

Smoke Gets in Your Lungs: Outdoor Wood Boilers in New York State



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Revised March 2008

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Acknowledgments:

Special thanks to Peter Skinner, P.E., Jared Snyder, Eugene Kelly, Emily Valerio, Ernesto Acosta, and Elizabeth Lenig for contributing to earlier versions of this report, and to reviewers at the Albany Environmental Bureau for thoughtful comments and suggestions.

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ACRONYMS USED IN THIS REPORT

ASTM	-	Association for Standards and Testing Materials
BTU	-	British Thermal Unit
CDDs	-	Chlorinated dibenzo-p-dioxins
DEC	-	New York State Department of Environmental Conservation
DOH	-	New York State Department of Health
ECL	-	Environmental Conservation Law
EPA	-	United States Environmental Protection Agency
HPBA	-	Hearth, Patio, and Barbecue Association
NYCRR	-	New York Code of Rules and Regulations
OAG	-	New York State Office of the Attorney General
OWB	-	Outdoor Wood Boiler
PAH	-	Polycyclic Aromatic Hydrocarbon
PCBs	-	Polychlorinated biphenyls
PM	-	Particulate Matter

Executive Summary

Homeowners, especially in rural communities, are increasingly turning to wood burning units installed outside the home, known as outdoor wood boilers (OWBs), to heat their homes. OWB sales have tripled in New York since 1999, with an estimated 14,500 OWBs sold in New York State from 1999 to 2007, and 188,500 sold nationwide.

The New York State Office of the Attorney General (OAG) Environmental Protection Bureau reviewed information on OWBs and analyzed the manufacture, distribution, testing, and sales of OWBs in New York State. We found that while OWBs are advertised as a clean and economical way to heat one's house and water, OWBs emit fine particulate matter in much larger amounts than other heating sources, and are among the dirtiest and least economical modes of heating, especially when improperly used. Even when used properly, OWBs emit, on an average per hour basis, about four times as much fine particulate matter pollution as conventional wood stoves, about 12 times as much fine particle pollution as EPA-certified wood stoves, 1000 times more than oil furnaces, and 1800 times more than gas furnaces. Such emissions are significant because fine particulate matter pollution has both short-term and long-term health effects on respiratory and cardiac health. Of special concern are nearby downwind neighbors who may be exposed to highly elevated levels of particulate matter. With improved design, some OWBs are more efficient and result in less pollution.

Currently, neither federal nor New York State regulations limit the pollution from nor address the proper use of OWBs. Unlike indoor woodstoves and other heating devices, OWBs do not have to meet safety or performance standards. In the absence of such regulations, some local governments have imposed their own limits on OWBs, which are described in this report. In 2007, the federal Environmental Protection Agency and OWB manufacturers agreed to voluntary goals of reducing particulate matter emissions. These voluntary goals are not enforceable and the emission goals are not adequate to prevent impacts on public health, although they may help alleviate the worst conditions.

Without federal or state regulations, neighbor disputes and problems have occurred which are often difficult to resolve. To prevent such problems from occurring, we recommend that comprehensive testing protocols and emission limitations be adopted by New York State or the EPA. In our report, we also suggest practical steps that owners and neighbors can take to mitigate environmental and health problems associated with OWBs.

I. Introduction: The Increasing Use of OWBs

In the 1980s, as the cost of oil and natural gas rose and as Americans attempted to reduce their heating expenses, the prevalence of residential wood burning stoves and furnaces increased. By 1998, nine percent of the homes in the United States used residential wood combustion units (including wood stoves, fireplaces, pellet stoves, masonry heaters and wood-fired furnaces) for at least a portion of their heating needs.¹ The United States Environmental Protection Agency (EPA) established emissions standards in 1988 for indoor residential wood stoves in an effort to decrease people's exposure to particulate matter, carbon monoxide, and other pollutants.² Consequently, all new residential wood stoves sold in the United States since 1992 require EPA certification and pollution controls.³ OWBs, however, which were rare in 1988, are not covered by the EPA residential wood stove regulations.

An OWB is a freestanding combustion unit located outside the home or structure to be heated (see Figure 1) that consists of a firebox surrounded by a water reservoir (see Figure 2). While designs vary by manufacturer, a typical OWB resembles a small shed with a short chimney to release combustion gases, and an oversized firebox, built to accommodate unsplit logs up to five feet in length. OWBs vary in size, but are typically three to five feet wide, six to nine feet deep, and six to ten feet tall, including the height of the chimney.

OWBs are designed to accommodate large wood loads which can burn for many hours without tending. Wood is placed in the firebox (combustion chamber) by the OWB operator and is ignited. The water in the reservoir surrounding the firebox is heated when hot combustion gases from the firebox pass, via pipes, through the reservoir to the exhaust stack (see Figure 2). The heated water is pumped through insulated underground pipes from the OWB to the home or building where it is circulated through the home's heating system. Wood in the firebox continues to burn until the temperature in the home reaches the desired level. A thermostat in the home controls the burn rate of the fuel by varying the amount of air that is supplied to the firebox for wood combustion. When the thermostat temperature is reached, the firebox is deprived of oxygen, leaving the wood smoldering, until more heat is needed.

¹ Houck, J., et al., *Air Emissions from Residential Heating: The Wood Heating Option Put into Environmental Perspective*, Proceedings of a U.S. EPA and Air Waste Management Association Conference. Emission Inventory: Living in a Global Environment, V.1, pp. 373-384 (1998).

² Standards of Performance for New Residential Wood Heaters, 40 CFR §§ 60.530-60.539b.

³ A list of EPA approved wood stoves can be found on the EPA website, *available at* <http://www.epa.gov/Compliance/resources/publications/monitoring/caa/woodstoves/certifiedwood.pdf> (last accessed August 28, 2007).

Figure 1: Schematic of OWB and Home

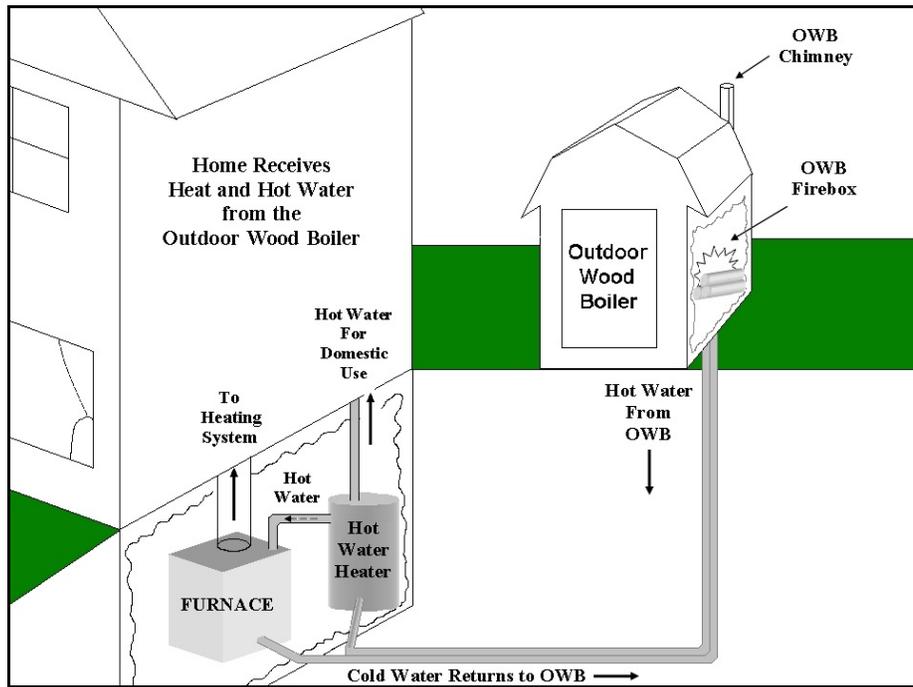
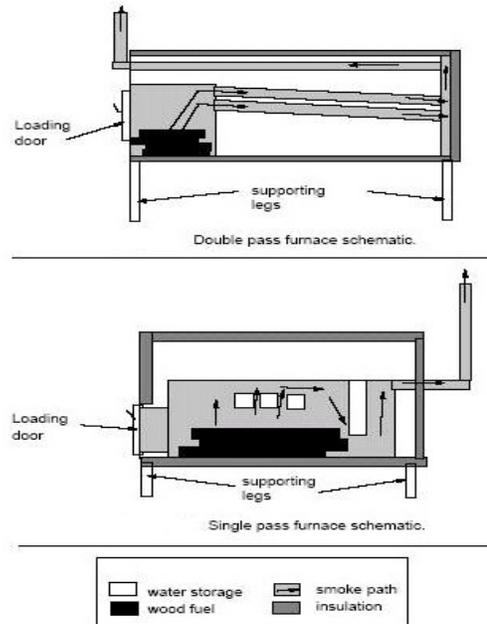
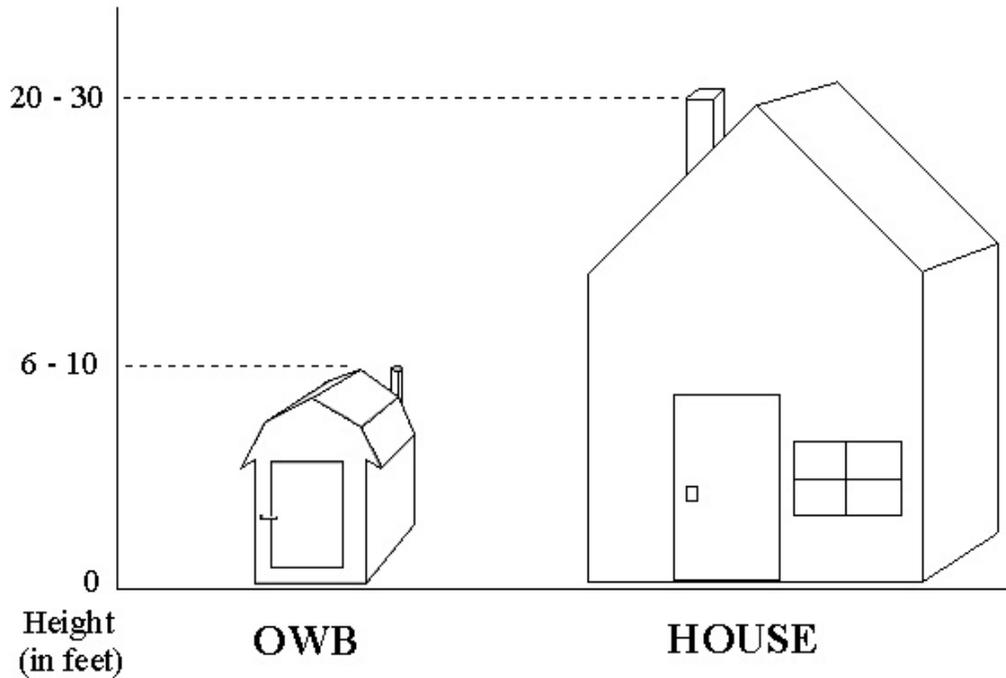


Figure 2: Schematic of Inside of OWB (side view cutaway)



In contrast to indoor wood stoves, which feature chimneys located above the building's roof line, smoke is released from the OWB via a short chimney, typically at a height of approximately six to ten feet (see Figure 3). Chimney extensions are sometimes added to increase the height.

Figure 3: Comparison of Chimney Heights



OWBs are increasingly becoming a primary method of heating homes in winter and providing hot water year-round. The number of OWBs sold annually in New York State has tripled from approximately 600 units in 1999 to 1,880 units in 2004 (the last year for which specific sales data are available). Sales across the United States have similarly increased, from about 4,800 in 1999 to over 15,000 in 2003. Based on partial data for 2004, it is estimated that 24,500 OWBs were sold across the U.S. in 2004. Since 1999, of the 77,500 units sold nationwide, nearly 7,500 OWBs have been sold in New York State (see Table 1). Assuming a continued rate of growth, sales of OWBs in New York State would be expected to be 2,100 in 2005; 2,350 in 2006; and 2,640 in 2007 giving a total of more than 14,000 units.

There are more than two dozen manufacturers of OWBs that sell units in the United States. Manufacturers typically sell OWBs to customers both directly and through more than 300 distributors and local dealers in New York State. One manufacturer accounts for approximately one-third of the United States sales since 1999.

