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Retired Wood Pole Disposal and Reuse Options

Guidance for Final Pole Disposition



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Guidance for Final Pole Disposition

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Abstract

When a utility wood pole reaches the end of its service life, it is replaced with a new pole. Old poles and crossarms are retired in one of four ways. They go to a landfill, they are incinerated in permitted waste-to-energy (WTE) facilities, they are repurposed/recycled, or they are donated or sold to third parties for uses consistent with their original intended use.

Each retirement option offers advantages and disadvantages. Landfilling can be expensive, is the least sustainable option, and carries moderate liability. WTE facilities may be too far away or demand too much documentation about pole condition. But WTE is more sustainable than landfilling, carries less liability, and can generate sustainability credits. Repurposing/recycling offers improved sustainability and moderate liability, as well as sustainability credits. Donation or sale to third parties has the highest level of sustainability but also carries the highest potential liabilities. The sustainability value of these options varies and it may be difficult for utilities to reconcile cost, sustainability, and potential liability.

EPRI members requested a single source of specific, up-to-date information that describes and evaluates wood pole and crossarm disposal options available in the United States and Canada. In response to their request, data and information for this report were acquired as follows:

- A wood pole disposal and reuse survey was developed and sent to 24 EPRI members in the United States and Canada in the third quarter of 2017. Eighteen members responded with information about their own wood pole and crossarm disposal methods and known or perceived liabilities.
- Federal and state/provincial regulatory requirements for treated wood disposal were gathered and summarized.

- In each state or province, one landfill that accepts treated wood was located and its requirements and tipping fees were summarized.
- A list of municipal solid waste incinerators and biomass plants in the United States and Canada that accept wood poles and crossarms was developed, and their requirements and fees were summarized.
- Wood pole reusers/recyclers were identified, and their requirements and fees were summarized.

Regardless of the U.S. federal hazardous waste exemption for arsenical preservatives and EPRI studies showing that creosote- and pentachlorophenol (penta)-treated poles are nonhazardous, most nonhazardous landfills and WTE facilities in the United States require an analytical characterization to demonstrate that the wood is nonhazardous. Some utilities simply default to hazardous landfills, even if tipping fees are higher than those for other options, because success in demonstrating the nonhazardous status of the materials is uncertain. All landfill operators have considerable latitude in deciding whether poles and crossarms are acceptable at their facility, even if a nonhazardous classification has been established. All the Canadian provinces allow landfill disposal, but their operators appear to be less cautious about accepting pole materials than their U.S. counterparts.

Most retired poles and crossarms are sent to landfills. More retired poles would probably be used for WTE if pre-processing and analytical requirements were less daunting, or if more utilities understood that WTE facilities may accept treated wood. A small proportion of all poles is sent to recycling facilities, where approximately half the volume is repurposed for fence posts and other landscaping uses. The other half ends up in landfills or WTE facilities. Very few poles and crossarms are used for gasification or biofuels. Donation programs still exist, but the survey identified only one utility that gave away all its retired poles. Other utilities give away some poles, using waivers to help manage potential liability. Waivers may or may not provide adequate legal protection.

Although most poles are still retired in landfills, many other options for more sustainable pole retirement have emerged in the past decade. These options are described and evaluated in this report, which provides valuable benchmarking information.

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PRIMARY AUDIENCE: Utility waste management staff.

KEY RESEARCH QUESTION

Utility waste management personnel often struggle to balance cost, liability, and sustainability in wood pole and crossarm disposal. This report describes and evaluates wood pole and crossarm disposal options that are available in the United States and Canada.

RESEARCH OVERVIEW

Eighteen utilities in the United States completed a survey to provide information about their wood pole and crossarm disposal practices and assist in characterization of common practices. In addition, EPRI sponsored research to identify U.S. and Canadian landfills, Waste-to-Energy (WTE) facilities, and remanufacturing operations and their potential liabilities. The survey questions are provided in Appendix A, and the names, locations, and requirements for facilities and operations that accept poles and crossarms are provided in tables of this report. Approximate tipping fees are included. The report text explains nuances that affect disposal options and describes facilities and operations.

KEY FINDINGS

- The U.S. federal exemption of chromated copper arsenate (CCA)-treated poles and crossarms from hazardous solid waste classification is disregarded in most states and by most landfill operators. These operators still require an analytical characterization that the wood is nonhazardous.
- EPRI has conclusively demonstrated that pentachlorophenol (penta)- and creosote-treated poles do not fail the tests applied to determine if they are hazardous. This "generator knowledge" that they are nonhazardous is not generally accepted by state regulators or landfill operators. They still require an analytical characterization that the wood is nonhazardous.
- Canadian landfill operators appear much less cautious and rarely request analytical data to demonstrate that poles and crossarms are nonhazardous. If analytical data are required by authorities or facility operators, the U.S. Environmental Protection Agency (EPA) Toxicity Characteristic Leaching Procedure (TCLP) is the analytical method of choice.
- Incineration of CCA-treated wood is generally not allowed by regulators in the United States because of concerns about emissions and concentrations of metals in the ash. However, there is at least one U.S. WTE facility that does incinerate CCA-treated wood while meeting its permit requirements.
- In Canada, WTE represents more than incineration and includes wood pellet manufacturing, biomass, and biogas.
- Facilities that incinerate creosote-treated railroad ties may be willing to accept penta-treated wood as well, though it may need to be ground, chipped, or shredded first. Cement kilns may also accept creosote-treated wood.

- The number of treated wood recyclers is growing, but only about half (or less) of the total volume of poles and crossarms they accept is actually reused. The remaining volume is typically burned at WTE facilities or disposed in landfills.
- Wood pole producers and other entrepreneurs have recognized that treated wood disposal can be a frustrating and inefficient task for utilities. Some producers have developed cradle-to-grave services, where they deliver new poles and remove retired poles. Entrepreneurs and recyclers are developing all-in-one mobile solutions, where they arrive at a site with poles and/or crossarms, chip or grind the treated wood, and haul it to an incinerator or landfill.
- Waivers of liability, intended to protect utilities from off-spec use of donated poles and crossarms, may or may not stand up in court. The waiver instrument should be state-specific and reference local and regional regulations and guidance.
- Utility personnel seeking better local and regional options should try using Internet and regulatory search terms that may seem counterintuitive or imprecise. Wood processor/recycler websites may not use words such as "treated" wood or "utility" pole. They may say "railroad ties" or "telephone" poles. The terms "wood recycling," "wood grinding," "wood chipping," "waste wood" may generate viable local options. Utilities may need to collaborate with local providers who have the equipment and skills to process retired poles and crossarms, but are unaware of this potential demand for their services.
- The number of pole and crossarm retirement options has grown noticeably in the past ten years and option sustainability has improved. This trend may continue, at least in the short term, as reusers/recyclers expand their services and fill the market niche.

WHY THIS MATTERS

Utility waste managers are charged with identifying and implementing disposal options for wood poles and crossarms that are regarded as safe, practical, affordable, and as sustainable as possible. This report provides an up-to-date resource for wood pole and crossarm asset recovery managers and a guide to facilities, landfills, and other operations where managers can dispose of retired wood poles and crossarms.

HOW TO APPLY RESULTS

Survey results discussed in this report can be used by readers to benchmark their performance by comparing or contrasting it with current wood pole and crossarm disposal practices of other utilities. Appendices to the report contain summaries of state regulations (where they could be identified) regarding treated wood disposal. Tables in the report and appendices allow users to rapidly identify local or regional landfills, facilities, and operations that may offer advantages to utility waste managers seeking wood pole and crossarm disposal solutions.

LEARNING AND ENGAGEMENT OPPORTUNITIES

- The Utilities Solid Waste Activities Group (USWAG) and the National Rural Electric Cooperative Association (NRECA) may find value in this report for their members, for the same reasons that EPRI members will find it useful.

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PROGRAM: Transmission and Distribution and ROW Environmental Issues, Program 51

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List of Terms

ACZA	ammoniacal copper zinc arsenate
Btu	British thermal unit
C	Celsius
C&D	construction and demolition
C&DD	construction and demolition debris
CCA	chromated copper arsenate
CH_4	methane
CO	carbon monoxide
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
H	hydrogen
MSW	municipal solid waste
NRECA	National Rural Electric Cooperative Association
OPP	Office of Pesticide Programs
PAH	polycyclic aromatic hydrocarbon
PCPA	Pest Control Products Act (Canada)
penta	pentachlorophenol
PMRA	Pest Management Regulatory Agency (Canada)
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
TCLP	Toxicity Characteristic Leaching Procedure
USWAG	Utilities Solid Waste Activities Group
WTE	waste-to-energy

List of Conversion Factors

Energy	1 Brutish thermal unit (Btu)	1,055 joules (J)
Length	1 foot (ft)	0.3 meters (m)
Mass	1 ton (t)	0.907 tonne (t)
Mass	1 pound (lb)	0.45 kilogram (kg)
Temperature	32 degrees Fahrenheit (°F)	0 degrees Celsius (°C)

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Section 1: Introduction

Most wood utility poles and crossarms in the United States and Canada are treated with chromated copper arsenate (CCA), creosote, or pentachlorophenol (penta) dissolved in a petroleum base, like fuel oil [1]. Fewer poles are treated with ammoniacal copper zinc arsenate (ACZA). These chemical formulations are used because they repel wood decay organisms (fungi and insects) effectively, such that pole in-service lifespans may exceed 50 years [2].

More than 3 million utility poles, representing 1,200,000 tons of treated wood, are retired from service each year in the United States.

National Public Radio [3] reported that there are approximately 160 million wood utility poles in service in the United States. Annual pole replacements are estimated at 2% to 4% of the total number [4]. This means that more than three million poles are retired from U.S. service on an annual basis. In Canada, roughly 70,000 poles are retired every year [5]. Each pole may also have one or more treated wood crossarms that are retired at the same time.

According to Bell Lumber and Pole Company [6], the shipping weight of one Class 4, 40-foot-long southern pine distribution pole (a common pole) is roughly 1,000 pounds. Upon retirement, the pole will likely weigh less due to weathering and preservative loss over the years. A conservative retirement weight is 800 pounds. So, on an annual basis about 1,200,000 tons of treated wood are retired by electric utilities in the United States. This amount is roughly equivalent to all the material an average privately owned landfill will consume in about three years of steady dumping. This statement is based on delivery of 1,200 tons per day [7] for 1,000 days and the volume it describes occupies a significant amount of landfill space. Based on the metrics described above, an estimated 28,000 tons of treated wood poles are retired in Canada each year. These weighs are conservative estimates for both the United States and Canada because crossarms and larger pole weighs are not considered.

EPRI members requested a single source of specific, up-to-date information that describes and evaluates wood pole and crossarm disposal options available in the United States and Canada.

Members of The Electric Power Research Institute (EPRI) Program 51—Transmission and Distribution and ROW Environmental Issues—focus on reducing the volume of waste they send to landfills, and increasing the sustainability of all practices. To support those objectives, EPRI has:

- Developed and distributed a wood pole and crossarm disposal practices survey to 24 Program 51 members.
- Conducted research to secure and evaluate disposal regulations at the U.S. federal and state level, and in Canada.
- Randomly chosen a cross section of municipal solid waste (MSW) landfills to identify their treated wood disposal requirements and costs.

- Sought out and listed in easy-to-use table format waste-to-energy (WTE) and biomass facilities that accept treated wood.
- Sought out and listed in easy-to-use table format facilities that recycle or reuse treated wood.

This report presents and discusses the results of these efforts.

Section 2: Wood Pole and Crossarm Disposal Practices Survey

A retired wood pole and crossarm survey questionnaire was developed using SurveyGizmo®, an on-line enterprise-level data collection platform that summarizes responses and presents the results with graphics and percentages.

EPRI's survey elicited information about wood pole and crossarm retirement practices from 18 member companies.

As mentioned above, the survey was provided to 24 members of EPRI Program 51 in the United States, with a commitment to keep identities anonymous in this report. Eighteen members (75%) responded. There are many more electric transmission and distribution companies in the United States, so the survey responses provide only a glimpse of practices throughout the entire industry. The survey results do, however, allow some benchmarking. The survey was designed to elicit qualitative and quantitative information regarding wood pole and crossarm retirement practices (Appendix A).

The survey posed questions about:

- Municipal solid waste landfilling
- Hazardous or "special waste" landfilling
- WTE disposal
- Recycling and reuse
- Donation or giveaway programs

The survey also requested information about specific preservative types, including:

- Creosote
- Pentachlorophenol (penta)
- Chromated copper arsenate (CCA)
- Ammoniacal copper zinc arsenate (ACZA)

Depending on the answers, follow-up questions were posed. The survey had a maximum of 71 questions and answers.

Some members responded with more detail than other members chose to provide. Some responses were unclear. In these cases, the respondent was

contacted to clarify the response. In all cases, a brief discussion resolved the issue and the results discussed in following pages reflect the clarifications.

In the remainder of this report, discussion of the survey results is combined with discussion of disposal options.

Section 3: Waste Classification of Wood Poles and Crossarms

Background information on federal regulations in the United States and Canada is presented here, prior to a discussion of wood pole and crossarm disposal practices. This background information provides context throughout the remainder of the report.

In the United States, the Environmental Protection Agency (EPA) Office of Pesticide Programs (OPP) administers the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). This act provides for U.S. federal regulation of registered pesticide distribution, sale, and use [8]. The pesticide registrant must demonstrate to the OPP that using the pesticide according to specifications "will not generally cause unreasonable adverse effects on the environment."

Federal agencies in the United States and Canada register and regulate the use of pesticides as wood preservatives.

The FIFRA definition [8] of "unreasonable adverse effects on the environment" means: "(1) any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide, or (2) a human dietary risk from residues that result from a use of a pesticide in or on any food inconsistent with the standard under Section 408 of the Federal Food, Drug, and Cosmetic Act." In 2008, penta, creosote, CCA, and ACZA were re-registered by OPP for commercial/industrial use in the United States [1].

In Canada, penta, creosote, and CCA are regulated under the federal Canadian Pest Control Products Act (PCPA) and registered for industrial use by the federal Canadian Pest Management Regulatory Agency (PMRA). U.S. and Canadian federal officials coordinate activities for mutual benefit [9]; in the long term, both countries want to reduce or eliminate the use of wood preservatives [10]. However, both countries recognize the benefits of effective wood preservatives in the absence of adequate alternatives, which have not been identified.

After its collaboration with EPA officials [11], PMRA announced its decisions to re-register penta, creosote, CCA, and ACZA in 2011 [12]. Beyond these Canadian federal actions, the Canadian provinces have authority over wood pole and crossarm disposal. In general, the provinces have classified treated wood as nonhazardous. In Canada, the EPA Toxicity Characteristic Leaching Procedure (TCLP) described below is specified as the analytical method to use in evaluating leaching and toxicity, if such information is required.

In the United States, to determine whether a solid waste may be hazardous, it must be characterized for leaching potential. The TCLP was developed to simulate the leaching that may occur from a solid waste in the subsurface (a landfill) and quantify the concentrations of a number of chemicals [13]. The chemicals and their regulatory limits are listed in Appendix B.

Toxicity of treated wood is determined in the laboratory using the Toxicity Characteristic Leaching Procedure (TCLP).

The material must also be analyzed to determine if it exhibits any of the following characteristics:

- Ignitability—a flash point less than 60° Celsius (C)
- Corrosivity—pH less than or equal to 2, or greater than or equal to 12.5
- Reactivity—unstable under "normal" conditions
- Toxicity—defined through use of the laboratory analytical procedure, TCLP

At a federal level (40 CFR §261.4(b)(9)), CCA-treated poles and crossarms are exempt from characterization as a hazardous solid waste [14] as long as the waste is generated by persons who utilize the wood for its intended end use, even if it fails the TCLP as a D004 thru D017 waste (see Appendix B). The generators, in this case, are utilities who certainly have used the poles and crossarms for their intended purposes—supporting the transmission and distribution of electricity.

