

**AMBIENT ODOR SURVEY OF THE LAWPCA
COMPOSTING FACILITY;
AUBURN, MAINE**

Prepared for:

LEWISTON-AUBURN WATER POLLUTION CONTROL AUTHORITY
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1. INTRODUCTION

The Lewiston-Auburn Water Pollution Control Authority (LAWPCA) has operated a 34 wet ton per day biosolids composting facility in Auburn, Maine since 1993. Odorous air emissions from the facility have historically been treated in a large, organic-media biofilter. Unfortunately, groundwater contamination attributed to leakage of biofilter leachate resulted in closure of the composting facility in 2018. Since then, LAWPCA has evaluated various strategies to continue processing biosolids without the use of the biofilter for odor control.

From September 3, 2019 until January 15th, 2020, LAWPCA operated the composting facility as part of a DEP-approved pilot program to evaluate a new strategy to continue to process LAWPCA biosolids while preventing nuisance conditions associated with odors. The strategy includes the following elements:

1. Processing only LAWPCA's anaerobically-digested biosolids (no outside, unstabilized sludge).
2. Eliminating odorous airflow to the biofilter.
3. Using natural ventilation of the building through open bay doors.
4. Blending coffee grounds into the feedstock to help control odors.
5. Modifying the schedule of compost turnings and aeration to improve working conditions inside the building.

Since operating the facility in pilot mode, there have been no complaints of odor attributed to the operation. The facility is sited in a rural, farm setting with the nearest receptor approximately 1,300 ft. away. Figure 1 is an aerial view of the facility and its rural surroundings.

In January of 2020, Bowker & Associates was retained to conduct a survey of ambient odors around the facility and provide an opinion as to whether the current operation has the potential to create nuisance odor conditions at downwind receptors. Bowker & Associates is a firm specializing in the assessment and control of odors from waste handling facilities.

2. METHODOLOGY

A series of ambient odor surveys around the facility was conducted on January 15, 2020. Weather conditions were good for the survey, with light winds and no precipitation. Six surveys were conducted, during which a range of normal activities were conducted including:

1. Biosolids delivery
2. Movement of cured compost
3. Loading of finished compost
4. Mechanical turning operations



FIGURE 1.
AERIAL VIEW OF LAWPCA COMPOSTING FACILITY SHOWING MAJOR COMPONENTS AND OBSERVATION POINTS.

At the time of the odor surveys, three of six composting bays were full, representing “worst-case” conditions for processing LAWPCA biosolids. (Previously, when accepting non-LAWPCA sludge, all six bays would often be full).

The ambient odor surveys were conducted by walking around the perimeter of the facility, both upwind and downwind, and recording location, odor concentration (dilutions to threshold), odor intensity (butanol scale), and odor character. The surveys were conducted by Robert Bowker, P.E. an odor control specialist with over 40 years of experience in the industry.

Odor concentration (dilutions to threshold or D/T) was estimated using a Nasal Ranger™ portable olfactometer. The device estimates the number of dilutions of odor-free air required to render the odor undetectable by supplying carbon-filtered air at a series of known pre-set dilutions. By determining at which dilution the odor can first be detected, the odor “concentration” can be estimated. For example, if the odor were detected at 7 dilutions to threshold (D/T) but not at 15 D/T, the odor concentration would be between 7 and 15 dilutions to threshold. Mr. Bowker has received training from St. Croix Sensory on the use of the Nasal Ranger™. The laboratory methodology for measuring odor concentration is described in ASTM E-679.

Odor intensity was estimated using the simple 0 to 5 butanol intensity scale as shown below. This scale is often used for field measurements.

- 0: No odor
- 1: Very faint
- 2: Faint
- 3. Distinct
- 4. Strong
- 5. Very strong

The laboratory methodology for measuring odor intensity using the n-butanol scale is described in ASTM E-544.

Finally, the character of the odor was recorded in response to the question, “what does it smell like?”

In general, the observations were made at distances ranging from 50 ft to 500 ft from the facility, and included both upwind and downwind observations. During the surveys, winds were generally from the northwest, blowing any odor emissions into adjacent cornfields with no human receptors. Winds were calm in the morning, increasing in the afternoon.

3. RESULTS

Tables 1-6 show the results of the odor surveys. Locations of the observations are typically referenced to the composting building, which is assumed to have a north-south orientation. Figure 1 showed the approximate locations of the observations.

During the first two surveys, winds were relatively calm, and the movement of the steamy emissions could be readily observed. In general, odors from the facility were detectable 200 to 250 feet downwind of the facility at relatively dilute odor concentrations, typically in the range of 4 to 7 dilutions to threshold, with an intensity of 1 (very faint). However, several observations at 30 to 200 feet downwind recorded an odor concentration range of 7 to 15 D/T and intensity as high as 3 (distinct).