Table 1: Number of OWBs Sold in NYS and Nationwide, 1999 to 2007

	<i>New York State</i>	<i>United States</i>
<i>1999</i>	606	4,828
<i>2000</i>	1,037	6,865
<i>2001</i>	1,721	15,330
<i>2002</i>	947	10,552
<i>2003</i>	1,272	15,340
<i>2004 *</i>	1,880	24,560
<i>2005 *</i>	2,100	30,000
<i>2006 *</i>	2,350	36,500
<i>2007 *</i>	2,640	44,600
<i>Total</i>	14,500	188,500

*Estimated based on partial data for 2004 to 2007 and assuming 12% continued rate of growth in New York State, and 22% Nationwide.

II. OWB Pollution

State health and environmental agencies have received a growing number of complaints from owners and neighbors that OWBs produce thick, acrid, foul smoke that permeates buildings and homes, causing not only a nuisance, but also environmental degradation and health problems. Even when operated using clean seasoned wood, OWBs can emit significant pollution because the basic design of the OWB causes fuel to burn incompletely, or smolder, resulting in thick smoke and high particulate emissions. The problem is aggravated when other materials, such as wet wood, processed wood, and garbage are burned. The short OWB chimney and reduced draft often fail to disperse the smoke, resulting in more concentrated pollution at lower heights reaching residents and neighbors. Exposure to this smoke, like other pollutants, can cause or contribute to short-term health harms such as eye, nose, throat, and lung irritation, coughing and shortness of breath, and may exacerbate asthma or trigger asthma attacks. Chronic exposure to smoke can cause long-term effects such as asthma, heart and lung disease, and cancer.



A. OWB Operation and Smoke

Wood smoke is one of the primary contributors to certain types of air pollution in the United States,⁴ especially in rural areas. Even though wood combustion accounts for only about nine percent of the nation's home heating needs, it accounts for an estimated forty-five percent of the total fine particulate matter directly released by all fuel combustion used for residential heating.⁵

To obtain the most efficient – and thus cleanest – burn from a wood combustion device, dry wood should be burned in a manner that allows airflow and oxygen to the greatest amount of surface area. OWBs create smoldering conditions as they cycle through periods of high and low burn, which in turn produce excess smoke. An efficient fire should produce clear exhaust during warmer months, and white exhaust (steam) during colder months. An inefficient fire produces gray, black, or thick smoke and releases much more harmful particulate matter. Because OWBs are designed to respond to the thermostatic setting by smoldering when less heat is required, they produce heavy smoke emissions more often than most other wood combustion devices.

Smoke from OWBs becomes more problematic when the owner burns items other than dry seasoned wood. Burning wet, damp, or green wood reduces the efficiency and heat output of any wood combustion device and increases particulate emissions.⁶ The energy that could be released in the form of heat is instead used to boil off the water content of the wood, which in freshly cut, green wood can be as much as fifty percent of the total weight. Thus, to generate the same amount of heat, more wood must be burned, increasing emissions of carbon dioxide – the most important pollutant responsible for global warming. In addition, when energy is expended to change water into steam, the temperature of the fire is decreased leading to incomplete combustion of the wood fuel. When that happens, increased amounts of unburned particulates will be emitted with the steam and combustion gases.⁷ Finally, all wood combustion, but particularly incomplete combustion such as in OWBs, produces a variety of toxic

⁴ Fisher, L., et al., *Long-Term Performance of EPA-Certified Phase 2 Woodstoves, Klamath Falls and Portland, Oregon: 1998/1999*, EPA/600/SR-00/100 (2000); McDonald, J., et al., *Fine Particle and Gaseous Emission Rates from Residential Wood Combustion*, *Environmental Science and Technology* 34(11): 2080-2091(2000).

⁵ EPA, *National Air Quality and Emissions Trends Report, 2003 Special Studies Edition*, Office of Air Quality Planning and Standards, EPA 454/R-03-005 (September 2003); Houck, J., et al., *Air Emissions from Residential Heating: The Wood Heating Option Put into Environmental Perspective*, Proceedings of the U.S. EPA and Air Waste Management Association Conference. *Emissions Inventory: Living in a Global Environment*, V.1, pp. 373-384 (1998). While wood accounts for nine percent of residential heating, fossil fuels – most burned in a home furnace but some burned in a power plant to produce electricity – are used for most US residential heating. Electricity-generating power plants emit the majority of their pollution as gases that are, in part, converted in the atmosphere to fine particles so that their overall contribution to fine particulate pollution in the ambient air is greater than that of wood combustion.

⁶ EPA, *Reducing Air Toxics in Your Community*, EPA-453/F-03-001 (October 2004); American Lung Association, *Woodburning* (April 2000).

⁷ Burning wet wood will result in creosote build-up inside the firebox and chimney. Creosote is a flammable sticky tar-like substance that is often responsible for chimney fires if it is allowed to accumulate from an initial gray powdery dusting into a thick crystalized build-up. Cleaning the firebox and chimney regularly will increase air flow in the wood heater, thereby reducing the rate of creosote build-up.

emissions including carbon monoxide, formaldehyde, benzene, naphthalene, and polycyclic aromatic hydrocarbons.⁸

When construction materials, packaging crates, and home garbage (which often includes plastics, rubber, batteries, electronics, and other materials unsuited for disposal by backyard combustion) are burned, the emission of harmful pollutants increases.⁹ While emissions from OWBs that burn household items have not been studied, studies of backyard burning of garbage have found that emissions include, but are not limited to, carbon monoxide, hydrogen chloride, hydrogen cyanide, benzene, styrene, formaldehyde, arsenic, lead, chromium, benzopyrene, dioxins, furans, and PCBs. According to a study conducted by EPA, the New York State Department of Health (DOH), and the New York State Department of Environmental Conservation (DEC), burning approximately ten pounds of household trash in a burn barrel releases as much air pollution as a modern, well-controlled municipal waste incinerator burning 400,000 pounds of trash.¹⁰

Although OWBs have not been subjected to extensive testing, limited testing has indicated that emissions of fine particulate matter (defined as particulates smaller than 2.5 millionths of a meter in diameter, and referred to as PM 2.5) from burning wood in OWBs are about four to 12 times higher than the emissions from indoor woodstoves.¹¹ Conventional wood stoves manufactured prior to 1992, which were not airtight and had no pollution controls, generated an average of 18.5 grams PM 2.5 per hour, whereas the newer EPA-certified wood stoves averaged about six grams per hour.¹² In similar tests, OWB emissions

⁸ Larson, R. and Koenig, J., *Summary of the Emissions Characterization and Noncancer Respiratory Effects of Wood Smoke*, EPA-453/R-93-036 (1993); Washington State Department of Ecology, *Health Effects of Wood Smoke* (March 1997).

⁹ Not surprisingly, for this reason the Hearth, Patio, and Barbecue Association advises homeowners to never use the following: trash, plastics, gasoline, rubber, naptha, household garbage, material treated with petroleum products (particle-board, railroad ties, pressure treated wood), leaves, paper products, and cardboard. Hearth, Patio, and Barbecue Association, *Outdoor Wood Furnace Best Burn Practices*, July 2006; http://www.hpba.org/fileadmin/PDFs/Tier_IV_Outdoor_Wood_Furnace_Best_Burn_Practices_-_MH1.pdf; (Accessed Aug 28, 2007).

¹⁰ Lemieux, P., *Project Summary. Evaluation of Emissions from the Open Burning of Household Waste in Barrels (with Errata)*, EPA/600/SR-97/134 (October 2003).

¹¹ Particulate pollution is typically measured using EPA Test Method 5 or Test Method 28 which collects PM as small as 0.3 microns. An additional test can then be used to distinguish between particles larger or smaller than 2.5 microns. Studies have shown that nearly all of the PM emitted in woodsmoke is PM2.5 or smaller. Houck, J., and Tiegs, P., Residential Wood Combustion – PM2.5 Emissions, WESTAR PM2.5 Workshop, Reno, Nevada (July 1998) (93% of the particulate emissions from wood combustion is PM2.5). In its assessment, The Mid-Atlantic Regional Air Management Association assumes that 100 percent of PM emissions from wood combustion is PM2.5 or smaller. See *Technical Memorandum No. 6: MANE-VU Residential Wood Combustion Emission Inventory*, Mid-Atlantic Regional Air Management Association (April 30, 2004).

¹² Valenti, J. and Clayton, R., *Emissions from Outdoor Wood-Burning Residential Hot Water Furnaces* EPA-600/R-98-017 (February 1998). EPA has established emission limits on indoor wood stoves, distinguishing between those with catalysts (through which the smoke passes, causing additional combustion) and those without catalysts. The EPA limits are 4.1 and 7.5 grams PM 2.5 per hour respectively. As can be seen in Table 2, however, testing indicates that many catalytic stoves are not, in fact, meeting the legal limit.

ranged from 18 to 147 grams PM 2.5 per hour and averaged about 72 grams per hour.¹³ In comparison to other emissions, one OWB produces approximately as much PM 2.5 per hour as two heavy duty diesel trucks, 45 passenger cars, 1000 oil furnaces, or 1800 gas furnaces.¹⁴ A comparison of PM 2.5 emissions from various home heating devices is shown in Figure 4. (Coal, while used extensively for electricity production, is not used extensively in New York for home heating.) As newer, more efficient designs are developed by OWB manufacturers, the levels of PM2.5 emissions are anticipated to decrease, although only preliminary testing has been conducted. As testing of new OWB models by the manufacturers continues, more data will become available on the EPA website.

Figure 4: Relative Emissions of Fine Particulate Matter From Home Heating Devices



¹³ These tests were conducted either by EPA or laboratories on behalf of manufacturers.

¹⁴ OWB, conventional wood stove, and EPA certified wood stove emission rates from Table 2; emission rates of 0.07 g/hr and 0.04 g/hr from *EPA Emission Factors AP-42*, Fifth Edition, Volume I, available at www.epa.gov/ttn/chief/ap42/ch01/index.html (last accessed August 28, 2007); EPA, *Emission Standards Reference Guide of Heavy-Duty and Nonroad Engines*, EPA 420-F-97-014 (September, 1997); EPA, *Federal Certification Exhaust Emission Standards for Light-duty Vehicles (Passenger Cars) and Light-duty Trucks: Federal Test Procedure (FTP), Cold CO, and Highway and Idle Tests*, EPA 420-B-00-001 (February, 2000).

Table 2: Comparison of Emissions from Various Wood Combustion Units

Type of Wood Combustion Unit	Particulate Matter, Average (grams per hour)	Polycyclic Aromatic Hydrocarbons, Average (grams per hour)
OWB	71.6 ⁱⁱ	0.96 ⁱⁱ
Conventional (non-EPA Certified) Wood Stove ⁱ	18.5 ⁱⁱⁱ	0.36 ^{iv}
EPA Certified Catalytic Wood Stove ⁱ	6.2 ⁱⁱⁱ	0.15 ^{iv}
EPA Certified Non-Catalytic Wood Stove ⁱ	6.0 ⁱⁱⁱ	0.14 ^{iv}
EPA Phase-II Certified Woodstove ^v	4.1: EPA limit for catalytic woodstoves 7.5: EPA limit for non-catalytic woodstoves	Not Available
EPA OWB Voluntary Partnership Program Goal ^{vi}	EPA voluntary goal of 0.6 pounds of fine PM per million BTUs of heat input	Not Available

ⁱ Assumes 1.0 kg/hr burn rate.

ⁱⁱ The results from manufacturers' tests and EPA data.

ⁱⁱⁱ Houck, J. and Tiegs, P., *Residential Wood Combustion Technology Review, Volume 1. Technical Report*, EPA-600/R-98-174a. (1998).

^{iv} Fisher, L., et al., *Long-Term Performance of EPA-Certified Phase 2 Woodstoves, Klamath Falls and Portland Oregon: 1998/1999*. EPA-600/SR-00-100 (2000).

^v Subpart AAA-Standards of Performance for New Residential Wood Heaters, 40 CFR §§ 60.530-60.539b.

^{vi} EPA website: <http://www.epa.gov/owhh> accessed March 3, 2008. Most current OWBs are estimated by EPA to emit 100 to 300 g/hr whereas most current EPA-certified woodstoves emit less than 4 g/hr and some emit less than 2 g/hr. As of March 2008, 2 OWB models meet the voluntary OWB Partnership Goal of no more than 0.6 pounds of PM per millions BTUs heat input. See list of EPA Voluntary Program Partner OWB manufacturers at <http://epa.gov/woodheaters/partners.htm> (Accessed February 27, 2008).