EPRI [15, 16] has demonstrated that poles and crossarms treated with creosote or penta do not fail the TCLP or exhibit ignitable, corrosive, reactive, or toxic traits that trigger a hazardous waste characterization. In the case of creosote- and penta-treated poles and crossarms, this nonhazardous characterization determined by EPRI represents “generator knowledge.” This means that the generator can report to regulators and landfill operators that creosote- and penta-treated poles and crossarms are a nonhazardous solid waste, without having to apply any analytical testing [17].

Although EPA exempts poles treated with chromated copper arsenate from hazardous waste classification and EPRI has demonstrated that poles treated with creosote or penta do not fail the TCLP, disposal facility operators may not accept utility materials.

In theory, the U.S. hazardous waste exemption for CCA-treated poles and crossarms, and generator knowledge for penta- and creosote-treated poles and crossarms, should confer the ability to dispose of poles and crossarms simply, in a nonhazardous waste landfill anywhere in the United States.

However, as reported in following sections, operators of U.S. landfills and incinerators frequently require generators to demonstrate, with TCLP analytical data, that retired poles and crossarms are nonhazardous. The operators do this because they are protecting themselves. Regardless of EPA exemptions and EPRI studies, once they accept the poles and crossarms they are also accepting liability for any future harm the materials may cause to humans or the environment.

TCLP testing is problematic for utilities for several reasons:

- TCLP testing costs approximately $1,000 per sample for penta- and creosote-treated wood [18]. If all of these poles and crossarms must be tested individually, the disposal cost is roughly three times the cost of new poles and crossarms [1].

TCLP testing for every pole is prohibitively expensive, but it is difficult to guarantee consistent use of composite sampling methods that would reduce analytical costs.

- Wood is a natural structure and preservative penetration varies somewhat throughout the wood [1]. As a result, preservative concentrations will also vary throughout the wood. One sample that meets TCLP regulatory limits does not necessarily represent the entire pole. A sample collected from a different portion of the same pole or crossarm might not meet the TCLP limits. Facility operators know this and therefore are cautious.
- Composite sampling methods (mixing samples from many poles to generate one representative sample) reduce analytical costs, but facility operators will likely regard data from a composite sample as more questionable than data from a single sample per pole or crossarm.
- Even if facility operators and utilities agree on an acceptable composite sampling method, the operators must trust that utilities apply the method consistently and deliver exactly the same material that was tested. Otherwise, the facility operator must provide personnel to observe and track samples and material.
- TCLP testing of CCA-treated wood costs less because arsenic, chromium, and copper are the only constituents of concern. However, the resulting concentrations will likely exceed their regulatory limits, indicating that the poles and crossarms are hazardous waste [19].

In both the United States and Canada, the facility operators control the incoming waste stream. Federal, state, and provincial governments support the operators' right to do so.

Section 4: Landfill Disposal

Nonhazardous wastes are commonly sent to municipal solid waste (MSW) landfills and industrial solid waste landfills, regulated under RCRA Subtitle D. Hazardous waste landfills are regulated under RCRA Subtitle C.

According to EPA, there are two prominent types of landfills in the United States. The most common nonhazardous landfills are municipal solid waste (MSW) landfills and industrial solid waste landfills. EPA identifies construction and demolition (C&D) landfills as a type of industrial solid waste landfill [20]. The number of active MSW landfills in the United States has decreased from approximately 7,900 in 1988 to 1,900 in 2009—but the average size of newer landfills is larger. There has also been a shift from public (municipal) to private (for-profit) ownership [7]. These nonhazardous landfills are regulated under the Resource Conservation and Recovery Act (RCRA) Subtitle D [21]. There are almost 2,000 active landfills in Canada [22]. Their number and ownership characteristics follow a trend similar to that in the United States. These landfills are regulated by the provincial government where they are located.

In general, new U.S. landfills must be designed and constructed to avoid impacts to sensitive land and surface water. Potential leaching to groundwater is prevented by engineered impermeable liners [20]. Groundwater also must be monitored at these landfills. Hazardous waste facilities have even more robust design, monitoring, and post-closure requirements and are regulated under RCRA Subtitle C [21]. The most common hazardous waste facilities are landfills [23].

EPRI reviewed state and provincial requirements for the disposal of treated wood.

In a general sense, landfilling is the least desirable retirement option for treated wood. It consumes land mass, offers no benefits, and results in the generation of methane (CH_4) gas as wastes decompose in an anaerobic environment. If the gas is released to the atmosphere, it absorbs radiation and traps heat [24]. Some landfills have systems to collect the gas. The gas is either "flared" or captured for use as fuel. A landfill that collects the methane gas for use as energy is a higher-sustainability option for pole and crossarm disposal.

Since disposal of treated wood can be regulated at the state and provincial levels, a review of state and provincial rules and regulations was conducted by EPRI, starting with a U.S. Army Public Health Center report on management of treated wood [25]. The Army's findings are presented in Appendix C, along with EPRI verifications and expanded information, where available. One nonhazardous landfill in each state and province was contacted to determine its pole and crossarm acceptance criteria and tipping fee. The names, locations, and requirements of these landfills are provided in Appendix D.

Some states (such as Indiana) have adopted the EPA hazardous waste exemption for CCA and agree with EPRI findings that penta- and creosote-treated poles and crossarms are nonhazardous. Many other states and/or landfill operators have developed requirements that disregard the EPA exemption and EPRI's generator knowledge (as shown in Appendix C), and/or introduce complicating factors. For example, Illinois treated wood disposal guidance includes this passage:

"Treated wood that is weathered and contains no surface deposits or surface staining destined for treatment, storage, disposal, or use as a fuel is a non-special solid waste. The generator is not required to determine if this wood is hazardous."

"Weathered," "no surface deposits," and "staining" are all subjective terms that provide landfill personnel with considerable latitude in deciding whether poles and crossarms are acceptable or not. Even though a utility has TCLP data demonstrating that a pole is nonhazardous, the landfill can still reject the pole.

State and provincial practices for treated wood disposal vary greatly. Twenty-one percent of EPRI survey respondents said state regulations are more restrictive than federal requirements.

Unfortunately for those landfills that will accept poles based on TCLP data alone, there is no easily applied, nationwide standard procedure accepted by all landfills or other disposal facilities for obtaining a "representative" sample of penta- and creosote-treated poles and crossarms. Reproducing the original procedures used by EPRI [15, 16] would be difficult, time-consuming, and cost-prohibitive— which is why EPRI did the study on behalf of the utility industry. As a result, some survey respondents state, they simply default to using and paying for a hazardous waste landfill because there is no question that poles will be accepted. Identifying a universal cost "differential" between hazardous and nonhazardous landfills is difficult, given the broad range of costs throughout the United States.

Many states, such as Colorado and California, require that generators conduct all the analyses necessary to demonstrate that poles and crossarms are nonhazardous, regardless of the EPA CCA exemption and EPRI studies. Even in states that do not require a nonhazardous demonstration, the landfill operator can, and often does, require it.

The term "special waste" can have slightly different definitions depending on the state. In general, special waste means that treated poles and crossarms must be disposed of at a modern, well-designed landfill with a robust liner (similar to a hazardous waste landfill)—but one that is not identified as a permitted hazardous waste landfill.

Quite a few states—such as Kansas, Maryland, and Minnesota—define retired treated poles and crossarms as C&D waste or construction and demolition debris (C&DD). However, there are also states—such as New Hampshire—that explicitly exclude treated wood from their definition of either C&D or C&DD.

Twenty-one percent of survey respondents reported that state regulations for the management of treated wood are more restrictive than federal requirements. In Texas, CCA-treated wood can go to a MSW landfill, but it must be disposed of in a landfill with a special "Class 1 cell." These facilities are less common and

more expensive than other landfills. In Pennsylvania, treated wood is defined as a residual waste and labor-intensive paperwork is required for landfilling.

EPRI survey results:
- 78% of utilities sent treated materials to a MSW landfill.
- 90% of materials were treated with creosote, penta, or CAA. Only 23% were treated with ACZA.

The Canadian provinces have various practices and classifications. Nova Scotia regards treated wood as C&D waste. Saskatchewan regards treated wood as an industrial waste. Most of the provinces (Appendix C) exclude treated wood from classification as a hazardous waste. In contrast to the United States, Canadian landfill operators are more comfortable accepting the provincial exclusions, and only one of the Canadian landfills reported a need for data to demonstrate lack of hazardous characteristics.

According to the disposal practices survey, 78% of utilities dispose of treated poles and crossarms in a MSW landfill, and that roughly 90% of the accepted materials were treated with either creosote, penta, or CAA. The survey indicates that only 23% of the accepted poles and crossarms were treated with ACZA. This is consistent with the overall lower use of ACZA in distribution and transmission networks.

U.S. MSW landfill tipping fees ranged from $14 to $150 per ton. Hazardous waste landfill tipping fees were as high as $250 per ton.

MSW landfill tipping fees reported by survey respondents ranged from $14 to $150 per ton, and as high as $250 per ton for disposal in a hazardous waste landfill. Nonhazardous landfills in the United States reported tipping fees of $24 to $117 per ton (Appendix D). Each nonhazardous landfill in Appendix D was randomly chosen, so the associated tipping fees are not representative of all landfills in the state or province accepting retired poles and crossarms.

The *Waste Business Journal* [26] has reported average tipping fees at MSW landfills in the United States since 2010. Their estimates are presented in Table 4-1, below.

Table 4-1
U.S. average tipping fee (per ton) by region and year

	2010	2011	2012	2013	2014	2015	2016	2017*	% Change
Northeast	$69.0	$69.3	$72.9	$74.9	$76.1	$77.0	$77.8	$79.3	2.0
Southeast	$38.1	$38.2	$39.3	$39.8	$40.2	$40.4	$40.9	$43.6	6.8
Midwest	$44.0	$44.0	$45.9	$46.2	$47.2	$47.6	$48.4	$52.7	8.9
West	$30.3	$30.4	$33.3	$34.0	$34.4	$34.4	$34.8	$35.7	2.6
Pacific	$50.5	$51.8	$54.0	$55.3	$56.7	$56.8	$57.2	$57.9	1.2
Entire US	$43.3	$43.5	$45.9	$46.8	$47.6	$48.1	$48.8	$50.6	3.6

* As of May 2017, Source: *Waste Business Journal*

The lowest tipping fees are associated with areas of the United States where landfill space is abundant, such as the Southeast and the West. Similar data were not available for Canada. However, specific Canadian landfills reported fees that ranged from $57 to $165 per ton.

Recent published information for the range of hazardous landfill tipping fees was not located.

A Calgary City, British Columbia landfill has higher tipping fees for penta- and creosote-treated poles than for CCA-treated poles. The operator reported that this reflects a technical policy decision based on the observation that CCA is less likely to leach due to the chemical fixation that occurs with waterborne CCA.

Sixty-nine percent of respondents indicated that they deliver poles to landfills at less than full length. In some cases, this was a landfill requirement. In other cases, it was a function of the delivery method. For example, if the utility shipped treated wood in a roll-off container, the dimensions of the container dictated the pole lengths. One respondent reported that 3 feet was the maximum length of any pole or crossarm. Another reported that metal hardware had to be removed. A third respondent reported a policy of cutting the butt off the pole if there had been supplemental, in-service treatment within the past 3 years.

Relative cost rather than hazardous classification often determines where materials are sent for disposal.

Two respondents said they never use municipal landfills. One of these, a small utility in a rural area, retires all poles and crossarms in a traditional giveaway program. The other respondent sends all poles and crossarms to a hazardous or "special waste" facility.

About half of the respondents who use municipal landfills also use hazardous or special waste landfills from time to time. The tipping fees for special waste and hazardous landfills ranged from $80 to $250 per ton.

According to survey respondents, the choice between a municipal landfill and a hazardous or special waste facility often depends more on relative cost than on a determination that the poles and crossarms are hazardous. For example, large utilities whose service territories cover hundreds of miles may send retired poles to a hazardous or special waste landfill because it is cheaper than the cost of trucking the poles to a less expensive landfill farther away.

One-quarter of survey respondents had liability concerns about placing poles and crossarms in landfills.

Almost 25% of respondents reported liability concerns about placing poles and crossarms in landfills. One respondent stated that there are "always" liability concerns. Another was more specific, citing a potential future requirement to clean up the landfill itself.

Based on research for this report and survey inquiries, landfilling is the most common method of disposal for retired poles and crossarms. More sustainable retirement options are available. They are evaluated with respect to cost, liability, and sustainability in the following sections.

Section 5: Waste-to-Energy (WTE)

One alternative to landfilling retired poles and crossarms is incinerating them at a municipal or private WTE facility. Incinerating offers the following advantages compared to landfilling [27]:

- WTE facilities are smaller than landfills.
- The volume of wood is reduced by approximately 85% during combustion. The only remaining solid is ash.
- The methane that would otherwise be generated during decomposition in a landfill is consumed.
- The heat generated is converted to electricity or steam heat, or both.

Incinerating poles and crossarms for energy is a good option for materials treated with creosote and possibly penta, but not with CCA.

One of the benefits of burning creosote-treated poles and crossarms is that burn temperatures are generally high enough to destroy the creosote [28] containing polycyclic aromatic hydrocarbons (PAHs), some of which are carcinogenic. Therefore, potential liability is decreased for this method of pole disposal for this preservative

For newer WTE facilities designed to generate higher temperatures and control emissions, burning of penta-treated poles and crossarms is possible.

In general, incineration of CCA-treated wood is not recommended because the resulting ash will be contaminated with metals, and there are concerns about generation of arsine gas. However, a few facilities will accept small amounts of CCA-treated wood. Discussion with operators of those facilities revealed that they are able to meet operating permit air and ash requirements if they infrequently burn small amounts of wood treated with CCA.

Forty-three U.S. WTE facilities that accept treated wood are identified in Figure 5-1 and Table 5-1. No Canadian facilities that incinerate treated wood were identified.

According to the Energy Recovery Council [29], in 2016 there were 77 WTE facilities in the United States. These facilities were contacted to determine whether they can accept treated wood poles and crossarms, and if so, what requirements they may have. This inquiry identified 43 WTE facilities that can accept treated wood; information about them is summarized in Figure 5-1 and in Table 5-1.

There was no similar list of WTE facilities in Canada. The Global Energy Observatory [30] listed five WTE plants for all of Canada. These facilities were closed or could not use treated wood (two use natural gas). The Ministry of Environment for Prince Edward Island reported that the Charlottetown Thermal Generating Station on the island cannot use treated wood [31] and was unaware of any Canadian WTE or biomass plant that can.

The Energy Justice Network [32] listed 13 WTE facilities in Canada. None of the 13 was on the Global Observatory facility list, and two were gasification plants that do not use treated wood.

Based on the lack of a single source of information, and the inconsistencies that were encountered, WTE in Canada seems to mean any facility that extracts energy or fuel from wood and other materials—oddly including natural gas—or that manufactures wood pellets for fuel. Only one facility in Canada (Emerald Energy From Waste Inc.) was confirmed to accept treated wood. However, it is a gasification facility. The facility's analytical and cost requirements are stringent ($250–$500 per ton) and it is difficult to conclude that it offers a viable retirement option for poles and crossarms. In short, no Canadian facilities that incinerate treated wood were identified.

