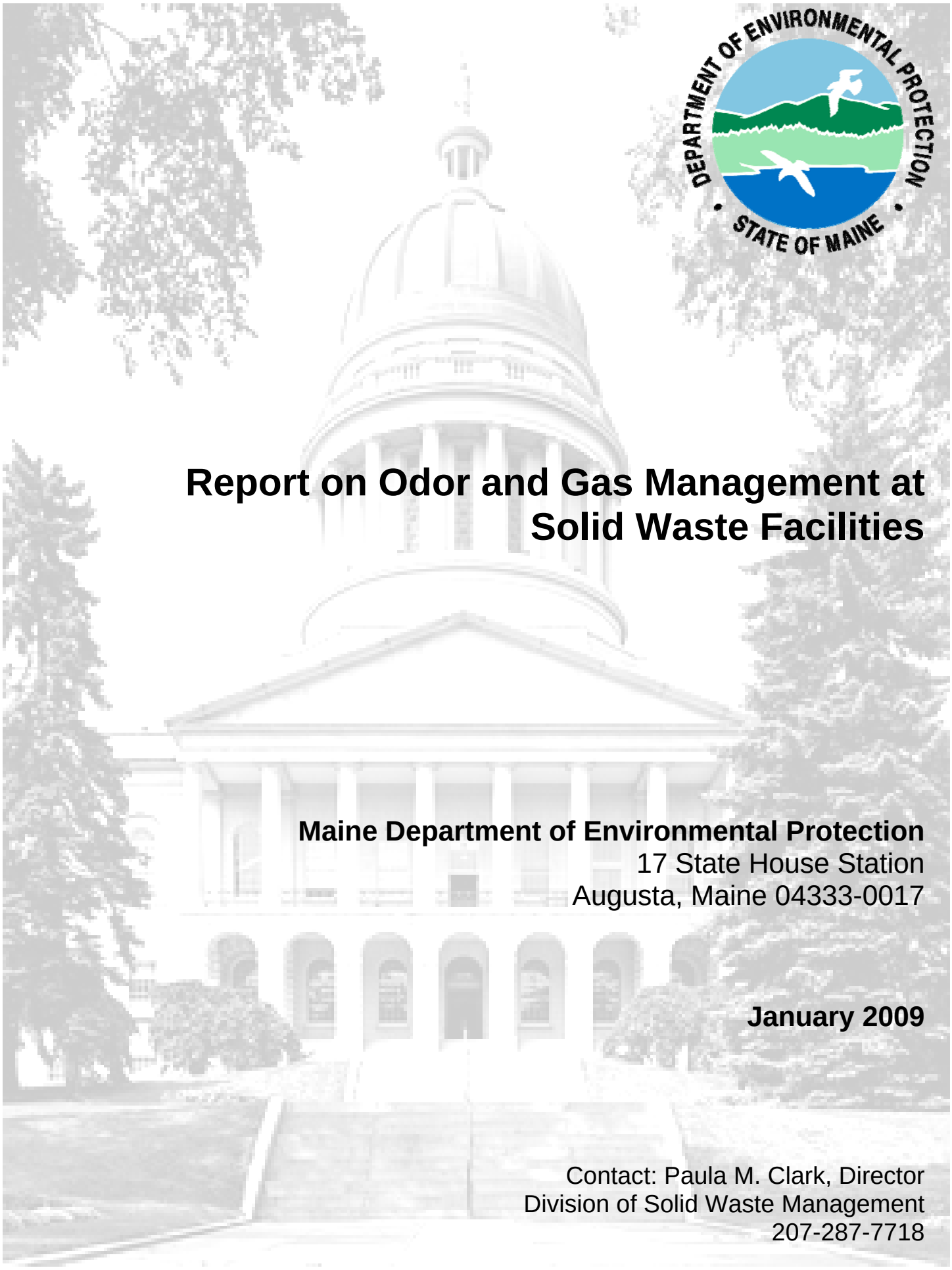
MAINE STATE LEGISLATURE



Report on Odor and Gas Management at Solid Waste Facilities

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I. INTRODUCTION

This report is submitted to the Joint Standing Committee on Natural Resources pursuant to Public Law 2007, Chapter 583 ("An Act to Improve Solid Waste Management") and Resolves 2007 Chapter 170 (Resolve, To Require Rulemaking Concerning Landfill Gas and Odor Management). Chapter 583 required the Department of Environmental Protection ("department" or "DEP") to prepare a report on solid waste odor management. The law required that the report include "an examination of solid waste odor regulation from the point of disposition of the waste through disposal of the waste at a solid waste disposal facility, including odor regulation related to transportation of the waste." The report was also to include "the status of federal weight restrictions on Interstate 95".

Resolves 2007 Chapter 170 required that the department "adopt rules concerning landfill gas and odor management that incorporate quantitative standards that can be used to measure compliance." The department was required to report on the status of this rulemaking by January 15, 2009.

This report addresses both Public Law 2007 Chapter 583 (attached as **Appendix A**) and Resolves 2007 Chapter 170 (attached as **Appendix B**).

II. BACKGROUND

Historically, problems arising from odors at solid waste facilities have occurred with some regularity. Over the past few years in particular however, a number of waste facilities have experienced odor problems that have drawn widespread attention and concern. Disposal facilities (landfills and incinerators) have been the source of most of these recent concerns. Odor problems are arising due to a variety of factors including the significant volumes and types of waste being disposed, and the location of the facilities, especially those in close proximity to the general public. Specific concerns and questions have also been raised regarding potential health effects associated with landfill gases, particularly hydrogen sulfide.

III. ODOR – GENERAL DISCUSSION AND ISSUES

A. What is Odor?

By definition, odor is a characteristic or quality of a substance that makes it perceptible to the sense of smell. One expert defines odor as "the perception experience when one or more chemicals come in contact with the receptors on the olfactory nerves and 'stimulate' the olfactory nerve." This definition is useful in that it points out that odor is not a chemical or group of chemicals, but instead the human body's reaction to and perception of one or more chemicals (odorants). The concentration of chemical odorants in a volume of air can be systematically measured with repeatable results. However, the detection and perception of odor for any given concentration of odorant varies among individuals who may have different

sensitivities to odors. Certain individuals may detect odor at very low levels. There is also variability in terms of whether a particular odor is perceived by an individual as pleasant, neutral, unpleasant, offensive or sickening.

The experience of odor perception is complex and can be both physiological and psychological. It may be influenced by a person's previous experiences. For example, a person who grew up in a rural environment may have a different sensitivity to and perception of common farm odorants than a person who grew up in an urban environment. The inverse may be true of those same individuals when exposed to chemicals commonly found in urban air.[1]

Because of this complexity and variability, the matter of determining thresholds and methods for detecting, classifying and quantifying odors cannot be reduced to simple chemical measurement alone. Odor must therefore be assessed with consideration to its varying effects on a range of individuals.

