American Forest & Paper Association
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AMERICAN WOOD COUNCIL

Background Materials for NHSM Supplemental Listing

BETTER PRACTICES BETTER PLANET 2020
Continuing AF&PA's Commitment to Sustainability

September 20, 2013

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TAB 1

Supplemental information to support the listing of Paper Recycling Residuals (PRR) as a non-waste fuel under section 241.4
(December 12, 2012)

The March 2011 final rule preamble lays out several factors that could be considered in conjunction with the BTU value of a material especially one that is below 5000 Btu/hr, as fired. As our February 2012 comments (and earlier ones) said, we do not believe that EPA should have a bright-line Btu/hr criteria in determine whether a material is a waste or fuel because the key question is whether a material is discarded. We do not believe that Paper Recycling Residuals are ever discarded, are generated on site and handled and managed as fuels. In fact, some of the PRR burned has Btu/hr values well above 5000 Btu/hr.

PRR combustion has been prevalent for 15-20 years in solid fuel boilers that also burn wood residues and coal. PRR can be effectively burned in these boilers as they are comprised of wood fiber at moisture contents > 40%, levels comparable to that in clean cellulosic biomass fuels such as hog fuel/bark. BTU values of PRR are comparable to, or better than, clean cellulosic biomass fuels and range from 8000 BTU/lb to 12,000 BTU/lb, on a dry basis. Even on a wet basis, some PRR are above 5,000 BTU/lb. NCASI has previously summarized available literature on OCC rejects combustion in mill boilers in Technical Bulletin 806 (May 2000). Seventeen mills that routinely burned OCC rejects in solid fuel boilers were also identified in this study. The literature review and survey of mills did not identify any operational issues with burning OCC rejects in these boilers. Available data on TPM, SO_2, NOx, and CO emissions from 3 wood residue boilers burning up to 25% OCC rejects were summarized in NCASI Technical Bulletin 906. These Bulletins have been provided to EPA previously. The burning of OCC rejects did not result in increased emissions of these pollutants.

PRR, being similar in characteristics to wood residues and other solid fuels, can be managed using a variety of approaches. Management practices for burning PRR range from mixing these materials with wood residues or coal in the appropriate fuel pile to shredding these materials for subsequent metering onto the solid fuel conveyor or for pneumatic feeding into the boiler.

As provided to EPA's contractor IEc in October (notes attached from call), when mills burn PRR they burn the majority of it and in many cases all that is generated onsite (55 to 100%). Even though only 30% of the total amount of PRR that is produced is burned for energy recovery, the mills where it is being sent off site for disposal is where there is not a solid fuel boiler at the mill. Many recycling mills only have gas fired boilers which cannot burn PRR. We would note that these mills would welcome opportunities to transfer PRR to a third party who could use the energy value if the NHSM status was clarified – determining that it is a non-waste fuel. PRR are processed to remove metals and dewatered to enhance their fuel qualities so are very amenable to off-site use as well.

Responses to Four factors identified in the March 2011 Preamble

1. "Whether the facility encounters a cost savings due to not having to purchase significant amounts of traditional fuels they otherwise would need"
   - roughly 15 to 20 mills currently burn PRR.
   - based on the responses of eight mills, over 140,000 tons are burned which suggests the previously reported 175,000 tons for the whole industry may be on the low end of current use.
   - Based on eight company reports, over $8 million would have to be spent to replace the fuel value. This is consistent with previous estimates that total costs could be between $10 and 20 M per year which is a significant cost of doing business that is unnecessary. Further costs would be incurred by mills if the costs of continuing to burn PRR for energy recovery rises to the point as to prevent its use as a fuel; the burden of meeting the CISWI limit will likely discourage mills from burning materials that could jeopardize a combustors status as a boiler.
   - Some of the replacement fuel for PRR would be thousands of tons of coal.

2. "Whether they are purchasing the non-hazardous secondary material to use as a fuel"
   - There are some processors that get PRR from mills and sell the further processed material to the final energy user which includes utilities that are working to obtain renewable energy credits. If PRR clearly become fuels, more third party users are likely.

3. "Whether the non-hazardous secondary material they are burning can self-sustain combustion"
   - One company at least has indicated that the PRR their mill burns can sustain combustion on its own.

4. "Whether their operation produces energy that is sold for a profit"
   - Many boilers in the pulp and paper industry produce electricity that is used onsite and sometimes sold offsite to local utilities. Some of the boilers burning PRR are producing electricity but primarily for onsite use which displaces the need to purchase electricity from the local utility. We are still trying to confirm that some of the boilers that burn PRR are co-generation units which are paid for their excess electricity sent to the grid.

AF&PA-AWC Responses to EPA's questions on PRR and Railroad ties
(May 2013)

In response to questions asked by EPA in early May, AF&PA and AWC are providing the responses below. We are deferring to the CMRA and BPA to respond to the questions on processed C&D.

Before we respond to these narrow questions, it is important to remind the Agency we have provided extensive information to EPA over the last three years on these two materials from the ANPRM, through the June 2010 proposal and on to the December 2011 Reconsideration rulemaking. In addition, we have provided various "white papers" and NCASI technical bulletins which are in the rulemaking record. These materials clearly show that these materials are highly valued fuels and are managed like other traditional biomass fuels and burned in boilers that can accommodate a wide variety of moister biomass materials. We remain opposed to the application of a "designed to burn" test as part of the legitimacy criteria when EPA has the discretion to consider other factors in making a determination under 241.4.

EPA Question: "Paper Recycling Residuals (PRRs) average Btu value is 3,700 Btu/lb as fired. You previously indicated that some PRRs are over 5,000 Btu/lb; however, can you explain why there are much lower values? For example, do the low values come from samples of PRRs burned in units that can handle high moisture content and thus, there has been very little processing, if any, to remove moisture?

Answer:

Yes, the PRRs with lower Btu values are combusted in units that can derive fuel value from materials with high moisture content without processing those materials.

The 3,700 Btu/lb value was derived from NCASI Technical Bulletin 806 with an average dry value of 9100 BTU/lb with solids around 40%; the range of dry BTU is 8K to 12K and solids vary from 40-60% with an average of 50%. A survey of about 10 companies finds some reporting higher BTU values than the older 3700 BTU/lb value and other companies reporting lower BTU values. Lower BTU values are due to higher moisture, less solids, types of fibers being processed (such as, saturated), and/or fewer non-fiber packaging materials. Mills manage the moisture content of all fuels including PRRs based on combustion efficiency of the boilers which function exceedingly well with high moisture fuels.

EPA Question: What is the split between PRRs with BTU/lb as fired under 5000 and over 5000?"

Answer:
The BTU value of PRR is a continuum that is influenced by amount of solids, fiber content, moisture, presence of non-fiber packaging materials, and combustion conditions necessary for the effective operation of the boiler, but most of the PRRs are

below 5000 on a wet basis since the average is less than 5000 BTU/lb. However, wetter biomass fuels are also in that same range and can have a lower Btu value than PRR at times. From the boiler's vantage point, burning wet biomass or PRRs is essentially the same and the two materials are managed similarly as well. The boilers used, like stokers and FBC, often have over-fire and/or under-grate air that assists the efficient burning of wetter fuels. Consistently wet materials are handled well in the boiler leading to fewer temperature swings and minimized boiler tuning adjustments. For PRR it would be inappropriate to consider a moisture level benchmark when determining if a material is a non-waste fuel because the boilers at pulp and paper mills can cost-effectively recover energy from PRRs. [1]

EPA Questions on Railroad ties or Rail Derived Fuel (RDF):

EPA Question: Of the AF&PA member boilers burning creosote-treated railroad ties, how many (or what percentage) burn or can burn fuel oil *during normal operations*?

Answer: The overwhelming majority of RDF burned at paper mills are burned in boilers that are fully capable and permitted to burn oil at maximum capacity rating. Most of these boilers (80 percent) can or do burn oil during operating conditionsoutside of startup and shutdown periods. However, we believe start-up and shutdown are part of normal operations since they cannot be eliminated and common to all boiler systems. Therefore, if EPA considers defining "designed to burn" further or "normal operation" it should include start-up and shutdown periods.

The percentage of oil the boiler is capable of burning varies but can be up to 100 percent of the energy load. The largest consumer of RDF uses boilers that are fully capable of, permitted to, and do burn fuel oil at maximum capacity rating. However, at the 20 percent of boilers that do not burn oil during normal operations, the use of RDF is no less legitimate. It is used as a fuel. Thus, EPA should not put any restrictions on "normal operations"

EPA Question: Are there differences among boiler types (stoker boiler, traveling grate, circulating fluidized bed etc.) with regard to what it takes to modify the unit so it could burn fuel oil?

Answer: No, these boiler types have relatively tall combustion chambers that make them ideal for burning multiple fuels from solids to liquids to gas. An oil burner system would be added that would require several ports to deliver the fuel.

[1] See 76 FR 15487: "While the meaningful heating value of the OCC rejects is lower than 5,000 Btu/lb, as fired, it can still meet this criterion if it can be demonstrated that the unit can cost-effectively recover energy from a non-hazardous secondary material."

EPA Question: Is it always as simple as installing a delivery system and a nozzle?

Answer: Burner systems can be installed because there is room in these tall boilers and the systems. However, engineering the system can be complicated and the cost of the delivery system can be significant ($100Ks) depending on the amount of fuel oil to be burned in the boiler.

EPA Question: Do states typically require different air pollution control devices for units burning fuel oil (as hinted at by the reference to SO2 emissions in the AF&PA response)?

Answer: No, controls for solid fuels like ESPs are sufficient; oil is generally easier to burn than solid fuels. There are frequently sulfur content limits for the oil burned that varies by state and sometimes a lower NOx limit when burning multiple fuels.

TAB 2

American Forest & Paper Association

AMERICAN WOOD COUNCIL

Draft December 6, 2012

Lisa Jackson
Administrator
U.S. Environmental Protection Agency
Mail Code 1101 A
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Re: Petition for Non-Waste Determination under 40 C.F.R. 241.4 and Request for Comfort Letter

Dear Administrator Jackson:

The American Forest & Paper Association (AF&PA) and the American Wood Council (AWC) submit the following petition for a determination that railroad ties are not a waste when used as a fuel in a combustion unit under 40 C.F.R. 241.4. We are seeking such a determination for all railroad ties combusted in any unit based on the balancing of the legitimacy criteria in Part 241 with other relevant factors described below. In addition, in advance of the rulemaking required to finalize such a determination, AF&PA and AWC request a letter from EPA acknowledging that railroad ties that are processed as described below and are combusted in units that are designed to combust liquid fuel as described below, are non-waste fuels under 40 C.F.R. 241.3(b)(4).

Petition for Non-Waste Determination

1. Petitioners' Name and Address.

American Forest & Paper Association
1111 19th Street, NW, Suite 800
Washington, DC 20036

American Wood Council
222 Catoctin Circle SE
Leesburg, VA 20175

2. Statement of Interest.

AF&PA is the national trade association of the forest products industry, representing pulp, paper, packaging and wood products manufacturers, and forest landowners. Its

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mission includes advancing the interests of its member companies in regulatory and judicial arenas. AF&PA members currently use a variety of secondary materials as fuel in combustion units at their facilities. At approximately 12 mills, these secondary materials include railroad ties that are treated with creosote.[1] A major supplier of railroad ties to the forest products industry estimates that in 2005, approximately 550,000 tons of railroad ties were sold to forest products mills for use as fuel. In 2010, more than 300,000 tons were burned at forest product mills and more mills are actively considering its use so they remain an important source of fuel for AF&PA members. We estimate that it would cost the 12 mills that combust railroad ties around $50 million a year to replace the fuel value of the railroad ties.