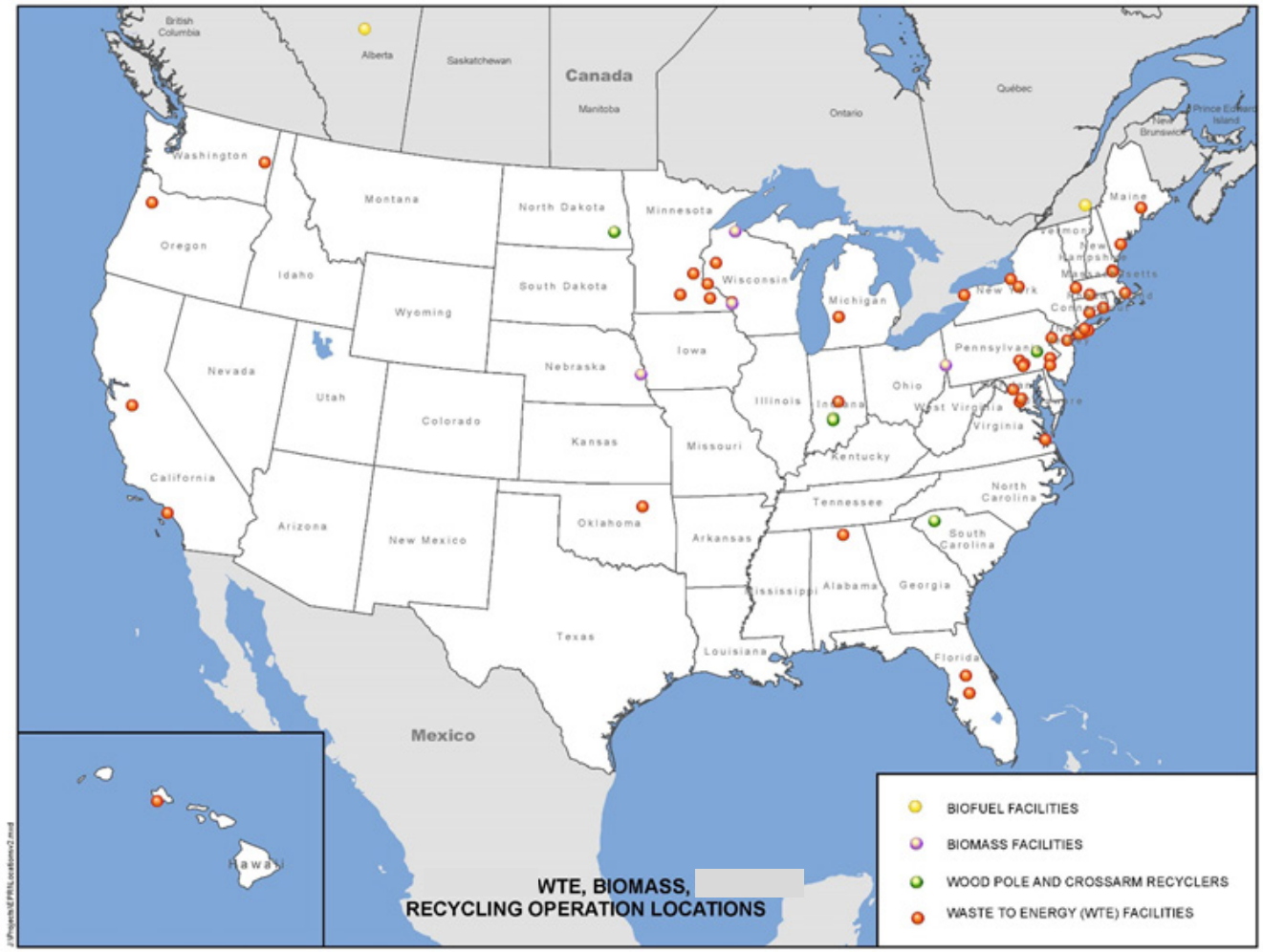


Figure 5-1
WTE, biomass, and recycling operation locations

Table 5-1
U.S. Waste-to-Energy facilities (none identified in Canada)

Facility Name/Address/Phone Number	Operator/ Contact	Accepts Poles/Crossarms	Special Conditions	Tipping Fee
Solid Waste Disposal Authority of Huntsville 5251 Triana Blvd SW Huntsville, AL 35805 Jesse Davis 256-714-3825	Covanta	*See footnote about Covanta	10-foot maximum length	$55/ton
Southeastern Connecticut Resource Recovery Facility 132 Route 12 / Military Highway Preston, CT 06365 John Vinson, jvinson@covanta.com	Covanta	*See footnote about Covanta		
Wallingford Resource Recovery Facility 530 South Cherry Street Wallingford, CT 06492 203-294-1649	Covanta	*See footnote about Covanta		
Lake County Resource Recovery Facility (not listed in ERC directory**) 3830 Rogers Industrial Park Rd Okahumpka, FL 34762 Gary Main, gmain@covanta.com 352-365-1611	Covanta	*See footnote about Covanta		
Indianapolis Resource Recovery Facility 2320 South Harding Street Indianapolis, IN 46221 800-950-8749	Covanta	* See footnote about Covanta		$48 to $170/ton, depending on whether certificate of destruction is required

Table 5-1 (continued)
U.S. Waste-to-Energy facilities (none identified in Canada)

Facility Name/Address/Phone Number	Operator/ Contact	Accepts Poles/Crossarms	Special Conditions	Tipping Fee
Southeast Resource Recovery Facility 118 Pier S. Ave Long Beach, CA 90802 562-570-7840	Covanta	* See footnote about Covanta		
Covanta Stanislaus, Inc. 4040 Fink Road Crows Landing, CA 95313	Covanta	*See footnote about Covanta		
Covanta Honolulu Resource Recovery Venture 91-174 Hanua Street Kapolei, HI 96707 Eric Schneider, eschneider@covanta.com 209-837-4423	Covanta	See footnote about Covanta		
Ecomaine 64 Blueberry Rd Portland, ME 04102 Lisa Bitter 207-523-3119	Twenty southern Maine municipalities	Yes (but no CCA or ACZA)		$70.50/ton, more if oily
Penobscot Energy Recovery (PERC) Holdings LLC 29 Industrial Way Orrington, ME 04474 Mike Mains, mmains@percwte.com 207-825-4566	Penobscot Energy Recovery (PERC) Holdings LLC	Yes (but CCA and ACZA may not be acceptable)		$55 to $95/ton
Northeast Maryland Waste Disposal Authority 21204 Martinsburg Road Dickerson, MD 20842 301-691-9000	Covanta	*See footnote about Covanta		

Table 5-1 (continued)
U.S. Waste-to-Energy facilities (none identified in Canada)

Facility Name/Address/Phone Number	Operator/ Contact	Accepts Poles/Crossarms	Special Conditions	Tipping Fee
Covanta Haverhill, Inc. 100 Recovery Way Haverhill, MA 01835 Bill Zaneski, bzaneski@covanta.com 978-241-3000	Covanta	* See footnote about Covanta		
Covanta Springfield, LLC Pioneer Valley Resource Recovery Facility 188 M Street Extension Agawam, MA 01001 Ken Ryan, kryan@covanta.com 508-291-4409	Covanta	*See footnote about Covanta		
Covanta SEMASS Resource Recovery Facility 141 Cranberry Highway West Wareham, MA 02576 Mark Davis, mdavis@covanta.com 508-291-4400	Covanta	*See footnote about Covanta		
Covanta Pittsfield Resource Recovery Facility 500 Hubbard Ave. Pittsfield, MA 01201 Chet Halek, chalek@covanta.com 413-443-7373	Covanta	*See footnote about Covanta		

Table 5-1 (continued)
U.S. Waste-to-Energy facilities (none identified in Canada)

Facility Name/Address/Phone Number	Operator/ Contact	Accepts Poles/Crossarms	Special Conditions	Tipping Fee
Wheelabrator North Andover 285 Holt Rd. North Andover, MA 01845 Kevin Beauregard 978-688-9011 ext 223	Wheelabrator	Yes	Must be shredded. Must schedule loads in advance. No testing requirements.	
Hennepin Energy Resource Center (HERC) Hennepin County 505 6th Ave. North Minneapolis, MN 55405 Rick Rud, rrud@covanta.com 612-333-7303	Covanta/ Hennepin County Environmental Services	*See footnote about Covanta		
Olmsted Waste-to-Energy Facility (OWEF) 301 Silver Creek Rd. NE Rochester MN 55906 Tony Hill 507-328-7070	Olmsted County	Yes	Must be shredded and pass TCLP.	$175/ton
Xcel Energy – Red Wing Steam Plant 801 E. 5th St. Red Wing, MN 55066 651-385-5601	Xcel Energy	Unable to generate a response.		
Xcel Energy – Wilmarth Plant 1040 Summit Ave. Mankato, MN 56001	Xcel Energy	Unable to generate a response.		

Table 5-1 (continued)
U.S. Waste-to-Energy facilities (none identified in Canada)

Facility Name/Address/Phone Number	Operator/ Contact	Accepts Poles/Crossarms	Special Conditions	Tipping Fee
Covanta Warren Energy Resource Company Facility 218 Mt. Pisgah Ave. Oxford, NJ 07863 Herman Love, hlove@covanta.com 908-453-2195	Covanta	*See footnote about Covanta		
Covanta Union County Resource Recovery Facility Union County Utilities Authority 1499 Rt. 1 North Rahway, NJ 07065 Alan Harleston, aharleston@covanta.com 732-499-0101	Covanta	*See footnote about Covanta		
Covanta Babylon Resource Recovery Facility Covanta Babylon, Inc. 125 West Gleam St., West Babylon, NY 11704 Mark O'Brien, mobrien@covanta.com 631-491-1976	Covanta	*See footnote about Covanta		
Covanta Hempstead 600 Merchants Concourse Westbury, NY 11590 Larry Evans, levans@covanta.com 516-683-5400	Covanta	*See footnote about Covanta		
Covanta Huntington Resource Recovery Facility 99 Town Line Rd. East Northport, NY 11731 Ken Hinsch, khinsch@covanta.com 631-754-1100	Covanta	*See footnote about Covanta		

Table 5-1 (continued)
U.S. Waste-to-Energy facilities (none identified in Canada)

Facility Name/Address/Phone Number	Operator/ Contact	Accepts Poles/Crossarms	Special Conditions	Tipping Fee
Covanta MacArthur Waste-to-Energy Facility Islip Resource Recovery Agency 4001 Veterans Memorial Hwy Ronkonkoma, NY 11779 Steve Cazer, scazer@covanta.com 631-471-7800	Covanta	*See footnote about Covanta		
Covanta Niagara Falls Resource Recovery Facility 100 Energy Blvd. at 56th St. Niagara Falls, NY 14303 Kevin O'Neil, koneil@covanta.com 716-278-8548	Covanta	*See footnote about Covanta		
Covanta Onondaga Resource Recovery Facility, L.P. 5801 Rock Cut Rd. Jamesville, NY 13078 Kathleen Carroll, kcarroll@covanta.com 315-498-4111 x3306	Covanta	*See footnote about Covanta		
Oswego County Energy Recovery Facility 2801 State Route 481 Fulton, NY 13069 315-591-9280	Oswego County	Yes	Permit required for the incinerator, Oswego County only.	
Covanta Tulsa Renewable Energy Facility 2122 South Yukon Ave. Tulsa, OK 74107 Matthew Newman, mnewman@covanta.com 918-295-4736	Covanta	*See footnote about Covanta		

Table 5-1 (continued)
U.S. Waste-to-Energy facilities (none identified in Canada)

Facility Name/Address/Phone Number	Operator/ Contact	Accepts Poles/Crossarms	Special Conditions	Tipping Fee
Covanta Marion County Solid Waste-to-Energy Facility 4850 Brooklake Road, NE Brooks, OR 97305 Matthew Marler 503-393-0890	Covanta	*See footnote about Covanta		
Covanta Plymouth Renewable Energy 1155 Conshohocken Rd. Conshohocken, PA 19428 John Polidore, jpolidore@covanta.com 610-940-6000	Covanta	*See footnote about Covanta		
Covanta Delaware Valley Resource Recovery Facility 10 Highland Ave. Chester, PA 19013 Alex Piscitelli, apiscitelli@covanta.com 610-497-8100	Covanta	*See footnote about Covanta		
Covanta Lancaster County Resource Recovery Facility 1911 River Rd. Bainbridge, PA 17502 Kevin Connor, kconnor@covanta.com 717-426-4938	Covanta	*See footnote about Covanta		
Susquehanna Resource Management Complex 1670 South 19th St. Harrisburg, PA 17104 717-724-0098	Covanta/LC SWMA	*See footnote about Covanta		

Table 5-1 (continued)
U.S. Waste-to-Energy facilities (none identified in Canada)

Facility Name/Address/Phone Number	Operator/ Contact	Accepts Poles/Crossarms	Special Conditions	Tipping Fee
York County Resource Recovery Center 2651 Blackbridge Road York, PA, 17406 717-843-2902	Covanta	*See footnote about Covanta		
Alexandria/Arlington Resource Recovery Facility 5301 Eisenhower Ave. Alexandria, VA 22304 Bryan Donnelly, bdonnelly@covanta.com 703-370-7722	Covanta	*See footnote about Covanta		
Hampton-NASA Steam Plant 50 Wythe Creek Rd. Hampton, VA 23666 John MacDonald, jmcdonald@hampton.gov 757-865-1914	City of Hampton	Yes, if plant requirements such as test burn conditions are met.	Must be shredded.	$38/ton if delivered by tri-axle dump truck, more if roll-off.
I-95 Energy/Resource Recovery Facility (Fairfax) 9898 Furnace Rd. Lorton, VA 22079 Frank Capobianco, fcapobianco@covanta.com 703-690-6860	Covanta	*See footnote about Covanta		
Spokane Waste-to-Energy Facility South 2000 Geiger Blvd. Spokane, WA 99224 Kelle Vigeland 509-625-6541	City of Spokane	Potential for creosote, but no CCA or ACZA.	Must be shredded.	$100/ton

Table 5-1 (continued)
U.S. Waste-to-Energy facilities (none identified in Canada)

Facility Name/Address/Phone Number	Operator/ Contact	Accepts Poles/Crossarms	Special Conditions	Tipping Fee
Barron County Waste-to-Energy & Recycling Facility, 575 10 1/2 Avenue Almena, WI 54805 Ray Zeman, ray.zeman@co.barron.wi.us 715-357-6566	Ray Zeman, Interim Solid Waste Manager ZAC, Inc.	Accepts all types.	Must be shredded.	
Xcel Energy French Island Generating Station 200 Bainbridge St., La Crosse, WI 54601	Xcel Energy	Unable to generate a response.		
Wheelabrator Ridge 3131 K-ville Avenue Auburndale, FL 33823 Tom Brislin 863-665-2255	Wheelabrator	Yes	Accepts all utility poles and crossarms. No metal. Volume of CCA is limited.	

* According to Pat Walsh, Facilities Compliance Manager at Covanta, all of their WTE facilities (except when noted above) will consider taking poles and crossarms on a case-by-case basis. In most cases. the poles and crossarms will need to be shredded and meet individual facility requirements, such as sampling protocols and analytical demonstration that the material is nonhazardous.

**Table 5-1 is based on checking with the facilities listed in the Energy Recovery Council, 2016 Directory of WTE Facilities developed by Ted Michaels and Ida Shiag, Energy Recovery Council, May 2016

It was fairly common for U.S. WTE facilities to require shredding since they were designed to process waste most efficiently in that form. Some facilities require customers to remove metal from the wood, but most indicated that metal was not an issue. Some require TCLP analytical data to determine whether the wood might be hazardous.

One WTE operation charges higher tipping fees for creosote- and penta-treated wood than for typical municipal solid waste materials. This seems counterintuitive since creosote and the fuel oil carrier for penta contain more British thermal units (Btu's) than MSW materials do, and thus should provide better payback. The operator explained that most MSW WTE incinerators are designed to process a steady, lower-Btu fuel. Burning anything with higher Btu's requires additional scrutiny and labor in the control room.

Most facilities were reluctant to provide tipping fees—they said those fees would be a function of the source and volume. The range of costs from facilities that did provide the information was $38 to $175 per ton.

Only two survey respondents reported pole disposal *via* WTE retirement for penta- and creosote-treated poles and crossarms. The facilities these respondents use do require metal removal. The respondents did not provide specific costs, but one reported that the WTE method is more expensive than landfilling while the other found no cost difference between the two methods. The same two respondents differed on whether the WTE facilities they used were able to handle the volume of wood from their entire service areas: one facility could, the other could not. None of the respondents indicated concern about potential liabilities of WTE incineration.

EPRI survey results:

- 71% of utilities carefully track the volume of wood that is not landfilled, but instead diverted to more beneficial disposal.
- 43% secure sustainability credits for this practice.