B. Can Odor be Measured?

Odor can be measured as "total odor" as caused by a mixture of compounds or by a single specific odor causing compound. Single, specific compounds can be measured using different methods based on site-specific needs. Methods generally consist of portable or stationary continuous air monitors, or air sampling with subsequent laboratory analysis. The latter method can be costly and time consuming. The selection of a specific monitoring method must be based on its ability to detect the specific compound or odorant of concern. The department is currently utilizing Single Point Monitors, manufactured by MDA Scientific, to measure levels of hydrogen sulfide in the ambient air near solid waste landfills. The monitors use a detection system that specifically responds to low levels of hydrogen sulfide. Hydrogen sulfide concentrations as low as 2 parts per billion can be detected; accuracy, however, has not been verified below 4 parts per billion. Generally, hydrogen sulfide is detectable by individuals at approximately 8 parts per billion. The monitors allow the department to gather real time information related to actual concentrations measured over specified time periods, and then use the information to design and direct implementation of necessary operational improvements.

Total odor can be described by both quantitative and qualitative means based on strength, intensity, character, and hedonic tone. The frequency and duration of an odor episode are also important factors. The relative strength of an odor can be determined based on a relationship between the volumes of fresh air required to dilute a volume of odorous air to a level where the odor is not detectable. This relationship is termed "dilution to threshold". An instrument called a scentometer can be used in the field to objectively determine odor strength. Currently, the department is using the Nasal Ranger® Field Olfactometer manufactured by St. Croix Sensory, Inc. to quantify dilution to threshold values.

Odor intensity is the perceived strength of an odor above the detection and recognition thresholds. It can be determined using a series of increasing concentrations of a standard

[1] Charles M. McGinley and others, *Element of Successful Odor/Odour Laws*, (presented at WEF Odor / VOC 2000 Specialty Conference, Cincinnati, Ohio, April 16-19, 2000) available from http://www.bae.ncsu.edu/programs/extension/manure/ulo/odorlaws.pdf

odorant, typically n-butanol. N-butanol test kits are developed in accordance with *ASTM Test Method E 544 – 99 (Reapproved 2004) Standard Practices for Referencing Suprathreshold Odor Intensity*. In consultation with Tech Environmental, a firm specializing in odor science, the department is currently using a modified n-butanol scale that ranges from 0 (no odor) to 5 (extremely strong odor) to measure odor intensity.

Finally, odor can be qualitatively reported using character descriptors and "hedonic tone" (a measure of pleasantness or unpleasantness of an odor). The department is currently using standard character descriptors with corresponding numerical values developed by St. Croix Sensory, Inc. A scale ranging from minus ten (- 10) to plus ten (+ 10) is used to indicate hedonic tone. The + side of the scale indicates relative pleasantness while the – side of the scale indicates relative unpleasantness with 0 being neutral. (Also see Section V(B))

C. Odors from Solid Waste Facilities and Handling

1. General

Food wastes frequently present significant odor challenges and problems during the handling of household and municipal solid waste. Most people have experienced objectionable odors from wastes such as: decayed fish, fowl, animals or shellfish; spoiled milk, vegetables and fruit; and rancid fat. All of these wastes can decompose quickly and readily under certain conditions and can produce odors that most people consider annoying and unpleasant.

There are commercial and industrial wastes that, like food wastes, are also highly putrescible or can produce similar unpleasant odors. These often include wastes that release sulfur or nitrogen compounds such as those generated from papermaking processes, wastewater treatment processes, agricultural activities, and food processing.

Solid waste management facilities can generate a complex range of process odors under specific conditions. In general, an experienced and trained odor observer can identify these odors by process type. The following describes some of the specific odor causing compounds and conditions that can arise from solid waste handling in Maine:

a. Waste Transportation

Odors from waste transportation can vary greatly depending on the type of waste and the method of transport. These odors are normally transient in nature and rarely the source of ongoing odor impacts.

Typical odor causing compounds from waste transportation include volatile organic acids and methyl mercaptan. These are often associated with decomposing putrescible wastes and can be best mitigated by proper transport and containment and by slowing the rate of decomposition. It is important that putrescible waste be kept relatively cool in an enclosed container and be removed and disposed quickly. It is also important that the container be adequately cleaned after that waste is removed so that

putrescible residues do not remain to decompose further and generate odor.

There are more than 600 licensed Maine non-hazardous solid waste transporters. Waste hauling is a business that is sometimes operated on very small profit margins. Potentially, this can lead to insufficient time and effort being spent cleaning the transport containers. Additionally, wet cleaning of vehicles and containers can lead to additional odor problems at the cleaning site. Dry clean-up of containers is usually preferred using a light application of hydrated lime.

b. Transfer Stations and Storage Facilities

The most notable odor causing compounds at transfer and storage facilities include volatile organic acids and methyl mercaptan. As discussed above, these compounds are produced from the decomposition of organic material.

Most transfer stations in Maine serve relatively small populations (often significantly fewer than 10,000 people), are located in rural areas, and receive relatively small amounts of waste. These factors together tend to minimize the number of odor complaints received regarding these small facilities. When there are odor problems at transfer and storage facilities, they are generally experienced onsite only with limited offsite impacts.

Establishment of large storage and transfer facilities in more populated areas however, may increase the frequency and severity of odor problems encountered at these facilities.

c. Waste Processing Facilities

Odor causing compounds at waste processing facilities can vary significantly depending on the type of waste received and process used. Many processing facilities receive inert wastes with little organic matter. These wastes usually present no odor problems. However, processing facilities that receive highly putrescible organic wastes may have significant issues with odor. It is critical that these facilities: exert adequate control over waste delivery; minimize the time that waste is stockpiled before being processed; eliminate excess moisture and temperature within the storage area; and routinely remove all waste from the delivery area and routinely clean that area.

The most notable odor causing compounds at wood waste processing facilities are “terpenes” (any of a number of hydrocarbons found in essential oils and resins, particularly those from conifers). At high concentrations terpenes can be considered a nuisance while at low concentrations they are usually considered pleasant. The concentration of terpenes in air generally drops rapidly with increased distance from the

site. Because of this, offsite nuisance odor impacts are unlikely from facilities that process clean wood waste.

d. Incineration Facilities

The most common odor causing compounds from incinerators and other types of waste combustion facilities are volatile organic acids and methyl mercaptan. These odorants are typically associated with the receipt, storage and handling of organic wastes. In addition, the combustion of municipal solid waste can produce sulfur dioxide and reduced sulfur compounds. These compounds are detectable at very low concentrations.

The waste combustion process itself is not generally prone to frequent odor problems. However, incineration facilities do receive significant volumes of waste and are typically located in or close to populated areas. Any odor problems that do occur at these facilities are likely to impact significant numbers of people, businesses, and activities, and may cause considerable disruption.

