



Date: October 14, 2025

To: Pennsylvania Department of Environmental Protection (PADEP)

Attn: David F. Matcho, P.E., Environmental Engineering Manager

Re: Technical Deficiency Letter Response – Application Number #603455-A251 APS ID #1129302, AUTH ID #1513091 Reilly Township, Schuylkill County

Facility: Liberty Soils, LLC

Dear Mr. Matcho,

This letter serves as the formal response to the Department’s Technical Deficiency Letter dated September 25, 2025, concerning the following deficiency items:

1. MRW-C – Compliance History - Section C.1 – Revision Requested
2. MRW-C – Compliance History - Section F.2 – Completion Request
3. Public Comment Odor Sensor Inquiry – Evaluation Requested

Item #1 – MRW-C – Compliance History – Section C.1 – The revision is complete to include Jared Sperry and Christian Cochran. Please see attached.

Item #2 – MRW-C – Compliance History – Section F.2 – The response to this section is “Not Applicable, or none”. Please see the attached.

Item #3 – Odor Sensor Evaluation, below:

Public Comment - Evaluation of potential perimeter odor monitoring

Liberty Soils’ alkaline stabilization process, utilizing quicklime, can result in specific odor signatures primarily driven by the high-pH chemical reaction. Below are our findings concerning a potential perimeter odor monitoring system.

1. Odor-Causing Compounds

The primary odor-causing compounds associated with the alkaline stabilization of municipal wastewater biosolids can be categorized into two major groups: nitrogen-based compounds and sulfur-based compounds. The alkaline environment (high pH) generated by the addition of quicklime (CaO) has a significant influence on the release of nitrogen compounds.

Category	Primary Compounds	Source/Mechanism	Odor Description
Nitrogen-Based (Alkaline)	Ammonia (NH ₃)	High pH (>10.5) converts ammonium ions (NH ₄ ⁺) present in biosolids into volatile gaseous ammonia (NH ₃), which is then released.	Sharp, pungent, irritating.
	Amines (e.g., trimethylamine, putrescine, cadaverine)	Breakdown of organic proteins and amino acids, accelerated by high pH and heat, leading to volatile organic nitrogen compounds.	Fishy, decaying organic matter.
Sulfur-Based	Hydrogen Sulfide (H ₂ S)	Present in the incoming biosolids, typically resulting from anaerobic activity in the wastewater treatment process. Odor is often concentrated during initial processing.	Rotten eggs.
Volatile Organic Compounds (VOCs)	Mercaptans, Skatoles, Indoles	General microbial decomposition and breakdown of organic matter. These contribute to the overall complex, earthy, or fecal odor background.	Fecal, decaying, swampy.

The dominant and most immediately actionable compound from the alkaline process itself is NH_3 .

2. Odor Concentration Ranges

Odor concentrations are highly variable and dependent on numerous factors, including feedstock quality, process temperature, air exchange rates, and meteorological conditions. We present concentrations in two phases: generation (within the facility) and ambient (at the perimeter/atmosphere).

A. Generation Concentrations resulting from Alkaline Stabilization

- **NH_3 :** During active lime mixing and curing phases, concentrations may range from 5 parts per million (ppm) to 50 ppm or higher, particularly in the immediate headspace above the reaction zone.
- **H_2S :** Concentrations typically remain below 5 ppm during processing.
- **Amines/VOCs:** Generally measured in the low ppm range.

B. Atmospheric/Perimeter Concentrations

Upon exiting the facility and mixing with the atmosphere, the compounds undergo significant dilution. Odor detection at the perimeter relies on the human nose's extreme sensitivity, often registering odors at levels far below instrumental chemical detection limits.

Compound	Human Odor Threshold (OT)	Atmospheric/Perimeter Concentration
H_2S	~ 0.0005 – 0.015 ppm	Odor nuisance can occur when levels are in the low ppb range.
NH_3	~ 5 – 50 ppm	Generally, levels remain below 1-2 ppm at the property line.
Amines	~ 0.0001 -0.001 ppm	Nuisance often relates to the sub-parts per billion range.