AWC is the voice of North American traditional and engineered wood products, representing over 60% of the industry. From a renewable resource that absorbs and sequesters carbon, the wood products industry makes products that are essential to everyday life and employs 360,000 men and women in well-paying jobs. AWC's engineers, technologists, scientists, and building code experts develop state-of-the-art engineering data, technology, and standards on structural wood products for use by design professionals, building officials, and wood products manufacturers to assure the safe and efficient design and use of wood structural components. AWC also provides technical, legal, and economic information on wood design, green building, and manufacturing environmental regulations advocating for balanced government policies that sustain the wood products industry. The types of biomass boilers AWC members operate could burn railroad ties and some companies are considering their use in the near future.

3. **Proposed Action.**

Please add the following language to 40 C.F.R. 241.4(a):

“(3) Railroad ties treated with creosote or creosote and borate.”

4. **Need and Justification for Proposed Action.**

The proposed action is needed to correct an erroneous conclusion reached in the March 2011 final NHSM Rule that combustion of railroad ties is combustion of a waste and to allow continued combustion of this fuel by any facility, irrespective of how railroad ties are processed or what feed mechanism is attached to a boiler that combusts railroad ties.

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[1] Newer railroad ties may also be treated with borate before the creosote is applied. *See* comment submitted by the Association of American Railroads, Document ID: EPA-HQ-RCRA-2008-0329-1920, Feb. 21, 2012, at 2-3 (AAR 2012 comments).

a. Railroad tie markets

In the preamble to the final NHSM Rule, EPA asserted that:

> [F]ew markets are available for creosote-treated wood due to concerns about the contaminants. This strongly suggests that burning this material is a waste treatment activity. 76 Fed. Reg. 15456, 15483 (Mar. 21, 2011).

Contrary to EPA's belief, there is a robust market for creosote-treated wood, specifically railroad ties that have been removed from service. As noted above, 12 forest products industry mills purchased approximately 550,000 tons of railroad ties a year for use as fuel in 2005 and over 300,000 tons as recently as 2010.

According to the Association of American Railroads, approximately 17 million railroad ties are removed from service each year.[2] Railroads typically contract with a railroad tie reclamation company to remove these ties. These contracts transfer ownership of the railroad ties to the reclamation company.[3] The reclamation company sorts the railroad ties for use in landscaping (about one third) and for use in co-generation facilities (the majority). According to the Association of American Railroads, only approximately 5% of railroad ties that are removed from service are disposed of in landfills.[4] Some reclamation companies sell railroad ties to processors who remove metal contaminants (typically nails and spikes) and grind the ties into chipped wood.[5] Other reclamation companies have their own grinders, do their own contaminant removal, and can sell directly to the co-generation facilities. According to a 10-K filed by Banyan Rail Services, Inc., there are approximately 15 railroad tie recovery companies in North America with an industry-wide revenue of $65-75 million. AF&PA members report paying approximately $20 to $30 per ton for railroad tie fuel which is sometimes a premium price compared to certain hog fuels.

The fact that railroad ties are valuable commodities also is demonstrated by the management of these materials. Sale of railroad ties is integral to the contracts for railroad tie removal and is integral to the business of railroad tie reclamation companies. These ties are valuable commodities and are treated as such. Combustors, such as AF&PA member companies, also manage these materials as valuable commodities. At

[2] Comment submitted by the Association of American Railroads, Document ID: EPA-HQ-RCRA-2008-0329-0875, Aug. 3, 2010, at 2 (AAR 2010 comments).
[3] This arrangement, which takes into account the value of the removed ties, allows removal of railroad ties to be "close to a break-even proposition for the railroad." AAR 2010 comments at 3.
[4] AAR 2012 comments, at 1. This disposal decision is made after the railroad ties are sorted so the ties that are used for energy recovery are never discarded.
[5] There may be some combustors that can combust whole railroad ties, but forest products industry boilers require chipped ties that have been processed to remove metal contaminants.

a mill, the chipped railroad ties are managed in the same manner as other biomass fuel materials and are fed to the combustion unit in the same way.

It is clear from the above description that there are robust markets for railroad ties and there are companies that exist entirely to serve those markets. It also is clear that combustors pay for the railroad ties that they use as fuel. These facts demonstrate that railroad ties are valuable fuel commodities. Thus, there is no basis for EPA's conclusion that burning railroad ties is a waste treatment activity.

b. Legitimacy criteria as applied to railroad ties.

Railroad ties easily meet all of the legitimacy criteria under 40 C.F.R. 241.3(d), except possibly the contaminant comparison criterion depending on what traditional fuels are considered in comparison. However, upon evaluating all the relevant factors relating to the use of railroad ties as a commodity fuel, EPA should conclude that railroad ties are non-waste fuels for all boilers, notwithstanding a contaminant comparison to wood or coal.

i. Railroad ties are managed as a valuable commodity. 40 C.F.R. 241.3(d)(1)(i).

As described above, railroad ties are removed from service for railroads by companies whose business model is based on the reclamation value of the railroad ties. These ties are the commodities that railroad tie reclamation companies sell in the marketplace. Thus, these companies manage railroad ties to retain their value as commodities. Typically reclamation companies receive railroad ties by rail. They inspect and sort the ties and remove metal of any kind (spikes, if any, nails, tags, etc). The resulting railroad tie fuel (RTF) is then chipped and delivered to combustors, typically by rail or truck.[6] At a forest products facility, RTF is stock piled in the wood yard in the same manner as bark fuel obtained from processing log feedstock for the pulping process. This generally amounts to a pile adjacent to the bark pile that is reclaimed via a front-end loader. Many hog fuel/RTF systems hammer and screen the combined bark/RTF one more time on route to combustion. Chip size typically is on the order of 1 to 2 inches. The contracts for the purchase of RTF include fuel specifications limiting contaminants such as metal and precluding the receipt of wood treated with preservatives other than creosote.

ii. Railroad ties have meaningful heating value and are used as a fuel to generate energy. 40 C.F.R. 241.3(d)(1)(ii).

[6] We are aware of one situation where the combustion facility is close to the reclamation facility and RTF is transported on a conveyor.

EPA reports that creosote-treated wood has a heating value of about 6000 Btu/lb.[7] The Treated Wood Council reports that the Btu value of creosote-treated wood is approximately 8000 Btu/lb.[8] Either level demonstrates meaningful heating value. These fuels are used to generate energy at AF&PA member facilities as well as other co-generation facilities that buy railroad ties from reclamation companies. In fact, when bark is very wet, forest products facilities often increase the use of RTF in proportion to bark because it has higher fuel value and improves combustion.

iii. Railroad ties contain contaminants that are comparable to or lower than those found in traditional fuels that boilers are designed to burn. 40 C.F.R. 241.3(d)(1)(iii).

In the NHSM final rule preamble, EPA expressed the concern that creosote-treated wood contains contaminants at levels that are not comparable to those found in coal or wood. "Accordingly, creosote treated wood, when burned, seems more like a waste than a commodity and does not meet the legitimacy criterion for contaminants and therefore should be considered a waste when burned as a fuel." 76 Fed. Reg. at 15483.

This analysis is based in part on an assumption that railroad ties are combusted for disposal and are not valuable fuel commodities. This assumption is contradicted by the above discussion of the robust markets for RTF. Thus, the only remaining basis for this analysis is the comparison of contaminants in railroad ties to contaminants in coal or fuel.

EPA has data provided by the Association of American Railroads that demonstrates that creosote treated railroad ties contain contaminant levels that are comparable to fuel oils, which are traditional fuels.[9] Under 40 C.F.R. 241.3, creosote-treated railroad ties would be considered a non-waste fuel if combusted in a unit that also could combust numbers 1-6 fuel oils.

EPA also has data that demonstrate that contaminants in borate preservatives are at levels that are significantly below levels found in untreated wood.[10] Accordingly, EPA

[7] Materials Characterization Paper In Support of the Final Rulemaking: Identification of Nonhazardous Secondary Materials That Are Solid Waste - Construction and Demolition Materials – Building-Related C&D Materials, Feb 3, 2011, EPA-HQ-RCRA-2008-0329-1811, at 3.

[8] Comment submitted by Jeffrey T. Miller, President and Executive Director, Treated Wood Council (TWC), EPA-HQ-RCRA-2008-0329-0772, at 11.

[9] EPA's traditional fuels data show that fuel oils have PAH levels as high as 54,700 ppm. Contaminant Concentrations in Traditional Fuels: Tables for Comparison, November 29, 2011 (EPA-HQ-RCRA-2008-0329-1877). The American Association of Railroads data for creosote-treated railroad ties show total PAH levels of 21,237 ppm.

[10] See comment submitted by KRK Consulting. EPA-HQ-RCRA-2008-0329-1569.

has already concluded that borate treated wood "meets the legitimacy criterion on the level of contaminants and comparability to traditional fuels." 76 Fed. Reg. at 15484.

iv. Other relevant criteria

An overall balancing of the legitimacy criteria with other relevant factors should lead EPA to the conclusion that the combustion of railroad ties is not a waste management activity and that railroad ties should be considered a commodity fuel even if contaminant levels are not comparable to coal or virgin wood. If EPA does not do so, then the same railroad tie from the same reclamation company could be considered a fuel if sold to a combustor that has a liquid fuel delivery system for its boiler and a waste if sold to a combustor has only a system for feeding solid fuel to its boiler. Given the overall management of these materials as valuable fuel commodities by market-place participants, in this case the fuel delivery system does not provide a meaningful distinction and is not an appropriate method of distinguishing between wastes and fuels.

In balancing the legitimacy criteria, EPA should give great weight to the fact that railroad ties are commodities that are bought and sold in the market-place. This fact alone should be dispositive support for an EPA determination that the combustors who buy this fuel are burning it for legitimate energy recovery and are not burning it with the intent to discard it. As EPA knows, the legitimacy criteria are factors used to ascertain the intent of a combustor to determine if discard is taking place. In the case of railroad ties, the fact that combustors buy this fuel is evidence that their intent is energy recovery. Combustors do not buy material for the purpose of discarding it.

EPA also should balance the environmental benefits of allowing continued combustion of railroad ties as fuel against the adverse consequences of increased disposal of railroad ties in landfills. As noted in comments filed by the American Association of Railroads, the use of railroad ties as fuels displaces fossil fuels that emit greenhouse gases that, unlike wood, are not currently part of the carbon cycle. Thus, if 9 million ties are disposed of in landfills instead of being used as fuels, 12.9 trillion Btus will have to be replaced with other fuels. If replaced with fossil fuels, "the GHG penalty will be approximately 3.3 billion CO2eq."[11] The disposal of greenhouse gas in landfills also could result in the anaerobic degradation of the ties over long periods of time, producing methane, which is a potent greenhouse gas.

In balancing environmental benefits, EPA should consider the solid waste management benefits of using railroad ties as fuel, instead of discarding them in landfills. According to the Association of American Railroads, the landfill space that would be required to dispose of the 17 million railroad ties that are used as fuel each year would be the

[11] AAR 2010 comments, at 3.

space equivalent to a football field that is 70 stories high. That landfill capacity would be needed each year.[12]

EPA also should consider the fact that, for the facilities that use railroad ties as fuel, those ties are as integral to the production process as any other fuel used by the facility. Further, railroad ties are functionally superior to other biomass fuels used in the boilers due to lower moisture content and higher BTU value compared with other biomass fuels. Use of railroad tie fuel is particularly important for industry boilers that are load following boilers where significant swings in steam demand require rapid ramping up and down of the boiler, and where the superior fuel characteristics of railroad tie fuel, as noted above, delivers, dry, consistent, high-BTU combustion benefits. Railroad ties improve mixed biomass combustion by providing a more even energy source especially during rainy seasons of the year.