B. Human Health Impacts of OWB Smoke

Exposure to various components of wood smoke and the contaminants found in wood smoke has been associated with adverse human health impacts, as discussed below. The likelihood of health effects depends on many factors, such as the amount of smoke to which one is exposed, the frequency and duration of exposure, and the sensitivity of the individual exposed. A recent review publication¹⁵ found that even though woodsmoke is ‘natural,’ it is far from benign, with a growing body of evidence that both acute and chronic exposures to woodsmoke are associated with adverse health effects.

Fine Particulate Matter (PM 2.5)

Exposure to PM 2.5 can cause short-term health effects such as eye, nose, throat, and lung irritation, coughing, sneezing, runny nose, and shortness of breath and can also affect lung function and worsen medical conditions such as asthma and heart disease. While the upper respiratory system will filter out particles larger than ten millionths of a meter (or microns), PM 2.5 can bypass the body’s natural filtering mechanisms to lodge deep in the lungs.¹⁶ Scientific studies have linked increases in daily PM 2.5 exposure with increased respiratory and cardiovascular hospital admissions, emergency department visits and deaths. Recent studies suggest that long-term exposure to PM 2.5 may be associated with increased rates of bronchitis and reduced lung function, and increased cancer risk. People with breathing problems (such as asthma, bronchitis, emphysema, or pneumonia) and/or heart problems, and certain members of the general population (such as children and the elderly) may be particularly sensitive to PM 2.5.¹⁷ More than 60,000 deaths each year in the United States can be attributed to exposure to air polluted with PM 2.5.¹⁸ EPA in its 2004 Air Quality Criteria for Particulate Matter found an association between exposure to outdoor PM2.5 and daily mortality and morbidity,¹⁹ and subsequently strengthened the annual National Ambient Air Quality Standard (NAAQS) for PM2.5 from 35 micrograms per cubic meter to 15 micrograms per cubic meter; the 24-hour PM2.5 standard is 35 micrograms per cubic meter.²⁰

In limited sampling conducted near an operating OWB in central New York State,²¹ PM2.5 was measured at four sampling distances of 50 to 150 feet during a variety of field conditions. PM2.5 was measured every 15 seconds over a 4.3 hour period (see Johnson 2006 for methodological details). Mean PM2.5

¹⁵ Naeher, L., et al., 2007, Woodsmoke Health Effects: A Review, *Inhalation Toxicology*, 19: 67-106.

¹⁶ EPA, *EPA Announces Final Designations for First Fine Particulate Standard, September 2006* <http://www.epa.gov/pmdesignations/documents/Mar07/factsheet.htm> (Accessed August 28, 2007)

¹⁷ New York State Department of Health Fact Sheet, *Fine Particles (PM 2.5) Questions and Answers* (June 2007), available at www.health.state.ny.us/nysdoh/indoor/pmq_a.htm (last accessed August 29, 2007).

¹⁸ Washington State Department of Ecology, Air Quality Program, *Health Effects of Wood Smoke* (March 1997, updated August 2004).

¹⁹ USEPA, Air quality criteria for particulate matter, Washington DC, October 2004.

²⁰ 71 Federal Register 61,144, October 17, 2006.

²¹ Johnson, P., In-Field Ambient Fine Particle Monitoring of an Outdoor Wood Boiler: Public Health Concerns, *Human and Ecological Risk Assessment*, 12: 1153-1170, 2006

levels ranged from 58 to 1,100 micrograms per cubic meter at 50 feet, 130 to 349 micrograms per cubic meter at 100 feet, 92 to 134 micrograms per cubic meter at 130 feet, and, 130 to 133 at 150 feet. The 95th percentile PM_{2.5} levels were 85 to 4,450 micrograms per cubic meter at 50 feet, 476 to 1,518 micrograms per cubic meter at 100 feet, 694 to 875 micrograms per cubic meter at 130 feet, and 351 to 368 micrograms per cubic meter at 150 feet. These monitoring data indicate PM_{2.5} levels are likely to exceed the 24-hour NAAQS (although measured in a different manner than for compliance with NAAQS).

Respiratory and cardiovascular diseases have been associated directly with wood smoke emissions.²² For example, a Seattle area study noted increases in asthma and other respiratory disease and declines in lung function among children exposed to wood smoke.²³ Long term exposure to wood smoke, like other emissions containing PM 2.5, can lead to chronic bronchitis, obstructive lung disease, and an increased risk of cancer.²⁴ In addition to creating PM_{2.5} outdoors, fine particulate matter is known to enter homes and other structures through windows, doors, cracks, and ventilation intakes, causing elevated levels of PM_{2.5} indoors, resulting in chronic exposure to people who live and work nearby.²⁵

Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs are a group of chemicals that are formed during the incomplete combustion of coal, oil, gas, wood, garbage, and other organic substances such as tobacco. PAHs generally occur as complex mixtures often containing hundreds of different PAHs. Tests on mice show that exposure to PAHs during pregnancy results in higher rates of birth defects, lower birth weights, and difficulty reproducing. Animal studies have also shown that both short-term and long-term exposure to PAHs can inhibit the body's ability to fight disease. Some PAHs have been categorized as probable human carcinogens (cancer causing chemicals) by the U.S. Department of Health and Human Services, and by the International Agency for Research on Cancer.²⁶

²² Zelikoff, J., et al., *The Toxicology of Inhaled Woodsmoke*, J. Toxicology and Environmental Health, Part B, 5: 269-282 (2002).

²³ Koenig, J., et al., *Pulmonary Function Changes in Children Associated with Fine Particulate Air Pollution*, Environmental Research 63(1): 26-38 (1993); Larson, R. and Koenig, J., *Wood Smoke: Emissions and Noncancer Respiratory Effects*. Annu. Rev. Public Health 15: 133-56 (1994).

²⁴ American Lung Association, *Wood Smoke Affects Your Health* (1990); Ammann, H., *Summary Overview of Health Effects Associated with Residential Wood Combustion: Health Effects Issue Assessment*, Internal Report, EPA, Research Triangle Park, NC (1986); Larson, T., et al., *Urban Air Toxics Mitigation Study: Phase I*, University of Washington report submitted to the Puget Sound Air Pollution Control Authority (1988); Morris, K., et al., *Wood Burning Stoves and Lower Respiratory Tract Infections in American Indian Children*, American Journal of Diseases of Children 144: 105-108 (1990); Stevens, R., et al., *Sources of Mutagenic Activity in Urban Fine Particles*, Toxicol. Industrial Health 6: 81-94 (1990).

²⁵ Meng, Q., et al., *How Does Infiltration Behavior Modify the Composition of Ambient PM_{2.5} in Indoor Spaces? An Analysis of RIOPA Data*, Environmental Science and Technology, published online September 22, 2007.

²⁶ Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Polycyclic Aromatic Hydrocarbons* (August 1995).

Carbon Monoxide

At low concentrations, carbon monoxide can cause fatigue in healthy people and chest pain in people with heart disease. At higher concentrations, it can cause impaired vision and coordination, headaches, angina (chest pain due to the heart muscle not receiving enough oxygen), dizziness, confusion, and nausea. Exposure can cause flu-like symptoms that stop after exposure ends. It can also be fatal at very high concentrations, due to the formation of carboxyhemoglobin in the blood, which inhibits oxygen uptake.²⁷

Benzene

Exposure to benzene can cause both short and long term health effects. At high concentrations, exposure to benzene can cause drowsiness, dizziness, rapid heart rate, headaches and tremors. Long term exposure to lower levels are associated with adverse effects in the blood and bone marrow (leukemia), the immune system, the reproductive system, and increased cancer risk.²⁸

Chlorinated Dioxins

Chlorinated dibenzo-p-dioxins (CDDs) are a family of 75 different compounds with varying harmful effects. CDDs are released to the environment during combustion of fossil fuels (coal, oil, natural gas) and wood, and during incineration processes. Burning materials that may contain chlorine, such as plastics, wood treated with pentachlorophenol, pesticides, polychlorinated biphenyls (PCBs), and even bleached paper can produce CDDs. Exposure to CDDs generally occurs through breathing contaminated air, or through skin contact with materials containing CDDs. Effects of exposure depend on the amount, but can range from skin disease, changes in blood, urine, and liver chemistry, as well as potential reproductive or developmental effects. Certain CDDs have been determined to be likely carcinogens.²⁹

Other Chemicals

Wood smoke contains inorganic and organic irritants such as formaldehyde and other aldehydes, nitrogen oxides and sulfur oxides. Inhalation of wood smoke containing irritants can lead to inflammation and swelling of the lung tissue and can contribute to respiratory distress. Irritants can interfere with the normal flow of mucus that removes particles from the respiratory tract, thereby increasing the amounts of particulate matter entering the lungs. These irritants can also contribute to allergic reactions.³⁰

²⁷ EPA, *Indoor Air Quality Tools for Schools Kit*, IAQ Coordinator's Guide, July 2007, available at www.epa.gov/iaq/schools/tfs/guideee.html (last accessed August 29, 2007).

²⁸ Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Benzene*, Public Health Statement (September 1997).

²⁹ Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Chlorinated Dibenzo-p-Dioxins*, Public Health Statement (December 1998).

³⁰ Agency for Toxic Substances and Disease Registry, *TOXFAQs for Formaldehyde* (June 1999), *Sulfur Dioxide* (June 1999), and *Nitrogen Oxide* (April 2002).

C. Neighborhood Problems Created by OWB Smoke

During summer months and calm winter days, wood smoke is slow to rise and disperse. With OWB chimneys not high enough to carry the smoke past the heights of surrounding homes and local terrain, wood smoke, soot, and toxins may enter homes and yards of owners and neighbors who are situated close to OWBs. Wood smoke particulates, due to their small size, can remain suspended in the air for long periods of time, can cause a smokey haze, and can easily enter homes through air intakes, cracks, doors and windows. Effects on neighbors are especially apparent when OWBs are installed in close proximity to homes and other buildings (schools and businesses) on adjacent properties. Smoke from OWBs can also cause adverse environmental conditions and prevent people from enjoying the outdoors, and can cause visibility problems on roads.

The OAG has received more than 50 complaints from individuals who are affected by OWB-generated smoke and odors.³¹ The complaints filed with the OAG note the following:

1. Smoke from OWBs has led to a variety of symptoms including upset stomach, headaches, dizziness, respiratory effects, and throat and eye irritation.
2. Smoke from OWBs has prevented residents from enjoying activities inside and around their homes. Residents have been unable to use their porches and backyards or conduct normal activities such as walking the dog, gardening, or hanging laundry outside. Some residents do not allow their children to play outside because of the smoke.
3. Smoke from OWBs has forced residents to close their windows, doors, and air conditioning units, in an effort to keep the smoke and smoke odors from entering their homes. Residents have complained of wood smoke odors on items inside the home, such as clothing, curtains and upholstery. Smoky conditions indoors have sometimes set off carbon monoxide and/or smoke detectors.
4. Materials besides natural wood are burned in the OWBs, producing even greater amounts of noxious smoke and odors.
5. In a few cases, the unhealthy and nuisance conditions created by OWBs have caused complainants to sell their homes.

³¹ Complaints have been received from people in the following counties: Broome, Cattaraugus, Chautauqua, Chemung, Chenango, Clinton, Dutchess, Franklin, Jefferson, Onondaga, Saratoga, St. Lawrence, Suffolk, Tioga, Ulster, Warren, and Wyoming. One OWB was adjacent to a public school.

III. OWB Efficiency, Costs, and Performance

OWBs are “designed to be installed outside of the home, and to heat by an indirect method, and are exempt from the EPA regulation(s)”³² that cover indoor wood stoves. Approached by the Hearth, Patio, and Barbecue Association (HPBA) in an effort to make test data on OWBs comparable, the Association for Standards and Testing Materials (ASTM) developed a consensus-based standard testing method for OWBs.³³ An analytical test method (for the laboratory not field use) was developed to evaluate the performance of OWBs for PM_{2.5} emissions and OWB efficiency.