Similar to processing facilities, odor problems at waste combustion facilities appear to be most commonly associated with improper delivery, storage and handling of putrescible organic wastes. It is particularly important that vehicles delivering waste be managed to minimize delays at the facility or along the routes used to and from the facility.

Normally, waste combustion facilities are designed to draw air from the waste receiving and storage areas to be used to provide oxygen to the combustion process. In theory, this should create a negative air pressure in these waste handling areas and prevent the escape of odor causing pollutants to outside surrounding areas. If odors are being emitted, the air pressure should be able to be controlled by closing unused openings to the outside.

e. Compost Facilities

Compost facilities often receive highly putrescible wastes, both because these wastes are particularly suited for the compost process and because when composted, they often provide a material of high agronomic or horticultural value.

Odor-causing compounds at compost facilities include reduced sulfur compounds, ammonia, reduced nitrogen compounds, and volatile organic acids. Of these, ammonia appears to be the most prevalent onsite odor-causing compound at compost facilities in Maine, while reduced nitrogen compounds and volatile organic acids appear to be the most notable contributors to offsite odors.

The department defines composting to mean the biological decomposition of organic matter under predominantly aerobic conditions and controlled temperatures between 110° and 160° F. Biological decomposition at such high temperatures is extremely energetic. In order to avoid odor problems, it is critical that the wastes being composted are compatible, properly mixed and carefully controlled throughout the entire composting process.

Appendix A of *Processing Facilities,* 06-096 CMR 409 (last amended June 16, 2006) contains a table indicating the carbon to nitrogen ratio of a number of common raw residuals found in Maine and sent to composting facilities. The carbon to nitrogen ratio (C:N) and the percent nitrogen can reliably indicate the relative putrescibility of a residual. The lower the C:N ratio, the more putrescible the material is. Highly putrescible materials decompose quickly which can result in leachate generation and nuisance odor potential. In a composting scenario, as the C:N ratio drops below 15:1 nuisance odor potential for the compost mixture increases significantly, resulting in the need for process controls such as mixing with a material with a high C:N ratio (e.g. sawdust). For this reason, composters target a C:N ratio for the compost mixture of 25:1 to 40:1.

The department has seen some success in odor mitigation with the use of biofilters at Maine composting facilities. A biofilter is a bed of organic material (medium), typically a mixture of compost and wood chips or shreds. As air passes through the biofilter the microbes on the organic material convert odorous gases to carbon dioxide and water. The effectiveness of the biofilter is primarily a function of the amount of time the odorous air spends in the biofilter (contact time) and the moisture content of the filter material.

f. Landfills

The most common odor-causing compounds at landfills are hydrogen sulfide, sulfur dioxide, ammonia, and methyl mercaptan. These odor-causing compounds are produced through the decomposition of wastes. At Maine landfills, hydrogen sulfide appears to be the most significant contributor to odor.

In addition, methane is generated by waste decomposition in most landfills. Methane gas can migrate through the waste, soils and groundwater at a landfill and be released to the atmosphere. Methane is odorless, is explosive at certain atmospheric concentrations, and is a powerful greenhouse gas. The Maine Solid Waste Management Rules include requirements for methane gas monitoring, collection, and control which can also help to mitigate and control odor-causing compounds.

Experience at Maine landfills (and elsewhere) shows that gypsum wallboard, a component of construction and demolition debris (CDD), is a major contributor to hydrogen sulfide formation (See paragraph 2 below). Hydrogen sulfide can be liberated from CDD and from crushed CDD ("fines") during the waste decomposition process.

Other landfill odor problems are normally related to waste delivery, storage and handling issues such as those that can occur at other solid waste facilities. These problems can be addressed by traffic control; appropriate waste storage and containment; minimization of the area and time that the active portion of the landfill remains exposed to the environment; and generally conscientious operation and maintenance of the landfill facility.

2. Hydrogen Sulfide Gas

As noted above, hydrogen sulfide gas is a significant contributor to odor at solid waste facilities especially at landfills. Hydrogen sulfide is a heavier than air, flammable gas with a characteristic rotten egg odor. It occurs naturally and is also produced by industrial facilities such as pulp and paper operations, wastewater treatment plants, and solid waste landfills. Hydrogen sulfide may account for up to 1 percent by volume of landfill gas emissions, although typically the percentage is much less. The formation of hydrogen sulfide within a landfill depends on certain factors including: moisture content, temperature, and pH; anaerobic conditions (lacking oxygen); and a sulfate source.

As mentioned above, gypsum wallboard, a component of construction and demolition debris (CDD), is a major contributor to hydrogen sulfide formation in landfills. Experience at Maine landfills indicates that CDD and crushed CDD fines, containing gypsum, are a significant source of sulfate. Other waste streams that may contain sulfate include wastes from pulp and paper mill bleaching and coating operations, and sludges from wastewater treatment plants.

Hydrogen sulfide is the source of many solid waste landfill odor problems, but at high enough concentrations can also pose health risks. In 2006, the Maine Center for Disease Control & Prevention (Maine CDC) established ambient air guidelines for hydrogen sulfide. These guidelines apply to the general public; the Occupational Health and Safety Administration (OSHA) sets exposure standards for site workers. Maine CDC has established ambient air guidelines of 30 parts per billion (ppb) for acute (short-term, 30 minute) exposure and 1 ppb for chronic (long-term, greater than 1 year). These guidelines are not regulatory standards but do provide health-based benchmarks for interpreting monitoring data. Monitoring data is used to help determine whether a landfill is effectively controlling hydrogen sulfide emissions.

3. General Approaches to Mitigation of Solid Waste Related Odors

There are a number of generally acknowledged approaches to mitigating or controlling solid waste related odor problems. All of these have been used in Maine in some way to address odor problems and have been incorporated to varying degrees into State rules and standard operating procedures. They include the following:

- Prohibiting the delivery of problematic wastes, when possible;
- Locating waste storage, transportation and handling sites and facilities with sufficient setbacks to minimize public exposure to waste odorants;
- Storing putrescible waste in ways that minimize its decomposition and control release and dispersal of its odorants;
- Cleaning and removing spilled debris from storage and transport containers and from waste handling facilities;
- Altering or breaking down an odiferous waste to a less offensive form; and,
- Controlling and treating the odorants potentially reaching people.

IV. REGULATION OF ODOR

A. Federal Regulation

In the United States, odor is not regulated by the U.S. Environmental Protection Agency as a pollutant, since there is not a direct link between the odor perceived by individuals to the presence of a specific concentration of an odorant that may have potential health effects. The most frequent resolution of odor complaints and problems has been through state or local nuisance laws.[2]

B. Regulation in Other States

Currently, many states have established health-based ambient air quality standards for hydrogen sulfide. Several of these states have further developed a nuisance odor regulation based on a dilution to threshold standard. The standard is typically applied at or beyond the property boundary. Only a few states have established odor nuisance standards based on specific odor causing compounds. The implementation and enforcement of these odor regulations are typically driven by odor complaints made by the general public. The department has surveyed other states regarding odor regulation and standards. Attached as **Appendix C** is a table presenting summary information concerning the regulation of odor in other states.