Finally, EPA should embrace the combustion of railroad ties as a practice that supports EPA's sustainability objectives. In June 2009, EPA issued its "2020 Vision Report: Sustainable Materials Management: The Road Ahead." The "2020 Vision Report" includes the following statement:

> In a system that recognizes the true value of materials, and accounts for all the environmental impacts associated with materials use, the concept of waste is significantly changed. Products and materials presently viewed as acceptable to throw away will increasingly be recognized as valuable. Materials that used to "go to waste" will be reused or become feedstocks for new products and processes. 2020 Vision Report, at 13

Consistent with that vision and a consistent history of use, EPA should recognize the value of railroad ties and allow their continued use as a fuel. To do otherwise would compel the disposal of this valuable fuel in landfills. That result undermines EPA's sustainable materials management objectives, reduces the ability of the U.S. to decrease the use of fossil fuels, and increases the pressure on solid waste landfill capacity. To avoid these adverse environmental outcomes, EPA should recognize that railroad ties are a valuable fuel and not a waste, when combusted for energy recovery.

These considerations provide ample support for a rulemaking to designate all railroad ties as a non-waste fuel in all combustion units.

[12] AAR 2010 comments, at 2.

Request for a letter confirming that processed railroad ties combusted in boilers combust or could be modified to combust liquid fuel are non-waste fuels.

Pending a national rulemaking to designate railroad ties as a non-waste fuel, AF&PA is requesting a letter from EPA that confirms that railroad ties that are processed and are combusted in units that combust or could be modified to combust liquid fuel are non-waste fuels under 40 C.F.R. 241.3(b)(4).[13] 40 C.F.R. 241.3(b)(4) provides that the following are not solid wastes when combusted: "Fuel or ingredient products that are used in a combustion unit, and are produced from the processing of discarded non-hazardous secondary materials and that meet the legitimacy criteria specified in paragraph (d)(1) of this section with respect to fuels…." While we do not believe that railroad ties used for energy recovery are discarded, absent listing under 40 C.F.R. 241.4, EPA's regulations consider these materials to be wastes when combusted by third parties, unless the criteria of 40 C.F.R. 241.3(b)(4) are met. Section 241.3(b)(4) requires that a fuel be both processed and meet the legitimacy criteria.

1. **Most railroad ties are processed**

According to EPA's regulations:

> Processing means any operations that transform discarded non-hazardous secondary material into a non-waste fuel or non-waste ingredient product. Processing includes, but is not limited to, operations necessary to: Remove or destroy contaminants; significantly improve the fuel characteristics of the material, *e.g.,* sizing or drying the material in combination with other operations; chemically improve the as-fired energy content; or improve the ingredient characteristics. Minimal operations that result only in modifying the size of the material by shredding do not constitute processing for the purposes of this definition.

40 C.F.R. 241.2.

While some combustors may be able to combust whole railroad ties, it is a common practice for railroad tire reclamation companies to process ties for use by combustors. Processing involves sorting by quality for other potential uses (e.g., landscaping) and by preservative type to meet fuel contract specifications required by individual combustors. Process also involves both the removal of metal contaminants and shredding RTF to an

[13] This request should not be viewed as an alternative to the request for listing under 40 C.F.R. 241.4. Rather, it should be viewed as a stop-gap measure to allow facilities to plan pending such listing.

appropriate size for the combustor. In fact, contracts for RTF typically specify fuel requirements such as size of material, moisture limits, and dirt and metal contamination limits. Please confirm that railroad ties that are processed in this manner meet EPA's processing definition.

2. **Railroad ties meet the legitimacy criteria when combusted in most boilers.**

As discussed above, railroad ties meet EPA's legitimacy criteria relating to management practices, meaningful heating value, and use as a fuel, irrespective of the type of boiler that is used for combustion. However, under EPA's regulations, railroad ties would not meet the contaminant legitimacy criterion (as EPA has laid it out) unless the RTF can be compared to fuel oils. Even under this framework, RTF would meet the legitimacy criteria because boilers capable of firing RTF also are capable of firing fuel oil. In fact most boilers are designed in a manner that fuel oil firing can be accommodated.[14] For example, one forest products company has at least 12 boilers that burn RTF. All 12 of these boilers either currently combust fuel oil, or could be readied to combust fuel oil. Please confirm that a boiler that has sufficient combustion conditions for oil (with or without the addition of additional equipment) and that could be modified to add a liquid fuel delivery system, is "designed to burn" fuel oil, whether or not such boiler modifications are actually made.

3. **Demonstration by combustors that the legitimacy criteria and processing requirements are met.**

Both the CISWI and the Boiler MACT rules require a combustor that combusts non-hazardous secondary materials to keep records showing that the fuel meets the legitimacy criteria of Part 241. *See* 40 C.F.R. 60.2740 (u) (CISIWI) and 40 C.F.R. 60.7555(d)(2) (Boiler MACT).

We believe that individual combustors can meet their obligations under the CISWI and Boiler MACT Rules to show that railroad ties are not solid wastes by keeping the following records:

a. A copy of an EPA letter confirming that railroad ties that are processed and combusted in boilers with liquid fuel delivery systems are not wastes.

b. A copy of a contract, purchase order, or other document that requires a supplier of railroad ties to process the railroad ties consistent with the practices described in this letter or a certification from the supplier that the practices described in this letter were followed.

[14] This is uniformly true of stoker boilers and fluidized bed combustors.

Allowing combustors to rely on these records to demonstrate that railroad ties are not wastes is consistent with how EPA proposes to implement its non-waste determination for tires from established tire collection programs. Units that combust tires are allowed to rely on certifications that the tires that are combusted are from established tire collection programs and were not discarded. 40 C.F.R. 60.2740(v). EPA recognizes that such a certification can be based on a contractual arrangement and is proposing to define established tire collection program to include "a contractual arrangement that ensures that scrap tires are not discarded and are handled as valuable commodities through arrival at the combustion facility." 76 Fed. Reg. at 80484 and proposed 40 C.F.R. 241.2. Once that certification is made, EPA does not intend to require the combustor to have perfect knowledge of the source of a secondary fuel and does not require the combustor to test that fuel. "Rather, it is sufficient that the ultimate user verify that it is obtaining tires from an established tire collection program, which program can provide the user with reasonable assurance that it manages tires carefully from point of collection to point of burning and which does not receive tires which have been abandoned in landfills or otherwise." 76 Fed. Reg. 28318, 28322 (May 17, 2011).

Please confirm that the records identified above are sufficient to meet any burden of proof a combustor may have to show that a fuel is not a waste and that these records meeting the requirements of 40 C.F.R. 60.2740 (u) and 40 C.F.R. 60.7555(d)(2).

Conclusion

For the forgoing reasons, AF&PA and AWC respectfully request EPA to determine by rule that all railroad ties treated with creosote or creosote and borate are non-waste fuels in all boilers and confirm by letter that processed railroad ties are non-waste fuels when combusted in a boiler that that has sufficient combustion conditions for oil combustion (with or without the addition of additional equipment).

Sincerely,

Paul Noe
Vice President for Public Policy
American Forest & Paper Association

Robert Glowinski
President
American Wood Council

Enclosure: Banyan Rail Services Inc.

cc: Mathy Stanislaus
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Railroad Tie Fuel
Supplemental Information
February 27, 2013

The information provided herein supplements materials previously submitted to EPA by the American Forest & Paper Association (AF&PA) and the American Wood Council (AWC) supporting a finding that Railroad Tie Fuel[1] should be listed under 40 CFR 241.4(a) as not a solid waste when used as fuel for purposes of the Clean Air Act regulations.

Background

Creosote-treated railroad ties have long been managed as a valuable commodity, used in a variety of ways including landscaping and combustion for energy, and bought and sold in the marketplace like other recognized fuels. On December 6, 2012, AF&PA and AWC submitted a draft petition to the EPA requesting that such railroad ties be listed in Section 241.4(a) as a "non-hazardous secondary material that is not a solid waste when used as a fuel in a combustion unit." Furthermore, we requested that pending a national rulemaking to designate railroad ties as a non-waste fuel, EPA provide a letter that confirms that railroad ties that are processed and are combusted in units that combust or could be modified to combust liquid fuel are non-waste fuels under 40 C.F.R. 241.3(b)(4).

AF&PA and AWC demonstrated in the draft petition that creosote (and borate) treated railroad ties meet all of the legitimacy criteria identified in Section 241.3(d)(1). Railroad ties are managed as a valuable commodity – through collection, processing and storage -- so as to maintain their integrity, they have meaningful heating value (at least 6000 BTUs) and contain contaminants comparable to other traditional fuels.

Final Rule

In the preamble to the final rule on Non-hazardous Secondary Materials that are Solid Waste (78 **Federal Register** 9173), EPA specifically requested additional information about railroad tie fuels to supplement the draft petition:

1. A list of industry sectors, in addition to forest products mills, that burn railroad ties for energy recovery.
2. The types of boilers (e.g., kilns, stoker boilers, circulating fluidized bed, etc) that burn railroad ties for energy recovery.
3. The traditional fuels and relative amounts (e.g., startup, 30%, 100%) of these traditional fuels that could otherwise generally be burned in these types of boilers.

[1] We refer to railroad ties used as fuels as Railroad Tie Fuels. We understand that the brokers of railroad tie fuel refer to these materials as cross-tied derived fuels or "CDF." In either instance, we are referring to the same materials -- fuels generated by the use of creosote and borate-treated rail ties as fuels.

4. The extent to which non-industrial boilers (e.g., commercial or residential boilers) burn railroad ties for energy recovery.
5. Laboratory analyses for contaminants known to be present in creosote-treated railroad ties or known to be significant components of creosote, specifically polycyclic aromatic hydrocarbons (i.e., PAH-16), dioxins, dibenzofurans, hexachlorobenzene, biphenyl, quinoline, crsols, and 2,4-dinitrotoluene.

This document provides the additional information requested by EPA as it relates to forest products industry use of railroad tie fuels. AF&PA and AWC are aware that M.A. Energy Resources has submitted a petition to EPA, including extensive analysis of contaminants in railroad tie fuel compared with traditional fuels, to seek a listing of railroad tie fuels under Section 241.4(a); we are supportive of their petition. We understand that the American Association of Railroads also is providing information to address questions 1 and 5 above.

Responses to EPA Questions

1. A list of industry sectors, in addition to forest products mills, that burn railroad ties for energy recovery

AF&PA and AWC will leave it to others to identify non-forest product mills that burn railroad tie fuels. Our data show that at least fifteen boilers at forest product mills are currently using railroad ties as a fuel. We know of four other mills that are permitted to burn these fuels, but have stopped due to the uncertainty of the regulatory status of railroad tie fuels or other economic factors.

2. The types of boilers (e.g., kilns, stoker boilers, circulating fluidized bed, etc) that burn railroad ties for energy recovery.

Forest product industry boilers used to burn railroad ties are generally one of three types: stoker, bubbling bed or fluidized bed boilers.

3. The traditional fuels and relative amounts (e.g., startup, 30%, 100%) of these traditional fuels that could otherwise generally be burned in these types of boilers.

In general, all of the boilers that burn railroad ties also burn significant quantities of biomass given the similarity of the fuels' characteristics. Most of these boilers are permitted to burn fuel oil either during start-up or during normal operations. Many factors determine how much fuel oil is burned. Currently, natural gas prices are low so that is often the fuel of choice if available. In addition, some states are trying to reduce SO2 emissions from sources and thus encourage greater use of biomass or natural gas rather than fuel oil.[2] Finally, we know of at least one boiler that had the capability to

[2] It would be ironic if efforts to reduce SO2 emissions hamper the ability of mills to use clean burning railroad ties simply because they are moving away from fuel oil for environmental reasons.

burn fuel oil and is still permitted to burn oil, but altered the boiler’s fuel feed system to accommodate only solid fuels.