As data become available from such testing, OWB manufacturers and EPA will be able to better evaluate emissions, and OWB manufacturers can develop improved designs to increase efficiency and decrease emissions. Most OWBs currently available are less environmentally sound, less efficient, and less economical than other common heating sources, such as indoor wood stoves, and gas- or oil-fueled furnaces. With improvements in design, the efficiencies of OWBs are expected to improve.

A. Heating Efficiency

Heating efficiency is a measure of heat output relative to the input value of the fuel – the actual heat output in comparison to the potential heat output of the fuel. The EPA has found heating efficiencies of about 54 percent for conventional wood stoves, and 68 to 72 percent for EPA-certified wood stoves.³⁴ In comparison, data obtained from manufacturers on tests conducted on OWBs found that they have heating efficiencies ranging from 28 to 55 percent, with an average of 43 percent (see Appendix B). An OWB that is 40% efficient burns twice as much wood to produce the same amount of heat as an OWB that is 80% efficient.

B. Costs

The initial cost of OWBs is significantly higher than that of other heating devices such as gas and oil furnaces (see Table 3), many of which will already be installed in the home. In addition, the cost of purchasing or harvesting wood fuel can be substantial. Table 4 shows the relative costs to purchase and fuel a variety of heating units.

³² Excerpted language is from an EPA exemption letter provided to an OWB manufacturer in response to a request for determination of exempt status in 1999. Letter from EPA Office of Enforcement and Compliance, Energy and Transportation Division, J. Rasnic, Director, dated November 30, 1999.

³³ ASTM, *E06.54.08, Task Group on Outdoor Wood-Fired Hydronic Heaters*, Sheraton Hotel and Convention Center, Madison Wisconsin, December 1-2, 2004. The committee, with representatives from OWB manufacturers, and state and federal governments, is in the process of developing testing methods that can be applied to OWBs. While generally agreeing that a standard test method should be adopted, committee members are deliberating the quantity, quality, moisture content, and stacking position of the wood for the test burns. Ideally the adopted test method will be realistic and reproducible, to enable “factory-tested” comparable results among OWBs.

³⁴ EPA, *Residential Wood Combustion Technology Review*, Volume I. Technical Report. EPA-600/R-98-174a. (December 1998).

Table 3: Initial Cost of Various Heating Systems

Type of Heating System	Average Cost ⁱ
Outdoor Wood Boiler ⁱⁱ (43% Efficient)	\$7,660
Indoor Wood Stove ⁱⁱ (68% to 72% Efficiency)	\$3,000
Gas or Oil Furnace ⁱⁱⁱ (83% Efficient)	
Gas	\$2,100
Oil	\$2,300
Gas or Oil Furnace ⁱⁱⁱ (90% Efficient)	
Gas	\$3,300
Oil	\$4,500
Hot Water Boiler ⁱⁱⁱ (84% Efficient)	
Gas	\$3,500
Oil	\$3,300

ⁱCosts are estimated based on average costs of heating units. Includes the estimated cost of installation, but does not include cost of internal home piping or duct work. Actual costs may vary widely based on manufacturer, efficiency, and region of the United States.

ⁱⁱ The estimated initial cost of an OWB is the average of for residential units of eight manufacturers plus the average cost of installation, based on information obtained by OAG from manufacturers' websites, and from NYSERDA (NYSOAG research, January 2008).

ⁱⁱⁱ The average costs of the gas and oil systems are based on RS Means data and a survey of home heating contractors conducted by the Consumer Energy Council of America, reported in *"Smart Choices for consumers: Analysis of the best ways to reduce high heating costs,"* (Washington, 2005).

<http://www.cecarf.org/Publications/MiscPub/Smart Choices Heating Analysis.pdf>

(Last accessed March 3, 2008).

Table 4: Fuel Costs for Various Heating Systems

Type of Fuel	Fuel Price ⁱ	Price per million BTU (Dollars)	Efficiency ⁱⁱ	Price per mMBTU adjusted for efficiency (Dollars)	Total Household Energy Cost per year (Dollars) ⁱⁱⁱ
Wood (for use in OWB)	\$190 per cord	\$8.64	43%	\$20.08	\$2,008
Wood (for use in catalytic indoor wood stove)	\$190 per cord	\$8.64	72%	\$11.99	\$1,199
Wood (for use in non-catalytic indoor wood stove)	\$190 per cord	\$8.64	68%	\$12.70	\$1,270
Oil	\$2.47 per gallon	\$17.81	78%	\$22.83	\$2,283
Gas	\$1.39 per therm	\$1.90	81%	\$17.71	\$1,771
Electricity	\$0.105 per kilowatt hour	\$30.86	97%	\$31.82	\$3,182

ⁱ Average efficiencies and price per million BTU for oil, gas, and electricity based on calculations by the Energy Information Administration, United States Department of Energy. "How do I compare Heating Fuels" (November 8, 2007), available at www.eia.doe.gov/neic/experts/expertanswers.html (last accessed December 24, 2007). We note that wood prices may vary widely compared to oil, gas and electricity. The heating fuel comparison calculator (Rev H-c 4/21/05) is available for download in Microsoft Excel format, available at www.eia.doe.gov/neic/experts/heatcalc.xls.

ⁱⁱ Average wood efficiency based on OWB efficiency testing provided in Appendix B of this report, and EPA, *Residential Wood Combustion Technology Review, Volume I. Technical Report*. EPA-600/R-98-174a. (December 1998).

ⁱⁱⁱ The assumed approximate household energy consumption per year (100 million BTU) is based on the 2003 Annual Energy Review by the Energy Information Administration of the United States Department of Energy, available at www.eia.doe.gov/emeu/aer/consump.html (last accessed October 31, 2007).

C. Environmental Performance

Any combustion device will create gaseous and particulate emissions and all wood combustion will create ash requiring disposal. OWBs often cause smoldering (oxygen deprived combustion) which generates heavy smoke during those conditions. When OWBs are filled with large wood loads, they can burn for up to 48 hours, with smoldering likely. Even burning seasoned hardwood can generate smoke, but burning rotten wood, freshly cut and green wood, old building scraps, wood scraps, newspapers, corrugated cardboard boxes, pine cones, grass, yard trimmings, and sawdust can produce worse conditions. Some OWB owners also burn household waste and garbage, which should not be burned in an OWB. EPA provides guidance on proper fuels for OWBs to reduce smoke emissions.³⁵ EPA advises never to start a fire with gasoline, kerosene, charcoal starter, or a propane torch. EPA further advises that safe wood burning practices include precautions never to burn household garbage or cardboard, plastics or materials with colored ink, painted or pressure-treated wood, plywood, particle board or any wood with glue or wet, rotted, diseased or moldy wood.

IV. Current Regulation of OWBs

A. Federal and State Regulations

EPA does not currently regulate the manufacture, sale, or efficiency claims of OWBs. OWBs are not subject to the federal regulations governing indoor stoves and fireplaces, which are tested and regulated by the EPA for safety, emissions, and efficiency. Any new residential wood stove sold in the United States after July 1, 1992 must be “Phase 2” certified, meaning that it does not emit more than 4.1 grams of particulate matter per hour for catalytic stoves and 7.5 grams of particulate matter per hour for noncatalytic stoves.³⁶ Most OWBs tested to date for PM (see Table 2) exceed the PM limits that apply to EPA-certified wood stoves.

As part of its effort to reduce the harmful effects of OWBs, EPA has created a voluntary partnership program with OWB manufacturers to reduce air pollution from OWBs. Under this program, OWB manufacturers need only produce one model that complies with this program. The EPA believes the voluntary program will bring significantly cleaner OWBs to the market in 2007.³⁷ However, because the voluntary program has no enforcement component, is limited in scope, and has weak emission goals, we are concerned that this program will not reduce OWB pollution substantially.

In New York State, there are no regulations directed specifically to OWBs. DEC regulations provide that “no person shall cause or allow emissions of air contaminants to the outdoor atmosphere of such quantity, characteristic or duration which are injurious to human, plant, or animal life or to property, or which unreasonably interfere with the comfortable enjoyment of life or property.”³⁸ Operation of OWBs may also violate the DEC smoke regulation which states, in part, that “no person shall operate a stationary combustion installation which exhibits greater than twenty percent opacity, except for one six-

³⁵ EPA website <http://www.epa.gov/woodheaters/bestpractices.htm> accessed 10/05/07.

³⁶ Fisher, L., et al., *Long-Term Performance of EPA-Certified Phase 2 Woodstoves, Klamath Falls and Portland, Oregon: 1998/1999*, EPA/600/SR-00/100 (2000); see also, Subpart AAA - Standards of Performance for New Residential Wood Heaters, 40 CFR §§ 60.530-60.539b.

³⁷ EPA website <http://www.epa.gov/woodheaters> accessed 10/04/07.

³⁸ 6 NYCRR § 211.2.

minute period per hour of not more than twenty-seven percent opacity.”³⁹ DEC has taken enforcement actions involving OWB owners on some occasions based on these regulations. In 2008, DEC plans on proposing regulations specifically pertaining to OWBs.

The states of Vermont and Washington regulate OWBs. The Vermont regulations⁴⁰ include the following provisions:

- (1) Installation of an OWB must be at least 200 feet from the nearest neighboring residence not owned by the OWB owner;
- (2) The stack on the furnace must be higher than the roof line if the OWB is between 200 feet and 500 feet from the nearest neighboring home;
- (3) The OWB must comply with local ordinances and its operation must not create a nuisance;
- (4) Dealers and sellers of OWBs must provide buyers with a legal notice stating that: only untreated natural wood may be burned; installation is subject to the distance and stack height requirements stated above; and that the OWB, even if meeting the above requirements, may not be used if the terrain is inappropriate and renders the OWB to be a nuisance or public health hazard. This legal notice must be signed by both the buyer and seller and filed with the Air Pollution Control Division of Vermont prior to delivery of the OWB to the buyer.

The Washington regulation⁴¹ establishes emission standards, certification standards and procedures, curtailment rules, and fuel restrictions for solid fuel burning devices. OWBs are considered solid wood burning devices, which, after January 1, 1995, must be shown to comply with an emission standard of 4.5 grams PM per hour before they can be offered for sale in the State of Washington. Prohibited fuels include garbage, treated wood, plastic and plastic products, rubber products, animal carcasses, asphaltic products, waste petroleum products, paints and chemicals, and any substance that normally emits dense smoke or obnoxious odors. OWBs, like other solid fuel burning devices, must comply with an opacity standard not to exceed an average of 20 percent opacity for six consecutive minutes in any one-hour period. Retailers must provide information on the proper operation of the unit, including information that opacity levels of ten percent or less are attainable through proper operation.

B. Local Requirements

Some local governments in New York State have deemed OWBs a nuisance because of smoke and toxic emissions. More than 60 towns and villages have placed restrictions on OWBs ranging from meeting certain requirements for setback distances, chimney height, terrain, population density and other factors, to outright bans. These municipal requirements are shown in Table 5 and Appendix A.

³⁹ 6 NYCRR § 227-1.3. Opacity is defined as: “The degree to which emissions other than water reduce the transmission of light and obscure the view of an object in the background.” 6 NYCRR§200.1(ay). The generally applicable opacity limit of twenty percent is roughly equivalent to a light grey smoke.

⁴⁰ Vermont Air Pollution Regulation, section 5-204, Outdoor Wood Fired Boilers, adopted April 2007.

⁴¹ Washington Administrative Code 173-433-100 (3), Solid Fuel Burning Devices (January 1995).