C. Current Regulation in Maine

The Maine Solid Waste Management Rules: *General Provisions*, 06-096 CMR 400 (last amended January 23, 2001) establish general standards that apply to all solid waste facilities at

[2] Ibid.

the time of licensing. Subsequent chapters of rule address particular types of waste facilities and activities and may establish licensing and/or operating standards specific to them.

06-096 CMR 400(4)(G) establishes a licensing standard that requires a demonstration of "no unreasonable adverse effect on air quality". Specifically, the rule requires, in part, that: "The applicant must control fugitive dust and nuisance odor". An applicant for a solid waste facility license is required to make a number of submissions to the department for the purpose of demonstrating compliance with the standard. These include: "the identification of any sources of nuisance odors from the facility"; "an estimation of the area that would be affected by the nuisance odor, based on general experience in dealing with the material or process that is the source of the odors"; and, "proposed systems for enclosure of nuisance odor-producing materials and processes, and proposed uses of technology to control, reduce or eliminate odors".

All solid waste facilities are required to prepare and submit operations manuals that detail policies, procedures, practices, regulatory requirements, etc. relevant to all aspects of a facility's operation. The manuals must include, among other items, details concerning compliance with any applicable standards related to odor control. Following is a summary of the current standards and requirements of the Maine Solid Waste Management Rules related to odor control:

1. Waste Transportation Requirements

The transportation of solid waste is regulated by the *Maine Solid Waste Management Rules: Non-Hazardous Waste Transporter Licenses,* 06-096 CMR 411 (last amended March 13, 1991). These rules require that all waste must be properly contained during transport and that the transporter must immediately clean up and in most cases report any waste spills to the department.

Temporary storage of municipal solid waste in the vehicle is limited to a maximum of two days, provided the solid waste remains in the vehicle.

2. Transfer Station and Storage Facility Requirements

The *Maine Solid Waste Management Rules: Transfer Stations and Storage Sites for Solid Waste,* 06-096 CMR 402 (last amended June 16, 2006) regulates the storage of solid waste at transfer stations and other storage facilities. This chapter has the following operating requirements that directly pertain to odor control:

- Storage of putrescible waste must be in a covered structure or in covered leak-proof containers;
- The facility design must include provisions for the control of odors if putrescible wastes are handled;
- A contract for the removal and/or disposal of putrescible waste must be included in the operations manual. Removal of waste must occur frequently enough to prevent nuisance problems at the transfer station, the storage site or during transport of the waste; and,

- The facility must provide provisions for the wash-down, dry cleanup or other cleanup of the site and make appropriate provision for the disposal of the cleanup materials.

3. Waste Processing Facilities Requirements

Solid waste processing facilities include facilities which are operated to reduce the volume or change the chemical or physical characteristics of solid waste (e.g. mechanical separation, shredding, baling, composting). Some processing facilities, such as composting facilities, may handle highly putrescible wastes that are likely to present significant odor control problems. The *Maine Solid Waste Management Rules: Processing Facilities*, 06-096 CMR 409, (last amended June 16, 2006) includes a number odor control provisions and requirements.

Prior to licensing, an applicant for a waste processing facility license must demonstrate that based upon the proposed location, design, and operational procedures for the facility, it will not cause an odor nuisance. This demonstration may be made by submission of one or more of the following:

- A demonstration that the materials handled at the facility will not generate objectionable odors;
- Comparative studies with similar existing facilities, taking into account similarities and differences in feed stocks, composting processes, facility design, throughput, proximity to neighbors, meteorological conditions and topography; or
- Odor dispersion modeling studies demonstrating that the facility will not cause more than a one hour average odor impact of 2 dilutions to threshold in any calendar year at any occupied building

Operational requirements of 06-096 CMR 409 state that a processing facility must be operated to prevent nuisance odors at occupied buildings. In addition, facility personnel must immediately contact the department to report odor complaints received by the facility.

If the department determines that the facility has caused a nuisance odor at an occupied building, the facility personnel must, within 30 days of the department determination, report to the Department in writing, the causes of odor generation and the completed or planned follow-up action to minimize, control, and treat the odorants from the facility.

4. Incineration Facility Requirements

The *Maine Solid Waste Management Rules: Incineration Facilities*, 06-096 CMR 403 (last amended November 2, 1998) requires a 500 foot setback from residences if the waste handling area is enclosed within a structure. The setback

requirement is increased to 1000 feet if the waste handling area is not enclosed within a structure.

Operationally, incineration facilities must comply with all applicable storage, handling, processing and cleanup standards included in 06-096 CMR 402 and 409.

5. Landfill Requirements

Landfills are designed and operated to control liquids and gases primarily because of the potential environmental, and health and/or safety hazards that these pollutants present. Landfills are regulated in accordance with the provisions of the *Maine Solid Waste Management Rules: Landfill Siting, Design and Operation,s 06-096 CMRr 401 (last amended September 6, 1999).*

The siting, design, construction, operation, closure and post-closure care of a landfill is a complex undertaking that requires evaluation of and compliance with a broad array of regulatory standards. Some of these standards address minimization and control of odorants at landfills. These include: establishment of certain setbacks from public roads, property boundaries and from residences; and design, construction, monitoring and operation of systems to collect, control and treat landfill gases and liquids.

Operating requirements in 06-096 CMR 401 that serve to mitigate and control odors at a landfill include standards for waste delivery, storage, containment and disposal; standards for the monitoring and control of landfill liquids and gases; and specific required actions that the landfill operator must take if certain gas levels are exceeded.

V. DEVELOPMENT OF NEW REGULATORY STANDARDS ADDRESSING GAS AND ODOR – STATUS OF DEP'S EFFORT

A. Background

The department has identified rulemaking related to solid waste odor management and landfill gas management as a high priority task. An internal workgroup of regulatory, field, and engineering staff was formed in October 2007 to design and coordinate the rulemaking effort.

Historically, the department has primarily regulated odor qualitatively by evaluating the location, design and operation of a solid waste facility to determine whether or not it would cause an unreasonable adverse impact, in a manner similar to the approach used for reviews under the Site Location of Development Act. This approach is effective for many solid waste facilities, but has proven inadequate for facilities where odors are more persistent, intense or unpleasant, and for facilities located in close proximity to the general public.

During 2007, department solid waste staff received training in the fundamentals of odor from a consulting firm specializing in odor science and response. Staff participated in a screening study designed to determine individual odor sensitivities, and participated in an interactive odor characterization workshop in order to develop actual odor monitoring skills. Using this training, department staff developed a program for the preliminary study of odor at solid waste facilities in Maine. An "odor panel" was established consisting of staff with varying odor sensitivities to conduct group odor evaluations at select solid waste facilities in order to obtain a scientific basis for the development of regulatory recommendations.