Seventy-one percent of survey respondents carefully track the volume of wood that is not landfilled, but instead is diverted to a disposal method with more benefits; 43% secure sustainability credits for the practice.

The main reasons that survey respondents don't use WTE facilities more often include:

- WTE facility requirements cannot be met with efficient and mutually acceptable processes, such as sampling methods to generate analytical data (when required).
- Shredding and trucking the shredded wood involves more processing than utilities want to handle.
- The nearest WTE facility is too far away for economical use.

When utilities seek additional retirement options for poles and crossarms, it's possible that they don't ask enough questions. For example, when facility operators were asked if they would accept utility poles and crossarms, some said "no." But when asked if they would accept treated wood that had been shredded, they said "yes," as long as the generator could meet the shredding specifications.

So, even though some utilities may not want the burden of shredding, others may be attracted to the idea under the right circumstances.

WTE is a more sustainable disposal practice than landfilling.

Considering the sustainability of disposal practices, using a WTE facility is better than landfilling. Survey respondents using the WTE retirement method claim sustainability credits that demonstrate improved environmental performance, minimize the use of landfill space (for resulting ash), produce less methane, reduce liability by destroying PAHs (and penta at the appropriate facility), and generate energy.

Section 6: Biomass and Biogas

As discussed in Section 5, burning wood eliminates the methane that would be released if the wood were decomposing in a landfill. Methane is considered to be a greenhouse gas. Carbon dioxide—much of which is generated when MSW and wood are burned [33]—is also a greenhouse gas. However, wood that is sustainably managed can capture and store carbon as it grows. When this wood is burned, the same amount of carbon is released, creating a "net zero" impact on carbon in the atmosphere [34]. One disadvantage of solid waste incineration is that much of the material burned is not wood—and other incinerated materials, such as plastics, are adding carbon to the atmosphere. Furthermore, with creosote- and penta-treated wood, the creosote and fossil-fuel oil carrier for penta are combusted. Thus, while wood pole and crossarm incineration is more sustainable than landfilling, the process is not actually net zero.

Woody biomass combustion provided about 2% of the primary energy used in the United States in 2016.

Biomass is a renewable source of energy composed of organic material from plants and animals [35]. Biomass facilities use these organic materials as a source of fuel. Biomass is most commonly burned to produce heat, but can also be converted to liquid and gaseous biofuels such as ethanol, biodiesel, and syngas. Woody biomass combustion provided approximately 2% of the primary energy used in the United States in 2016 [36] and 2% of the electricity produced in Canada in 2015 [37].

Wood utility poles and crossarms are biomass, although they contain other man-made organics (creosote and penta) and metals (CCA). Based on the information above, retiring poles and crossarms at a biomass facility increases sustainable practices compared with retiring them at WTE plants where co-burning MSW produces carbon that is not recycled.

Burning poles and crossarms at a biomass facility is a more sustainable disposal practice than WTE, which does release some carbon.

Biomass Magazine identified 78 facilities in the United States that use woody biomass as a fuel source [38]. Contact was made with seven of these facilities, none of which accepts treated wood because their plants were constructed before March 2016. Until that time, EPA's Non-Hazardous Secondary Materials Rule [39] barred use of treated wood as a fuel.

EPA amended the rule in March 2016 to allow inclusion of creosote-treated wood as fuel, with a substantial caveat: creosote-treated wood could be burned only in boilers that also burn fuel oil "as part of normal operations" [40]. It is reasonable to assume that most facilities were designed and constructed before March 2016 (to process only untreated wood), and they are unlikely to have fuel

oil burners. In other words, it is improbable that the other U.S. biomass facilities, not contacted for the survey, accept treated wood.

The change to the Non-Hazardous Secondary Materials Rule, however, may hold some promise. U.S. biomass plants may choose to add fuel oil equipment, or petition EPA on a case-by-case basis for an exemption.

Creosote-treated wood can be burned in U.S. boilers if those boilers also burn fuel oil. Four such facilities are identified in Figure 5-1 and Table 6-1. No Canadian facilities that use treated wood as a biogas fuel were identified.
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Four biomass plants that do accept treated wood were found *via* Internet searches; they are identified in Table 6-1 and Figure 5-1. These plants have the ability to burn fuel oil or have operating permits that otherwise allow it.

Canadian Biomass [41] has published a map of biomass energy producers in Canada. However, many of the mapped locations are actually wood pellet manufacturers, not biomass burners. The Research Director of the Wood Pellet Association of Canada reported [42] that no pellet manufacturers in Canada use retired poles or crossarms to make pellets; he also commented that he is unaware of any biomass burners that use any type of treated wood. The Executive Director [43] of *Canadian Biomass* reported no knowledge of biomass plants in Canada that use treated wood. Ecostrat is a biomass broker for biomass energy companies throughout North America. According to their Director of Business Development [44], there are no facilities in Canada that use treated wood as a biomass fuel.

However, based on the number of WTE facilities in the United States that can or do use treated wood, numerous other Canadian energy facilities using "biomass" were contacted.

Northland Power in Ontario operates eight biomass plants in Canada. None use treated wood. Ontario Power operates two biomass plants that use untreated wood. None of the facility operators knew of any Canadian plants using any kind of treated wood.

Atlantic Power Corporation at Lake Williams in Alberta has burned railroad ties in the past, but ended the practice due to local opposition. They recently petitioned to do so again [45], based on operational and other changes. Atlantic Power did not respond to inquiries about the current state of affairs. Finally, Kruger, Inc. in Montreal uses creosote railroad ties and wood poles as fuel for some of its operations. Kruger reported that they anticipate a permit change that will allow use of penta-treated wood.

Table 6-1
U.S. and Canadian biomass and biogas facilities

	Treatment Type	Analytical Requirements	Special Conditions	Approximate Cost
Bay Front Generating Plant 122 N 14th Ave. W, Ashland, WI 54806 Jim Witt, james.witt@xcelenergy.com 303-571-7158	Creosote only	Must provide analytical to demonstrate that treatment is creosote.	No dimension can exceed 3 inches.	Typically pay for source material.
French Island Generating Station 200 Bainbridge Street South. La Crosse, WI 54603-1564 Jim Witt, james.witt@xcelenergy.com 303-571-7158	Creosote only	Must provide analytical to demonstrate that treatment is creosote.	No dimension can exceed 3 inches.	Typically pay for source material.
Heritage-WTI, Inc. 1250 Saint George St. East Liverpool, OH 43920 Adam J. Hoy, adam.hoy@heritage-enviro.com 802-238-2391	All types	Cannot accept p-Cresol, 1,4-Dichlorobenzene, or 1,2-Dichloroethane. Sufficient analytics to classify waste—suggests total metals and TCLP.	Sized to fit in 55-gallon drums OR ground for dump roll-offs to pit.	$0.95/lb with a $160 per 55-gallon drum minimum. In bulk roll-offs of shredded material $0.35/lb with a $3,500 per load disposal minimum.
Bdone Biomass Rob Faber, info@Bdonebiomass.com 519-532-9601	All types		12–20 feet long, any diameter.	Waiting for approvals to build.
Enerkem Biofuels Site 460, 250, 250 Aurum Rd, Edmonton, AB T6S 1G9, Canada Richard Schofield rschofield@enerkem.com 514-875-0284	Enerkem can use retired poles as feedstock if they are properly shredded. Call Richard Schofield, Project Development Manager, for details.			

One company, Bdone Biomass claims to operate throughout North America. However, the company representative explained that Bdone Biomass is in the midst of negotiating a partnership and contract with a large, existing biomass company. As a result, the representative was not at liberty to provide additional details [46].

Another potential option for wood pole and crossarm retirement is conversion to biogas. Biogas is generated when organic materials decay, under anaerobic conditions, releasing methane. If the methane is captured, it can then be burned for energy, which also reduces the magnitude of heat that may be trapped in the atmosphere. Landfills that collect methane can also burn it for energy. The

difference is that biogas facilities are designed *exclusively* for production, capture, and combustion of methane.

The efficiency and value of biogas production depends on a number of factors including the type of organic material, the temperature in the biogas production vessel, and the rate and efficiency with which the anaerobic bacteria degrade the organic material. Any type of organic material, including fat and food waste, can be used as fuel [47].

Conversion to biogas (methane) *via* anaerobic digestion does not work well for wood containing lignocellulose that retards decomposition.
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However, the cost of constructing commercial biogas facilities is high, so most biogas operations are in close proximity to a steady and cheap or free source of organic matter that is easily digested in the biogas vessel—such as massive pig, dairy, or chicken farms whose manure is the fuel source.

Biomass Magazine has published a list of 361 biogas plants [48] throughout the United States. A total of 70 facilities were investigated to determine their feedstocks. The vast majority of these plants are associated with large agricultural operations and sewage treatment plants. Not one of the 70 facilities reported using any kind of wood as a feedstock.

According to the Canadian Biogas Association [49] there are approximately 115 biogas operations in Canada. The Executive Director reported [50] no knowledge of any operations that use treated wood as a fuel stock. Ecostrat [44] reported the same.

Gasification heats fuel in an anaerobic environment to release carbon monoxide, hydrogen, and methane. Woody biomass is rarely used as a fuel for gasification.

Much research has investigated biogas production using lignocellulose, which is found in the cell walls of woody plants. Unfortunately, lignocellulosic biomass has both physical and chemical properties that hinder rapid decomposition [51], compared with other fuel stocks such as manure. In short, it appears that the most common pole and crossarms species, southern pine and Douglas fir [1], are not an attractive source of fuel for profitable, anaerobic digestion.

Gasification is another potential way to retire treated wood. Gasification is accomplished by heating wood in an environment with little or no oxygen. As the wood heats up it emits a combination of carbon monoxide (CO), hydrogen (H), and methane [52]. The dominant feedstock today is coal. Biomass is one of the least used feedstocks [49]. Aside from the Emerald Energy Company mentioned in Section 5, no facilities that use treated wood for gasification were identified in Canada.

Section 7: Pole Recycling and Remanufacturing

The pinnacle of pole and crossarm sustainability is reuse and recycling because most of the carbon remains locked in the wood, and the wood continues to offer benefits. The recycling operations are identified in Table 7-1.

The pinnacle of pole and crossarm sustainability is reuse and recycling because most of the carbon remains locked in the wood, and the wood continues to offer benefits. But only 1 out of 18 survey respondents used a wood pole recycler.

Only 1 out of 18 survey respondents indicated use of a wood pole recycler. That recycler accepts all preservative treatment types, but does not accept materials that are shorter than 8-feet long or require removal of metal. The respondent reported that this form of retirement was no more expensive than other methods, but did not want to report the cost. The respondent also indicated that this diversion from other retirement methods was certainly tracked and reported for their sustainability program. There was some liability concern, so the respondent uses waivers with the pole recycler.

None of the survey respondents indicated that they engage operators who saw poles into lumber, or remanufacture them in any way. In 2010, EPRI researched the possibility of remanufacture [1] and found economic analyses and other studies [53] indicating that sawing treated poles into lumber was feasible under the right conditions. At the time, EPRI also identified two sawmills that were making lumber from treated poles, but neither are still in business.

Available technology can convert poles to lumber, but commercialization is hindered by regulations that prohibit residential customers from legally purchasing wood treated with creosote, penta, or CCA.

The idea of recycling poles *via* conversion to lumber remains tantalizing. But regulatory requirements for worker health and safety are sure to include significant air quality control systems. The milling equipment would have to be fully contained, with systems that capture and control the sawdust. Workers likely would need personal protective equipment (PPE) to prevent exposure to the dust and chemicals emitted during operations that convert poles to lumber. The technology is available and all of these measures could be implemented, but commercialization is difficult due to the fact that regulations prohibit residential consumers from legally purchasing wood treated with creosote, penta, or CCA. Thus, reuse and recycling are not currently a viable alternative for pole retirement.

Fortunately, wood pole and crossarm producers and entrepreneurs have noticed that utilities are seeking more reuse and recycling options. A number have occupied the niche in useful ways.

But it is important to qualify these recycling services. Most services that accept retired treated wood can recycle only some of it. This is due to the lack of markets for products that are consistent with the original intended use, such as fence posts and rails. For example, it is difficult to find a reuse consistent with the intended use of a 2-foot piece of pole. The same is true for cracked or splintered poles, or badly warped crossarms. Material that cannot be reused is usually chipped or ground and shipped to one of three final destinations:

Most services that accept retired treated wood can recycle only some of it—the rest goes to a WTE plant, biomass plant, or landfill.

- A WTE plant
- A biomass plant
- A landfill (that may or may not have a gas recovery system)

Tred'si is a Canadian pole recycling company located east of Montreal. They resell retired pole and crossarm portions that are long enough and sturdy enough to be reused as posts and rails. They will accept material from the United States and are planning a second facility in western Canada. Tred'si claims that material they cannot resell is used on-site as fuel or feedstock [55]. Titan Clean Energy Projects in western Canada accepts creosote-treated and a small amount of penta-treated wood, in any condition, which it uses to produce carbon products, *via* pyrolysis, for agricultural use.

Commercial recyclers can simplify procedures and produce the best mix of options and sustainability for utilities, given local or regional conditions. Eight U.S. and Canadian treated wood recyclers are identified in Figure 5-1 and Table 7-1.

At least in some cases, those who sell these services are offering more value and options than most utility personnel can find and manage efficiently on their own. Some, such as Cox Recovery, offer "cradle-to-grave" services—selling and delivering new poles and hauling away those that have been retired. These vendors have the potential to be one-stop shops, simplifying procedures and producing the best mix of options and sustainability for utilities, given local or regional conditions.

EPRI sought treated wood recyclers by searching the Internet and talking with industry contacts. This effort included contacting the Treated Wood Council, who assisted by sharing a June 2017 list of recyclers and combustors [55]. Most of the combustors on their list were already captured in Tables 6-1 and 7-1 of this report. Table 7-1 and Figure 5-1 present the recyclers that were identified.

Table 7-1
U.S. and Canadian wood pole and crossarm recyclers

Facility Name/Address/Contact	Accepts Treated Wood	Accepts Liability	Preparation	Products	Cost
Blackwood Solutions 205 N College Ave Suite 410, Bloomington, IN 47404 Jason Feagans 812-272-8458	Yes, all types.	Yes	Not required but may affect price. Service eastern half of United States, hope to expand.	60% repurposed, 30% WTE, 10% landfill.	Competitive with landfills,
National Salvage & Service Corp. 6755 S. Old State Road 37 Bloomington, IN 47401 Birk Billingsly 812-327-7879	Yes, all types	Yes	Not required, but may affect price.	Material less than 20 feet long goes to landfill.	$150 to $180/ton
Cox Recovery 128 Millport Circle, Suite 200 Greenville, SC 29607 Chad Russell 888-919-9935	Yes, all types.	Yes	Not required but may affect price. Service all of United States	Mostly giveaway and landfill.	Depends on location and mix of services.
Zwicky Processing and Recycling 220 Buena Vista Road Fleetwood, PA 19522 484-248-5300 bsheeler@wdzwicky.com	Yes, but CCA-treated wood ends up in landfill.	Yes	No pick-ups, but can take all lengths and metal OK.	93% put to new and beneficial use.	$55/ton for creosote and penta; $80/ton for CCA
Fraedrich Transport 13635 54th St SE Enderlin, ND 58027 701-437-2882	Creosote only.			Chips and shredding.	$28.85/ton
Omaha Track (wood processor only—sells to Bay Front Generating Plant) 12930 I St, Omaha, NE 68137 402-339-0332 lisa@omahatrack.com	Creosote only.		Can accept whole poles by railroad.	Chips and shredding.	$10/pole

Table 7-1 (continued)
U.S. and Canadian wood pole and crossarm recyclers

Facility Name/Address/Contact	Accepts Treated Wood	Accepts Liability	Preparation	Products	Cost
Tred'si 550 Chemin de la Tuilerie, Westbury, QC J0B 1R0, Canada Patrice Gladu patrice@tredsi.com 450-522-3575	Yes, all types.	Yes	25-foot maximum, some metal OK, no wires.	Fence posts, lumber, rails, guards.	Approximately $85/ton, final price based on distance and loading trucks.
Titan Clean Energy Projects PO Box 296, 501 Crossford Avenue Craik, SK S0G 0V0, Canada 306-734-2222	Penta (very little) and creosote.	Yes	Any length, no cabling, some metal OK.	Carbon products.	$200/ton

Just eight "recyclers" are identified in the Table 7-1 and all except two are in the United States. Two of the U.S. companies, Fraedrich Transport and Omaha Track, aren't quite recyclers, but their services offer an improvement compared with landfilling. Blackwood Solutions reported that they can service the eastern half of the United States at present, but will find ways to expand if their services are requested elsewhere. Cox Recovery reported that they can service all of the United States. Tred'si reported that they are working to develop similar operations in western Canada. All of the operators in Table 7-1 emphasized that costs are based on a variety of factors, such as distance and type and volume of recoverable materials. So, interested utilities should discuss specifics with them before concluding they are too far away or too expensive.