It should not matter in determining the acceptability of burning railroad ties if a mill can burn fuel oil, is permitted to burn fuel oil, or could modify its boiler and fuel delivery system to accommodate fuel oil. It makes no environmental or economic sense to force significant investments (up to $1 million) in nozzle systems that will rarely or never be used.

The most comparable traditional fuel to railroad ties is fuel oil. However, we believe the question of whether a boiler is designed to burn a specific fuel is not relevant when EPA makes a determination under section 241.4(a). With respect to liquid fuels, we recognize that the Agency interprets the phrase “designed to burn” to mean that a combustor that makes a self-determination that its railroad tie fuel is a processed fuel product may have to meet the contaminant legitimacy criterion by installing a nozzle for the delivery of liquid fuel into the boiler. According to EPA, this condition is to avoid the possibility that discard could be occurring in some situations.

However, in the context of a specific non-waste determination under section 241.4, EPA has the opportunity to evaluate all the factors relating to the use of railroad ties as a fuel, including the fact that railroad tie fuel is a commodity that is purchased by the combustor. EPA, in granting a petition for a non-waste determination, has the discretion to recognize that when a combustor purchases railroad tie fuel and then burns it in a boiler, that combustion is not for the purpose of discarding the railroad ties. Rather, the combustion is for the legitimate purpose of generating energy. Any other conclusion would lead to the absurd result that one boiler can burn railroad tie fuel as a legitimate fuel and the other boiler – with essentially the same design except for a nozzle feed for fuel oil – would have to consider the railroad tie fuel as a solid waste.

4. The extent to which non-industrial boilers (e.g., commercial or residential boilers) burn railroad ties for energy recovery.

AF&PA and AWC do not have information about non-industrial boilers.

5. Laboratory analyses for contaminants known to be present in creosote-treated railroad ties or known to be significant components of creosote, specifically polycyclic aromatic hydrocarbons (i.e., PAH-16), dioxins, dibenzofurans, hexachlorobenzene, biphenyl, quinoline, crsols, and 2,4-dinitrotoluene.

M. A. Energy Resources has developed significant data on concentrations of contaminants in railroad tie fuels. Similarly, the Association of American Railroads developed data from two of their rail yards. (Both of these sets of data have been submitted to EPA by the respective organizations.) We asked NCASI to review those data as well as other data NCASI had available on railroad tie fuels and compare them to contaminants found in traditional fuels (coal, biomass and fuel oil) as provided by EPA in its November 29, 2011 document entitled “Contaminant Concentrations in Traditional Fuels: Tables for Comparison.” This comparison is found in Attachment A.

Table 1 of Attachment A presents the results of analysis of various railroad tie samples for the eleven trace metal HAPs and for several major elements including Cl, Fl, N, and S. Table 2 presents the results of analysis of various railroad tie samples for several VOC HAPs, semi-volatile VOC HAPs, total PAHs and naphthalene (also a PAH).

Finally, Table 3 compares the maximum values in the OAQPS databases for coal, wood/biomass, and fuel oil with the range of values that were summarized in Tables 1 and 2 for railroad tie fuels. The comparison is made between the groups of contaminants that share physical and chemical properties that influence their behavior in a combustion unit. The contaminants are grouped as three types of trace metal HAPs (volatile, semi-volatile and low volatile), total VOC HAPs, total semi-volatile VOC HAPs, and total PAHs, consistent with the approach EPA specified.

The comparison shows that contaminants in railroad tie fuels are well within the range of traditional fuels based on the groupings EPA has suggested.

EPA asked specifically for information about dioxins and dibenzofurans in rail tie fuels. We understand that this request was based on a Material Safety Data Sheet from a forest products company that identified the presence of dibenzofurans. However, the chemistry of dioxins and dibenzofurans is different. As explained in Attachment B, dibenzofurans are not chlorinated and thus are not considered “dioxins.” Because there little likelihood that sufficient chlorine would be present in rail tie fuels to form dioxins, we believe that EPA’s request for dioxin information is not appropriate.

Conclusion

The information provided in this document, together with that provided in our draft petition, show clearly that railroad tie fuel is a legitimate fuel material, sold in the marketplace, and in many ways is superior to fossil fuels it is used to replace. AF&PA and AWC respectfully request that EPA make the determination under section 241.4(a) that railroad tie fuels are not solid waste when burned for energy.

Comparison of Contaminant Concentrations in Cross Tie-Derived Fuel with Traditional Fuels

On November 29, 2011, EPA published a document titled "Contaminant Concentrations in Traditional Fuels: Tables for Comparison". This document contained ranges and averages for contaminant concentrations in three common traditional fuels namely coal, biomass and fuel oil. EPA indicated that members of the regulated community could use the data when comparing contaminants in their non-hazardous secondary materials (NHSMs) to contaminants in the appropriate traditional fuels. EPA presented three tables with contaminant data summarized from both the scientific literature and EPA databases for coal, wood/biomass, and fuel oil. In this report, limited available contaminant data for samples of cross tie-derived fuel (CDF) are compared with those compiled by EPA for the three common traditional fuels coal, biomass and fuel oil. At the current time, CDF is burned in thirty or more industrial boilers.

EPA agrees that "when compared to the full range of contaminants in traditional fuels, suitable measures of NHSM contaminants would include the upper end of a statistical range, a calculation involving the mean and standard deviation, or perhaps a single data point in situations where data is limited." 78 Fed. Reg. 9112, 9153 (Feb. 7, 2013). For example, EPA agreed that it is appropriate to compare "the UPL at the 90 percent confidence level for each contaminant or group of contaminants in NHSMs to the maximum values for each contaminant or group of contaminants in the appropriate traditional fuel." *Id*. Thus, in the case of CDF samples, since insufficient data are available to estimate 90% UPLs, a comparison of the maximums in the available analytical data with the maximums presented by EPA for the traditional fuels coal, biomass and oil should constitute a reasonable albeit conservative approach for contaminant comparison.

Table 1 presents the results of analysis of various CDF samples for the eleven trace metal HAPs and for several major elements including Cl, Fl, N, and S. The sources of data included a recent CDF test report prepared by All4 Inc. on behalf of M.A. Energy Resources, LLC and presented to EPA, selective data from EPA references summarized in Table A2 of NCASI Technical Bulletin No. 906 (2005), and recent CDF fuel sampling data extracted from EPA's Boiler MACT Database. The latter corresponded to five facilities – ALIPPrattville, ALIPRiverdale, AREvergreenPackaging, LABoiseNewsprintDeRidder, and NDADMNorthernSun, four of which were pulp mills.

Table 2 presents the results of analysis of various CDF samples for several VOC HAPs, semi-volatile VOC HAPs, total PAHs and naphthalene (also a PAH). The data were obtained from several sources including tests for a range of individual PAHs, VOCs and SVOCs carried out by M.A. Energy Resources, LC, tests for several PAHs carried out by URS Corp. on behalf of the Association of American Railroads (at two U.S. facilities, Duluth, MN and Selma, AL), and some historical PAH, VOC and SVOC data obtained from an EPA source (Wood Waste Energy).

Table 3 compares the maximum values in the OAQPS databases for coal, wood/biomass, and fuel oil with the range of values that were summarized in Tables 1 and 2 for cross tie-derived fuels. The comparison is made between groups of contaminants that share physical and chemical properties that influence their behavior in a combustion unit. *Id*. at 9146. The contaminants are grouped as three types of trace metal HAPs (volatile, semi-volatile and low volatile), total VOC HAPs, total semi-volatile VOC HAPs, and total PAHs. It is seen that for all the categories of comparison, the grouped contaminants fall well within the range of the same grouped contaminants for one or more of the traditional fuels used for comparison.

Conclusion

Based on the available data for cross tie-derived fuels summarized in Tables 1 and 2, and the relevant comparisons made in Table 3 with the OAQPS database for the traditional fuels coal, biomass and oil, the contaminants in CDF fall well within the range of contaminants found in one or more of three traditional fuels, coal, biomass and oil, thus supporting a determination that cross tie-derived fuel is not a waste when combusted.

Table 1. Trace Metals and Major Elements in Various Cross Tie-Derived Fuels

	Units, dry basis	MAER[1]	NCASI TB 906[a]				Boiler MACT Fuel Analysis Data[b]				
			n[2]	mean	min	max	n[3]	[2]	mean	min	max
Heat Value	Btu/lb		35	8,970	8,828	7,394	n				
Trace Metal HAPs											
Antimony (Sb)	ppm	<5									
Arsenic (As)	ppm	<10	6	1.75	1.38	2.15	4	25	1.78	1.03	3.16
Beryllium (Be)	ppm	<0.5					4	25	0.12	0.06	0.30
Cadmium (Cd)	ppm	<0.5	1	0.10			4	25	0.26	0.23	0.30
Chromium (Cr)	ppm	<2.5	8	0.67	0.23	1.44	4	25	9.68	3.97	15.28
Cobalt (Co)	ppm	<2.5									
Lead (Pb)	ppm	<10.0	1	8.00			4	22	7.55	4.09	9.58
Manganese (Mn)	ppm	63					4	25	135	104	185
Mercury (Hg)	ppm	0.02	1	<0.25			5	25	0.04	0.02	0.05
Nickel (Ni)	ppm	<5	1	<5.0			4	35	13.78	3.73	38.24
Selenium (Se)	ppm	<5					4	25	0.57	0.14	1.00
Major Elements											
Chlorine (Cl)	ppm	400	5	225	39	345	5	35	81	22	161
Fluorine (F)	ppm	100									
Total Halogens (Cl + Fl)	ppm	500									
Nitrogen (N)	ppm	1,600	28	6,142	3,574	141					
Sulfur (S)	ppm	800	34	1,700	681	3,277	1	1	1,100		

[1]M.A. Energy Resources, LLC CDF Testing (March 2013); [2]no. of samples tested; [3]no. of mills at which CDF was tested with no. of samples ranging from 2 to 10

[a]From Table A2 of NCASI Technical Bulletin No. 906 – Sources included the following:

1. Emissions Database Test Report E710, "Compliance Stack Emissions Report/1996 for the Waste Wood-Fired Boiler", by AirRECON, March 10, 1997
2. Results of the March 23-26, 1993 Air Emission Tests on the No. 1 Boiler Stack at the NSP Bay Front Steam Plant, Interpoll Labs, April 26, 1993.
3. Emissions Database Test Report E721, "Results of the November 12-14, 1991 State Air Emission Compliance Tests on the No. 5 & 6 Boilers at the Blandin Paper Company Plant in Grand Rapids, Minnesota", by Interpoll Laboratories, Inc., January 17, 1992
4. Emissions Database Test Report E860, "Results of the October 7-9, 1997 Air Emission Compliance Tests of Unit 1 at the NSP French Island Plant in La Crosse, Wisconsin", by Interpoll Laboratories, Inc., November 5, 1997
5. "Wood Products in the Waste Stream -- Characterization and Combustion Emissions", by Atkins, Richard S. and Donovan, Christine T. as subcontractors to New York State Energy Research and Development Authority, October 1996

[b]EPA's Boiler MACT Database - Fuel Sampling Data for Rail Road Ties at 5 Facilities – ALIPPrattville; ALIPRiverdale; AREvergreenPackaging; LABoiseNewsprintDeRidder; NDADMNorthernSun