The department has also identified the need for more prescriptive regulations for the management of landfill gas. The department has recently identified gas-related impacts from landfills that are difficult to address under the current solid waste regulations. These impacts include fugitive air emissions (which can result in odor complaints and possible health and safety impacts) and water quality changes caused by landfill gas migrating in ground water or through soil. Knowledge, technology, and federal requirements related to the management of landfill gas have changed significantly since the current landfill regulations were adopted. The department plans to update the solid waste regulations to provide specific guidance for designing gas management systems when new landfill capacity is developed, and requirements for effective monitoring and management of landfill gas generated at new and existing landfills.

B. Development of a Nuisance Odor Standard for Total Odor

As noted above, the department is currently conducting an ambient odor monitoring study at several types of solid waste facilities using a trained odor panel. The first round of monitoring was performed during July 2008. A subsequent round is planned for early February 2009 in an effort to incorporate varying weather conditions. Facilities were selected based on their potential to cause nuisance odors linked to historical odor complaints, waste characteristics, and/or anecdotal evidence.

The odor panel is measuring total odor based on each individual's assessment of an odor's strength (concentration), perceived intensity, character (what the odor smells like), and hedonic tone (a measure of the pleasantness or unpleasantness of an odor). Total odor or odor caused by a mixture of compounds is being measured rather than specific odor causing compounds, based on the complex nature of odor and the knowledge that different odor causing compounds are evident at the different types of solid waste facilities. The odor panel is using the two most common methods for field assessment of odor strength and intensity: the Nasal Ranger® Field Olfactometer and the n-butanol scale method. The Nasal Ranger® is a hand-held instrument for measuring and quantifying ambient odor using a calibrated dilution to threshold (D/T) method. The n-butanol scale method consists of a series of jars containing increasing concentrations of the standard odorant n-butanol, prepared in accordance with a standard method (ASTM E544), to determine the relative strength of an odor. The odor panel is reporting odor

quality using character descriptors and a scale that represents the pleasantness or unpleasantness of an odor ("hedonic tone").

Based on a preliminary assessment of the data gathered to date, it is evident that odor characterization at solid waste facilities is complex and odors can be variable. The internal rulemaking workgroup will be evaluating the information available from the work of the odor panel, the department's records concerning operation of different types of solid waste facilities, odor-related complaints received, a comprehensive evaluation of other available state odor regulations, and local odor regulations (e.g. the City of Biddeford's odor monitoring guidelines which include a quantitative odor intensity standard that must be met by the Maine Energy Recovery Company as a condition of its waste handling agreement with the City) to develop draft compliance criteria. The data from the ambient odor monitoring study will be evaluated with consideration of the ability of different people to detect an odor; and categorization of the typical concentration, frequency and duration of detection of an odor that is annoying to the general population. Experience of other regulators indicates a successful nuisance odor regulation should be based on all of these factors. The department's draft proposal for the regulation of nuisance odors will likely incorporate standards related to concentration (D/T), frequency, intensity, duration, and offensiveness of an odor, and be broadly applicable to various types of solid waste facilities.

C. Development of a Nuisance Odor Standard for Hydrogen Sulfide

Hydrogen sulfide is a gas with a characteristic rotten egg odor that can be detected by most people when present at very low (typically 8 parts per billion) levels. Landfills are one of the common sources of hydrogen sulfide gas. The department is currently working with the Maine Center for Disease Control and Prevention (Maine CDC) to develop a specific nuisance odor standard for hydrogen sulfide. The Maine CDC has provided to the department's internal rulemaking workgroup the results of research it has done on previously established standards for hydrogen sulfide gas on national and international levels. The workgroup, with assistance from the Maine CDC, is using this research to assess the relationship between the percentage of individuals able to detect certain levels of hydrogen sulfide and the percentage that consider the same levels to be a nuisance. This relationship will be compared to Maine's "Ambient Air Guidelines for Hydrogen Sulfide", published by the Maine CDC on March 27, 2006, which contains recommendations concerning the public health risks of both short-term and long-term exposure to hydrogen sulfide gas.

Hydrogen sulfide monitoring data obtained from solid waste landfills in Maine is being compared to actual odor complaints available on file with the landfills and with the department. An evaluation of this data is expected to help further pinpoint the hydrogen sulfide concentrations and duration of detection that the general public considers to be an annoyance. The department is currently considering a tiered standard for hydrogen sulfide-related nuisance odors, based on short-term and longer-term odor duration. The hydrogen sulfide nuisance odor standard will typically be applicable only to landfills, but

may be applied to other solid waste facilities if generation of hydrogen sulfide is found to be problematic.

D. Modifications to the Solid Waste Management Rules

Based in part on the ongoing work described above, the department is developing revisions to the Maine Solid Waste Management Rules that establish:

- Quantifiable odor standards for solid waste facilities that can be used to measure compliance; and,
- Updated, comprehensive design and operational standards for gas management at landfills.

Rule changes are also being considered that would strengthen provisions of existing rule related to operational and maintenance aspects of odor control at all solid waste facilities.

1. Quantifiable Odor Standards

The department's goal with respect to the development of quantifiable odor standards, is to adopt revisions to the solid waste regulations that require applicants to address (and the department to evaluate) potential nuisance odor from all types of solid waste facilities both quantitatively and qualitatively at the time of licensing, and that require all solid waste facilities to operate in compliance with specific odor standards. The department is considering the inclusion of requirements for specific corrective actions if a facility fails to meet the standards. Specifically, the department is considering proposing revisions to:

- Include qualitative and quantitative definitions of "nuisance odor", and standards and submission requirements related to odor control in 06-096 CMR 400(4)(G) (*No Unreasonable Adverse Effect on Air Quality)*; and
- Revise the operating requirements for all types of solid waste facilities to include specific operational standards related to odor control. The standards would apply both to all currently operating facilities and to new facilities at the time of licensing.

2. Landfill Gas Management Standards

With regard to the development of new standards for the management of landfill gas, the department's goal is to adopt revisions to *Landfill Siting, Design and Operation,* 06-096 CMR 401 and *Water Quality Monitoring, Leachate Monitoring, and Waste Characterization,* 06-096 CMR 405 that, in conjunction with the nuisance odor provisions described above, would require an applicant to address (and the department to comprehensively evaluate) all aspects of landfill gas management for new or expanded landfills or vertical increases at existing landfills. The department is also considering proposing comprehensive operational provisions for the management of landfill gas that would apply to both

existing and new landfills. Facilities would be required to demonstrate the ongoing effectiveness and efficiency of the selected landfill gas collection and control system, establish operating, monitoring and maintenance procedures for the selected system, and establish response provisions that would be implemented upon the detection of gas levels exceeding the established standards.