Table 5:
Municipalities with Requirements Pertaining to OWBs
As of January, 2008

Town / Village and County	Date	Regulate	Ban
Rockland County–Modified Sanitary Code*	Apr 2006		X
Suffolk County–Local Law*	Jul 2007	X	
Adams, Village of (Jefferson County)*	Jul 2004	X	
Bainbridge, Village of (Chenango County)**	Mar 2006		X
Barneveld, Village of (Oneida County)**	Apr 2005		X
Beekman, Town of (Dutchess County)**	Apr 2006		X
Binghamton, City of (Broome County)*	Jan 2006	X	
Brookhaven, Town of (Suffolk County)**	Aug 2006	X	
Brownville, Town of (Jefferson County)*	Oct 2005	X	
Burke, Village of (Franklin County)**	Jul 2004		X
Camden, Town of (Oneida County)**	Dec 2003		X
Camden, Village of (Oneida County)**	Jun 1999		X
Canton, Town of (St. Lawrence County)**	Dec 2003		X
Cape Vincent, Village of (Jefferson County)**	Sep 2005		X
Carthage, Village of (Jefferson County)+	Sep 2006		X
Champion, Town of (Jefferson County)*	Oct 2005	X	
Chateaugay, Village of (Franklin County)**	Apr 2004		X
Chenango, Town of (Broome County)*	Sep 2005	X	
Clayton, Village of (Jefferson County)**	Oct 2004		X
Constableville, Village of (Lewis County)*	Mar 2006		X
Copenhagen, Village of (Lewis County) **	Jul 2005		X
Dickinson, Town of (Franklin County)**	Mar 2006		X
Dolgeville, Village of (Fulton County)**	Dec 2005		X
Edwards, Village of (St. Lawrence County)**	June 2003		X

Town / Village and County	Date	Regulate	Ban
Elba, Town of (Genesee County)*	June 2001	X	
Elmira Heights, Village of (Chemung County)**	Jan 2006		X
Fenton, Town of (Broome County)*	Aug 2005	X	
Fort Covington, Town of (Franklin County)*	Jan 2006	X	
Geneva, City of (Ontario County)	Oct 2006		X
Gouverneur, Village of (St. Lawrence County)**	Apr 2004		X
Greenwood, Town of (Steuben County)*	Jun 2005	X	
Herkimer, Village of (Herkimer County)**	Feb 2004		X
Hermon, Village of (St. Lawrence County)*	Feb 2006		X
Heuvelton, Village of (St. Lawrence County)**	Nov 2003		X
Holland Patent, Village of (Oneida County)**	Apr 2005		X
Hurley, Town of (Ulster County)	Jan 2007	X	
Kingsbury, Town of (Washington County)*	Oct 2004	X	
Kirkwood, Town of (Broome County)*	Aug 2006	X	
LeRoy, Village of (Genesee County)*	Jan 2007	X	
Lowville, Village of (Lewis County)**	Dec 2001		X
Malone, Village of (Franklin County)**	Mar 2004		X
Marcellus, Town of (Onondaga County)*	Jan 2004		X
Martinsburg, Town of (Lewis County)*	Jun 2005	X	
Moreau, Town of (Saratoga County) (proposed)*	Oct 2004	X	
Newport, Village of (Herkimer County)**	Apr 2004		X
Newstead, Town of (Erie County)*	July 2007	X	
Otego, Village of (Otsego County)**	Mar 2001		X
Owego, Village of (Tioga County)*	June 2007	X	
Pierrepont, Town of (St. Lawrence County)*	Oct 2005	X	
Prospect, Village of (Oneida County)**	Mar 2005		X
Queensbury, Town of (Warren County)*	May 2004	X	

Town / Village and County	Date	Regulate	Ban
Red Hook, Town of (Dutchess County)**	June 2006		X
Rensselaer Falls, Village of (St. Lawrence County)**	Jan 2004		X
Richville, Village of (St. Lawrence County)**	May 2004		X
Rodman, Town of (Jefferson County)*	Nov 2005	X	
Rutland Center, Village of (Jefferson County)*	Sep 2006	X	
South Glens Falls, Village of (Saratoga County)*	Dec 2003	X	
Union, Town of (Broome County)*	Mar 2006	X	
Warwick, Town of (Orange County)*	Jan 2006	X	
Watertown, City of (Jefferson County)*	Oct 2003	X	
Watertown, Town of (Jefferson County)*	Aug 2006	X	
Wayland, Village of (Steuben County)**	Mar 2006		X
Whitney Point, Village of (Broome County)**	Mar 2006		X

* See Appendix A for further details on requirements.

**OWBs may no longer be built or expanded as of filing date. Non-conforming uses will be allowed, under specific guidelines.

+ 6 month moratorium, none allowed.

V. Recommendations

A. Develop Federal and State Regulations

The adoption of federal regulations is the best way to address effectively the problems identified in this report. Ideally, such regulations would require emissions testing, performance standards, and control technologies to ensure that OWBs are environmentally sound and do not pose a health hazard to users and neighbors. Given the complexities of establishing testing protocols and emission limits, there are significant advantages to manufacturers of federal regulation, instead of a multitude of state and local limits. Consistent with all other Clean Air Act programs, however, it must be clear that any federal regulations only set a floor for health protections, and that states are free to enact stricter protections.

The EPA voluntary incentive program is geared toward evaluating existing and new OWB models so manufacturers can improve design and efficiency. While this is a step in the right direction, it does not replace the need for federal regulation to protect the environment and public health.

In the absence of federal regulations, DEC plans to fill the regulatory void by developing an air quality regulatory program that would effectively address OWB problems across the state. DEC may establish siting, operation, and emission limits. A DEC rulemaking would offer the additional advantage of

providing the public and affected parties with the opportunity to shape policy through submission of comments and participation in rulemaking hearings.

B. Adopt Local Requirements

Towns and villages can evaluate the suitability of OWB operation in their jurisdictions. Just as local zoning codes can address activities that create nuisances and require permits or establish conditions for certain activities, communities can consider requiring permits before installation of an OWB, especially in more densely settled areas. In evaluating permit applications, determinations can be made whether local conditions such as setback distances, terrain, and sensitive neighbors such as schools, hospitals and residences are compatible with OWB operation.

Local requirements could limit acceptable fuel to dry, natural, and untreated wood. A document acknowledging that limitation, signed by the OWB purchaser, could be filed with the local code officer, thereby becoming an enforceable condition of the usage of the OWB. The Town of Queensbury's ordinance is shown in Appendix D, as an example.

C. Provide Adequate Enforcement

Whether Federal, State or local, regulations and restrictions regarding the siting and usage of OWBs are only effective if enforcement accompanies them. Officials are often reluctant to issue violations to homeowners using an OWB as their primary heating source. However, if the smoke from an OWB is causing health or environmental problems, action should be taken to resolve the situation. This may entail working with the OWB owner to reduce the adverse impacts of the OWB by increasing the stack height, moving the OWB to a different location on the property, ensuring that seasoned wood is being used as fuel, or adding pollution controls. Sometimes small lot size and/or terrain make the OWB unsuitable for that location, such as in rural villages where neighbors are close to each other. Even when clean dry wood is burned, OWBs that are in such locations often result in smokey situations unacceptable to nearby neighbors.

In New York State, the DEC has primary enforcement responsibility under the Environmental Conservation Law and should be the first agency contacted when there is a problem. However, county and state Health Departments, and local fire departments and code officials may also be able to assess health and environmental conditions to determine whether a health or environmental nuisance exists. If the situation cannot be resolved satisfactorily, the New York State Office of the Attorney General can be contacted to assist. A list of contacts is provided at the end of this report.

D. Improve Performance of and Information About OWBs

In the absence of regulation, manufacturers can take steps to reduce OWB emissions by adding pollution control devices, installing taller stacks for smoke dispersal, or re-designing OWB units to minimize the smoldering and smoke that are inherent in the majority of the OWBs currently on the market. EPA's voluntary incentive program is designed to encourage such pollution control development.

Manufacturers should ensure that their advertising and marketing materials reflect the basis for any claims about efficiency, cost, and environmental performance and that handling instructions make clear that only dry seasoned wood be burned. Retailers should help prospective customers assess the

suitability of an OWB in light of the customer's property, taking into account such factors as proximity of neighboring residences, terrain, and nearby property uses (residential, commercial, industrial, size of OWB, etc.).

Finally, OWB manufacturers and distributors should commit to provide technical assistance in the event that an OWB creates a smoke nuisance for an OWB owner or neighbors, or is not performing as advertised. The manufacturer or distributor, by phone or personal visit, should evaluate the situation and recommend technical solutions, such as extending the smoke stack to a height that is greater than the height of the neighboring roof line or the installation of a control apparatus, such as a catalytic device.

E. Increase Consumer Awareness: Buyer Beware

Before purchasing an OWB, potential buyers should consider the size and location of their property, their heating needs, and suitable wood availability in addition to local laws and regulations. Consumers should carefully scrutinize manufacturer claims.

For people who have already purchased an OWB or who live near an OWB that is creating smoky conditions, these steps may help resolve the situation:

- (1) OWB owners should make sure they are operating the OWB only with suitable materials. If smoky conditions persist despite burning of proper materials, contact the manufacturer or distributor of the OWB unit. The manufacturer may be able to assess, adjust, and/or retrofit the unit to reduce the smoke or emissions problem by, for example, installing a taller smoke stack and/or catalytic device.
- (2) If the manufacturer or distributor cannot or will not provide assistance, or if the OWB operator will not contact the manufacturer or distributor, contact the regional DEC office that serves the county. The DEC may be able to assist in evaluating the smoke opacity to determine whether excessive smoke is present and may be able to suggest ways to improve the situation. Contact information for local officials, regional offices of the DEC, and county health departments is listed in Appendix C.
- (3) OWBs should not be used to burn pressure treated wood, painted wood, household garbage or other waste materials. Local zoning or building code officers, local fire officials, a regional DEC office, or county health departments should be called for assistance.
- (4) If you are an owner or a neighbor experiencing conditions detrimental to health (smoke in the home causing respiratory difficulties, for example), contact the public health department that serves the county (See contact list in Appendix C). The county or state DOH may be able to assist in evaluating the situation to determine if a condition exists that is detrimental to life or health.
- (5) If neither DEC nor DOH is able to assist, contact the Environmental Protection Bureau at the New York State Office of the Attorney General for further advice and assistance at 1-518-474-8096 or 1-800-771-7755.

APPENDIX A: SPECIFIC MUNICIPAL REQUIREMENTS

Specific Requirements Regarding OWBs. Contact the locality for the full regulation or code.

County Regulations:

Rockland County- Modified Rockland County Sanitary Code. No person shall operate an OWB until guidelines and standards are promulgated by NYSDEC or USEPA. Waivers for existing units can be requested. Applies to all jurisdictions in Rockland county.

Suffolk County- Proposal to regulate OWBs in Suffolk county was passed by the legislature and signed by the County Executive. The legislation requires compliance with the following through Dec 31, 2009: (1) OWB operation only between October 1 through May 1, (2) set back of at least 200 feet from hospitals, schools, day care center or nursing home, or residential building not served by an OWB, (3) fueled by natural wood only, (4) chimney height of at least 15 feet, and (5) installed according to manufacturer's instructions and compliance with local ordinances.

After January 1, 2010, no person shall operate an OWB except in the case of an emergency or natural disaster. Penalties not to exceed \$250 per day that the violation continues.

Municipal Regulations:

Village of Adams- Installation of an OWB requires a permit and meet the following requirements: (1) installed, operated and maintained according to manufacturer instructions, (2) fueled by natural untreated wood, propane, natural gas, or any combination thereof, (3) set back at least 100 feet from road and 20 feet from side and rear lot line, (4) minimum chimney height of 15 feet, and (5) use October 1 through April 30 only.

Village of Bainbridge - Prohibits new uses. Nonconforming units may continue certain to the following limitations: (1) The furnace shall not be extended or enlarged, (2) Any furnace which is abandoned or discontinued for a one year period shall not be reestablished and must be immediately removed by the property owner, and (3) Any furnace which becomes damaged by natural causes to the extent of more than 75% of its value shall not be repaired or rebuilt.

Village of Barneveld - Prohibits new uses and there are no non-conforming uses.

Town of Beekman- Prohibits new uses. Nonconforming units (pre-existing OWBs) must meet the following requirements: (1) installed, operated and maintained according to manufacturer instructions, (2) fueled by natural untreated wood or fuels specifically permitted by the manufacturer excluding non-wood products, kerosene, garbage, painted or treated wood, (3) No burn period May 1 through October 1, (4) minimum chimney height of 15 feet, and (5) must be equipped with spark arrestor. Current furnaces are not to be extended or enlarged, any furnace which is unused, abandoned or discontinued for seven months must be immediately removed by the owner, and any furnace which becomes damaged by natural causes to the extent of more than 75% of its value shall not be repaired or rebuilt.

City of Binghamton- Installation of an OWB requires a permit and meet the following requirements: (1) only firewood and untreated lumber are permitted to be burned, (2) OWBs permitted only in the Industrial zoning districts, (3) minimum lot size of 3 acres or more, (4) set back at least 200 feet from the

nearest lot line, (5) use between September 1st and May 31st only, (6) must be equipped with a spark arrester. Permits may be suspended if 20% opacity is violated as provided in NYCRR 227-1.3(b); or if malodorous air contaminants are detectable beyond property of OWB location; or if emissions interfere with the reasonable enjoyment of life or property, damage vegetation or property, or are harmful to human or animal health. Under certain conditions, waivers may be issued.