Critical Finding: Specific odors such as amines can be detectable by the human nose (i.e., constitute a public nuisance) when the chemical concentration is in the single-digit parts per billion range. This is the key challenge for instrumental monitoring.

3. Available Monitoring Technologies and Detection Limits

Due to the complex, multi-compound nature of odor and the extremely low concentrations required for human perception, no single instrument accurately correlates chemical concentration directly to odor nuisance potential (measured in Odor Units, OU_E). Monitoring approaches typically fall into three categories:

Technology	Target Compound(s)	Notes on Application
Electrochemical Sensors	H_2S , NH_3 , VOCs	Instrument detection limits are typically above the human odor threshold
Photoionization Detector (PID)	Total Volatile Organic Compounds (VOCs) and Amines	Measures total mass of ionizable compounds. Does not measure H_2S or NH_3 effectively.
Advanced Spectroscopy	Highly accurate NH_3 or H_2S	High capital and operating cost. Provides excellent chemical accuracy but still tracks only one or two target compounds.

4. Conclusion and Existing Odor Management Systems

As noted above, **fixed-point instrumental monitoring is not a feasible method** for reliably detecting odor nuisance conditions in the low-ppb range at the facility perimeter. The human nose remains the most sensitive and relevant "instrument" for determining nuisance potential.

Therefore, our odor management strategy is built upon two established systems that focus on *prevention* at the source and *rapid response* to community concerns.

System A: Operational Odor Mitigation and Containment

Liberty Soils uses a BioScent mist system around the perimeter of the processing area to contain odors created during the alkaline stabilization process. The BioScent mist system for odor suppression uses a high-pressure pump to create an ultra-fine fog. This fog mixes water with an odor-neutralizing chemical that actively binds with and eliminates bad smells at the molecular level, rather than just masking them. It's primarily used in industrial settings (like landfills or wastewater plants) to provide continuous, effective odor control with minimal water use.

System B: Odor Response and Tracking

A vital component of Liberty Soils' odor management is addressing odor complaints. Receipt of off-site odor complaints will immediately trigger the implementation of the odor control and tracking plan outlined below.

I. Odor Complaint Reporting and Response

1. **Reporting:** Reports of off-site odors must be communicated directly to the facility via the main phone line (24/7). An answering service will handle calls received outside of standard business hours.
2. **Response Commitment:** A facility staff member will respond to the location of each reported odor. Response will occur on the same day if the complaint is received during business hours, or on the following business day if received after business hours.
3. **Documentation:** All odor complaints will be formally documented. The following data will be recorded:
 - Complainant's name, telephone number, and street location.
 - Time and date of the complaint.
 - Description and severity of the odor.
 - Prevailing weather conditions.
 - Operational activities that may have contributed to the odor.
 - Measures taken to control or eliminate the odor (Corrective Actions).

II. Internal Corrective Actions

Upon the determination that Liberty Soils is the source of the odor, the following actions **will be taken** by facility personnel:

- Specific components of the processing method will be evaluated (e.g., polymer use, presence of septic conditions, amount of "dead dust," processing schedules).
- Housekeeping procedures will be evaluated and enhanced as necessary.
- Storage piles identified as odor sources may be covered with tarps.
- Material identified as the source of odors may be removed from the site and delivered to a permitted disposal facility.



III. Procedure Modifications

If regular odor issues arise due to standard site practices (e.g., loading/unloading, and handling of the biosolids product), modifications will be made to existing procedures to attempt to alleviate odor issues without compromising the processing goals and objectives of pathogen reduction and production of a high-quality end-product.

Sincerely,

A handwritten signature in black ink that reads "Jared Sperry". The signature is written in a cursive, flowing style.

Jared Sperry
Principal –
Liberty Processing & Soils Member