Specifically, the department is considering proposing revisions to 06-096 CMR 401 that would include:

- A definition of "nuisance condition" for hydrogen sulfide, based on the research done by the Maine CDC and the internal rulemaking workgroup described above, that could be used to measure compliance and/or trigger additional measures to control hydrogen sulfide gas;
- Health-based standards for hydrogen sulfide based on the ambient air guidelines for hydrogen sulfide developed by the Maine CDC;
- Standards and submission requirements for new or expanded landfills or vertical increases to existing landfills that would require the assessment of the various technologies available for gas management, the evaluation of any existing soil gas migration, the inclusion of a landfill gas recovery or direct-use facility proposal, and consideration of eligibility for offset credits under available carbon trading programs;
- Revisions to the operating requirements that would require a gas monitoring program to verify the quantity, constituents and concentrations of gases generated by a landfill;
- Revisions to the operating requirements, that would establish a tiered response to levels of hydrogen sulfide gas detected above the nuisance condition standards or when citizen complaints are received and verified by the department;
- Notification requirements that would initiate the response period upon discovery of explosive gas levels above the established standard, to be followed by the submission and implementation of a response plan, and if needed, by a remediation plan.
- Provisions requiring implementation of a department-ordered emergency landfill gas remediation plan under certain circumstances;
- Revisions to the closure and post-closure care sections that would ensure that appropriate management of landfill gas is addressed during closure of a landfill, and continues throughout the post-closure period; and
- Revisions to the rules concerning disposal of wood waste and construction and demolition debris that would allow the department to require a facility to implement a site-specific gas monitoring program based on conditions at and surrounding the landfill, including any gas-related odor complaints.

The department is considering proposing revisions to 06-096 CMR 405 that will apply to both new and existing landfills which include:

- A requirement to implement a corrective action plan when landfill gas causes verified impacts to ambient air, ground water, or residential water supplies or creates nuisance conditions;
- Standards for monitoring of landfill gas and landfill gas condensate; and
- Standards for installation of instruments for monitoring of landfill gas and landfill gas condensate.

3. Schedule

It is anticipated that the internal working group will complete its conceptual development of the regulatory package addressing odor and landfill gas by spring 2009. At that point, work will commence on drafting the actual regulatory language. It is anticipated that the formal rulemaking process will be initiated in 2009. It will include a variety of opportunities for participation, discussion and comment by interested parties.

E. Status of Federal Weight Restrictions on Interstate 95

As noted in the introduction of this report, PL 2007, Chapter 583 required that the department provide an update on the status of federal weight restrictions on Interstate 95. The federal weight restriction of 80,000 pounds on Interstate 95 is recognized as contributing to the number of trucks traveling through urban areas; unless posted for a lower weight limit, the weight limit in Maine on all non-Interstate 95 roads is 100,000 pounds. Maine has sought for many years to have the federal weight restriction increased so heavy trucks may use the interstate.

Department staff have discussed the matter of federal weight restrictions with the Maine Department of Transportation (Maine DOT) which is following this issue. According to Maine DOT, authorization for funding for highway maintenance and improvements is on a 6 year cycle, with the next authorization scheduled for September 2009. The current plan is for Maine to seek approval for a 3 to 6 year pilot project to increase weight limits as part of the 2009 reauthorization package. Safety improvements, condition of the roadway and other relevant issues would be monitored and measured over that time period. It is not certain how likely it is that such a pilot will be approved.

LIST OF APPENDICES

APPENDIX A

PUBLIC LAWS 2007 CHAPTER 583
AN ACT TO IMPROVE SOLID WASTE MANAGEMENT

Amend the bill by striking out everything after the enacting clause and inserting the following:

'**Sec. 1. 38 MRSA §1303-C, sub-§32-A** is enacted to read:

32-A. Solid waste processing facility. "Solid waste processing facility" means a land area, structure, equipment, machine, device, system or combination thereof, other than an incineration facility, that is operated to reduce the volume or change the chemical or physical characteristics of solid waste. "Solid waste processing facility" includes but is not limited to a facility that employs shredding, baling, mechanical and magnetic separation or composting or other stabilization technique to reduce or otherwise change the nature of solid waste.

Sec. 2. 38 MRSA §1310-N, sub-§1, ¶C, as repealed and replaced by PL 1997, c. 393, Pt. A, §47, is amended to read:

C. In the case of a disposal facility or a solid waste processing facility that generates residue requiring disposal, the volume of the waste and the risks related to its handling and disposal have been reduced to the maximum practical extent by recycling and source reduction prior to disposal. This paragraph does not apply to the expansion of a commercial solid waste disposal facility that accepts only special waste for landfilling or to any other facility exempt from the requirements of subsection 5-A. The department shall find that the provisions of this paragraph are satisfied when the applicant demonstrates that the applicable requirements of subsection 5-A have been satisfied.

Sec. 3. 38 MRSA §1310-N, sub-§5, as repealed and replaced by PL 1997, c. 393, Pt. A, §48, is repealed.

Sec. 4. 38 MRSA §1310-N, sub-§5-A is enacted to read:

5-A. Recycling and source reduction determination. The requirements of this subsection apply to solid waste disposal facilities and to solid waste processing facilities that generate residue requiring disposal.

A. An applicant for a new or expanded solid waste disposal facility shall demonstrate that:

(1) The proposed solid waste disposal facility will accept solid waste that is subject to recycling and source reduction programs, voluntary or otherwise, at least as effective as those imposed by this chapter and other provisions of state law. The department shall attach this requirement as a standard condition to the license of a solid waste disposal facility governing the future acceptance of solid waste at the proposed facility; and

(2) The applicant has shown consistency with the recycling provisions of the state plan.

This paragraph does not apply to the expansion of a commercial solid waste disposal facility that accepts only special waste for landfilling.

B. The provisions of this paragraph apply to solid waste processing facilities that generate residue requiring disposal.

(1) An applicant for a new or expanded solid waste processing facility that generates residue requiring disposal shall demonstrate that all requirements of this paragraph will be satisfied. On an annual basis, an owner or operator of a licensed solid waste processing facility that generates residue requiring disposal shall demonstrate compliance with all the requirements of this paragraph. The annual demonstration of compliance must be included as an element of the facility's annual report to the department submitted in conformance with the provisions of subsection 6-D, paragraph B and department rules.

(2) A solid waste processing facility that generates residue requiring disposal shall recycle or process into fuel for combustion all waste accepted at the facility to the maximum extent practicable, but in no case at a rate less than 50%. For purposes of this subsection, "recycle" includes, but is not limited to, reuse of waste as shaping, grading or alternative daily cover materials at landfills; aggregate material in construction; and boiler fuel substitutes.

(3) A solid waste processing facility subject to this paragraph shall demonstrate consistency with the recycling provisions of the state plan.