Town of Brookhaven- Prohibition, penalties for violations.

Town of Brownville- Installation of an OWB requires a permit and must meet the following requirements: (1) follow all manufacturer instructions, (2) fueled only by fuels recommended by the manufacturer excluding trash, plastics, gasoline, rubber, naphtha, household garbage, material treated with petroleum products, leaves, paper products and cardboard, (3) set back at least 50 feet from any property line, (4) chimney height requirements based on distance from non-using residences, (5) use September 1 to May 31 unless used to provide domestic water service, and (6) must comply with any other county, State or Federal guidelines.

Town of Burke - New uses are prohibited. Non-conforming uses are permitted according to the following guidelines: (1) May only be used for burning wood, all other substances are prohibited, (2) No furnace shall be extended or enlarged, (3) Any furnace which is abandoned or discontinued for 7 months shall be immediately removed by owner, and (4) Any furnace which has been damaged by natural causes more than 75% of its value shall not be repaired or rebuilt.

Town of Camden - New uses are prohibited in Residential Zoning Districts. Non-conforming uses may continue provided that replacement of any existing furnace shall be prohibited. Variances may be allowed.

Village of Camden - New uses are prohibited and there are no non-conforming uses.

Village of Canton - New uses are prohibited. Non-conforming uses are permitted according to the following guidelines:(1) No furnace shall be extended or enlarged, (2) Any furnace which is abandoned or discontinued for 7 months shall be immediately removed by owner, and (3) Any furnace which has been damaged by natural causes more than 75% of its value shall not be repaired or rebuilt.

Village of Cape Vincent - New uses are prohibited. Non-conforming uses are permitted for a one year period subject to the following guidelines, after one year the use must be discontinued or brought into compliance with the Law: (1) No furnace shall be extended or enlarged, (2) Any furnace which is abandoned or discontinued for 7 months shall be immediately removed by owner, and (3) Any furnace which has been damaged by natural causes more than 75% of its value shall not be repaired or rebuilt.

Village of Carthage - All uses are currently prohibited during a six month moratorium.

Town of Champion- Installation of an OWB requires a permit and meet the following requirements: (1) follow all manufacturer instructions, (2) only firewood, untreated lumber, fossil fuels and corn are permitted, (3) minimum set backs shall follow applicable zoning district, and (4) chimney height requirements based on distance to next nearest house.

Village of Chateaugay - New uses are prohibited. Non-conforming uses are permitted subject to the following guidelines: (1) May only be used for burning wood, all other substances are prohibited, (2) No

furnace shall be extended or enlarged, (3) Any furnace which is abandoned or discontinued for 7 months shall be immediately removed by owner, and (4) Any furnace which has been damaged by natural causes more than 75% of its value shall not be repaired or rebuilt.

Town of Chenango- Installation of an OWB requires a permit and meet the following requirements: (1) only firewood and untreated lumber may be burned, (2) permitted only in Agricultural Zone (A) with a minimum of two acres or more, (3) set back a minimum of 50 feet from nearest property line and 50 feet from nearest public road, (4) must be equipped with spark arrestor, (5) chimney height at least nine feet above the ground of the furnace and other requirements based on distance, (6) a permit may be suspended if emissions interfere with the reasonable enjoyment of life, safety or property, or if the emissions cause damage to vegetation or property, or if the emissions are unreasonably malodorous as judged by the Ordinance Officer.

Village of Clayton - New uses are prohibited. Non-conforming uses are permitted according to the following guidelines: (1) No furnace shall be extended or enlarged except that stack height may be changed based on distance from non-using residence and in compliance with manufacturer's specifications, (2) Any furnace which is abandoned or discontinued for 7 months shall be immediately removed by owner, and (3) Any furnace which has been damaged by natural causes more than 75% of its value shall not be repaired or rebuilt.

Village of Constableville- Installation is prohibited within the Village. Pre-existing units must meet the following requirements: (1) may operate only between September 1 and May 31, (2) be equipped with a spark arrestor, (3) replacement or enlargement is prohibited, (4) emissions shall not interfere with the reasonable enjoyment of life or property, (5) emissions shall not be harmful to human or animal health, (6) firewood and untreated lumber used for fuel, and (7) shall not emit emissions greater than 20% opacity (6 minute average).

Village of Copenhagen - New and replacement uses are prohibited. Non-conforming uses are permitted according to the following guidelines: (1) Must be in compliance with state and federal regulations, (2) Operated only between September 1st and May 31st, (3) equipped with properly functioning spark arrestors equal to or exceeding those specified by its manufacturer, (4) shall not emit emissions having a greater than 20% opacity during any six minute average of time, (5) no malodorous air contaminants shall be detectable beyond the boundary of the property on which it is located, (6) emissions shall not interfere with the reasonable enjoyment of life or property of the residents of the Village, (7) emissions shall not cause damage to vegetation or property, (8) emissions shall not be harmful to human or animal health, and (9) replacement of any furnace is strictly prohibited.

Town of Dickinson - New uses are prohibited. Non-conforming uses are permitted according to the following guidelines: (1) No furnace shall be extended or enlarged except that stack height may be changed based on distance from non-using residence and in compliance with manufacturer's specifications, (2) Any furnace which is abandoned or discontinued for one year shall be immediately removed by owner, and (3) Any furnace which has been damaged by natural causes more than 75% of its value shall not be repaired or rebuilt.

Village of Dolgeville - New uses are prohibited. Non-conforming uses are permitted subject to the following guidelines: (1) compliance with manufacturer's guidelines, (2) No furnaces shall be extended or enlarged, (3) any furnace which is abandoned or discontinued for 7 months shall be immediately removed by owner, (4) any furnace which has been damaged by natural causes more than 75% of its

value shall not be repaired or rebuilt, (5) all furnaces are subject to random testing and installation verification to ensure compliance, (6) no operation between June 1 and August 31st, (7) burn only natural and properly seasoned wood, and (8) smokestack shall be higher than any building within 50 feet of furnace.

Village of Edwards - New uses are prohibited. Non-conforming uses are permitted subject to the following guidelines: (1) no furnace shall be extended or enlarged and (2) any furnace which has been damaged by natural causes more than 75% of its value shall not be repaired or rebuilt.

Town of Elba- Zoning Law Section 411. OWBs shall not be installed within 500 feet of the municipal boundary of the Village of Elba or within 500 feet of an existing residence in the Town of Elba, outside the Village. When installed outside the required 500-foot buffer, such units shall be installed and operated in accordance with the manufacturers instructions so as to not allow smoke or fumes to enter buildings on surrounding properties.

Village of Elmira Heights - New uses are prohibited. Non-conforming uses are permitted subject to the following restrictions: (1) No furnace shall be extended or enlarged, (2) burn only dry, natural, untreated wood, (3) properly installed spark arrestors, (4) a smokestack at least 15 ft in height, (5) Use from October 1st through March 31st, (6) any current furnace may not be replaced, (7) must comply with federal, state and county rules and regulations, (8) operation is personal and cannot be transferred, and (9) must obtain a permit.

Town of Fenton- No person shall operate an OWB without a permit issued by the Town Building Inspector and a certificate of compliance issued by the Building Inspector. Applicants for a permit must show that the installation would meet manufacturer's recommendations, show site plan and boundaries, and proposed OWB location. Existing units shall comply with Section 105-5 which states: (1) OWBs must have spark arrestor, (2) No OWB shall be close than 350 feet to the nearest neighboring dwelling. If more than 350 feet but less than 500 feet, the chimney shall be at least as high as the roof of the neighboring dwelling, (3) only untreated natural wood shall be burned, (4) No OWB shall be closer than 10 feet from any structure, (5) If possible, OWBs shall be located to minimize the effect of smoke, given the prevailing wind direction, (6) No OWB shall be operated in a Residential A or Residential B zoning district, (7) Provided that use does not create a nuisance, OWBs may be used year round. However, individuals who use OWBs during the summer months shall take extra care to insure that adverse consequences to neighbors are minimized, including limiting the hours or frequency of use, (8) OWBs shall be installed in accordance with manufacturer's recommendations. There are also provisions that OWBs not create nuisance conditions. If a nuisance is created, the permit can be revoked.

Town of Fort Covington- A permit is required for installation and must meet the following requirements: (1) minimum of 150 feet from property line of nearest neighbor, (2) chimney at least 12 feet above roof of the furnace, (3) used to burn only wood, (4) pre-existing units must have chimney at least 12 feet above roof of furnace by September 1, 2006.

Village of Gouverneur - New uses are prohibited. Non-conforming uses are permitted subject to the following restrictions: (1) no furnace shall be extended or enlarged, but the stack height may be increased with permission, (2) stack height subject to distance from non-using residences, (3) compliance with manufacturer's specifications, (4) any furnace abandoned or unused for 8 months must be immediately removed and may not be reestablished, and (5) any furnace damages greater than 75% or otherwise incapable of safe operation may not be repaired or rebuilt.

Town of Greenwood- A permit is required for installation and must meet the following requirements: (1) only firewood and untreated lumber may be burned, (2) OWBs shall be permitted only in the portion of the town outside the Water District, (3) permitted only on lots of three acres or more, (4) set back not less than 400 feet from nearest dwelling not serviced by the OWB, (5) permit may be suspended if the Town Code Enforcement Officer determines one of the following conditions: emissions opacity exceeds 20% (6 minute average), malodorous emissions are detectable outside property where OWB is located, emissions interfere with the reasonable enjoyment of life or property, emissions damage vegetation or property, or emissions are or may be harmful to human or animal health.

Village of Herkimer - New uses are prohibited. Non-conforming uses are permitted subject to the following guidelines: (1) no furnace shall be extended or enlarged, (2) any furnace which has been abandoned or discontinued for 7 months shall be immediately removed by the owner, and (3) any furnace which has been damaged by natural causes more than 75% of its value shall not be repaired or rebuilt.

Village of Herman- OWBs must be registered with the Code Enforcement Officer and provide installation instructions and all literature provided by the manufacturer when purchased. OWBs must meet the following requirements: (1) location shall be a minimum of 100 feet from all neighboring structures, (2) chimney height is determined by the distance to the nearest residence, (3) only natural untreated wood may be burned, (4) all furnaces must have a chimney cap and spark arrestor.

Village of Heuvelton - New uses are prohibited. Non-conforming uses are permitted subject to the following guidelines: (1) only burn wood, (2) no furnace shall be extended or enlarged, (3) any furnace which has been abandoned or discontinued for one year shall be immediately removed by the owner, and (4) any furnace which has been damaged by natural causes more than 75% of its value shall not be repaired or rebuilt.

Village of Holland Patent - New uses are prohibited and there are no non-conforming uses.

Town of Hurley- Existing OWBs must have permit within 2 months of regulation, fueled only with firewood or untreated lumber kept under cover, minimum lot size of 4 acres, set back of not less than 300 feet from nearest dwelling not on same property, operation only between October 1 and May 1, stack height 2 feet above the peak of neighboring home. Various waivers and penalties are detailed.

Town of Kingsbury - Installation of an OWB requires a permit and must meet the following requirements: (1) installed, operated, and maintained according to manufacturer instructions, (2) fueled with natural untreated wood, (3) set back at least 25 feet from nearest property line, and (4) minimum chimney height of 15 feet.

Town of Kirkwood - Permit required from the Town Code Enforcement Office, with one year notice to conform for existing units (other than setback requirements). Other requirements include: (1) Only firewood and untreated lumber are permitted to be burned. Burning of all other materials such as rubbish, garbage, paint, treated or stained wood (and others listed) is strictly prohibited, (2) all OWBs are required to have a stabilized smoke stack that extends a minimum of 17 feet above ground levels of the OWB, and extends above the peak of any building on neighboring property if within 150 feet, (3) OWBs shall be set back a minimum of 50 feet from the nearest property line and 60 feet from the nearest public road, (4) the pipe carrying the hot water produced must be at least 48 inches below ground, (5) period of operation shall be only between September 15 and May 15. A permit may be revoked by the Town Board upon recommendation of the Code Enforcement Officer if the Board determines it to be necessary to protect

the public health, safety and welfare of residents if any of the following occur: emissions interfere with reasonable enjoyment of life, health, safety or property, emissions cause damage to vegetation or property, emissions are malodorous. There is an appeals and variance procedure. Penalties for violation include a fine of not more than \$500 or imprisonment for not more than 10 days for the first offence; subsequent offences are punishable by fines of not more than \$1,000 or imprisonment of not more than 30 days.