To put these odor concentrations in perspective, 7 D/T is often selected as a target odor concentration at the nearest receptor or at the fence line of an odor-emitting facility, as this concentration is considered an “acceptable” level of odor that is unlikely to result in odor complaints from downwind receptors. Note that the second survey was conducted specifically during mechanical turning operations to assess the odor impact during worst-case conditions. Downwind observation did not indicate an increase in ambient odor levels.

The remaining four surveys were conducted during increasing wind conditions. Although higher wind speeds can dilute odors through mixing with clean ambient air, wind can also “pull” odors from buildings and enclosures by creating negative pressure around the building envelope. The results of the surveys were relatively consistent – odors could routinely be detected close to the compost building, but at distances of 200 to 250 feet downwind, odor concentrations were typically in the non-nuisance 4 to 7 D/T range, with an intensity of 1 (very faint). The character of the odor observed downwind of the facility was consistently “compost”. At no time was the odor of digested biosolids observed, even when a truck discharged its load of LAWPCA biosolids through an open bay door.

During one of the last surveys, observations were made at greater distances (approx.500 ft) downwind of the facility in the cornfield to the southeast of the building. The odor of compost could still be detected, but at dilute levels that would be very unlikely to trigger odor complaints (odor concentrations less than 7 D/T with intensity of 1).

4. CONCLUSIONS

1. The LAWPCA composting facility is sited in a highly rural, farm setting with the nearest receptor residing approximately 1,300 feet from the facility.
2. During pilot testing of a new odor management strategy that began in September, 2019, LAWPCA processed only LAWPCA-generated, anaerobically-digested biosolids, with the building ventilated naturally with no treatment of odorous emissions.
3. Anaerobically-digested biosolids is a more stabilized material than the raw sludge previously accepted from outside sources, and has lower odor potential.
4. Although odor reduction is not documented, the blending of coffee grounds into the feedstock has potential to reduce odors during mixing and composting.
5. The only odor detected during a series of six ambient odor surveys was that of compost, not the feed biosolids that could have a more objectionable odor character.
6. Surveys were conducted during the full range of operations inside the building, including loading and unloading, mixing, and mechanical turning.
7. Since the bay doors of the building are opened to provide natural ventilation, the odor of compost is readily detectable around the building. However, at distances of 200 to 250 ft from the facility, the level of odor is typically diluted to non-nuisance levels.
8. Given that the nearest receptor is approximately 1,300 feet (1/4 mile) from the composting building, it is unlikely that under the current operating strategy, odors would be detectable at nuisance odor/concentrations above 7 dilutions to threshold.

TABLE 1

AMBIENT ODOR SURVEY LOG

Date: 1/15/2020
Surveyor: R. Bowker

Weather: Temperature 30°F RH
 Wind direction NW Speed 0-5 mph
 Cloud cover Sunny

Compost turners previously on

Location	Time	D/T	Intensity 0 – 5	Character	Comments
Upwind, on biofilter	9:05	0	0	-	No odor
Entrance road – 100 ft from bldg.	9:10	0	0	-	No odor
SW corner 150 ft from bldg.	9:12	0	0	-	No odor
SW corner 100 ft from bldg.	9:15	7-15	3	Compost	Fleeting; truck just loaded
Fenceline; South 100 ft from bldg..	9:15	0	0	-	No odor
Fenceline; SE corner 100 ft	9:17	4-7	1	Compost	Faint
SE corner 150 ft from bldg.	9:20	0	0	-	No odor
End of fence SE 200 ft	9:21	4-7	1	Compost	Active loading in curing bay
Downwind of finished compost bay	9:25	4-7	1	Compost	Active loading in curing bay
Berm 200ft E of bldg. (open bay)	9:25	4-7	3	Compost	Active loading in curing bay
S. end of push wall 300 ft east	9:26	4-7	1	Compost	Active loading in curing bay
Push well; 30 ft from piles	9:27	7-15	3	Compost	Very close to finished compost piles
N. end of push wall	9:30	0	0	-	No odor
N. end of bldg. 100 ft from open door	9:55	4-7	1	Compost	fleeting
NW corner near propane tanks	10:00	0	0	-	No odor
W side of bldg. 50 ft from open door	10:05	4-7	1	Compost	

TABLE 2

AMBIENT ODOR SURVEY LOG

Date: 1/15/2020
Surveyor: R. Bowker

Weather: Temperature 34°F RH
 Wind direction NW Speed 0-5 mph
 Cloud cover Clear

Compost turners previously ON

Location	Time	D/T	Intensity 0 – 5	Character	Comments
Entrance road 100 ft from open bay	10:30	0	0	-	No odor
SW corner 100 ft from bldg.	10:31	0	0	-	No odor
Fenceline 100 ft south of bldg.	10:33	0	0	-	No odor
Fenceline 150 ft from SE corner	10:34	0	0	-	No odor
S end of fence on berm	10:35	0	0	-	Wind shift to NE
E side 200 ft from open bay	10:36	0	0	-	Wind shift to NE
Push wall E of bldg.	10:37	0	0	-	No odor
Push wall N end near compost	10:38	4-7	1	Compost	Next to finished compost
NE corner 100 ft from bldg.	10:40	4-7	1	Compost	Near finished compost
N end 100 ft from open bay	10:41	4-7	3	Compost	
Along west side 50 ft from bldg.	10:45	4-7	1	Compost	
South end of biofilter	10:47	<4	1	Compost	Barely detectable
N. end of biofilter	10:55	4-7	1	Compost	Wind shifted to SE