(4) The requirements of this paragraph do not apply to solid waste composting facilities; solid waste processing facilities whose primary purpose is volume reduction or other waste processing or treatment prior to disposal of the waste in a landfill or incineration facility; solid waste processing facilities that are licensed in accordance with permit-by-rule provisions of the department's rules; or solid waste processing facilities that are exempt from the requirements of the solid waste management rules related to processing facilities adopted by the board.

(5) If the department amends the rules relating to fuel quality for construction and demolition wood fuel and the amendment adversely affects the ability of a solid waste processing facility to meet the 50% standard in subparagraph (2), the department may not enforce the requirements of subparagraph (2) against that processing facility and the department shall submit to the joint standing committee of the Legislature having jurisdiction over natural resources matters a report relating to the rule change. The joint standing committee of the Legislature having jurisdiction over natural resources matters may submit legislation related to the report.

The department shall adopt rules to implement the provisions of this paragraph. Rules adopted pursuant to this paragraph are major substantive rules as defined in Title 5, chapter 375, subchapter 2-A. The department may not enforce the recycling requirements of subparagraph (2) prior to the effective date of rules that define "to the maximum extent practicable."

Sec. 5. 38 MRSA §1310-R, sub-§2, ¶A, as amended by PL 1989, c. 585, Pt. E, §30 and affected by c. 890, Pt. A, §40 and amended by Pt. B, §246, is further amended to read:

A. The department shall apply the provisions of section 1310-N, subsection ~~5~~5-A, paragraph A, subparagraph (1) when relicensing any solid waste disposal facility, except that, to the extent that waste disposal contracts in effect on June 29, 1987~~,~~ are inconsistent with section 1310-N, subsection ~~5~~5-A, paragraph A, ~~in which case~~subparagraph (1), those provisions apply at the expiration of the term of those contracts without consideration of any renewals or extensions of those contracts.

Sec. 6. 38 MRSA §1310-R, sub-§2, ¶C, as amended by PL 1989, c. 585, Pt. E, §30, is further amended to read:

C. The provisions of section 1310-N, subsection ~~5~~5-A, paragraph ~~B~~A, subparagraph (2) do not apply to the relicensing of any solid waste disposal facility licensed prior to June 29, 1987.

Sec. 7. 38 MRSA §2101, sub-§1, as enacted by PL 1989, c. 585, Pt. A, §7, is amended to read:

1. Priorities. It is the policy of the State to plan for and implement an integrated approach to solid waste management for solid waste generated in this State and solid waste imported into this State, which ~~shall~~must be based on the following order of priority:

A. Reduction of waste generated at the source, including both amount and toxicity of the waste;

B. Reuse of waste;

C. Recycling of waste;

D. Composting of biodegradable waste;

E. Waste processing ~~which~~that reduces the volume of waste needing land disposal, including incineration; and

F. Land disposal of waste.

It is the policy of the State to use the order of priority in this subsection as a guiding principle in making decisions related to solid waste management.

Sec. 8. 38 MRSA §2124-A, as amended by PL 2007, c. 192, §5, is further amended to read:

§ 2124-A. Solid waste generation and disposal capacity report

By January 1, 2008 and annually thereafter, the office shall submit a report to the joint standing committee of the Legislature having jurisdiction over natural resources matters, the Governor and the department setting forth information on statewide generation of solid waste, statewide recycling rates and available disposal capacity for solid waste.

The report submitted under this section must include an analysis of how changes in available disposal capacity have affected or are likely to affect disposal prices. When the office determines that a decline in available landfill capacity has generated or has the potential to generate supracompetitive prices, the office shall include this finding in its report and shall include recommendations for legislative or regulatory changes as necessary.

Beginning on January 1, 2009 and every odd-numbered year thereafter, the report submitted under this section must include an analysis of how the rate of fill at each solid waste landfill has affected the expected lifespan of that solid waste landfill. The January 2009 report must also include an analysis of the solid waste disposal needs of the State as of January 1, 2009 for the next 3, 5 and 10 years.

Beginning on January 1, 2010 and every even-numbered year thereafter, the report submitted under this section must include an analysis of consolidation of ownership in the disposal, collection, recycling and hauling of solid waste.

The joint standing committee of the Legislature having jurisdiction over solid waste matters may report out legislation related to the report submitted pursuant to this section.

Sec. 9. Solid waste odor management report. The Department of Environmental Protection shall prepare a report on solid waste odor management. The report must include an examination of solid waste odor regulation from the point of disposition of the waste through disposal of the waste at a solid waste disposal facility, including odor regulation related to transportation of the waste. The report must also include the status of federal weight restrictions on Interstate 95. The report must be submitted to the joint standing committee of the Legislature having jurisdiction over natural resources matters by January 5, 2009.

Sec. 10. Duties and responsibilities for managing solid waste. By July 31, 2008, the Department of Environmental Protection and the Executive Department, State Planning Office, referred to in this section as "the agencies," shall develop a system by which solid waste management activities are performed by them. By August 30, 2008, the agencies shall implement elements of the system that do not require statutory changes. By January 5, 2009, the agencies shall submit a report on the system to the joint standing committee of the Legislature having jurisdiction over natural resources matters. The report must identify any legislative changes that are necessary for the implementation of the system and must report on the elements of the system that have been implemented by the agencies. The report must also include an analysis of the agencies' respective ability to control the different and various waste streams flowing into state-owned landfills. The committee may report out legislation relating to the report to the First Regular Session of the 124th Legislature.

Sec. 11. Solid waste disposal facility recycling standards; report. By January 15, 2009, the Department of Environmental Protection shall submit to the joint standing committee of the Legislature having jurisdiction over natural resources matters a report detailing a method for setting mandatory recycling standards for all solid waste disposal facilities.’

SUMMARY

This amendment extends the statutory recycling and source reduction requirements to solid waste processing facilities.

The amendment affirms that it is the policy of the State to use the solid waste hierarchy provided in the Maine Revised Statutes, Title 38 as a guiding principle in decision making related to solid waste management and clarifies that the State's policy applies to solid waste generated in the State and solid waste imported into the State.

The amendment requires the Executive Department, State Planning Office to include analyses of marketplace consolidation and solid waste landfill fill rates in the annual solid waste generation and disposal capacity report.

The amendment directs the Department of Environmental Protection to prepare a report on solid waste odor management.

The amendment directs the Department of Environmental Protection and the State Planning Office to develop a system by which solid waste management activities are performed by the agencies.

The amendment requires the Department of Environmental Protection to prepare a report detailing a method for setting mandatory recycling standards for all solid waste disposal facilities.