Section 8: Pole Donation or Sale

Sixty-seven percent of survey respondents retire some poles and crossarms by donating (64%) or selling (36%) them to the public. There appears to be no selectivity in, or reluctance to, offer all preservation types to the public. Ninety-two percent of respondents do careful tracking of what they sell or give away and do not view tracking as a disruption to normal workflow. Eight percent of respondents do not track giveaways because of the work involved and difficulties arranging transportation to a final destination

Forty-six percent of respondents track the metrics and take sustainability credits related to donations or giveaways. Five respondents reported liability concerns about donations, but not all of them specified the concerns.

EPRI survey results:

- 67% of utilities donate or sell retired poles to the public.
- 92% carefully track these materials.
- 46% take sustainability credits.
- 5 utilities ended giveaway programs due to liability concerns; 100% with continuing programs require new owners to sign a liability waiver.

Five respondents once had giveaway programs that ended due to liability concerns. Only one respondent reported a post-donation issue. A pole that had been given away was abandoned on non-utility property by the party that originally accepted it. The utility had to mobilize equipment and labor to remove the pole from the private property.

Some utilities attempt to mitigate potential risks before giving their poles away. Sixty-seven percent of respondents remove metal from the poles and crossarms; 33% check for previous supplemental preservative treatment of the pole butt.

One hundred percent of respondents willing to donate or sell retired poles and crossarms require the new owner to sign a written agreement, or waiver. The agreement is intended to pass all liability and responsibility for proper use to the new owner. However, utility personnel still have concerns. A new owner can sign an agreement or waiver, but utility personnel can never be certain that the new owner will follow the "rules."

The poles and crossarms still contain preservatives that noncommercial users generally cannot purchase otherwise. The possibility of dermal contact for the new owner and anyone in the vicinity persists as long as the wood lasts. Examples of unintended consequences include the new owner who lays pole lengths in a muddy spot to support crossing equipment, only to discover that the muddy spot is an environmentally sensitive area. The same new owner may use crosarms like fence rails that some farm animals like to "crib" (chew on).

The question for utilities is whether a waiver will "stand up in court." In many cases, it will not [56]. The main reason is that waiver laws are generally state-specific and state courts will interpret and enforce them based on state laws.

Liability waivers should be state-specific documents written by local liability law professionals citing local and regional precedents or customs.

Another reason is that the waiver may be specific and binding only to the signatory. For example, suppose a new owner signs a waiver to accept all liability for creosote poles. He and his son cut them into fence post lengths and the son has a skin reaction to the sawdust. The son may be able to make a claim against the utility company because he didn't sign a waiver and laws in his state may not hold the father responsible.

Of all disposal methods, pole and crossarm donation or sale to nonindustrial users is arguably the highest-risk option for utilities because it exposes them to potential liabilities beyond their control. Landfilling and combustion methods at least eliminate the possibility of liability exposure. If utilities like the donation option, they should consider using state-specific waivers that have been written by local liability law professionals. They should also consider local and regional precedents or customs.

Section 9: Pole Retirement and Best Management Practices

The pole and crossarm retirement practices currently available have advantages and disadvantages—primarily in terms of cost, convenience, and liability.

Under a sustainability scenario, a hierarchy of pole and crossarm retirement choices emerges, as follows:

Sustainability ranking of pole retirement options (lowest to highest):

- Landfilling
- WTE
- Biomass
- Biogas
- Recycling
- Donation or sale

- Landfilling is the least desirable retirement option. It eliminates the potential for direct dermal contact, but there is concern about methane generation and potential environmental liabilities.
- WTE retirement consumes methane and polycyclic aromatic hydrocarbons (creosote) so it is better than landfilling in terms of liability. However, it is not a net zero carbon process. This option is generally not available in Canada.
- Pole and crossarm retirement as biomass fuel for energy is more desirable than WTE retirement because it is closer to a net zero carbon process. There are a number of biomass plants in the United States and Canada, but they generally do not accept retired treated wood as fuel.
- Retired poles and crossarms as feedstock for biogas is more desirable than biomass fuel because it results in less carbon release then either biomass fuel or WTE. However, there are few (to no) biogas plants in the United States and Canada that use treated wood as feedstock. This likely will remain the case until difficulties with lignin decomposition are overcome.

Pole retirement options also vary in terms of cost, convenience, and liability.

- Recycling poles and crossarms into products that can be reused consistent with original intent is the highest value option. This alternative is available, but not currently common. It does not result in 100% diversion of spent utility materials from landfills or WTE use. The number of recycling vendors and the range of services they offer appear to be growing in the United States and Canada.
- Donation or sale of poles and crossarms for reuse consistent with their original use is sustainable and has social benefits. However, it carries the greatest potential liabilities for utility companies because it surrenders all responsibility for proper use and management to the general public.

Wood pole and crossarm retirement alternatives have improved in the United States and Canada. The best options may be too distant for many utilities to

Utilities can now use sustainability credits as an incentive for diversion of treated wood to any option with more benefits than landfilling.

This report provides the most comprehensive list to date (November 2017) of facilities in the United States and Canada that offer treated wood retirement solutions that are better than landfilling.

Creative use of novel or unconventional search terms may identify "hidden" providers who list their services on the Internet.

choose. But entrepreneurs have noticed the potential new markets and are moving to fill the niche. Furthermore, utilities are now able to use sustainability credits as an incentive for diversion of treated wood to any option with more benefits than landfilling.

This report provides the most comprehensive list to date (November 2017) of facilities in the United States and Canada that offer treated wood retirement solutions that are better than landfilling. However, in the process of executing this project it became apparent that utilities may be able to create improved local sustainability options with more aggressive and creative Internet searches.

Take, for example, "Treated wood recyclers in New Jersey." This search strategy assumes that there are New Jersey operations that accept treated wood and have websites that say exactly that. It also assumes that their websites are optimized so that search engines will easily find them. However, local or regional companies that now accept treated wood may have started their businesses many years ago based on using untreated wood. In the meantime, they have not updated their websites with associated language that enables search engines to flag them. Another shortcoming of the search phrase suggested above is that a website might say "chippers" or "grinders" or "reusers" instead of "recyclers."

Two other search phrases that may not sound right, but could be helpful, are "railroad ties" and "telephone poles." For example, if an operation accepts railroad ties it may take creosote-treated utility poles and crossarms. And, as most utility personnel know, probably half of the U.S. population, including business owners, say (and write) "telephone" pole instead of "utility" pole. Finally, a search on "cement kilns" may identify facilities that accept creosote-treated wood.

Section 10: Conclusions

This report characterizes current options for the management of retired wood poles and crossarms, and provides one source of specific, up-to-date information (as of November 2017) that identifies and describes endpoint facilities.

Current methods for wood pole and crossarm retirement are characterized in Appendices A and C and Tables 5-1, 6-1, and 7-1. They include landfilling, WTE incineration, biomass combustion for energy, use of treated wood as a biogas feedstock, recycling, and pole donation or sale. All of these alternatives are available today, but some may be unavailable in certain regions of the United States or Canada. Use of retired poles and crossarms as feedstock for biomass, biogas, and sawmills may become more viable in the future.

Eighteen utilities responded to a survey about their current disposal practices. Their responses offered a helpful snapshot of a small segment of the industry and actual poles and crossarm retirement practices. Utilities that responded do not generally have better access to more sustainable choices. Only a few respondents are not bound to landfill disposal as the primary option.

There is ample evidence of many more alternatives to landfilling in 2017 than in 2010 [1], and each alternative provides more benefits than landfilling. In addition, the diversion of poles and crossarms away from landfilling generally results in sustainability credits. These credits are both an incentive for utility personnel and an award for better corporate environmental performance.

Table 10-1 presents a summary of retirement methods, availability, cost, and liability.

Recycling 100% of retired treated wood poles and crossarms is generally impossible. But entrepreneurs and facilities are emerging whose representatives claim [46, 55] they can keep nearly 100% of these materials out of landfills. Assuming this is true, it won't benefit utilities that are too far from the outlets to justify hauling costs. However, in some cases vendors can now go to a utility site with self-contained chipping or grinding units, particularly if there are rail services in the vicinity. Table 10-1 presents a summary of retirement methods, availability, cost, and liability.

Unfortunately, in many states the operators of incinerators and landfills require generators to provide TCLP data before they will accept treated wood poles and crossarms. The analytical cost for one TCLP sample is roughly $1,000 [18]. This cost might be tolerable for generators if WTE and landfill operators developed a standard sampling methodology in which one representative composite sample is collected from a cross section of all the poles requiring disposal. However, a

standard sampling methodology for composite samples is rarely available. Regardless of the federal exemption for CCA-treated wood and EPRI's findings on creosote- and penta-treated poles and crossarms, operators and facilities remain concerned about their own potential environmental liabilities. So, they require a demonstration that the retired material passes the TCLP test. Even if it does pass, operators can still refuse the material.

As described in Section 9, utility personnel seeking local or regional options can improve their chances by applying a range of Internet search terms that may not be intuitively obvious. Jargon useful for Internet searches was also helpful in some searches for state regulations for treated wood. To actually find state rules for treated wood, using search terms such as "railroad ties," "telephone poles," and "C&D wood" was necessary.

Table 10-1
Summary of retirement options for treated wood poles and crossarms in the United States and Canada

Disposal Method	Sustainability	Availability	Cost	Liability
Landfilling	Poor	Generally good. May require TCLP data	$24 to $165/ton	Moderate
WTE	Better than landfilling	Good U.S. East Coast. Poor elsewhere in U.S. and Canada. May require TCLP data.	$38 to $175/ton	Low
Biomass	Better than WTE	Poor—no confirmed facilities using treated wood.	No data, but if technology improves could be low or no-cost, possibly even profitable.	Low
Biogas	Better than biomass	Poor—no confirmed facilities using treated wood.	No data, but if technology improves could be low or no-cost, possibly even profitable.	Low
Recycling	Better than biomass or biogas	Good on U.S. East Coast. Poor elsewhere but growth is occurring. TCLP data not required.	$55 to $180/ton	Moderate
Donation or Sale	As good as recycling	Good, for utilities that want the option. TCLP data not required. State-specific waivers required.	Low, if an efficient program is in place.	Potentially high due to possible claims against the utility by new owner.

Section 11: References

1. *Assessment of Treated Wood and Alternate Materials for Distribution Utility Poles*. EPRI, Palo Alto, CA: 2010. 1019849.
2. Jeffrey Morrell. 2016. *Estimated Service Life of Wood Poles*. Technical Bulletin No. 16-U-101. The North American Wood Pole Council. Accessed 10/3/17. http://woodpoles.org/portals/2/documents/TB_ServiceLife.pdf.
3. National Public Radio, January 6, 2007. News interview with Brian Hayes, author of *Infrastructure—A Guide to the Industrial Landscape*, and Jeffrey Morrell, Wood Products professor at Oregon State University. Archived at: http://www.npr.org/templates/story/story.php?storyId=6735420.
4. Western Wood Preservers Institute. 1996. *Wood Pole Newsletter*, Volume 20. http://www.americanpoleandtimber.com/wp-content/uploads/how-long-do-wood-poles-last.pdf.
5. *Treated Wood Poles in Use and in the Environment, Questions and Answers about Utility Poles*. EPRI, Palo Alto, CA: 2015. 3002006335.
6. Bell Lumber and Pole Company. http://www.blpole.com/products/4/weight Accessed 10/15/17.
7. EPA, June 2014. *Municipal Solid Waste Landfills—Economic Impact Analysis of the Proposed New Subpart to the New Source Performance Standards*. U.S. Environmental Protection Agency Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711.
8. *Summary of the Federal Insecticide, Fungicide, and Rodenticide Act.* https://www.epa.gov/laws-regulations/summary-federal-insecticide-fungicide-and-rodenticide-act Accessed 11-7-17.
9. *Treated Wood Pole Management.* EPRI, Palo Alto, CA: 2008. 1015562.
10. Canadian Environmental Protection Act. July 1, 1999. *Strategic Options for the Management of CEPA-Toxic Substances from the Wood Preservation Sector, Volume I, Final Report from the Issue Table.*
11. Environment Canada and Health Canada. PMRA. April 2008. Update on the Re-evaluation of the Heavy Duty Wood Preservatives Creosote, Pentachlorophenol and CCA. Re-evaluation Note REV2008-08.
12. Environment Canada and Health Canada. PMRA. June 2011. Heavy Duty Wood Preservatives: Creosote, Pentachlorophenol, Chromated Copper Arsenate (CCA) and Ammoniacal Copper Zinc Arsenate (ACZA). Re-evaluation Decision RVD2011-06.

13. EPA, September 2005. "Introduction to Hazardous Waste Identification (40 CFR Parts 261)." Training Module. https://www.epa.gov/sites/production/files/2015-09/documents/hwid05.pdf

14. U.S. Government Publishing Office, 2017. *Electronic Code of Federal Regulations*. 40 CFR §261.4(b)(9). https://www.ecfr.gov/cgi-bin/text-idx?SID=f320a854985c3080311cada749f613f0&mc=true&node=pt40.26.261&rgn=div5#se40.26.261_14

15. *Creosote-Treated Wood Poles and Crossarms: Toxicity Characteristic Leaching Procedure (TCLP) Results.* EPRI, Palo Alto, CA: 1992. 100870.

16. *Pentachlorophenol (PCP)-Treated Wood Poles and Crossarms: Toxicity Characteristic Leaching Procedure (TCLP) Results.* EPRI, Palo Alto, CA: 1991. EN-7062.

17. EPA, September 2005. "Introduction to Generators (40 CFR Part 362)." Training Module. https://www.epa.gov/sites/production/files/2014-12/documents/gen05.pdf.

18. Author knowledge, Gerald Zak.

19. Timothy Townsend, Brajesh Dubey, Thabet,Tolaymat and Helena Solo-Gabriele, "Preservative Leaching from Weathered CCA-Treated Wood.," *Journal of Environmental Management.* Volume 75, Issue 2, (2005).

20. EPA. https://www.epa.gov/landfills/basic-information-about-landfills Accessed 10/5/17.

21. EPA. https://www.epa.gov/landfills/municipal-solid-waste-landfills#whatis Accessed 10/5/17.

22. *State of Waste Management in Canada.* 2014. Canadian Council of Ministers of the Environment.

23. EPA. https://www.epa.gov/hwpermitting/hazardous-waste-management-facilities-and-units Accessed 10/5/17.

24. EPA. 2017. Inventory of US Greenhouse Gas Emissions and Sinks, 1990–2015. https://www.epa.gov/sites/production/files/2017-2/documents/2017_complete_report.pdf

25. U.S. Army Public Health Center. January 2017. *Guide for Handling, Reuse, and Disposal of Chemically Treated Wood Material.* Technical Guide 146. Army Public Health Center, 5158 Blackhawk Road Aberdeen Proving Ground, MD 21010- 5403

26. *Waste Business Journal.* http://www.wastebusinessjournal.com/news/wbj20170711A.htm Accessed 11/21/17.