Table 2. VOCs, SVOCs, PAHs and Naphthalene in Various Cross Tie-Derived Fuels

Compound	Units	MAER[1]	Duluth, MN[2]	Selma, AL[2]	EPA[3]
VOC HAPs[1]					
Benzene	ppm	<0.050			
Cumene	ppm	<0.050			
Ethyl benzene	ppm	0.0575			
Formaldehyde	ppm	<1.60			
Styrene	ppm	<0.050			
Toluene	ppm	<0.050			
Xylenes	ppm	0.325			
Semi-Volatile VOC (SVOCs) HAPs					
Phenol	ppm	<15			
Biphenyl	ppm	137			
Dibenzofuran	ppm	789			
Quinoline	ppm	40			
Total SVOCs[1,4,5]		966			
Base Neutral SVOCs[6]					
Total PAHs	ppm	~ 7,200	18,318 - 23,150	12,601 - 24,533	21,237
Naphthalene	ppm	444	1,100 – 1,400	2,600 – 3,200	490

[1]M.A. Energy Resources, LLC CDF Testing, March 2013
[2]"Evaluation of Used Railroad Ties Treated With Creosote and POMs Which Includes PAHs"; prepared for the Association of Amercan Railroads by URS Corp., Jan. 28, 2013
[3]Data received from EPA - Wood Waste Energy
[4]SVOCs m- & p-cresols were also detected in "trace amounts" in a TCLP sample extract (0.076 mg/L)
[5]Lindane was also detected in trace amounts
[6]Although Naphthalene is a PAH, it is separated out here consistent with EPA's approach

Table 3. Comparison of Typical Cross-Tie Concentrations With OAQPS Max for Coal, Biomass & Oil

Compound	Units	OAQPS Coal Max	OAQPS Biomass Max	OAQPS Fuel Oil Max	n[1]	CDF Min	CDF Max
Trace Metal HAPs							
Volatile Metals (Hg)	ppm	3.1	1.1	0.2	37	0.016	0.054
Semi-Volatile Metals (Pb, Cd, Se)	ppm	241	255	57	27	4	11
Low-Volatile Metals (Sb, As, Be, Cr, Co, Mn & Ni)	ppm	1,822	16,842	3,551	32	68	242
Major Elements							
Chlorine (Cl)	ppm	9,080	5,400	1,260	41	22	400
Fluorine (F)	ppm	178	128	14	1	100	100
Total Halogens (Cl + Fl)	ppm	9,258	5,528	1,274	41	122	500
Nitrogen (N)	ppm	54,000	4,600	3,000	29	1,600	14,400
Sulfur (S)	ppm	61,300	6,100	57,000	36	681	3,277
Total VOC HAPs[2]	ppm	153.4	27	13,745	1	0.38	
Total SVOCs[3]	ppm			8,900	1	966	
Total PAHs[4]	ppm	2,090[5]		54,700	4[6]	7,200	24,533

[1]no. of samples tested; [2]includes benzene, cumene, ethyl benzene, formaldehyde, styrene, toluene and xylenes; [3]includes phenol, biphenyl, dibenzofuran and quiniline; [4]includes naphthalene; [5]PAH (52 extractable); [6]no. of sources;

40 CFR PART 241, SUBPART B – CROSSTIE DERIVED FUEL (CDF) CATEGORICAL PETITION FOR A NON-WASTE DETERMINATION

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1. INTRODUCTION

The Identification of Non-Hazardous Secondary Materials that are Solid Wastes When Used as Fuels or Ingredients in Combustion Units Rule, the so-called Non-Hazardous Secondary Materials Rule (NHSM Rule), is codified at 40 CFR Part 241. The rule establishes the process or procedures by which non-hazardous secondary materials (NHSMs) are or are not considered to be solid wastes when burned in combustion units. The NHSM Rule has far reaching regulatory impacts for those facilities that wish to utilize NHSMs as alternative fuels.

1.1 DOCUMENT PURPOSE

This document is a rulemaking petition the purpose of which is to demonstrate that Crosstie Derived Fuel (CDF) is a non-waste fuel in accordance with the provisions of 40 CFR 241.4(b)(2), and to hereby request that U.S. EPA issue a categorical determination specifically identifying CDF as a non-waste, exempt, NHSM fuel under 40 CFR §241.4(a). CDF is not currently considered to be a traditional fuel and is not currently considered to be a non-waste fuel under the NHSM Rule. However, M.A. Energy Resources, LLC (MAER), an alternative fuels company that specializes in managing the logistics associated with the collection, handling, processing, and distribution of specification CDF, is committed to the process of establishing CDF as a legitimate non-waste alternative fuel. MAER strongly believes that CDF is indeed a non-waste fuel and that U.S. EPA should issue a categorical determination that CDF is a non-waste fuel in accordance with the provisions of 40 CFR §241.4(b)(2), and specifically list CDF as a non-waste NHSM fuel under 40 CFR §241.4(a). MAER is submitting this document in addition to and consistent with similar submissions made previously by the following stakeholders and members of the regulated community:

- American Forest & Paper Association (AF&PA)
- Creosote Council (CC)
- Treated Wood Council (TWC)
- Association of America Railroads (AAR)
- American Wood Council (AWC)

This document has been developed in accordance with the provisions of 40 CFR §241.4(b) and requests a specific categorical NHSM non-waste determination for CDF.

1.2 NHSM RULE OVERVIEW

An NHSM considered to be a non-waste material can be burned as an alternative fuel or an ingredient in a combustion unit regulated by either of the following CAA Section 112 rules (or other applicable MACT standard):

- 40 CFR Part 63, Subpart DDDDD – National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters [i.e., the Major Source Boiler Maximum Achievable Control Technology (MACT) Standard].
- 40 CFR Part 63, Subpart JJJJJJ – National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources [i.e., the Area Source Boiler Maximum Achievable Control Technology (MACT) Standard].

Conversely, a NHSM considered to be a solid waste material cannot be burned as an alternative fuel or used as an ingredient in a combustion unit regulated by either the Major or Area Source Boiler MACT rules and must instead be burned in a combustion unit regulated by either of the following CAA Section 129 rules:

- 40 CFR Part 60, Subpart CCCC – Standards of Performance for Commercial and Industrial Solid Waste Incineration Units for Which Construction is Commenced After November 30, 1999 or for Which Modification or Reconstruction is Commenced on or After June 1, 2001
- 40 CFR Part 60, Subpart DDDD – Emissions Guidelines and Compliance Times for Commercial and Industrial Solid Waste Incineration Units that Commenced Construction on or Before November 30, 1999.

Without a NHSM non-waste determination, a combustion unit that burns a NHSM fuel will be labeled an incinerator. Given the choice of being permitted as an incinerator or a boiler, the overwhelming majority of facilities will choose to stop utilizing alternative fuels that are considered to be solid-wastes and comply with Boiler MACT. This would have an unintended negative environmental impact as generators of presumed "solid wastes" used as fuels would then potentially be forced to landfill materials that are currently beneficially used as alternative fuels, and could also potentially increase emissions of regulated pollutant emissions from such facilities as they return to the use of fossil fuels.

On February 7, 2013, the United States Environmental Protection Agency (U.S. EPA) promulgated final revisions to the NHSM Rule. U.S. EPA's promulgation of the final NHSM Rule revisions represents the culmination of a long dialogue with stakeholders from a variety of industry sectors stemming back to January 2, 2009 and the original issuance of the Advanced Notice of Proposed Rulemaking (ANPRM). Since the ANPRM, the NHSM Rule has undergone significant scrutiny and garnered considerable comments at each step of the regulatory process, including comments from combustors that utilize Crosstie Derived Fuel (CDF) as an alternative fuel to offset all or a portion of the fossil fuels used in their combustion units.

CDF is a non-hazardous alternative biomass fuel derived from railroad crossties that have been removed from service and processed by reclamation companies such as MAER. Approximately 17 million crossties are removed from service each year. This volume of material is roughly equivalent to an area the size of a football field with crossties piled seventy (70) stories tall. CDF crossties are overwhelmingly comprised of North American hardwoods that have been treated with creosote. As a function of its high energy content, CDF is beneficially used for heat and energy recovery in many combustion units across a variety of industry sectors as a non-hazardous, biomass derived, alternative to fossil fuel.

1.3 DOCUMENT ORGANIZATION

- **SECTION 1 – INTRODUCTION:** Provides a brief overview of the NHSM Rule background and impacts on the regulated community, and states the document's overall purpose.
- **SECTION 2 – NHSM CDF PETITION NON-WASTE DETERMINATION:** Provides the components of a rulemaking petition specified by 40 CFR §241.4(b)(1) and requests a categorical determination that CDF is a non-waste fuel in accordance with the provisions of 40 CFR §241.4(b)(2).

- **SECTION 3 – SPECIAL CONSIDERATIONS:** Provides additional information as requested to U.S. EPA responses to comments including the December 20, 2013 final rule.
- **SECTION 4 – CONCLUSION:** Provides a concluding summary of the information included in the document.
- **APPENDIX A – CONSTITUENT/CONTAMINANT COMPARISON TABLES.**
- **APPENDIX B – CONSTITUENT/CONTAMINANT RAW TESTING RESULTS.**

2. NHSM CDF PETITION NON-WASTE DETERMINATION

As stated above, the NHSM Rule is codified at 40 CFR Part 241 and identifies the requirements and procedures for the identification of non wastes used as fuels or ingredients in combustion units. In accordance with 40 CFR §241.4(b), *"Any person may submit a rulemaking petition to the Administrator to identify additional non-hazardous secondary materials to be listed in paragraph 40 CFR §241.4(a)."* 40 CFR §241.4(a) includes a list of NHSMs that EPA has determined are not solid wastes when used as a fuel in a combustion unit. The required components of the NHSM CDF Petition for a Non-waste Determination are detailed in 40 CFR §241.4(b)(1)(i) through (iv) and are discussed in more detail below.

2.1 PETITIONER'S NAME AND ADDRESS [40 CFR §241.4(B)(1)(I)]

Petitioners Name:

M.A. Energy Resources, LLC

Petitioners Address:

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Overland Park, KS 66210

2.2 A STATEMENT OF THE PETITIONER'S INTEREST IN THE PROPOSED ACTION [40 CFR §241.4(B)(1)(II)]

As stated above, MAER is an alternative fuels company that specializes in managing the logistics associated with the collection, handling, processing, and distribution of specification CDF. MAER operates as an intermediary between the railroad industry and the end-use combustors that utilize CDF as a non-hazardous, biomass derived, alternative to fossil fuel. MAER receives railroad creosote crossties from the railroads or the companies contracted by the railroads to remove crossties. MAER proceeds to process the crossties into specification CDF depending on the particular needs of the end-use combustor. MAER's primary business is the collection, processing, and sale of specification CDF to their diverse client base of end-use combustors.

2.3 A DESCRIPTION OF THE PROPOSED ACTION, INCLUDING SUGGESTED REGULATORY LANGUAGE [40 CFR §241.4(B)(1)(III)]

MAER proposes that U.S. EPA provide a determination that CDF is not a solid-waste and instead is a legitimate alternative fuel. MAER further proposes that U.S. EPA include CDF categorically as "crossties that have been treated with creosote" in the list of NHSMs that are not solid-wastes when used as fuels codified at 40 CFR §241.4(a). MAER has provided proposed language to be included in 40 CFR §241.4(a) below:

40 CFR §241.4(a)(5) – Crossties that have been treated with creosote.

2.4 A STATEMENT OF THE NEED AND JUSTIFICATION FOR THE PROPOSED ACTION

As stated above, MAER is submitting this document in conjunction and collaboration with stakeholders and members of the regulated community both "up-stream" and "down-stream" from MAER's position in the CDF reclamation-to-fuel process. MAER and the other stakeholders potentially affected by the outcome of this NHSM CDF Petition for Non-waste Determination strongly believe that the reclaimed crossties that comprise CDF are not solid-wastes for the following reasons:

- The use of CDF as a non-hazardous, biomass derived, alternative to fossil fuel has a significant beneficial environmental impact.
- CDF meets the legitimacy criteria specified by 40 CFR §241.3(d).