Village of LeRoy- Installation, construction and operation is prohibited within the Village of LeRoy, other than those installed and operational prior to January 24, 2007. Any such pre-existing unit may be operated only between December 1 and April 30, and must be installed no closer than 20 feet from any of the property lines, and no closer than 300 feet from any residence. The stack must extend to a height at least 5 feet higher than the highest point on the roof line of any adjacent residence within 500 feet of the furnace location. Only suitable fuels may be used.

Village of Malone - New uses are prohibited. Non-conforming uses are permitted only according to the following requirements: (1) only burn wood, (2) no furnace may be extended or enlarged, (3) any furnace abandoned or discontinued for 7 months must be immediately removed by the owner, and (4) any furnace damaged by natural causes beyond 75% of its value shall not be repaired or rebuilt.

Town of Marcellus - Zoning ordinance Section 24 K, OWBs using wood or other solid fuels are prohibited in all zones.

Town of Martinsburg- Installation must comply with the following requirements: (1) minimum set back of 50 feet from any property line, (2) use must follow manufacturer's instructions, (3) stack height determined by distance and nearest neighbor roof line.

Town of Moreau (proposed) - A permit, issued by the Town Building Inspector or Code Enforcement Officer, is required for operation of an OWB and must meet the following requirements: (1) only firewood and untreated lumber may be burned, (2) may be installed only in permitted zones, (3) must be installed on a lot of three acres or more, (4) must be set back at least 500 feet from nearest lot line, (5) may only be operated between September 1st and May 31st, and (6) must be equipped with a properly functioning spark arrestor.

Village of Newport - No owner or tenant of real property shall install or maintain an outdoor furnace within the village limits.

Town of Newstead - A permit is required for newly installed OWBs. Existing units shall be permitted to remain in operation and shall not require a permit until such time as a valid written complaint is made. Permitted fuels are designated (firewood and untreated lumber), lot size of one acre or more, setbacks of not less than 150 feet from nearest dwelling located off the lot serviced by the OWB. Review of permit if the Code Enforcement Officer observes and determines any of the following conditions: (1) malodorous air contaminants from the OWB are detectable outside the property where the OWB is located, (2) emissions interfere with the reasonable enjoyment of life or property, (3) emissions from the OWB are or may be harmful to human or animal health, (4) emissions from the OWB cause damage to vegetation or property, or, (5) violation of the NYSDEC opacity regulation. Failure to comply with any of the provisions shall be punishable by a fine of not more than \$500 or imprisonment of not more than 10 days. Enforcement after the 4th complaint within 12 months will result in suspension of the operating permit and requires removal of the OWB at the owner's expense.

Village of Otego - New uses are prohibited. Non-conforming uses are permitted only according to the following requirements: (1) no furnace may be extended or enlarged, (2) any furnace abandoned or discontinued for 7 months must be immediately removed by the owner, and (3) any furnace damaged by natural causes beyond 75% of its value shall not be repaired or rebuilt.

Village of Owego- All new construction and use of OWBs is prohibited except in industrial zones. To use an OWB in an industrial zone, the furnace or boiler must: (1) be setback a minimum of 200 feet from any other zone; (2) the fuel used shall only be natural untreated wood; (3) the OWB must be in strict compliance with the manufacturer's specifications for installation, operation, and maintenance; (4) the minimum chimney height must be 15 feet above the furnace; (5) must be equipped with a functioning spark arrestor; (6) and the operator of the OWB must obtain a permit from the Code Enforcement Officer of the Village of Owego. If an OWB is in compliance but goes unused or abandoned for a period of seven consecutive months will not be able to be reestablished as a preexisting use, and must be immediately removed from the property by the property owner.

A pre-existing OWB that was installed and in operation prior to the effective date of this chapter (6/25/07) is permitted to continue as long as it is in compliance with the requirements stated above. If an existing OWB goes unused or is abandoned for seven consecutive months, it will no longer be considered a pre-existing use, and cannot be reestablished as one and must be immediately removed by the property owner from the premise.

Town of Pierrepoint- OWBs must be registered with the Code Enforcement Officer, require a permit, and meet the following requirements: (pre-existing units must meet all but setback requirements), (1) minimum of 100 feet from any property line in the hamlet, and 30 feet in other zoning districts, (2) chimney height is determined by distance from nearest residence and roof height, (3) must have chimney cap and spark arrestor.

Village of Prospect - New uses are prohibited. Non-conforming uses are permitted only according to the following requirements: (1) no furnace may be extended or enlarged and (2) any furnace abandoned or discontinued for 7 months must be immediately removed by the owner.

Town of Queensbury - A permit is required for operation of an OWB and must meet the following requirements: (1) only firewood and untreated lumber may be burned, (2) may be installed only in permitted zones, (3) must be installed on a lot of three acres or more, (4) must be set back at least 200 feet from nearest lot line, (5) may only be operated between September 1st and May 31st, and (6) must be equipped with a properly functioning spark arrestor.

Village of Rensselaer Falls - All furnaces are prohibited even if enclosed in a building and there are no non-conforming uses.

Village of Richville - New uses are prohibited. Non-conforming uses are permitted subject to the following restrictions: (1) no furnace shall be extended or enlarged, but the stack height may be increased with permission, (2) stack height subject to distance from non-using residences, (3) compliance with manufacturer's specifications, (4) any furnace abandoned or unused for 8 months must be immediately removed and may not be reestablished, and (5) any furnace damages greater than 75% or otherwise incapable of safe operation may not be repaired or rebuilt.

Town of Rodman- A permit is required from the Town Zoning Officer and meet the following requirements: (1) operate according to manufacturer's instructions, (2) use only fuels recommended by the manufacturer, (3) minimum set back of 100 feet from the edge of any road right-of-way and 50 feet from any residence not serviced by the OWB, operated only from September 15 to May 15, (4) chimney height based on distance to next residence and roof height.

Village of Rutland Center- Existing OWBs may remain, but no new OWB may be closer to the road than the house it is serving. OWBs in the town can be operated all year except in areas zoned as hamlets, as well as the Taylor Park, Percy-Chicks, Pine Acres and Cross subdivisions. The chimney on any OWB less than 50 feet from an unserved residence must be at least 2 feet higher than the eave line of the unserved residence (and other height requirements based on distance). Only firewood, untreated lumber and other fuels approved by the furnace manufacturer are permitted. Owners of new and existing OWBs will have to apply for a free permit from the zoning officer. Requests for variances can be brought to the Zoning Board of Appeals.

Village of South Glens Falls - Installation of any OWB must meet the following requirements: (1) stack must exceed four feet and be higher than any adjacent structure within 50 feet of the furnace, (2) must be installed at least 200 feet from the closest residential property line, (3) may only burn wood, and (4) may not be used as a waste incinerator.

Town of Union- A permit is required from the Town Building Official and must meet the following requirements: (1) only firewood and untreated lumber are permitted to be burned, (2) OWBs are permitted only in the agricultural zoning district, (3) minimum lot size of 3 acres, (4) setback not less than 100 feet from the nearest lot line and to the rear of the principle building.

Town of Warwick- A permit is required from the Town Fire Marshal and must meet the following requirements: (1) only firewood and untreated lumber may be burned, (2) OWBs are permitted in the RU, MT, CO and AI Zoning Districts, (3) minimum lot size of 3 acres, (4) setback of not less than 200 feet from the nearest adjoining or neighboring dwelling, and a minimum of 150 feet from the adjoining property line, (5) use between September 1 and May 31 only, (6) chimney height must be a minimum of 4 feet above the furnace owner's home roofline, and must have a spark arrestor.

City of Watertown- No person shall operate, in the City, any free standing fuel-burning heat-producing equipment, not enclosed in a structure, which is designed to provide hot water or heat source for a structure on the property.

Town of Watertown - Outdoor wood-burning furnaces are prohibited in overlay zones (zones with denser populations). Outdoor wood-burning furnaces are allowed in underlying zones when a permit is obtained from the zoning officer. Non-conforming uses must obtain a permit within one year. All (new or non-conforming) furnaces shall comply with the following rules and regulations: (1) must be installed, operated and maintained per the manufacturer's instructions, (2) only firewood and untreated lumber may be burned, (3) set backs as follows: 100 feet from the front lot line, 75 feet from rear and side lots and 150 feet from residential structures on adjacent properties, (4) operation only between September 15th and June 1st, (5) chimney height is determined by distance to structures, and (6) if replaced or upgraded, a permit must be obtained.

Village of Wayland - New uses are prohibited. Non-conforming uses are permitted only when complying with the following specifications: (1) no furnace may be extended or enlarged, (2) any furnace

abandoned or discontinued for 7 months must be immediately removed by the owner, (3) no furnace damaged greater than 75% may be repaired or rebuilt, (4) burn only firewood or untreated lumber, and (5) operation of or emissions from an outdoor wood burning furnace shall not unreasonably interfere with the public health, safety and welfare of the residents nor shall same prevent residents from the reasonable enjoyment of their life and property.

Village of Whitney Point - New uses are prohibited. Non-conforming uses are permitted when the following requirements are met: (1) no furnace shall be extended or enlarged and (2) any furnace abandoned or discontinued for one year shall be immediately removed by the owner.

APPENDIX B: NEW YORK STATE CONTACTS FOR OWB PROBLEMS

(1) Local Zoning, Health, and Code Enforcement Officials

New York State County, City, Town, and Village Contact Information is available in local telephone directories or is *available* at www.nysgov.com/citguide.cfm?context=citguide&content=munibycounty1

(2) Regional Department of Environmental Conservation (DEC) Offices

Region	County	DEC Regional Office
1	Nassau and Suffolk	631-444-0205
2	Bronx, Brooklyn, Manhattan, Queens, and Staten Island	718-482-4944
3	Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, and Westchester	845-256-3045
4	Albany, Columbia, Delaware, Greene, Montgomery, Otsego, Rensselaer, Schoharie, and Schenectady	518-357-2350
5	Clinton, Essex, Franklin, Fulton, Hamilton, Saratoga, Warren, and Washington	518-623-1212
6	Herkimer, Jefferson, Lewis, Oneida, and St. Lawrence	315-785-2513
7	Broome, Cayuga, Chenango, Cortland, Madison, Onondaga, Oswego, Tioga, and Tompkins	315-426-7552
8	Chemung, Genesee, Livingston, Monroe, Ontario, Orleans, Schuyler, Seneca, Steuben, Wayne, and Yates	585-226-5311
9	Allegany, Cattaraugus, Chautauqua, Erie, Niagara, and Wyoming	716-851-7130

(3) County Health Departments

County	Health Department	County	Health Department
Albany	518-447-4620	Niagara	716-439-7444
Allegany	585-268-9250	Oneida	315-798-5064
Bronx (NYC)	212-268-7185	Onondaga	315-435-6623
Broome	607-778-2887	Ontario	315-789-3030
Cattaraugus	716-373-8050	Orange	845-291-2331
Cayuga	315-253-1405	Orleans	585-589-3272
Chautauqua	716-753-4481	Oswego	315-349-3564
Chemung	607-737-2019	Otsego	607-432-3911
Chenango	607-337-1673	Putnam	845-278-6130
Clinton	518-565-4870	Queens (NYC)	212-268-7185
Columbia	518-828-3358	Rensselaer	518-270-2674
Cortland	607-753-5035	Richmond (NYC)	212-268-7185
Delaware	607-432-3911	Rockland	845-364-2608
Dutchess	845-486-3404	St. Lawrence	315-386-1040
Erie	716-858-7677	Saratoga	518-793-3893
Essex	518-891-1800	Schenectady	518-386-2818
Franklin	518-891-1800	Schoharie	518-295-8382
Fulton	315-866-6879	Schuyler	607-324-8371
Genesee	585-344-8506	Seneca	315-539-1945
Greene	607-432-3911	Steuben	607-324-8371
Hamilton	518-891-1800	Suffolk	631-853-3058
Herkimer	315-866-6879	Sullivan	845-794-2045
Jefferson	315-785-2277	Tioga	607-687-8566
Kings (NYC)	212-268-7185	Tompkins	607-274-6688
Lewis	315-785-2277	Ulster	845-340-3150
Livingston	585-243-7280	Warren	518-793-3893
Madison	315-366-2526	Washington	518-793-3893
Monroe	585-274-6067	Wayne	315-789-3030
Montgomery	315-866-6879	Westchester	914-813-5000
Nassau	516-571-3410	Wyoming	585-786-8894
New York (NYC)	212-268-7185	Yates	315-789-3030

- (4) New York State Office of the Attorney General**
Environmental Protection Bureau: 800-771-7755

APPENDIX C: TOWN OF QUEENSBURY ORDINANCE

LOCAL LAW NO.: ___ OF 2004

A LOCAL LAW TO AMEND THE QUEENSBURY TOWN CODE BY REPLACING CHAPTER 119 ENTITLED “OUTDOOR FURNACES” WITH A NEW CHAPTER 119 REGULATING THE USE OF OUTDOOR FURNACES IN THE TOWN OF QUEENSBURY.