TABLE 3

AMBIENT ODOR SURVEY LOG

Date: 1/15/2020
Surveyor: R. Bowker

Weather: Temperature 36⁰F RH _____
 Wind direction NW Speed 3-10 mph
 Cloud cover Clear

Location	Time	D/T	Intensity 0 – 5	Character	Comments
Entrance road 100 ft from bldg.	12:00	0	0	-	No odor - upwind
SW corner 50 ft from bldg.	12:02	0	0	-	No odor - upwind
SE end of fence 200 ft	12:04	0	0	-	No odor
Berm 200 ft downwind of south end	12:05	<4	0-1	Compost	Fleeting, faint
S end of push wall, east side	12:06	4-7	1	Compost	
Push wall near finished compost	12:07	0	0	Compost	
N end of push wall, east side	12:09	<4	1	Compost	
NE corner 50 ft from bldg.	12:11	4-7	1	Compost	
Northside, 100 ft from open door	12:12	4-7	1	Compost	
NW corner near propane tanks	12:15	0	0	No odor	Upwind
West side 50 ft from bldg.	12:20	0	0	No odor	

TABLE 4

AMBIENT ODOR SURVEY LOG

Date: 1/15/2020
Surveyor: R. Bowker

Weather: Temperature 36⁰F RH
 Wind direction NW Speed 3-6 mph
 Cloud cover Partly cloudy

Location	Time	D/T	Intensity 0 – 5	Character	Comments
Entrance road 100 ft from bldg.	1230	0	0	-	No odor - upwind
SW corner 50 ft from bldg.	12:31	0	0	-	No odor - upwind
SE end of fence 200 ft from bldg.	12:34	0	0	-	No odor
E side 200 ft from open bays	12:37	4-7	1	Compost	Fleeting, variable wind
S end of push wall, east side	12:38	4-7	1	Compost	Fleeting, variable wind
Along push wall – east side	12:40	<4	1	Compost	Very faint, fleeting
NE corner of push wall	12:45	4-7	1	Compost	
N side 50 ft from open door	12:46	4-7	1-2	Compost	
NW corner near propane tanks	12:47	0	0	-	No odor
West side of bldg.	12:50	0	0	-	No odor

TABLE 5

AMBIENT ODOR SURVEY LOG

Date: 1/15/2020
Surveyor: R. Bowker

Weather: Temperature 36⁰F RH
 Wind direction NW Speed 3 – 6 mph
 Cloud cover Mostly cloudy

Location	Time	D/T	Intensity 0 – 5	Character	Comments
Entrance road 100 ft from bldg.	1:00 PM	0	0	-	No odor - upwind
South side 50 ft from bldg.	1:05	0	0	-	No odor – upwind
SE of bldg. 200 ft end of fence	1:06	4-7	1	Compost	
500 ft downwind in cornfield	1:10	0	0	-	No odor
500 ft downwind – east side	1:15	4-7	1	Compost	Very faint
500 ft downwind – east	1:17	<4	0-1	Compost	Barely detectable
300 ft downwind of push wall	1:18	<4	0-1	Compost	Barely detectable
300 ft downwind of push wall	1:20	<4	0-1	Compost	
300 ft downwind – NE corner	1:22	<4	0-1	Compost	
200 ft downwind – NE	1:25	4-7	1	Compost	
North end of bldg.	1:30	0	0		Upwind
W side of bldg.	1:35	0	0		No odor

TABLE 6

AMBIENT ODOR SURVEY LOG

Date: 1/15/2020
Surveyor: R. Bowker

Weather: Temperature 40°F RH
 Wind direction NW Speed 3 – 12 mph
 Cloud cover Mostly cloudy

Location	Time	D/T	Intensity 0 – 5	Character	Comments
Entrance road 100 ft from bldg.	1:45PM	0	0	-	Upwind
South side 100 ft from bldg.	1:47	0	0	-	Upwind
200ft SE - end of fence	1:50	0	0		Increasing wind
Berm downwind open bays	1:52	4-7	2	Compost	
S end of push wall – E. side	1:53	<4	1	Compost	
Middle of push wall – E. side	1:55	<4	0-1	Compost	
N. end of push wall	1:56	<4	0-1	Compost	
N. end of bldg.	2:00	0	0	-	Sludge unloading – no detectable odor