2.4.1 The Combustion of CDF has a Significant Beneficial Environmental Impact

The current combustion of CDF as a non-hazardous alternative biomass fuel has a significant beneficial environmental impact. A determination that CDF is not a solid-waste and is instead a legitimate alternative fuel, coupled with the categorical inclusion of CDF in the list of NHSMs that are not solid-wastes when used as fuels codified at 40 CFR §241.4(a), would keep a significant volume of crossties from being unnecessarily land-filled.

Keeping crossties from being land-filled has a secondary affect on limiting greenhouse gas (GHG) emissions as well. The utilization of CDF by end-use combustors can displace the use of fossil fuels that emit GHG. The GHG limiting effect of combusting CDF is magnified when one considers that alternative fuels derived from biomass such as wood are included within the carbon cycle while traditional fossil fuels are not. Should CDF's status as a non-waste continue to be undefined and its use as an alternative fuel cease, the thermal equivalent of the CDF that is currently utilized by end-use combustors will need to be offset by a non-waste fuel considered legitimate by U.S. EPA or more likely a fossil fuel. Offsetting the use of CDF with a legitimate non-waste fuel or a fossil fuel could potentially carry a significant GHG penalty. This GHG penalty will again be magnified as the CDF that has been unnecessarily land-filled begins to undergo anaerobic decomposition, generating emissions of methane (CH_4), a GHG that is 21 times more potent than carbon dioxide (CO_2).

2.4.2 CDF Meets the Legitimacy Criteria Specified by 40 CFR §241.3(d)

Pursuant to 40 CFR §241.3(b)(4), non-hazardous secondary materials, including fuels, are not solid wastes when combusted as long as the following criteria are met:

- The fuel is not discarded or is produced from the processing of a discarded NHSM [40 CFR §241.3(b)(4)].
- The fuel meets the legitimacy criteria specified in 40 CFR §241.3(d)(1).
  - The fuel is managed as a valuable commodity [40 CFR §241.3(d)(1)(i)].
  - The fuel has a meaningful heating value and is used as a fuel in a combustion unit that recovers energy [40 CFR §241.3(d)(1)(ii)].
  - The fuel contains contaminants at levels comparable in concentration to or lower than those in traditional fuel(s) which the combustion unit is designed to burn [40 CFR §241.3(d)(1)(iii)].

2.4.2.1 The Fuel is Not Discarded or is Produced from the Processing of a Discarded NHSM [40 CFR §241.3(b)(4)]

MAER understands that a petition to categorically list an NHSM as a legitimate fuel must include a demonstration or justification that the material either is not discarded, or if it is discarded, then the material has been sufficiently processed. MAER asserts that the vast majority of crossties used as CDF by end-use combustors are not discarded as they are instead obtained via contractual arrangements. MAER also asserts that those crossties that could be considered discarded are sufficiently processed into specification CDF prior to utilization by end-use combustors.

According to the Association of American Railroads, approximately 17 million crossties are removed from railways each year. Railroads contract with a crosstie reclamation company to remove and reclaim the crossties. Such contracts actually transfer ownership of the reclaimed crossties to the removal/reclamation company for the time that the ties are in their possession. As such, the reclaimed crossties, while not in the control of the original generator (i.e., the railroads), are not discarded in the typical common use of the term discarded. They are instead transferred to the removal/reclamation company who sorts the ties according to their condition for different end uses. Removed and reclaimed crossties may be temporarily stored in the railroad right-of-way or at another location by the crosstie reclamation companies. However, regardless of the length of time the crossties are stored, the crossties are not discarded in accordance with the common use definition of discarded in that they are not abandoned or no longer considered to be useful. The crossties are simply stored until such a time as their value as an alternative fuel (i.e., for use as an alternative fuel or other end-use purposes such as landscaping) can be realized. MAER understands that even long term storage does not diminish the value of the CDF crossties as an alternative fuel. One third of the reclaimed crossties are used for landscaping. The majority of the other two thirds of the reclaimed crossties are used by end-use combustors for energy recovery.

Not all CDF originates from crossties removed from service in the same year. Some CDF is processed from crossties that were removed from service in prior years and stored by the railroads or removal/reclamation companies until their value as a landscaping element or alternative fuel could be realized. These crossties are not discarded. There is no record of such crossties being abandoned. Waiting until the value of the material can be realized is relevant to a determination whether the length of time in storage is reasonable. 76 Fed. Reg. 15456, 15520 (Mar. 21, 2011) (reasonable time frame for storage is flexible enough to allow accumulation of materials to be cost-effective).

However, even if EPA believed that crossties removed from service in prior years have not been stored for a reasonable period of time, MAER maintains that all crossties are sufficiently processed prior to utilization by the end-use combustors. Certain removal and reclamation companies sell the crossties to companies like MAER who process the crossties, reclaimed by the removal companies or otherwise originating from stored crossties, using a combination of the following, as appropriate:

- Removal of metal (i.e., spikes, nails, plates, etc.) via magnetic removal. Note that depending on the configuration of a facility's processing equipment, magnetic removal could be applied more than once.
- Grinding or shredding of the crossties to specified size depending on the particular needs of the end-use combustors. Note that depending on the configuration of a facility's processing equipment, the grinding stage of the crosstie processing may occur via primary and secondary grinding phases or a single grinding phase.
- Additional screening of the ground or shredded crosstie material to specified size depending on the particular needs of the end-use combustors. Note that depending on the configuration of a facility's processing equipment, screening may occur concurrently with grinding or as a subsequent stage of the crosstie processing.
- Applying a surfactant to minimize dust during transfer and handling of the material.

The end result of such processing is a specification CDF that has been sufficiently processed to improve combustion of the material, remove contaminants, and meet the particular needs of the end-use combustor. The specification CDF is then sold directly to the end-use combustor for energy recovery.

In conclusion, crossties that have been removed by companies contracted directly to the railroads have not been discarded. In addition, all crossties in the CDF population whether stored prior to processing are processed sufficiently to meet the definition of processing codified at 40 CFR §241.2.

2.4.2.2 The Fuel is Managed as a Valuable Commodity [40 CFR §241.3(d)(1)(i)]

Several companies in the United States, including MAER, exist using a business model that revolves entirely around the value created by the removal, reclamation, processing, and sale of creosote-treated railroad crossties as CDF. Such companies generate annual industry-wide revenue of $65-$75 million. The removed/reclaimed crossties are the valuable commodity that creates this industry and the associated revenue. Note that the CDF industry is a thriving marketplace where removal/reclamation companies compete both for railroad contracts and the end-use combustor customer base who buys the CDF.

In demonstrating that an NHSM is managed as a valuable commodity U.S. EPA stipulates pursuant to 40 CFR §241.3(d)(1)(i)(A) and (B) that storage of the NHSM prior to use as a fuel must not exceed reasonable timeframes, and that the NHSM must be managed and contained in a manner consistent with an analogous fuel to prevent releases to the environment. Processed CDF is delivered to end-use combustors via railcar and/or truck similar to how other biomass fuels would be delivered. End-use combustors may also employ additional magnetic removal of metal. After receipt, the CDF is stock-piled prior to combustion in a similar manner to other analogous fuels like bark fuel, hog fuel, or biomass (i.e., in fuel piles or silos). Prior to combustion, which usually takes place within a timeframe from a day to a week of arrival, the CDF is transferred and/or handled from temporary storage in a manner consistent with the transfer and handling of other biomass fuels; procedures that typically include screening again by the end-use combustor, combining with other biomass fuels, and transferring to the combustor via conveyor belt or front-end loader. CDF is managed as a valuable commodity since a competitive marketplace exists for the removal, reclamation, and sale of CDF crossties, and since such crossties are not stored for unreasonable lengths and are handled and treated similar to other analogous biomass fuels by end-use combustors.

2.4.2.3 The Fuel Must Have a Meaningful Heating Value [40 CFR §241.3(d)(1)(ii)]

In an effort to compare the constituents/contaminants of CDF to traditional fuels (i.e., coal, biomass, fuel oil, and coal tar oil), MAER has had qualitative laboratory testing performed on a sample of the specification CDF that they process and sell. In so doing, a heating value of 6,595 Btu/lb as fired was determined for the sample tested. U.S. EPA has previously reported that creosoted-treated wood has a heating value of 6,000 Btu/lb. Other stakeholders and affected industry members like the Treated Wood Council (TWC) have previously reported a heating value for creosote-treated wood of upwards of 8,000 Btu/lb. As a result, a heating value range of 6,000-8,000 Btu/lb as fired is reasonable for specification CDF. U.S. EPA has consistently referenced 5,000 Btu/lb as threshold for presuming that an NHSM has a meaningful heating value. Based on the qualitative laboratory testing that MAER has had performed, CDF has a meaningful heating value pursuant to 40 CFR §241.3(d)(1)(ii).

2.4.2.4 The Fuel Must Contain Contaminants at Levels Comparable to Traditional Fuel(s) [40 CFR §241.3(d)(1)(iii)]

As stated above, in an effort to make a comparison of the constituents/contaminants present in CDF to those found in traditional fuels (including coal, biomass, fuel oil, and coal tar oil), MAER has had qualitative laboratory testing performed on a sample of the specification CDF that they process and sell. MAER contracted Columbia Analytical Services to perform the qualitative testing of CDF.

The CDF sample was obtained from a CDF fuel pile located at the facility of an end-use combustor. The operation of the CDF fuel pile, including any associated processing and handling is performed by MAER. Note that the tested CDF sample was obtained in accordance with the sampling provisions of 40 CFR §63.7521(c)(2) and composited by the analyzing laboratory in accordance with the compositing provisions of 40 CFR §63.7521(c)(2) and (d)(1) through (7). In obtaining the composite CDF sample in accordance with the provisions referenced above, MAER understands that the CDF sampling has been conducted in a method that is compliant with the applicable 40 CFR Part 63, Subpart DDDDD fuel sampling requirements. In so doing, MAER believes that the tested CDF sample has been obtained in a manner consistent with regulated procedures and is therefore, suitable for inclusion in the NHSM CDF Petition for Non-waste Determination.

In performing the comparison of the constituents/contaminants present in CDF to those found in traditional fuels, MAER reviewed a list of constituents/contaminants using the CAA Section 112 and 129 regulated pollutants and using engineering judgment and other internal resources determined which constituents/contaminants could be reasonably expected to be present in the crossties comprising CDF. Specifically, MAER reviewed Material Safety Data Sheet (MSDS) data and/or industry generated data (i.e., publicly available databases and/or technical documents) to prepare a list of constituents that could reasonably be expected to be present in the creosote material used to preserve wooden crossties.

Similarly, using available technical databases and other publically available technical documents [largely obtained from the National Counsel for Air and Stream Improvement, Inc. (NCASI) technical documents], a list of constituents that could reasonably be expected to be present in northern and southern North American hardwoods was compiled. This list of "expected" constituents/contaminants was then compared to the list constituents/contaminants known to exist in coal, wood biomass, and fuel oil based on publically available databases and documents from U.S. EPA's NHSM website. This list was also compared to a list of constituents/contaminants obtained from a representative coal tar oil MSDS. Based on U.S. EPA's response to comments pertaining to contaminant comparisons all constituent/contaminant comparisons were made on a pre-combustion basis (i.e., % weight, ppm, µg or mg/kg, etc. as appropriate).