27. T. Rand, J. Haukohl, and U. Marxen. 2000. *Municipal Waste Incineration - A Decision Makers Guide*. The World Bank. Washington, DC.

28. European Commission. August 2006. *Integrated Pollution Prevention and Control. Reference Document on the Best Available Techniques for Waste*

Incineration
http://eippcb.jrc.ec.europa.eu/reference/BREF/wi_bref_0806.pdf.

29. Ted Michaels, and Ida Shiang. May 2016. *Energy Recovery Council 2016 Directory of Waste-To-Energy Facilities*. Energy Recovery Council.
30. Global Energy Observatory. http://globalenergyobservatory.org/ Accessed 11/6/17.
31. Gerard Zak. Enhanced Vision, LLC. November 11, 2017. Personal communication with Todd Fraser, Prince Edward Ministry of the Environment.
32. Energy Justice Network. http://www.energyjustice.net/ Accessed 11/6/17
33. IPCC, 2013. "Summary for Policymakers." In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
34. PennState, College of Earth and Mineral Sciences. Biomass/Solid Waste. https://www.e-education.psu.edu/egee401/content/p7_p3.html Accessed 10/4/17.
35. U.S. Department of Energy. June 2016. "Growing America's Energy Future."
36. U.S. Energy Information Administration. https://www.eia.gov/energyexplained/?page=biomass_wood Accessed 10/10/17.
37. Government of Canada, National Energy Board. https://www.neb-one.gc.ca/nrg/sttstc/lctrct/rprt/2017cnddptnrnwblpwr/xctvsmmr-eng.html Accessed 11/8/17.
38. *Biomass Magazine.* http://biomassmagazine.com/plants/listplants/biomass/US/page:1/sort:plant/direction:asc Accessed 9/13/17.
39. Galen Heffern. GEI Consultants, Inc. September 2017. Personal Communication with Carrie Annand, Vice President of External Affairs, Biomass Power Association. Washington, DC.
40. Katie Fletcher. April 2016. "Playing by the Non-Waste Fuels Rules." *Biomass Magazine.* http://biomassmagazine.com/articles/13135/playing-by-the-nonwaste-fuels-rules Accessed 10/3/17.
41. *Canadian Biomass Magazine.* https://www.canadianbiomassmagazine.ca/ Accessed 11/8/17.
42. Gerard Zak. Enhanced Vision, LLC. November 9, 2017. Personal communication with Steffan Melin, Research Director of the Wood Pellet Association of Canada.

43. Gerard Zak. Enhanced Vision, LLC. November 9, 2017. Personal communication with Jennifer Green, Canadian Biomass Executive Director.

44. Gerard Zak. Enhanced Vision, LLC. November 9, 2017. Personal communication with Brett Hogarth, Ecostrat Director of Business Development and Oversight (Biomass Advisory Group).

45. Atlantic Power Corporation. "Williams Lake Renewal Project." Press Release. http://www.atlanticpower.com/sites/default/files/imce/APWL%20EXTERNAL%20FAQs%20-%20FINAL%2002July15_0.pdf

46. Rob Faber, Representative for Bdone Biomass. September 2017. Personal communication with author, Gerald Zak.

47. American Biomass Council. https://www.americanbiogascouncil.org/biogas_questions.asp Accessed 9/21/17.

48. *Biomass Magazine.* http://biomassmagazine.com/plants/listplants/biogas/US/page:1/sort:plant/direction:asc Accessed 9/13/17.

49. Canadian Biogas Association. https://www.biogasassociation.ca/ Accessed 11/2/17.

50. Gerard Zak. Enhanced Vision, LLC. November 10, 2017. Personal communication with Jennifer Green, Executive Director of Canadian Biogas Association.

51. Hakan Rylander. May 2012. *Biogas from Lignocellulosic Biomass*. The Swedish Waste Management Authority. Baltzarsgatan 25, S-211 36 Malmö, Sweden.

52. Food and Agriculture Organization of the United Nations (FAO), 1986. *Wood Gas as an Engine Fuel.* FAO Forestry Paper 72. Via delle Terme di Caracalla, 00100 Rome, Italy.

53. Paul Cooper, Tony Ung, J.-P. Aucoin, and Chris Timusk. "The Potential for Reuse of Preservative-Treated Utility Poles Removed From Service," *Waste Management & Research.* Volume 14. pp. 263–279 (1996). http://dx.doi.org/10.1177/0734242X9601400303

54. Patrice Gladu. U.S. Representative for Tred'si. September 2017. Personal communication with author, Gerald Zak.

55. Treated Wood Council. http://www.treated-wood.org/

56. Wilson Elser. *Express Assumption of Risk/Waiver/Exculpatory Clauses, 50 State Survey.* Wilson Elser Law Firm, 2012.

Appendix A: Wood Pole and Crossarm Disposal Practices Survey Questions

The Electric Power Research Institute (EPRI) has developed this survey to evaluate current electric industry wood pole and crossarm disposal methods. The answers to these questions will help focus additional research on areas of knowledge that appear to be weak or lacking.

This survey is requesting information on your pole disposal/recycling practices and cost ranges. Please indicate if the following are considered confidential business information (CBI) that you do not want included in an EPRI publication, even if presented anonymously:

- Recycling/disposal fees (Yes/No)
- Vendor names (Yes/No)
- Other [fill in the blank]

Landfill Disposal

Do you dispose of wood poles/crossarms in a municipal solid waste landfill? Yes/No. If yes, which preservative types are accepted?

- Penta
- CCA
- ACZA
- Creosote

Does the landfill require that poles/crossarms arrive in any special condition? If yes, briefly explain.

Do you dispose of poles/crossarms in a hazardous/special waste landfill? Yes/No. If yes, which preservative types are accepted?

- Penta
- CCA
- ACZA
- Creosote

Can you provide an approximate range of landfill disposal cost (tipping fees)?

- Municipal solid waste landfill cost range:
- Hazardous/special waste landfill cost range:

Do you have liability concerns about landfill disposal? Yes/No. If yes, briefly explain.

Waste-to-Energy Disposal

Do you use a waste to energy facility to dispose of wood poles/crossarms? Yes/No. If yes, which preservative types are accepted?

- Penta
- CCA
- ACZA
- Creosote

Does the facility require that poles/crossarms arrive in any special condition? If yes, briefly explain.

Can you provide an approximate range of waste to energy cost (tipping fees)?

Can you provide waste to energy facility name? Fill in the blank.

Does the facility:

- Incinerate the wood? Yes/No.
- Does the facility generate gas from the wood? Yes/No.

Is waste to energy recycling more expensive than landfill disposal or remanufacturing? Yes/No.

Can the waste to energy facility service your entire service territory? Yes/No.

Do you have liability concerns about waste to energy recycling? Yes/No. If yes, briefly explain.

Do you track metrics associated with the amount of wood you divert from landfills? Yes/No. If yes, briefly explain.

Do you take credit for wood pole diversion as a sustainable practice? Yes/No. If yes, briefly explain.

Remanufacturing

Do you use a wood pole/crossarm recycler? Yes/No. If yes, which preservative types are accepted?

- Penta
- CCA
- ACZA
- Creosote

Can you provide the name and the location? Fill in the blank.

What "product" is the result of recycling? Explain briefly.

Does the facility require that wood poles/crossarms arrive in a specific condition? Yes/No. If yes, briefly explain.

Is recycling more expensive than other disposal methods? Yes/No.

What is the approximate recycling cost?

Can the recycler handle all of your wood pole disposal needs?

Do you track metrics associated with the amount of wood you divert from landfills? Yes/No. If yes, briefly explain.

Do you take credit for wood pole diversion as a sustainable practice? Yes/No. If yes, briefly explain.

Do you have liability concerns about wood pole/crossarm recycling? Yes/No. If yes, briefly explain.

Do you use local or regional operations that saw or re-manufacture retired wood poles? Yes/No.

If yes, can you provide the name and location of the operation?

What product are they producing? Explain briefly.

Are they able to service your entire service territory? Yes/No.

Are wood pole re-manufacturing options more expensive than waste to energy disposal? Yes/No.

Does the facility require that wood poles/crossarms arrive in a specific condition? (Such as maximum lengths, metal removal, or removal of butt sections that had supplemental treatments? Yes/No. If yes, briefly explain.

Do you have liability concerns about re-manufacturing of wood poles/crossarms? Yes/No. If yes, briefly explain.

Do you track metrics associated with the amount of wood you divert from landfills? Yes/No. If yes, briefly explain.

Do you take credit for wood pole diversion as a sustainable practice? Yes/No. If yes, briefly explain.

Giveaway Programs

Do you employ a wood pole giveaway or sale program? Yes/No. If yes,

Which preservative types do you offer?

- Penta
- CCA
- ACZA
- Creosote

If yes, are the poles donated or sold?

How do you manage your giveaway programs?

- Relaxed (left by the roadside for anyone to pick up).
- Formally (you track how many and know who takes them).

Do you consider giveaway programs a major disruption to normal work flow? Yes/No. If yes, briefly explain.

Do you prepare poles for giveaway?

- Remove metal from the pole? Yes/No.
- Examine for previous remedial treatment in the butt? Yes/No.

Do you use waivers or releases of liability and MSDS? Yes/No. If yes, briefly explain.

If you once sold or donated wood poles but have ended the practice, why did you end the practice? Briefly explain.

Have you encountered environmental or human health questions/concerns with poles after they were donated or sold? Briefly explain.

Do you track metrics associated with the amount of wood you divert from landfills? If yes, briefly explain.

Do you take credit for wood pole diversion as a sustainable practice? Yes/No. If yes, briefly explain.

Do you have liability concerns about pole/crossarm giveaway? If so, briefly explain.

Are you confronted with state regulations regarding disposal that are more restrictive than EPA regulations? Yes/ No. If yes, what state and which regulations? Briefly explain.

Appendix B: Toxicity Characteristic Leaching Procedure Constituents List and Regulatory Limits

Table B-1
Toxicity characteristic constituents and regulatory levels (EPA, 2005)

Waste Code	Contaminants	Concentration
D004	Arsenic	5.0
D005	Barium	100.0
D018	Benzene	0.5
D006	Cadmium	1.0
D019	Carbon tetrachloride	0.5
D020	Chlordane	0.03
D021	Chlorobenzene	100.0
D022	Chloroform	6.0
D007	Chromium	5.0
D023	o-Cresol*	200.0
D024	m-Cresol*	200.0
D025	p-Cresol*	200.0
D026	Total Cresols*	200.0
D016	2,4-D	10.0
D027	1,4-Dichlorobenzene	7.5
D028	1,2-Dichloroethane	0.5
D029	1,1-Dichloroethylene	0.7
D030	2,4-Dinitrotoluene	0.13
D012	Endrin	0.02
D031	Heptachlor (and its epoxide)	0.008

Table B-1 (continued)
Toxicity characteristic constituents and regulatory levels (EPA, 2005)

Waste Code	Contaminants	Concentration
D032	Hexachlorobenzene	0.13
D033	Hexachlorobutadiene	0.5
D034	Hexachloroethane	3.0
D008	Lead	5.0
D013	Lindane	0.4
D009	Mercury	0.2
D014	Methoxychlor	10.0
D035	Methyl ethyl ketone	200.0
D036	Nitrobenzene	2.0
D037	Pentachlorophenol	100.0
D038	Pyridine	5.0
D010	Selenium	1.0
D011	Silver	5.0
D039	Tetrachloroethylene	0.7
D015	Toxaphene	0.5
D040	Trichloroethylene	0.5
D041	2,4,5-Trichlorophenol	400.0
D042	2,4,6-Trichlorophenol	2.0
D017	2,4,5-TP (Silvex)	1.0
D043	Vinyl chloride	0.2

* If o-, m-, and p-cresols cannot be individually measured, the regulatory level for total cresols is used.

Appendix C: Treated Wood Disposal Regulations by State and Province

Table C-1
U.S. treated wood disposal regulations by state

State	Information	EPRI Comments
Alabama	Army—PCP/Creosote: reuse or use as fuel in properly permitted industrial burners for generation of steam energy to power a manufacturing plant.	EPRI—Commercial and industrial users can deposit treated wood in a landfill or use properly permitted industrial incinerators. http://www.aces.edu/natural-resources/water-resources/faq/subject.php?code=208&display=25&page=3 Marlena Brewer, Technical Assistant at Alabama DEP, 907-269-1099, reported that most landfills require TCLP testing and can refuse to accept treated wood.
Alaska	Army—Creosote treated wood cannot be open burned.	EPRI—Anchorage Municipal Landfill reports that they will consider accepting treated wood (eight feet long and less) that passes TCLP at $58/ton from in-county, $115/ton from outside of county.
Arizona	Army—Determine whether potential RCRA characteristic hazardous waste.	EPRI—Arizona DEQ Solid Waste Program reported that they follow 40 CFR 257-258.
Arkansas	Army—Determine whether potential RCRA characteristic hazardous waste. May be disposed of in a Class 1 Landfill if nonhazardous.	EPRI—Chris Krou of Arkansas DEP reported that TCLP (and whatever else an individual facility needs) is required. If results meet regulatory requirements. nonhazardous landfilling is acceptable. If hazardous, must be disposed as hazardous waste.
California	Army—Determine whether potential RCRA characteristic hazardous waste. Dispose of in a Class 1 hazardous waste landfill or in a composite-lined portion of a Special Waste landfill approved to accept treated wood waste in accordance with California COR 22, Division 4.5 Chapter 34 under the Alternative Management Standards.	EPRI—Excellent state guidance provided at link below. http://www.dtsc.ca.gov/PollutionPrevention/ToxicsInProducts/TWW_Regulations.cfm

Table C-1 (continued)
U.S. treated wood disposal regulations by state

State	Information	EPRI Comments
Colorado	Army—Determine potential RCRA characteristics. May be disposed of in a MSW landfill if nonhazardous.	EPRI—From David Foster, Environmental Protection Special III, Hazardous Materials and Waste Management Division, Colorado Department of Public Health and the Environment, 303-692-3372: Treated wood is not exempt from hazardous waste classification. Treated wood being disposed still needs a hazardous waste determination prior to disposal. Typically treated wood does not fail TCLP and is not deemed a characteristic hazardous waste. Treated wood that is not a characteristic hazardous waste may go to a municipal landfill if the landfill will take it.
Connecticut	Army—Reuse and recycle where possible. Contractors, utilities, and manufacturers should directly contact the Connecticut Department of Energy and Environmental Protection (DEEP) for disposal in a permitted bulky waste landfill.	EPRI—Contractors, utilities, and manufacturers should contract directly with a DEEP permitted bulky waste landfill, or send materials to an out-of-state incinerator appropriately equipped and permitted to burn treated wood. http://www.ct.gov/deep/cwp/view.asp?a=2714&q=324870
Delaware	Army—Dispose in MSW facility.	EPRI—Delaware Solid Waste Authority calls treated wood a "special waste" and it must be characterized per DSWA Policy on Special Solid Wastes rules: http://dswa.com/resources/policies/
Washington DC	Army—Pressure-treated and creosote-treated wood are considered hazardous and are not recyclable. Contact the District of Columbia Department of Public Works Sanitation Services to determine treated wood disposal and reuse requirements.	EPRI—Victoria North, Environmental Protection Specialist, 202-535-1909, reported that treated wood is subject to TCLP, and that there are no landfills in DC.

Table C-1 (continued)
U.S. treated wood disposal regulations by state

State	Information	EPRI Comments
Florida	Army—Dispose of in a lined landfill.	EPRI—It must be disposed in lined landfills only or at a C/D site operating under Best Management Practices to separate materials before processing. http://swa.org/189/Special-and-Commercial-Waste-Disposal-Gu#wood-treated
Georgia	Army—Burn only in commercial or industrial incinerators or boilers in accordance with state and federal regulation.	EPRI—In Georgia, treated wood is apparently defined as C&D waste. https://epd.georgia.gov/sites/epd.georgia.gov/files/related_files/site_page/CandDStudy.pdf
Hawaii	Army—Reuse according to intended purpose or dispose of in Hawaii Department of Health permitted landfill. Incineration/burning is prohibited.	EPRI—In Hawaii, treated wood is considered C&D waste. For landfill disposal, the landfill must be approved by the Department of Health. http://health.hawaii.gov/shwb/files/2013/06/trtdwood1.pdf
Idaho	Army—Contact the Idaho Department of Environmental Quality Solid Waste Program to determine landfill type for disposal.	EPRI—Phone calls to Idaho DEQ not returned.

