authorizes controlled burning but does not specify:

- setback distances for WMA or landfill operations
- meteorological operating limits
- air-quality monitoring requirements
- contamination control procedures

Many jurisdictions address these issues through operational permits or regulations.

7 Alternative Green-Waste Management Programs

Many jurisdictions manage routine vegetative debris through grinding, mulching, and composting.

These methods produce materials used for landscaping, soil improvement, erosion control, or agriculture. The thinking is that composting preserves biomass and produces a usable soil product, whereas burning converts biomass into ash.

Puerto-Rico has a composting program. After Hurricane María, mulching operations processed approximately 5,000–6,000 cubic yards of vegetative debris per day. In the rest of the Caribbean, St. Lucia promotes household composting and organic waste diversion, Barbados operates green-waste composting facilities, the Cayman Islands have grinding and mulch distribution programs. Other islands have or promote similar programs. However, they do burn when volume exceed the capacity of their operations.

8 Conclusion

Air-curtain incinerators are effective at rapidly reducing large volumes of vegetative debris, particularly after storms or land-clearing operations. At the same time, combustion produces particulate emissions that can affect nearby communities under certain meteorological conditions.

For this reason, many jurisdictions combine debris burning with other methods such as grinding, mulching, and composting, and establish operational safeguards including setback distances, monitoring, and debris separation procedures when burning occurs near populated areas.