The qualitative laboratory test data performed on the CDF sample represents one (1) constituent/contaminant data point. However, MAER believes that one (1) data point is sufficient to perform a meaningful constituent/contaminant comparison because the components of CDF, wood and creosote, are homogeneous. The wood component of CDF is homogeneous because the source is North American hardwoods. The creosote component of CDF is homogeneous because the production of creosote is governed by standards established by the American Wood Protection Association (AWPA). AWPA has established two blends of creosote, P1/P13 or P2. These standards identify the source material for creosote as well as the physical-chemical characteristics of the pesticide product. Railroad ties are typically manufactured using the P2 blend. Given the homogeneity of the components of CDF, the qualitative laboratory test data submitted with this petition is sufficient to provide a meaningful constituent/contaminant comparison. Further, the processing of CDF adds further homogeneity to the product, by removing contaminants and sizing the material to give it homogeneous fuel characteristics.

Table A-1 of Appendix A presents the compiled list of constituents/contaminants that could reasonably be expected to be present in CDF and presents the results of the qualitative testing. Table A-2 of Appendix A compares the results of the qualitative testing to the constituents/contaminants of the solid fuels coal and biomass and the liquid fuels fuel oil and coal tar oil on a concentration basis. Contaminant levels for coal and biomass were chosen for comparison since a combustion unit currently utilizing CDF could reasonably be expected to be capable of combusting coal and/or other biomass fuels as an innate feature of its original design characteristics and no separate delivery system is needed to switch from one solid fuel to another. Fuel oil and coal tar oil were chosen for comparison since a combustion unit currently utilizing CDF also could reasonably be expected to be capable of combusting either fuel oil or coal tar oil as an innate feature of its original design characteristics.

With respect to liquid fuels, we recognize that EPA interprets the phrase “designed to burn” to mean that a combustor that makes a self-determination that its CDF is a processed fuel product may have to meet the contaminant legitimacy criterion by installing a nozzle for the delivery of liquid fuel into the boiler. According to EPA, this condition is to avoid the possibility that discard could be occurring in some situations. However, in the context of a specific non-waste determination under section 241.4, EPA has the opportunity to evaluate all the factors relating to the use of CDF as a fuel, including the fact that CDF is a commodity that is purchased by the combustor. EPA, in granting a petition for a non-waste determination, has the discretion to recognize that when a combustor purchases CDF and then burns it in a boiler, that combustion is not for the purpose of discarding the CDF. Rather, the combustion is for the legitimate purpose of generating energy.

In comparing the constituents/contaminants that could reasonably be expected to be present in CDF to the contaminants in coal, biomass, fuel oil, and coal tar oil, MAER is providing a meaningful comparison of CDF contaminants to a collective end-use combustor fuel contaminant profile. Such a collective fuel contaminant profile provides a genuine comparison of the contaminants potentially present in CDF to the contaminants present in the traditional fuels that an end-use combustor capable of burning CDF actually burn.

MAER combined the individual contaminants into specific groups based on similar physical and chemical properties. Specifically, MAER established a Volatile Organic Compounds (VOC) hydrocarbon group, a group comprising the common 16 Polycyclic Aromatic Hydrocarbons (PAHs), and a semi-VOC hydrocarbon group, which included the 16 PAH group and other semi-VOCs. MAER did not choose to combine any metal contaminants. The individual contaminants have been combined into their respective groupings as presented on Table A-1.

As presented in Tables A-1 and A-2, the levels of the constituents/contaminants expected to be present in CDF are comparable to the levels known to exist in coal, biomass, fuel oil, and/or coal tar oil. All relevant groups of CDF constituents/contaminants tested were either non-detect or lower than the comparable levels of groups of contaminants present in one or more of the traditional fuels. For contaminants that are VOCs, the analytical data indicate that the sum of all CDF VOC contaminants are approximately 0.89 part per million (ppm) by weight which is much less than the individual contaminant level listed for n-hexane in fuel oil (10,000 ppm). The CDF semi-VOC contaminants are present at approximately 978 ppm which is considerable less than the individual contaminant level of phenol that is reported for fuel oil (7,700 ppm). The common 16 PAH plus two (2) additional PAHs (1-methylnapthalene and 2-methylnaphthalene) detected in CDF summed to 7,036 ppm while the contaminant level of naphthalene (just one of the 16

PAHs) is 7,330 ppm from fuel oil. Only two (2) metals were present in CDF at detectable levels (manganese and mercury) and both of these contaminants are present at levels less than either coal or biomass. Finally the concentration levels for the “precursor contaminants” (chlorine, fluorine, nitrogen, and sulfur) detected in CDF are less than the corresponding levels measured in coal, biomass, and fuel oil. Overall the groups of contaminants detected in CDF are lower than the levels of individual, representative contaminants present in traditional fuels such as coal, biomass, and fuel oil.

3. SPECIAL CONSIDERATIONS

In the final revision to the NHSM, U.S. EPA provided responses to a *Petition for Non-Waste Determination under 40 CFR §241.4 and Request for Comfort Letter* submitted by the AF&PA on December 6, 2012. In their response, U.S. EPA requested that the AF&PA provide additional information as follows:

1. A list of industry sectors, in addition to forest product mills, that burn railroad ties for energy recovery.
2. The types of boilers (e.g., kilns, stoker boilers, circulating fluidized bed, etc.) that burn railroad ties for energy recovery.
3. The traditional fuels and relative amounts of these traditional fuels that could otherwise generally be burned in these types of boilers.
4. The extent to which non-industrial boilers (e.g., commercial or residential boilers) burn railroad ties for energy recovery.
5. Laboratory analyses for contaminants known to be present in creosote-treated railroad ties or known to be significant components of creosote, specifically Polycyclic Aromatic Hydrocarbons (i.e., PAH-16), dioxins, dibenzofurans, hexachlorobenzene, biphenyl, quinoline, cresols, and 2,4-dinitrotoluene.

MAER has provided additional information in response to U.S. EPA's request below:

1. MAER knows of 10-16 end-use combustors that utilize CDF as an alternative fuel to offset fossil fuel use at all times that their combustion units are operating. CDF usage from such end-use combustors can be as much as 100-500 tons daily. MAER knows of 10-16 additional end-use combustors that utilize CDF occasionally based on availability and cost drivers. MAER also knows well over 100 more end-use combustors that are operationally able to utilize CDF as an alternative fuel to offset fossil fuel that choose not to use CDF as a result of the current solid-waste implications associated with CDF. The 20-32 end-use combustors that utilize CDF, both full-time and part-time, represent a variety of industries including pulp and paper manufacturing, cogeneration, utilities, and chemical manufacturing facilities.
2. The types of boilers operated by those end-use combustors that currently utilize CDF as an alternative fuel to offset fossil fuel include fluidized bed, traveling grate, and spreader stoker.
3. Boilers operated by end-use combustors that utilize CDF as an alternative fuel to offset fossil fuel also burn a variety of "traditional fuels" including: coal, biomass (i.e., hog fuel, bark fuel, and other biomass fuel materials), fuel oil, Tired Derived Fuel (TDF), Waste Derived Liquid Fuel (WDLF), and Waste Derived Solid Fuel (WDSF).

4. MAER understands that the residential use of CDF for purposes of energy recovery is unlikely. However, MAER does know of several local utilities in the northern Midwest that utilize CDF for purposes of power generation.
5. MAER understands that Tables A-1 and A-2 of Attachment A, and the raw qualitative laboratory test data provided in Attachment B, fulfill U.S. EPA's fifth request as appropriate. However, note that since MAER developed the list of constituents/contaminants beginning with what constituents/contaminants could be expected to be present in CDF not all of the specific constituents/contaminants referenced by U.S. EPA were tested as they do not represent constituents/contaminants that would be expected to be present in CDF (i.e., dioxins).

Also, in the final revisions to the NHSM, U.S. EPA provided added four (4) elements to the definition of contaminants as precursor "contaminants" including chlorine (Cl), fluorine (F), nitrogen (N), and sulfur (S). As a result, MAER has provided data pertaining to the presence of Cl, F, N, and S in the qualitative laboratory test data provided as Attachments A and B.

4. SUMMARY AND CONCLUSION

CDF is a non-hazardous alternative biomass fuel derived from railroad crossties that have been reclaimed as part of normal railroad maintenance activities. As a function of its high energy content, CDF is currently beneficially used for heat and energy recovery in many combustion units across a variety of industry sectors as a non-hazardous, biomass derived, alternative to fossil fuel.

Based on the information contained herein, crossties that comprise CDF are not solid-wastes. The use of CDF as a non-hazardous, biomass derived, alternative to fossil fuel has a significant beneficial environmental impact by reducing emissions of GHG and decreasing the unnecessary land-filling of this valuable fuel resource. The CDF meets the legitimacy criteria specified by 40 CFR §241.3(d) in that the crossties that comprise CDF are (1) either not discarded or are sufficiently processed; (2) are managed as a valuable commodity; (3) have a meaningful heating value; and (4) have levels of constituents/contaminants comparable to the levels known to exist in coal, biomass, fuel oil, and/or coal tar oil.

For these reasons, the information presented herein, and the overabundance of previously submitted similar information, CDF is indeed a non-waste fuel and that U.S. EPA should issue a categorical determination that CDF is a non-waste fuel in accordance with the provisions of 40 CFR §241.4(b)(2), and specifically list CDF as a non-waste NHSM fuel under 40 CFR §241.4(a).

APPENDIX A –
CONSTITUENT/CONTAMINANT COMPARISON TABLES

Table A-1
M.A. Energy Resources, LLC
CDF Testing Qualitative Laboratory Results
40 CFR Part 241, Subpart B – Crosstie Derived Fuel (CDF) Petition for Non-Waste Determination

No.	Analytes	CDF Test Results	Unit	Notes
Physical/Fuel Characteristics				
1	Moisture	**27.98**	%wt	-
2	Ash	**0.58**	%wt (as received)	-
		0.81	%wt (moist. free)	
3	Heat Content	**6,595**	Btu/lb (as received)	-
		9,157	Btu/lb (moist. free)	
Non-HAP/Non-Metal Elements				
4	Hydrogen	**5.79**	% wt (Moist Free)	-
5	Nitrogen	**0.16**	% wt (Moist Free)	-
6	Sulfur	**0.080**	% wt (Moist Free)	-
7	Fluorine	**0.01**	% wt (Moist Free)	-
8	Chlorine	**0.04**	% wt (Moist Free)	-
9	Oxygen (diff)	**32.28**	% wt (Moist Free)	-
10	Carbon	**52.72**	% wt (Moist Free)	-
Volatile Organic Compounds by GC/MS				
11	Benzene	50	ug/Kg	Non-Detect
12	Ethyl benzene	**57.5**	ug/Kg	-
13	Styrene	50	ug/Kg	Non-Detect
14	Toluene	50	ug/Kg	Non-Detect
15	Xylenes	**325**	ug/Kg	(Total)
16	Cumene	50	ug/Kg	Non-Detect
17	Acrolein	1,000	ug/Kg	Non-Detect
18	Bromomethane	50	ug/Kg	Non-Detect
19	Carbon Tetrachloride	50	ug/Kg	Non-Detect
20	Carbon-Disulfide	100	ug/Kg	Non-Detect
21	Chlorobenzene	50	ug/Kg	Non-Detect
22	Methyl Isobutyl Ketone	100	ug/Kg	Non-Detect
23	Methylene Chloride	100	ug/Kg	Non-Detect
24	m,p-xylene	**178**	ug/Kg	-
25	o-xylene	**148**	ug/Kg	-
26	Tetrachloroethylene	50	ug/Kg	Non-Detect
27	Trichloroethylene	50	ug/Kg	Non-Detect
28	Vinyl Chloride	50	ug/Kg	Non-Detect
29	n-Hexane	50	ug/Kg	Non-Detect
TCLP Volatile Organics by GC/MS				
30	1,1-dichloroethylene	0.10	mg/L	Non-Detect
31	1,2-dichloroethane	0.10	mg/L	Non-Detect
32	1,4-dichlorobenzene	0.10	mg/L	Non-Detect
33	Chloroform	0.10	mg/L	Non-Detect
Selected HAPS in Condensates by GC/FID				
34	Acetaldehyde	1.00	mg/Kg	Non-Detect
35	Methanol	1.00	mg/Kg	Non-Detect
36	Propionaldehyde	1.00	mg/Kg	Non-Detect
Semivolatile Organic Compounds by GC/MS				
37	2,4-dinitrophenol	57,400	ug/Kg	Non-Detect
38	2,4-dinitrotoluene	14,600	ug/Kg	Non-Detect
39	Acetophenone	29,100	ug/Kg	Non-Detect
40	Aniline	14,600	ug/Kg	Non-Detect