Table C-1 (continued)
U.S. treated wood disposal regulations by state

State	Information	EPRI Comments
Illinois	Army—Treated wood that is not weathered or that does contain surface deposits or surface staining must be tested to determine if it is hazardous. Treated wood that is weathered and contains no surface deposits or surface staining destined for treatment, storage, disposal, or use as a fuel is a non-special solid waste. The generator is not required to determine if this wood is hazardous. Treated wood must be nonhazardous for use as a fuel in a permitted boiler or industrial furnace.	EPRI—Army findings were verified. http://www.epa.illinois.gov/topics/waste-management/factsheets/treated-wood/index
Indiana	Army—Determine whether potential RCRA characteristic hazardous waste. May be disposed of in a MSW landfill if nonhazardous.	EPRI—Indiana guidance indicates that CCA is exempt, and that creosote and penta have been conclusively shown to be nonhazardous. Therefore, due to generator knowledge, poles are nonhazardous and can go to a MSW facility. http://www.in.gov/idem/ctap/files/nrpd_waste-0006.pdf
Iowa	Army—PCP- and creosote-treated wood may be burned only in industrial incinerators or boilers in accordance with state and federal regulations. CCA-treated wood should not be burned, even in state-of-the-art incinerators.	EPRI—Disposal of CCA-treated wood in a lined landfill is the only acceptable disposal option. No additional guidance for penta or creosote was located. www.iowadnr.gov/portals/idnr/uploads/waste/treatedwood.pdf

Table C-1 (continued)
U.S. treated wood disposal regulations by state

State	Information	EPRI Comments
Kansas	Army—Dispose of in a C&D landfill.	EPRI—Verified. http://www.kdheks.gov/waste/techguide/SW-1994-G2.pdf
Kentucky	Army—Contact the Kentucky Department for Environmental Protection to determine landfill type for disposal.	EPRI—Brian Osterman, Kentucky DEP, reported that CCA-treated wood is acceptable in a Construction and Demolition Debris Landfill in Kentucky.
Louisiana	Army—Contact the Louisiana Department of Environmental Quality to determine landfill type for disposal.	EPRI—See "Proper Disposal of Preservative-Treated Wood" at the Louisiana State University Ag Center website: http://www.lsuagcenter.com/topics/environment/forestry/forest_products/proper-disposal-of-
Maine	Army—Arsenical treated wood must be separated from the other waste at a lined solid waste landfill. There is a limit to the amount that can be disposed of in an unlined landfill.	EPRI—No additional guidance located.
Maryland	Army—Determine whether potential RCRA characteristic hazardous waste. May dispose of in a MSW or rubble Landfill if nonhazardous.	EPRI—No additional guidance located.
Massachusetts	Army—Manage in accordance with Massachusetts Special Waste requirements.	EPRI—The state has banned landfill disposal of treated wood. Waivers may be possible. http://www.mass.gov/eea/agencies/massdep/recycle/solid/massachusetts-waste-disposal- bans.html

Table C-1 (continued)
U.S. treated wood disposal regulations by state

State	Information	EPRI Comments
Michigan	Army—Dispose of in landfills licensed to hold treated wood.	EPRI—Treated wood is classified as C&D material. https://www.michigan.gov/documents/deq/deq-wmrpd-sw-FY2016-SW-Landfilled-Rpt_552961_7.pdf
Minnesota	Army—Dispose of in C&D or MSW lined landfill; only creosote-treated wood can be burned in industrial incinerator approved by Minnesota Pollution Control Agency.	EPRI—In Minnesota, all types of structural treated wood may be disposed of in a permitted, lined, industrial or mixed solid waste landfill provided the landfill operator is notified and approves the disposal. In this case, you do not need to determine whether the waste is hazardous. https://www.pca.state.mn.us/sites/default/files/w-hw4-67.pdf
Mississippi	Army—Reuse according to originally intended use. Small amounts dispose of in a MSW landfill or Class I rubbish site. Larger volumes should be disposed of in a municipal landfill or larger lined disposal facility.	EPRI—If the activity involves large volumes of material, Mississippi Department of Environmental Quality (MDEQ) recommends the treated wood material be disposed of in a municipal landfill or other similarly lined disposal facility. For treated wood products that are newly manufactured or off-spec materials, Class I rubbish disposal is not a suitable disposal option and generators should contact MDEQ at 601-961-5171 for additional guidance. http://www.deq.state.ms.us/Mdeq.nsf/pdf/SW_ArchitecturalDebrisDisposalGuidance(June2007)/$File/Arch.%20Debris%20Guidance%20-%20June%202007%20(web).pdf?OpenElement
Missouri	Army—Dispose of in landfills permitted for sanitary or demolition waste, or burn in incinerators or energy recovery units that have permits to burn treated wood.	EPRI—As a regulated solid waste, railroad ties and utility poles may be disposed of in a permitted sanitary landfill or a permitted demolition landfill. No other land disposal option exists in the Solid Waste Management Law. https://dnr.mo.gov/pubs/pub196.htm

Table C-1 (continued)
U.S. treated wood disposal regulations by state

State	Information	EPRI Comments
Montana	Army—Solid waste when used for its intended purpose. Contact local landfill for disposal options. Burning treated wood prohibited.	EPRI—Treated wood poles are not a hazardous waste. They are a solid waste that can be disposed of at any Class 2 (MSW) or Class 4 (C&D) landfills that are properly permitted.
Nebraska	Army—Dispose of in a permitted municipal solid waste or C&D landfill without prior approval from the Department of Environmental Quality. Any type of treated wood that has been painted or contaminated with anything that may be hazardous, is subject to a hazardous waste determination. If determined to be hazardous, it must be disposed of according to the Nebraska Hazardous Waste Laws.	EPRI—Pentachlorophenol- or creosote-treated wood (*e.g.* railroad ties or telephone poles) that has been used for its intended purpose is generally not considered a hazardous waste or a special waste. The same is true for arsenic (CCA)-treated wood. Debris from treated wood that is not intended to be recycled must be disposed of at a permitted Municipal Solid Waste (MSW) or Construction and Demolition (C&D) landfill. If treated wood has not been sufficiently weathered to expend the preservative within it (i.e. new boards or poles), it may be considered a hazardous waste if disposed. EQ!! [Publica.nsf&documentId=8C4717D33310FE7C8625728200590C36&action=editDocument http://www.deq.state.ne.us/NDEQProg.nsf/PubsForm.xsp?databaseName=CN=DEQSER6/O=ND
Nevada	Army—Contact the Nevada Department of Conservation and Natural Resources Division of Environmental Protection to determine landfill type for disposal.	EPRI—Mike Ruffner, Nevada Department of Conservation and Natural Resources. reported that Nevada does not have an official classification of treated wood, but they have not formally exempted CCA-treated wood from a hazardous classification. The state may require a generator to demonstrate no exceedance of TCLP regulatory limits for CCA-treated wood. Nevada is likely to consider the results of EPRI penta and creosote studies as generator knowledge.

Table C-1 (continued)
U.S. treated wood disposal regulations by state

State	Information	EPRI Comments
New Hampshire	Army—Disposed in a permitted landfill or a C&D debris processing facility.	EPRI—Poles and crossarms are not defined as C&D waste. Dispose of pressure-treated wood in landfills. https://www.des.nh.gov/organization/commissioner/pip/factsheets/bb/documents/bb-19.pdf
New Jersey	Army—Determine whether potential RCRA characteristic hazardous waste. May dispose of in a MSW if nonhazardous.	EPRI—No additional guidance located.
New Mexico	Army—Contact the New Mexico Environment Department to determine landfill type for disposal.	EPRI—No additional guidance located.
New York	Army—Dispose of in C&D landfill or MSW landfill authorized to accept C&D waste. Contact the appropriate DEC regional office for information on disposing of CCA-treated wood. http://www.dec.ny.gov/chemical/8790.html	EPRI—C&D waste includes, but is not limited to, wood (including painted, treated and coated wood and wood products). CCA-treated wood may be disposed of in construction & demolition (C&D) debris landfills and municipal solid waste landfills which are authorized to accept construction and demolition debris. Wood treated with creosote from construction and demolition (C&D) activities can be disposed of as C&D debris waste. Penta-treated wood is not specifically mentioned in any guidance we found. However, it appears to be covered by the definition of C&D waste. http://www.dec.ny.gov/chemical/42394.html http://www.dec.ny.gov/chemical/107410.html

Table C-1 (continued)
U.S. treated wood disposal regulations by state

State	Information	EPRI Comments
North Carolina	Army—Contact the North Carolina Department of Environment and Natural Resources to determine landfill type for disposal.	EPRI—Jason Watkins, Field Operations Branch Head, Division of Waste Management – Solid Waste Section in North Carolina, reported that, per North Carolina 15A NCAC 13B .0542 (e)(15), copper chrome arsenate (CCA)- and creosote-treated woods are excluded from disposal in a C&D landfill unless they are comingled with other C&D wastes. Watkins also reported "we have historically directed the disposal of creosote and CCA timbers to lined MSW landfill disposal due to the leachate collection and groundwater monitoring systems." Geoffrey H. Little, Environmental Engineer, Solid Waste Division, NC DEQ, pointed out that landfill operators may have additional requirements. Specific guidance regarding penta-treated wood was not secured.
North Dakota	Army—Solid Waste landfill. Contact the North Dakota Department of Health Division of Waste Management to determine landfill type for disposal.	EPRI—CCA-treated crossarms and wood poles are not a hazardous waste. No additional guidance located. http://www.legis.nd.gov/information/acdata/pdf/33-24-02.pdf
Ohio	Army—Dispose of in a C&D landfill.	EPRI—Weathered poles and crossarms are regarded as Construction and Demolition Debris (C&DD). The definition follows: "materials resulting from the alteration, construction, destruction, rehabilitation, or repair of any manmade physical structure...and weathered railroad ties and utility poles." http://epa.ohio.gov/portals/34/document/currentrule/3745-400-01_current.pdf (page 1)
Oklahoma	Army—Solid waste that must be disposed of in an Oklahoma DEQ permitted landfill.	EPRI—John Galen at Oklahoma DEQ (solid waste, Phone: 405-702-5100) reported that poles and crossarms are regarded as industrial waste and can go to any permitted landfill where the operator must decide whether to accept them, or require TCLP data. Galen said it's an operator's choice.

Table C-1 (continued)
U.S. treated wood disposal regulations by state

State	Information	EPRI Comments
Oregon	Army—Solid Waste. Treated wood from commercial or industrial use may be burned only in commercial or industrial incinerators or boilers in accordance with state and federal regulations.	EPRI—Treated wood is exempt from hazardous classification and it can be disposed of at any facility authorized to receive it. http://infohouse.p2ric.org/ref/45/44118.pdf
Pennsylvania	Army—Dispose of in a MSW landfill or C&D landfill.	EPRI—No additional guidance secured.
Rhode Island	Army—Solid waste landfill. Contact the Rhode Island Department of Environmental Management to determine landfill type for disposal.	EPRI—Treated wood is a nonhazardous construction and demolition solid waste, per http://www.dem.ri.gov/pubs/regs/regs/waste/swrg05_1.pdf No additional guidance located.
South Carolina	Army—Solid waste landfill. Contact the South Carolina Department of Health and Environmental Control to determine landfill type for disposal.	EPRI—CCA-treated wood is excluded from hazardous waste classification. Utility poles treated with penta or creosote are unacceptable at Class II landfills. They appear to be destined for disposal at Class III landfills. No additional guidance located. https://www.scdhec.gov/Agency/docs/lwm-regs/261%2012.pdf
South Dakota	Army—Disposed of at a permitted solid waste landfill.	EPRI—Wood treated with inorganic chemicals, chromated copper arsenate (CCA), pentachlorophenol (PCP), or creosote is not regarded as C&D waste. Waste must be taken to a permitted municipal solid waste landfill for disposal. http://denr.sd.gov/des/wm/sw/documents/C&DGeneralPermitGPCD12-20.pdf

Table C-1 (continued)
U.S. treated wood disposal regulations by state

State	Information	EPRI Comments
Tennessee	Army—Solid waste landfill. Contact the Tennessee Department of Environment and Conservation to determine landfill type for disposal.	EPRI—Recently treated wood is a Special Waste. $300 fee and approval required from Tennessee Department of Environment and Conservation (TDEC). May require TCLP data, depending on generator knowledge and age of wood. If the retired wood is obviously old, properly permitted landfills can accept at their discretion.
Texas	Army—Class I landfill	EPRI—CCA-treated wood is not a hazardous solid waste. If the treated wood is disposed, burned, or incinerated, then it is a solid waste and must be characterized for proper disposal. [Title 30 Texas Administrative Code Chapter 335, Subchapter R
Utah	Army—Manage as a Special Waste in accordance with Utah special waste requirements.	EPRI—It is a Special Waste and must be disposed of in a Class V lined landfill. https://rules.utah.gov/publicat/code/r315/r315-301.htm#T2
Vermont	Army—Determine whether potential RCRA characteristic hazardous waste. If it is hazardous, it must be disposed of in accordance with Vermont hazardous waste regulations. If nonhazardous, wood can be disposed of in a certified lined landfill.	EPRI—the hyperlink in the Army document is broken Treated wood waste... must be evaluated to determine if it is hazardous waste. Waste that is determined to be hazardous must be managed in accordance with the Vermont Hazardous Waste Management Regulations. The owner or operator of a business can determine whether or not treated wood is hazardous waste based on either "generator knowledge" about the wood, or laboratory analysis. Nonhazardous wood may be disposed of in certified, lined landfills. Treated wood should not be shredded or ground prior to disposal. http://dec.vermont.gov/sites/dec/files/ead/documents/FactSheets/woodwaste_fs.pdf
Virginia	Army—Contact the Virginia Department of Environmental Quality to determine landfill type for disposal. http://www.deq.virginia.gov/Por	EPRI—Construction, renovation, and demolition wastes (including but not limited to railroad ties and telephone poles), are exempt from the definition of municipal solid waste.

