



REGION 1

BOSTON, MA 02109

May 13, 2025

Mark DePasquale
QSS Biosolids, LLC
135 All American Way
North Kingstown, RI 02852

Becky Raymond
SAGE Environmental/Terracon
10 Post Office Square
Boston, MA 02109

RE: ***Request for EPA Applicability Determination of Clean Air Act
QSS Biosolids, LLC - Pyrolysis Facility (Site)
135 All American Way
North Kingstown, Rhode Island
SAGE/Terracon Project No. C096/L5247042***

Dear Mr. DePasquale and Ms. Raymond:

The United States Environmental Protection Agency, Region 1 (EPA) has reviewed your applicability determination request dated March 6, 2025, for the proposed QSS Biosolids, LLC sewage sludge pyrolysis facility in North Kingstown, Rhode Island. Your request asks for a determination as to whether the following regulations apply to the proposed facility:

- 40 CFR part 60, subpart LLLL—Standards of Performance for New Sewage Sludge Incineration Units
- 40 CFR part 60, subpart O—Standards of Performance for Sewage Treatment Plants
- 40 CFR part 60, subpart CCCC—Standards of Performance for Commercial and Industrial Solid Waste Incineration Units

Based on the information in your letter as well as the supplemental materials you provided, we have determined that the facility is not subject to subparts LLLL, O, or CCCC.

In your letter, you state that the proposed pyrolysis facility is an alternative solution to the current methods of treating and disposing of sewage sludge. The proposed facility will have the capacity to pyrolyze up to approximately 160 tons of dewatered sewage sludge per day via two parallel treatment lines. According to the process description provided by the pyrolysis system supplier, VOW ASA (VOW), each treatment line includes an enclosed reception area, wet feedstock storage silos, a sewage sludge dryer, a dried feedstock silo, a feedstock pelletizer, and an electrically heated rotary kiln pyrolysis reactor. The conveyance systems between these components are closed.

During the proposed treatment process, sewage sludge is dried and pelletized before entering the pyrolysis reactor through an infeed system. The feedstock pellets are indirectly heated to a temperature of 600-750 °C in

an oxygen-limited environment. Under these conditions, pyrolysis occurs, and the feedstock is thermochemically converted into biochar and pyrolysis gas. The biochar is fed through a cooled screw conveyor and then transferred to a logistics station for packing and storage. Hot pyrolysis gas enters a combustion system composed of a multi-stage thermal oxidizer, a heat recovery device, and a catalytic filter. The treated flue gas is emitted through a stack into the atmosphere.

Attachment A to your letter discusses the main differences between pyrolysis and incineration in detail, including reaction conditions and types of products generated. You state that pyrolysis converts waste into energy or valuable products, while incineration generates heat from burning waste to reduce its volume. Incineration is a combustion reaction that takes place in excess oxygen, requiring a stoichiometric oxygen-to-fuel ratio greater than 1. Pyrolysis, on the other hand, is a thermal decomposition reaction that occurs under oxygen-deprived conditions, with a stoichiometric ratio close to zero. Incineration is carried out at higher temperatures than pyrolysis; incineration temperatures range from 800 to 1,450 °C while pyrolysis temperatures range from 250 to 700 °C.

You also provided information from VOW regarding the measures taken to reduce the presence of oxygen in the pyrolysis reactors. VOW identifies two main sources of oxygen in the pyrolysis process: air in feedstock and air ingress through equipment seals. From these sources, the amount of total oxygen gas that could enter the pyrolysis process is estimated to be 30 kg/hour, which amounts to a stoichiometric ratio of 0.005. VOW indicates that this ratio is close to zero, and the potential air ingress would not introduce enough oxygen to the system for combustion to occur. To achieve such a low air ingress, VOW employs infeed airlocks, equipment seals, under-pressure control, outfeed airlocks, and inert gas purging in its pyrolysis systems. The equipment is also leak-tested prior to start-up.

According to 40 CFR § 60.4770, subpart LLLL regulates sewage sludge incineration (SSI) units that commenced construction after October 14, 2010, or for which modification commenced after September 21, 2011. Per 40 CFR § 60.4930, an SSI unit is defined as “an incineration unit combusting sewage sludge for the purpose of reducing the volume of the sewage sludge by removing combustible matter.” The proposed facility would utilize pyrolysis reactors to pyrolyze sewage sludge; it would not combust sewage sludge. As a result, the pyrolysis reactors do not meet the definition of an SSI unit. We acknowledge that the facility does combust pyrolysis gas via thermal oxidizers. However, 40 CFR § 60.4930 defines sewage sludge as a “solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works.” Pyrolysis gas is not a solid, semi-solid, or liquid residue. As a result, the thermal oxidizers also do not meet the definition of an SSI unit. The proposed facility would not operate an SSI unit; therefore, it is not subject to subpart LLLL because it does not meet the applicability criteria at 40 CFR § 60.4770.

Similarly, 40 CFR § 60.150(a) states that subpart O applies to an “incinerator that combusts wastes containing more than 10 percent sewage sludge (dry basis) produced by municipal sewage treatment plants, or each incinerator that charges more than 1000 kg (2205 lb) per day municipal sewage sludge (dry basis).” The combustion of sewage sludge would not occur at this proposed facility, therefore the proposed facility is not subject to subpart O because it does not meet the applicability criteria at 40 CFR § 60.150(a).

Furthermore, 40 CFR § 60.2010 provides that subpart CCCC applies to an incineration unit that (a) is a new incineration unit as defined in 40 CFR § 60.2015, (b) is a commercial and industrial solid waste incineration unit (CISWI) as defined in § 60.2265 or an ACI as defined in 40 CFR § 60.2265, and (c) is not exempt under 40 CFR § 60.2020. In the Definitions at 40 CFR § 60.2265, a CISWI “means any distinct operating unit of any commercial or industrial facility that combusts, or has combusted in the preceding 6 months, any solid waste as that term is defined in 40 CFR part 241.” The proposed facility’s pyrolysis reactors do not carry out combustion, which indicates that they are not CISWI.

Likewise, the thermal oxidizers are not CISWI either. 40 CFR § 241.2 defines solid waste to mean “the term solid waste as defined in 40 CFR 258.2.” Section 258.2 in turn defines solid waste as “any garbage, or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities.” Subpart CCCC defines contained gaseous material at 40 CFR § 60.2265 as “gases that are in a container when that container is combusted.” The proposed facility would not combust a container with pyrolysis gas inside of it; the pyrolysis gas would be uncontained. The thermal oxidizers are not CISWI because the pyrolysis gas is not a solid waste. The proposed facility does not meet the definition of a CISWI and, therefore, does not meet the applicability criteria at 40 CFR § 60.2010. As a result, the proposed facility is not subject to subpart CCCC.

EPA relied upon the accuracy of the information provided by QSS Biosolids, LLC to make this determination. QSS Biosolids, LLC is not relieved of the responsibility for complying fully with any and all applicable federal, state and local laws, regulations and permits. Should the facility undergo a process change, this applicability determination may no longer be valid.

This applicability determination was coordinated with EPA Region 1, the Office of Air Quality Planning and Standards, and the Office of Enforcement and Compliance Assurance. If you have any questions regarding this letter, please contact Jessica Kilpatrick of my staff at kilpatrick.jessica@epa.gov or (617) 918-1652.

Sincerely,

Patrick Bird
Deputy Director
Air and Radiation Division

CC: Lacy Reyna, SAGE Environmental/Terracon
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