BE IT ENACTED BY THE TOWN BOARD OF THE TOWN OF QUEENSBURY AS FOLLOWS:

1. Title and Authority – This Local Law shall be known as the Town of Queensbury Outdoor Furnace Local Law. It is adopted pursuant to Municipal Home Rule Law § 10.

2. Legislative Intent – Although outdoor furnaces may provide an economical alternative to conventional heating systems, concerns have been raised regarding the safety and environmental impacts of these heating devices, particularly the production of offensive odors and potential health effects of uncontrolled emissions. This Local Law is intended to ensure that outdoor furnaces are utilized in a manner that does not create a nuisance and is not detrimental to the health, safety and general welfare of the residents of the Town.

3. Definitions – "Outdoor Furnace" means any equipment, device or apparatus, or any part thereof, which is installed, affixed or situated outdoors for the primary purpose of combustion of fuel to produce heat or energy used as a component of a heating system providing heat for any interior space.

“Untreated Lumber” means dry wood which has been milled and dried but which has not been treated or combined with any petroleum product, chemical, preservative, glue, adhesive, stain, paint or other substance.

“Firewood” means trunks and branches of trees and bushes but does not include leaves, needles, vines or brush smaller than three inches (3”) in diameter.

4. Permit Required – No person shall cause, allow or maintain the use of an Outdoor Furnace within the Town of Queensbury without first having obtained a permit from the Town Fire Marshal. Application for permit shall be made to the Fire Marshal on the forms provided.

5. Existing Outdoor Furnaces – Any Outdoor Furnace in existence on the effective date of this Local Law shall be permitted to remain provided that the owner applies for and receives a permit from the Town Fire Marshal within one (1) year of such effective date; provided, however, that upon the effective date of this Local Law all the provisions hereof except paragraphs 6(B), (C) and (D) shall immediately apply to existing Outdoor Furnaces. All of the provisions of this Local Law shall continue to apply to existing Outdoor Furnaces which receive permits except paragraphs 6(B), (C) and (D). If the owner of an existing Outdoor Furnace does not receive a permit within one (1) year of the effective date of this Local Law, the Outdoor Furnace shall be removed. “Existing” or “in existence” means that the Outdoor Furnace is in place on the site.

6. Specific Requirements –

- A. Permitted Fuel – Only Firewood and Untreated Lumber are permitted to be burned in any Outdoor Furnace. Burning of any and all other materials in an Outdoor Furnace is prohibited.

- B. Permitted Zones – Outdoor Furnaces shall be permitted only in the LC-10A, LC-42A, RR-5A zoning districts as shown on the Town’s Zoning Map.
- C. Minimum Lot Size – Outdoor Furnaces shall be permitted only on lots of three (3) acres or more.
- D. Setbacks – Outdoor Furnaces shall be set back not less than 200 feet (200’) from the nearest lot line.
- E. Months of Operation – Outdoor Furnaces shall be operated only between September 1st and May 31st.
- F. Spark Arrestors – All Outdoor Furnaces shall be equipped with properly functioning spark arrestors.

7. Suspension of Permit – A permit issued pursuant to this Local Law may be suspended as the Fire Marshal may determine to be necessary to protect the public health, safety and welfare of the residents of the Town of Queensbury if any of the following conditions occurs:

- A. Emissions from the Outdoor Furnace exhibit greater than 20 percent (20%) opacity (six minute average), except for one continuous six-minute period per hour of not more than 27 percent (27%) opacity, which shall be determined as provided in 6 NYCRR 227-1.3(b);
- B. Malodorous air contaminants from the Outdoor Furnace are detectable outside the property of the person on whose land the Outdoor Furnace is located;
- C. The emissions from the Outdoor Furnace interfere with the reasonable enjoyment of life or property;
- D. The emissions from the Outdoor Furnace cause damage to vegetation or property; or
- E. The emissions from the Outdoor Furnace are or may be harmful to human or animal health.

A suspended permit may be reinstated once the condition which resulted in suspension is remedied and reasonable assurances are given that such condition will not recur. Recurrence of a condition which has previously resulted in suspension of a permit shall be considered a violation of this Local Law subject to the penalties provided in paragraph 9 hereof.

8. Waivers; Board of Health Ratification – Where the Town Board of Health finds that extraordinary and unnecessary hardships may result from strict compliance with this Local Law, it may vary the regulations so that substantial justice may be done and the public interest secured, provided that such variations will not have the effect of nullifying the intent and purpose of this Local Law or of jeopardizing the health, safety or welfare of the public. In varying any regulations, the Board of Health may impose such conditions and requirements as it deems reasonable and prudent. The Board of Health may, at its discretion, hold a public hearing as part of its review. If the Board of Health grants the waiver, a permit shall be issued for the Outdoor Furnace. If the Board of Health denies the waiver, the Outdoor Furnace must either be brought into compliance with this Local Law or removed. If the Board

of Health does not take any action with respect to the waiver within sixty (60) days from its receipt of an application for waiver, the waiver shall be deemed denied.

9. Enforcement; Revocation of Permit – Failure to comply with any of the provisions of this Local Law shall be a violation and, upon conviction thereof, shall be punishable by a fine of not more than \$500 or imprisonment for a period of not more than ten (10) days, or both, for the first offense. Any subsequent offense shall be punishable by a fine of not more than \$1,000 or imprisonment for a period of not more than thirty (30) days, or both. In addition, any permit issued pursuant to this Local Law shall be revoked upon conviction of a second offense and the subject Outdoor Furnace shall not be eligible for another permit. Each day that a violation occurs shall constitute a separate offense. The owners of premises upon which prohibited acts occur shall be jointly and severally liable for violations of this Local Law. Any fine imposed hereunder shall constitute a lien upon the real property where the Outdoor Furnace is located until paid.

10. Effect of Other Regulations – Nothing contained herein shall authorize or allow burning which is prohibited by codes, laws, rules or regulations promulgated by the United States Environmental Protection Agency, New York State Department of Environmental Conservation, Adirondack Park Agency, Lake George Park Commission any other federal, state, regional or local agency. Outdoor Furnaces, and any electrical, plumbing or other apparatus or device used in connection with an Outdoor Furnace, shall be installed, operated and maintained in conformity with the manufacturer’s specifications and any and all local, State and Federal codes, laws, rules and regulations. In case of a conflict between any provision of this Local Law and any applicable Federal, State or local ordinances, codes, laws, rules or regulations, the more restrictive or stringent provision or requirement shall prevail.

11. Severability – The invalidity of any clause, sentence, paragraph or provision of this Local Law shall not invalidate any other clause, sentence, paragraph or part thereof.

12. Repealer – All Local Laws or ordinances or parts of Local Laws or ordinances in conflict with any part of this Local law are hereby repealed.

13. Effective Date – This Local Law shall take effect upon filing in the office of the New York State Secretary of State or as otherwise provided by law.

APPENDIX D: REFERENCES AND ADDITIONAL INFORMATION

American Lung Association, *Wood Smoke Affects your Health* (September 1990).

Bascom, R., *Health effects of outdoor air pollution*, Am J Respir Crit Care Med 153:477-498 (1996).

Brook, R., et al., American Heart Association, *AHA Scientific Statement: Air Pollution and Cardiovascular Disease. A statement for Healthcare Professionals from the Expert Panel on Population and Prevention Science of the American Heart Association*, 109: 2655-2671 (June , 2004), available at <http://circ.ahajournals.org/cgi/reprint/109/21/2655>

Consumer Energy Council of America. “*Oil, Gas, or...? An Evaluation of the Economics of Fuel Switching Versus Home Energy Conservation.*” Final Report (March 2001), available at www.cecac.org/Publications/MiscPub/FuelSwitchingReport.pdf

Dockery, D. and Pope, C., *Acute respiratory effects of particulate air pollution*, Annu Rev Public Health 15: 107-132 (1994).

Energy Information Administration, United States Department of Energy. Heating Fuel Cost Comparison Calculator, available at www.eia.doe.gov/neic/experts/heatcalc.xls

Fairley, D., *The relationship of daily mortality to suspended particulates in Santa Clara County, 1980-1986*, Environ Health Perspect 89: 159-168 (1990).

Johnson, P., *In-Field Ambient Fine Particle Monitoring of an Outdoor Wood Boiler: Public Health Concerns, Human and Ecological Risk Assessment*, 12: 1153-1170 (2006).

NESCAUM (Northeast States Coordinated Air Use Management), *Assessment of Outdoor Wood-fired Boilers*, March 2006

Ostro, B., *Fine particulate air pollution and mortality in two Southern California counties*, Environ Res 70: 98-104 (1995).

Pope, C., et al., *Daily mortality and PM10 pollution in Utah Valley*, Arch Environ Health 47: 211-217 (1992).

Pope, C., et al., *Particulate air pollution and daily mortality on Utah's Wasatch Front*, Environ Health Perspect 107: 567-573 (1999).

Samet, J., et al., *Fine particulate air pollution and mortality in 20 U.S. cities, 1987-1994*, New England Journal of Medicine 343: 1742-1749 (2000).

Schwartz, J., *Air pollution and daily mortality in Birmingham, Alabama*, Am J Epidemiol 137: 1136-1146 (1993).

Schwartz, J., *What are people dying of on high air pollution days?* Environ Res 64: 26-35 (1994).

Schwartz, J., et al., *Is daily mortality associated specifically with fine particles?*, J Air Waste Manag Assoc 46: 927-939 (1996).

Tesfaigzi, Y., et al., *Health effects of subchronic exposure to low levels of wood smoke in rats*,

Toxicological Sciences 65: 115-125 (2002).

Vedel S., *Ambient particles and health: lines that divide*, J Air Waste Manag Assoc 47: 551-581(1997).

Wordley, J., et al., *Short term variations in hospital admissions and mortality and particulate air pollution*, Occup Environ Med 54: 108-116 (1997).

Zelikoff, J., et al., *The toxicology of inhaled woodsmoke*, J Toxicology and Environmental Health, Part B, 5: 269-282 (2002).

Select Websites and Links for More Information

American Lung Association, available at www.lungusa.org

Woodburning, available at www.lungusa.org/site/pp.asp?c=dvLUK9O0E&b=23354

Clean Air Revival, Inc., Burning Issues, available at www.BurningIssues.com

Department of Environmental Conservation, New York State, available at www.dec.state.ny.us

Environmental Protection Agency, United States.

Main Web Page, available at www.epa.gov

Fine Particulate Matter, available at www.epa.gov/pmdesignations/index.htm

Outdoor Wood Boilers, available at www.epa.gov/woodheaters

Puget Sound Clean Air Agency, available at www.pscleanair.org

Hearth, Patio, and Barbecue Association, available at www.hpba.org

Smoke Troubleshooting Checklist for OWBs, available at

<http://www.hpba.org/fileadmin/PDFs/troubleshootingGuidlines.pdf>

Northeast States Coordinated Air Use Management, Outdoor Wood Boiler report, available at www.nescaum.org/documents/assessment-of-outdoor-wood-fired-boilers Office of the Attorney General, New York State, available at www.ag.ny.gov

Washington State Department of Ecology

Outdoor Burning, available at www.ecy.wa.gov/pubs/9204.pdf

Health Effects of Wood Smoke, available at www.ecy.wa.gov/biblio/92046.html