Table C-1 (continued)
U.S. treated wood disposal regulations by state

State	Information	EPRI Comments
Washington	Army—Arsenical treated wood excluded if used for its intended purpose (WAC 173-303-071 (3) (g) (i)). PCP- and creosote-treated wood is regulated as Dangerous Waste unless managed under Treated Wood Exclusion (WAC 173-351) or Excluded categories of waste (WAC 173-303-071 (3) (g)). Allows disposal of treated wood in a municipal solid waste landfill permitted under chapter 173-351 WAC, provided it is not a listed or TCLP waste. This landfill option cannot be used for wood waste that designates because it is listed or fails the TCLP test, but it may be sent to a non-permitted facility that will treat or recycle it. Treated wood waste may also be sent to a permitted TSD facility. With any of these disposal options, the treated wood waste does not have to be managed or reported as a dangerous waste, but it must be removed from the generator's site within 180 days. Creosote-treated wood may be burned for energy recovery in a regulated commercial or industrial furnace or boiler. Any residue or ash resulting from treating or burning creosote-treated wood must be designated and managed appropriately. http://www.ecy.wa.gov/programs/hwtr/dangermat/wood_waste.html	EPRI—Confirmed the Army findings

Table C-1 (continued)
U.S. treated wood disposal regulations by state

State	Information	EPRI Comments
West Virginia	Army—Manage as a C&D waste that is disposed of in an approved C&D landfill.	EPRI—Utility poles and crossarms are not C&D waste. http://www.dep.wv.gov/pio/Documents/Rules%202011/DWWM/Solid%20Waste/Waste%20Mgt. %2033-1.%20Solid%20Waste%20Management%20Rule.pdf Additional guidance not located. 304) 926-0448
Wisconsin	Army—Reuse and recycle according to intended use or dispose of in a C&D waste landfill. http://dnr.wi.gov/topic/Demo/Debris.html	EPRI—Painted and/or treated wood waste must be disposed at a licensed, approved solid waste facility. http://dnr.wi.gov/topic/forestfire/documents/woodwastedisposal.pdf
Wyoming	Army—Determine whether potential RCRA characteristic hazardous waste. Contact the Wyoming Department of Environmental Quality to determine landfill type for disposal.	EPRI—Treated wood... may exhibit hazardous waste characteristics. If the treated wood is quite old, it may be reasonable to assume that it will not exhibit these characteristics and that it may be accepted for disposal without testing at any permitted MSW landfill. If hazardous, there are no permitted hazardous waste disposal facilities in Wyoming. The generator of the waste should check with the nearest MSW landfill operator. Recently treated wood wastes should be analyzed for hazardous waste characteristics. http://deq.wyoming.gov/media/attachments/Solid%20%26%20Hazardous%20Waste/Solid%20Waste/Guidance%20%26%20Standards/SHWD_Solid-Waste_Guidelines-10-Waste-Screening_1994-0907_RLfyqGN.pdf

Table C-2
Canadian treated wood disposal regulations by province

Province	Information*
Alberta	Treated wood waste is not hazardous and can be disposed of at Class I or Class II landfills. http://aep.alberta.ca/waste/waste-management/documents/ChemicallyTreatedWoodWaste-Feb2012.pdf
British Columbia	Hazardous waste does not include waste wood products treated with wood preservatives for wood protection products registered under the Pest Control Products Act. Dispose of treated wood at landfills authorized to accept it. http://www.bclaws.ca/civix/document/id/loo90/loo90/63_88_01#part1
Manitoba	Treated wood is not regarded as hazardous waste as long as it was treated with a wood preservative registered under the Pest Control Products Act. Pena, creosote, and CCA are all registered under the Pest Control Products Act. http://web2.gov.mb.ca/laws/regs/current/_pdf-regs.php?reg=195/2015
New Brunswick	The only disposal option available for pressure treated wood is disposal at a landfill with permission of the owner or reuse of the material for another purpose. http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/EIA-EIE/SectorGuidelines/PortsHarboursWharves.pdf
Newfoundland and Labrador	Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Owner's Representative. www.tw.gov.nl.ca/works/masterspec/060573.doc
Nova Scotia	Treated wood is considered a construction and demolition waste and requires management at an approved C&D facility. http://divertns.ca/assets/files/Guides/CandDManagementGuide.compressed.pdf
Ontario	Treated wood is not defined as hazardous waste. As such, disposal in a nonhazardous but properly permitted facility is an appropriate option.

Table C-2 (continued)
Canadian treated wood disposal regulations by province

Province	Information*
Prince Edward Island	Special wastes include (xi) creosoted or pressure-treated material, including (A) chemically treated lumber and wood. Is NOT C&D waste, special waste disposal permit is required. https://www.princeedwardisland.ca/sites/default/files/legislation/E%2609-15-Environmental%20Protection%20Act%20Waste%20Resource%20Management%20Regulations.pdf
Quebec	Treated wood is excluded from hazardous waste classification. http://www.mddelcc.gouv.qc.ca/matieres/dangereux-en/index.htm No additional guidance located.
Saskatchewan	Treated wood is considered an Industrial Waste and must be disposed in a lined landfill permitted to accept it. It can also be incinerated or pyrolyzed at permitted facilities.

* The U.S. Army did not research Canada.

Appendix D: Requirements and Tipping Fees for Specific, Unique Landfills Located in Each State and Province

Table D-1
Requirements and tipping fees for specific, unique U.S. landfills located in each state

UNITED STATES
Alabama
Cedar Hill Landfill, 1319 North Business Creek Road, Ragland, AL 35131, 205-368-3560. Wood must be weathered. From in-state only. Maximum length 6.0 feet. Approximately $53.00/ton.
Alaska
Anchorage Municipal Landfill, 15500 Eagle River Loop, Anchorage, AK. 907-343-6262. Wood must pass TCLP. Maximum length 8.0 feet. $58/ton from in-county. $115/ton from outside of county.
Arizona
Marana Regional Landfill, 14508 West Avra Valley Road, Marana, AZ 85653, 480-457-4795. Accepts all types of treated wood. Maximum length 10 feet. $47.50/ton.
Arkansas
Fort Smith Landfill, 5900 Commerce Road, Fort Smith, AR 72916, 479-784-2350. Requires TCLP of a composite. If TCLP acceptable they will take all poles any length at $34.43/ton.
California
John Smith Road Solid Waste Disposal Site, 2650 John Smith Rd, Hollister, CA 95023, 831- 637-4515. Wood must pass TCLP. Maximum length 3 feet. $52.75/ton. $75 handling fee per load.
Colorado
Sedelia Landfill, 5970 US-85, Sedalia, CO 80135, 720-733-8584. Accepts all preservative types, in any condition. $68/ton.
Connecticut
Manchester MSW Landfill, 311 Olcott Street, Manchester, CT 06040, 860-647-3257. Accepts shredded treated wood if it passes TCLP. $95.00/ton.

Table D-1 (continued)
Requirements and tipping fees for specific, unique U.S. landfills located in each state

UNITES STATES
Delaware
Sandtown Landfill, 1107 Willow Grove Road, Felton, DE 19943, 302-284-8851. Tales treated wood that has passed TCLP, on a case-by-case basis, maximum length of 10 feet, for approximately $85/ton. One must request disposal there ahead of time.
Washington DC
There are no Landfills in Washington DC.
Florida
Brevard County Central Landfill, 2250 Adamson Rd. Cocoa, FL 32926-2619, 321-633-1888. Accepts creosote poles and crossarms. $41.00/ton.
Georgia
Taylor County Landfill, 33 Stewart Road Butler/Mauk, GA, 478-862-3693 or 478-862-2610. Accepts all poles and crossarms. 8-foot lengths preferred. $45/ton.
Hawaii
PVT Land Company, Ltd., 87-2020 Farrington Highway, Waianae, HI, 96792, 808-668-4561. Accepts all types if they pass TCLP with a composite sample. 10-foot maximum length. If deemed a special waste $97/ton. Otherwise $90/ton.
Idaho
No landfills identified that accept treated wood. One Idaho operator suggested Whitman Landfill in nearby Washington State. See notes for Washington, below.
Illinois
Turkey Trot Landfill, Mannish Ryan Rd., Citronelle, AL, 251-866-7787. Accepts all types but must pass TCLP. 8-foot lengths preferred. $26/ton.
Indiana
Hayes Landfill, 3450 S. Spiceland Rd., New Castle, IN 47362, 765-529-2337. Accepts all types if they pass TCLP. Maximum length of 15 feet. $36.10/ton.
Iowa
Metro Park East Landfill, 12181 NE University Ave,, Mitchellville, IA 50169, 515-967-2076. Reported they accept all pole and crossarm types. Max length 17 feet. Approximately $42/ton (plus tax).
Kansas
Brooks Landfill, 4530 W 37th, North Wichita, KS, 316-350-3225. Accepts all types as C&D. Maximum length 15 feet. $34.50/ton.
Kentucky
Many calls were made. Did not reach a landfill that accepted retired poles or crossarms.

Table D-1 (continued)
Requirements and tipping fees for specific, unique U.S. landfills located in each state

UNITED STATES
Louisiana
River Birch Landfill, 5000 Highway 90, Avondale, LA 70094, 504-436-1288. Accepts creosote and penta if they pass TCLP. CCA-treated wood can go to their Type III landfill. $35/ton.
Maine
Graham Road Landfill, 49 Graham Rd., Brunswick, ME 04011, 207-353-9781. http://www.brunswickme.org/wp-content/uploads/2012/01/comgrl.pdf $80/ton.
Maryland
R B Baker & Sons Rubble Landfill, 501 4-H Park Rd, Queenstown, MD 21658, 410-827-8831. Accepts all pole types, no special conditions. $117/ton.
Massachusetts
The state has banned landfill disposal of treated wood; waivers may be possible. http://www.mass.gov/eea/agencies/massdep/recycle/solid/massachusetts-waste-disposal-bans.html
Michigan
Arbor Hills Landfill 10690 W. Six Mile Road Northville, MI 48168, Phone: 734-320-9619 Accepts all poles and crossarms $24/ton.
Minnesota
SKB Rosemount C&D Facility, 13425 Courthouse Blvd., Rosemount, MN 55068, 651-438-1500. Accepts all types. Call ahead for details. $81.50/ton. Recycling options may be available with SKB.
Mississippi
Leflore County Landfill, 15200 Highway 49 South, Sidon, MS 38954, 662-455-7762 or 662-455-7760. Poles and crossarms must be obviously old. Newer materials require TCLP. Tipping fee $35/ton.
Missouri
Courtney Ridge Landfill, 2001 Missouri 291, Sugar Creek, MO 64058, 816-897-4516. No TCLP required, but additional paperwork is necessary. $42/ton.
Montana
Custer County Landfill, 4752 Leighton Blvd., Miles City, MT 59301, 406-232-4032. Must pass TCLP. $50/ton in-county. $100/ton out of county.
Nebraska
Butler County Landfill, 3588 R Road, David City, NE 68632, 402-367-4669. The material must be obviously old and weathered. $38.25/ton. Otherwise, must pass TCLP and have a special waste permit. $52.25/ton.
Nevada
Western Elite Landfill, US Hwy 93, Mile Marker 8, Lincoln County, NV, 702-369-4242. Accepts all poles and crossarms. Maximum length 20 feet. $29.59/ton for landfilling. They prefer to "repurpose" them, however.

Table D-1 (continued)
Requirements and tipping fees for specific, unique U.S. landfills located in each state

UNITED STATES
New Hampshire
Casella Waste, 581 Trudeau Rd., Bethlehem, NH 03574. Many calls made to Casella. No response.
New Jersey
Atlantic County Utilities Authority, 6700 Delilah Road, Egg Harbor Township, NJ 08234, 609-272-6950.Accepts all types as C&D. Maximum 8 feet long. $88.91/ton. However, if the landfill compliance officer has “concerns,” TCLP may be required, and may determine that the material is “industrial waste” at $122.70/ton.
New Mexico
Lea County Landfill, 3219 East State Road 176, Eunice, NM 88231, 575-394-9109. Accepts all pole types. Maximum length 10 feet. $35/ton in county. $45/ton out of county.
New York
Allegany County Landfill, 6006 County Road 48, Angelica, NY 14709 585-268-9230. Many calls made. No response.
North Carolina
Republic Services Charlotte Motor Speedway Landfill, 5105 Morehead Road, Concord, NC 28027, 704782-2004. Accepts creosote without data. If penta or CCA, must run TCLP. If they pass, approximately $80/ton.
North Dakota
Bismarck Landfill, 2111 N 52nd Street, Bismarck, ND 58501, 701-355-1700. Accepts all types. No special Conditions. $45/ton.
Ohio
Athens Hocking Landfill Reclamation Center, 17970 State Route 33, Nelsonville, OH 45764, 740-385-6019. Reported they accept all types, no special conditions. $30/ cubic yard.
Oklahoma
Oklahoma City Landfill, 7600 SW 15th Street, Oklahoma City, OK 73128, 405-833-0269. Many calls made. No response.
Oregon
Columbia Ridge Recycling and Landfill, 18177 Cedar Springs Lane, Arlington, OR 97812, 503-493-7834. Accepts all pole types. No analytical required. Maximum length 10 feet. $40.60/ton. 10 ton minimum.
Pennsylvania
No landfills that accept retired poles or crossarms were located.
Rhode Island
Rhode Island Resource Recovery Corporation, 65 Shun Pike, Johnston, RI 02919, 401-942-1430. Must be obviously weathered, or otherwise pass TCLP. Maximum length 4 feet. $90/ton.

Table D-1 (continued)
Requirements and tipping fees for specific, unique U.S. landfills located in each state

UNITED STATES
South Carolina
Berkley County Landfill, 2277 US-52, Moncks Corner, SC 29461, 843-761-2713. Accepts all types. No length requirement. $57/ton.
South Dakota
Rapid City Landfill, 5555 South Dakota 79 S, Rapid City, SD 57703. Acceps all types. Maximum length 15 feet. $59/ton.
Tennessee
Called several landfills. None accept treated wood.
Texas
Polk County Landfill, 3477 FM 942 W, West Leggett, TX 77351, 936-327-6829. Accepts all types if profiled as old and "weathered out." Otherwise must pass TCLP. If acceptable, $7.45 per cubic yard.
Utah
Sanpete County White Hills Landfill, South of 137 Mayfield, UT 84643, 435-427-3812. Accepts all types. No maximum length. $28/ton.
Vermont
Casella Waste, 403 Landfill Lane Coventry, VT 05825. Many calls made to Casella. No response.
Virginia
Hampton Roads Recovery Center, 1613 Centerville Turnpike, Virginia Beach, VA 23462, 757-420-0128. Accepts all pole types. No maximum length. $75/ton. One ton minimum.
Washington
Whitman County Landfill, 252 Landfill Rd, Pullman, WA 99163, 509-334-2400/ Accepts creosote, need TCLP for penta and CCA. Maximum length 20 feet. $106/ton.
West Virginia
Charleston City Landfill, 741 South Park Road, Charleston, WV 25304, 304-925-1192. Accepts all types. No maximum length. $40/ton.
Wisconsin
Lacrosse County Solid Waste Landfill, 6500 State Rd., La Crosse, WI 54601, 608-785-9572. Must be less than 8 feet long. Accepts penta and creosote. May require TCLP for CCA $62/ton.
Wyoming
Lincoln County, Kemmerer Landfill, End of County Road 345, Kemmerer, WY 83101, 307-877-2095. Accepts all types. No special conditions. Creosote $100/ton. Penta and CCA $150/ton. Call ahead.

Table D-2
Requirements and tipping fees for specific, unique Canadian landfills located in each province

CANADA
Alberta
Ryley Facility, 2 km North of Hwy.14 on Secondary Rd. 854, Ryley, AB T0B 4A0, 780-663-3828. Accepts all pole types. Maximum length 8 feet. Non-dispersible. $123/ton.
British Columbia
Calgary City Landfill, 12111–68 Street SE, Calgary, BC. All preservative types accepted. Maximum length 8 feet. No metal preferred. CCA $113/ton. Penta and creosote $165/ton.
Manitoba
Brady Road Landfill, 1777 Brady Rd, Winnipeg, MB R3V 0B5, 204-986-4813. Creosote only. $172/ton. Miller Environmental, Inc., P.O. Box 279 St. Jean Baptiste, MB R0G 2B0. Accepts all types. TCLP data required. Cost based on TCLP results. Minimum of $185/ton. Maximum length 2 feet.
Newfoundland and Labrador
Town of St Georges Landfill. Trans-Canada Highway, just southeast of the Steel Mountain Road to St. Georges, St. Georges, NL, 709-214-1255. Accepts all types. Call ahead about lengths. $59/ton.
New Brunswick
Hemlock Knoll Landfill, 5749 Route #3, St.. Stephen, NB, 506-466-7830. Accepts all preservative types. TCLP data needed for CCA treated wood. $87/ton. Call ahead for specifics.
Nova Scotia
Valley Waste-Resource Management, 90 Donald E Hiltz Connector Rd., Kentville, NS B4N 3V7, 902-679-1325. Accepts all preservative types. $57–$110, depending on pole condition.
Ontario
Halton Regional Solid Waste Landfill, 5400 Regional Road 25, Milton, ON L9T 2X5, 905-825-6000. Accepts all preservative types. Maximum length 8 feet, or ground up. $165/ton.
Quebec
Ste-Sophie Landfill, 2535, 1 Premiere Rue, Ste-Sophie, QC J5J 2R7, Phone: 514-773-6584. All preservative types accepted but must be profiled and approved. Analytical data may not be required. Approximately $140/ton, may be additional handling charges.
Saskatchewan
No data

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