FISCAL NOTE REQUIRED
(See attached)

APPENDIX B

RESOLVES 2007 CHAPTER 170
RESOLVE TO REQUIRE RULEMAKING CONCERNING LANDFILL GAS AND ODOR MANAGEMENT

Amend the resolve by striking out the title and substituting the following:

'Resolve, To Require Rulemaking Concerning Landfill Gas and Odor Management'

Amend the resolve by striking out everything after the title and before the summary and inserting the following:

'**Sec. 1 Landfill gas and odor management rules. Resolved:** That the Department of Environmental Protection, Board of Environmental Protection shall adopt rules concerning landfill gas and odor management that incorporate quantitative standards that can be used to measure compliance. Rules adopted pursuant to this section are routine technical rules as defined in the Maine Revised Statutes, Title 5, chapter 375, subchapter 2-A. By January 15, 2009, the Department of Environmental Protection shall submit a report on the status of the rules to the joint standing committee of the Legislature having jurisdiction over natural resources matters.'

SUMMARY

This amendment replaces the resolve. It requires the Department of Environmental Protection, Board of Environmental Protection to adopt rules concerning landfill gas and odor management that incorporate quantitative standards that can be used to measure compliance. It also requires the Department of Environmental Protection to report on the status of the rules to the joint standing committee of the Legislature having jurisdiction over natural resources matters.

FISCAL NOTE REQUIRED
(See attached)

APPENDIX C

TABLE, SURVEY OF STATE ODOR REGULATIONS

SURVEY OF STATE ODOR REGULATIONS

State	Odor Requirements
Alabama	Control odors.
Alaska	Control odors.
Arizona	Control odors.
Arkansas	Control odors.
California	Requires an Odor Impact Minimization Plan for compost facilities. Control odors at landfills and disposal sites.
Colorado	For residential or commercial areas, it is a violation if odors are detected after the odorous air has been diluted with 7 or more volumes of odor free air. For other land use areas, it is a violation if odors are detected after the odorous air has been diluted with 15 or more volumes of odor free air.
Connecticut	Odor in ambient air is considered a nuisance if hydrogen sulfide is present in excess of 4.5 ppb based on a fifteen-minute average. Odor in ambient air constitutes a nuisance if after a dilution of 7 parts clean air to 1 part sampled air the odor is equal to or greater than the odor detection threshold.
Delaware	Landfill operation shall not result in odors associated with solid waste being detected off site. Prevent odors from the facility being detectable at the property line in sufficient quantities to cause or create a condition of air pollution.
Florida	If gas causes objectionable odors beyond property boundary need odor remediation plan and odor monitoring program.
Georgia	Control odors.
Hawaii	Control odors.
Idaho	Control malodorous gases.
Illinois	Minimize odors. Have established a regulatory definition including a quantitative odor level for an objectionable odor nuisance determination. • 8 D/T - on or adjacent to residential, recreational, institutional, retail, hotel or educational premises. • 24 D/T - on or adjacent to industrial premises. • 16 D/T - other premises.

State	Odor Requirements
Indiana	Control odors.
Iowa	N
Kansas	Control and minimize odors.
Kentucky	Ambient air quality standards state that any time when 1 volume unit of ambient air is mixed with 7 volume units of odorless air, the mixture must have no detectable odor.
Louisiana	Reduce noxious odors by minimizing outward movement of methane and other gases. Odors shall be controlled by the best means practicable. Odor regulations require that an odorous substance can not cause a perceived odor intensity of 6 or greater on the specified eight point butanol scale at or beyond the property line.
Maine	Control nuisance odor. Solid waste processing facilities must demonstrate that the facility will not cause more than a 1 hour average odor impact of 2 dilutions to threshold in any calendar year at any occupied buildings.
Maryland	May not create an odor problem.
Massachusetts	Prevent odor. 2007 Policy on Control of Odorous Gas at Massachusetts Landfills focuses on prevention, identification, quantification and control of H_2S emissions.
Michigan	Control odors.
Minnesota	N
Mississippi	Control odors.
Missouri	Minimize odors. • Restriction of Emissions of Odor different for different cities. For the Outstate Missouri, Springfield Green County, and Kansas City Metro Areas: No person may cause the emission of odorous matter when 1 volume of odorous air is diluted with 7 volumes of odor-free air for 2 separate trials not less than 15 minutes apart within the period of 1 hour. • For the St. Louis Area: No person shall emit odorous matter to cause an objectionable odor on or adjacent to 1) residential, recreational, institutional, retail, hotel, or educational premises; 2) industrial premises when air containing odorous matter is diluted with 20 or more volumes of odor-free air; or 3) premises other than those above when air containing odorous matter is diluted with 4 or more volumes of odor-free air.

State	Odor Requirements
Montana	Control odors.
Nebraska	N
Nevada	Control odors. Odor violation if the Director is able to make two odor measurements within 1 hour. Odor measurement consists of a detectable odor after the odorous air has been diluted with 8 or more volumes of odor-free air. Measurements must be separated by at least 15 minutes.
New Hampshire	Control odor to the greatest extent practicable. An odor management plan must be developed for landfill reclamation work to avoid the dispersion of off-site odors and should include provisions for work stoppage if odor measures fail.
New Jersey	Shall not cause any air contaminant, including a contaminant detectable by the sense of smell, to be present in such quantity and duration which is injurious to human health or welfare. Malodorous gas emissions which result in odors in any off-site area of human use shall be cause for requiring the construction of an interior gas collection system.
New Mexico	Control odors.
New York	N
North Carolina	Control odors.
North Dakota	May not cause a violation of the odor rules. May not discharge any objectionable odorous air contaminant that measures 7 odor concentration units or higher outside the property boundary. Two samples with concentrations greater than 50 ppb hydrogen sulfide sampled at least 15 minutes apart within a two-hour period constitutes a violation of the odor rules.
Ohio	Proposed rules for CDD landfills require the operator to monitor for hydrogen sulfide, other gases, or odors. Corrective action is required if levels of hydrogen sulfide equal or exceed 30 ppb (1 hour average) 5 times with a 7 day period beyond the facility boundary. In addition, corrective action is required when hydrogen sulfide, other gases, or odors released beyond the boundary pose a nuisance, cause an offensive odor, or pose a threat to public health, safety, or the environment.
Oklahoma	Control odors.
Oregon	Malodorous decomposition gases can not become a public nuisance.
Pennsylvania	Minimize and control odors.

State	Odor Requirements
Rhode Island	Control odors. An odor control program must be established.
South Carolina	Control odors.
South Dakota	Prevent objectionable odors.
Tennessee	Minimize odors.
Texas	Odor management plan required. Have formal Odor Complaint Investigation Procedures.
Utah	Control odors.
Vermont	Prevent and/or control odors.
Virginia	Control odors. No owner or other person shall cause or permit to be discharged any emissions which cause an odor objectionable to individuals of ordinary sensibility.
Washington	Control odors.
West Virginia	Control odors.
Wisconsin	N
Wyoming	Minimize odors. Ambient standards for odors: • Emission shall be limited to an odor that is undetectable at 7 dilutions with odor free air as determined by a scentometer or equivalent. The occurrence shall be measured so that at least two measurements can be made within an hour, being separated by at least 15 minutes.