Table A-1

M.A. Energy Resources, LLC

CDF Testing Qualitative Laboratory Results

40 CFR Part 241, Subpart B – Crosstie Derived Fuel (CDF) Petition for Non-Waste Determination

No.	Analytes	CDF Test Results	Unit	Notes
41	Biphenyl	**137,000**	ug/Kg	-
42	Dibenzofuran	**798,000**	ug/Kg	-
43	Hexachlorobenzene	14,600	ug/Kg	Non-Detect
44	Pentachlorophenol	57,400	ug/Kg	Non-Detect
45	Phenol	14,600	ug/Kg	Non-Detect
46	Quinoline	40,200	ug/Kg	-
TCLP Semivolatile Organic Compounds by GC/MS				
47	o-cresol	0.05	mg/L	Non-Detect
48	m,p-cresol	**1.5100**	mg/kg	-
49	Hexachlorobutadiene	0.05	mg/L	Non-Detect
50	Hexachloroethane	0.05	mg/L	Non-Detect
51	Nitrobenzene	0.05	mg/L	Non-Detect
52	Pyridine	0.20	mg/L	Non-Detect
53	2,4,5-trichlorophenol	0.05	mg/L	Non-Detect
54	2,4,6-trichlorophenol	0.05	mg/L	Non-Detect
Base Neutral Semivolatile Organic Compounds by GC/MS SIM				
55	1-Methylnaphthalene	**144,000**	ug/Kg	-
56	2-Methylnaphthalene	**251,000**	ug/Kg	-
57	Acenaphthene	**610,000**	ug/Kg	-
58	Acenaphthylene	58,600	ug/Kg	Non-Detect
59	Anthracene	**447,000**	ug/Kg	-
60	Benz(a)anthracene	**201,000**	ug/Kg	-
61	Benzo(a)pyrene	**81,900**	ug/Kg	-
62	Benzo(b)fluoranthene	**128,000**	ug/Kg	-
63	Benzo(g,h,i)perylene	29,300	ug/Kg	Non-Detect
64	Benzo(k)fluoranthene	**57,900**	ug/Kg	-
65	Chrysene	**182,000**	ug/Kg	-
66	Dibenz(a,h)anthracene	29,300	ug/Kg	Non-Detect
67	Fluoranthene	**1,100,000**	ug/Kg	-
68	Fluorene	**529,000**	ug/Kg	-
69	Indeno(1,2,3-cd)pyrene	29,300	ug/Kg	Non-Detect
70	Naphthalene	**444,000**	ug/Kg	-
71	Phenanthrene	**1,930,000**	ug/Kg	-
72	Pyrene	**930,000**	ug/Kg	-
Organochlorine Pesticides by Gas Chromatography				
73	Chlordane	708	ug/Kg	Non-Detect
TCLP Organochlorine Pesticides by Gas Chromatography				
74	Lindane	**0.2380**	mg/kg	-
75	Heptachlor	0.0002	mg/L	Non-Detect
76	Methoxychlor	0.0004	mg/L	Non-Detect
77	Toxaphene	0.005	mg/L	Non-Detect

Table A-1
M.A. Energy Resources, LLC
CDF Testing Qualitative Laboratory Results
40 CFR Part 241, Subpart B – Crosstie Derived Fuel (CDF) Petition for Non-Waste Determination

No.	Analytes	CDF Test Results	Unit	Notes
Carbonyl Compounds by High Performance Liquid Chromatography (HPLC)				
78	Formaldehyde	1,600	ug/Kg	Non-Detect
Trace Metal HAP:				
79	Antimony (Sb)	<5	mg/kg (Moisture Free)	Non-Detect
80	Arsenic (As)	<10	mg/kg (Moisture Free)	Non-Detect
81	Beryllium (Be)	<0.5	mg/kg (Moisture Free)	Non-Detect
82	Cadmium (Cd)	<0.5	mg/kg (Moisture Free)	Non-Detect
83	Chromium (Cr)	<2.5	mg/kg (Moisture Free)	Non-Detect
84	Cobalt (Co)	<2.5	mg/kg (Moisture Free)	Non-Detect
85	Lead (Pb)	<10	mg/kg (Moisture Free)	Non-Detect
86	Manganese (Mn)	**63**	mg/kg (Moisture Free)	-
87	Mercury (Hg)	**16.1**	ppb (moisture free)	-
88	Nickel (Ni)	<5	mg/kg (Moisture Free)	Non-Detect
89	Selenium (Se)	<5	mg/kg (Moisture Free)	Non-Detect

[a] Constituent/contaminant data obtained from Columbia Analytical Services, Inc., Qualitative Laboratory Test Report, Service Request No. T1201895.

Table A-2

CDF Testing Qualatative Laboratory Results Traditional Fuel Comparison (i.e., Coal, Biomass, Fuel Oil, and Coal Tar Oil) (Grouped Contaminant Results)

40 CFR Part 241, Subpart B – Crosstie Derived Fuel (CDF) Petition for Non-Waste Determination

Crosstie Sample			Solid Fuel				Liquid Fuel				
Unit	**CDF Test Results[a]**		**COAL[b]**		**Wood & Biomass[b]**		**Fuel Oil**			**Coal Tar Oil**	
Analytes	**Laboratory Result (ppm)**	**Laboratory Comment**	**US EPA Literature Sources (ppm)**	**US EPA OAQPS Database (ppm)**	**US EPA Literature Sources (ppm)**	**US EPA OAQPS Database (ppm)**	**Literature[b] Sources (ppm)**	**OAQPS[b] Database (ppm)**	**Refinery ICR (ppm)[c]**	**AWPA P1/P13 (ppm)[d]**	**MSDS Coal Tar Solution (P1/P2)[e]**
Moisture	27.98	%wt	-	-	-	-	-	-	-	-	-
Ash	0.58	%wt (as received)	-	-	-	-	-	-	-	-	-
	0.81	%wt (moist. free)	-	-	-	-	-	-	-	-	-
Heat Content	6,595	Btu/lb (as received)	-	-	-	-	-	-	-	-	-
	9,157	Btu/lb (moist. free)	-	-	-	-	-	-	-	-	-
Non-HAP/ Non-Metal											
Hydrogen	57,900	-	-	-			-	-	-	-	-
Nitrogen	1,600	-	N/A	13,600 – 54,000	200 – 39,500	2,200 – 4,600	42 – 8,950	2,000 – 3,000	-	-	-
Sulfur	800	-	N/A	740 – 61,300	Non-Detect – 8,700	Non-Detect – 6,100	N/A	Non-Detect – 57,000	-	-	-
Fluorine	100	-	N/A	Non-Detect – 178	Non-Detect – 300	Non-Detect – 128	N/A	Non-Detect – 14	-	-	-
Chlorine	400	-	N/A	Non-Detect – 9,080	Non-Detect – 2,600	Non-Detect – 5,400	N/A	Non-Detect – 1,260	-	-	-
Oxygen (diff)	322,800	-	-	-	-	-	-	-	-	-	-
Carbon	527,200	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds	0.38	-	8.6 – 56	N/A	1.6 - 27	N/A	50 – 10,000	N/A	2,410	N/A	1,500
Semi-Volatile Organic Compounds	977	-	N/A	N/A	N/A	N/A	Non-Detect – 7,700	N/A	1,170	6,000 – 12,000	10,300
16-PAHs	7,036	-	N/A	N/A	N/A	N/A	Non-Detect – 7,330	N/A	2,850	110,000 – 140,000	161,100
Trace Metal Haps											
Antimony (Sb)	<5	Non-Detect	0.5 – 10	Non-Detect – 6.9	Non-Detect – 26	Non-Detect – 6.0	Non-Detect – 15.7	Non-Detect – 3.8	-	-	-
Arsenic (As)	<10	Non-Detect	0.5 – 80	Non-Detect – 174	Non-Detect – 6.8	Non-Detect – 298	N/A	Non-Detect – 13	-	-	-
Beryllium (Be)	<0.5	Non-Detect	0.1 – 15	Non-Detect – 206	N/A	Non-Detect – 10	N/A	Non-Detect – 19	-	-	-
Cadmium (Cd)	<0.5	Non-Detect	0.1 – 3	Non-Detect – 19	Non-Detect – 3	Non-Detect – 17	N/A	Non-Detect – 1.4	-	-	-
Chromium (Cr)	<2.5	Non-Detect	0.5 – 60	Non-Detect – 168	Non-Detect – 130	Non-Detect – 340	N/A	Non-Detect – 37	-	-	-
Cobalt (Co)	<2.5	Non-Detect	0.5 – 30	Non-Detect – 25.2	Non-Detect – 24	Non-Detect – 213	N/A	Non-Detect – 8.5	-	-	-
Lead (Pb)	<10	Non-Detect	2 – 80	Non-Detect – 148	Non-Detect – 340	Non-Detect – 229	Non-Detect – 56.8	Non-Detect – 52	-	-	-
Manganese (Mn)	63	-	5 – 300	Non-Detect – 512	Non-Detect – 840	Non-Detect – 15,800	N/A	Non-Detect – 3,200	-	-	-
Mercury (Hg)	0.0161	-	0.02 – 1	Non-Detect – 3.1	Non-Detect – 0.2	Non-Detect – 1.1	N/A	Non-Detect – 0.2	-	-	-
Nickel (Ni)	<5	Non-Detect	0.5 – 50	Non-Detect – 730	Non-Detect – 540	Non-Detect – 175	Non-Detect – 50.2	Non-Detect – 270	-	-	-
Selenium (Se)	<5	Non-Detect	0.02 – 10	Non-Detect – 74.3	Non-Detect – 2	Non-Detect – 9.0	NA	Non-Detect – 4	-	-	-

[a] Represents constituent/contaminant data converted to ppm as appropriate originally obtained from Columbia Analytical Services, Inc., Qualitative Laboratory Test Report, Service Request No. T1201895.

[b] Information obtained from U.S. EPA's *"Contaminant Concentrations in Traditional Fuels: Tables for Comparison"* from U.S. EPA was acquired from www.epa.gov/osw/nonhaz/define/pdfs/nhsm_cont_tf.pdf.

[c] Constituent/contaminant data obtained from Table A-1 - Refinery Average Stream Hazardous Air Pollutant Compositions—Default Values of the *Emission Estimation Protocol for Petroleum Refineries Final ICR.*

[d] Constituent/contaminant data obtained from Coopers Creek Chemical Corporate Safety Data Sheet for Coopersote Creosote Oil (AWPA P1/P13).

[e] Constituent/contaminant data obtained from Material Safety Date Sheet (MSDS) NO. US 614838 for Creosote/Coal Tar Solution and Creosote Oil.

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CDF Testing Qualatative Laboratory Results Traditional Fuel Comparison (i.e., Coal, Biomass, Fuel Oil, and Coal Tar Oil) (Individual Contaminant Results)
40 CFR Part 241, Subpart B – Crosstie Derived Fuel (CDF) Petition for Non-Waste Determination

Crosstie Sample				Solid Fuel				Liquid Fuel				
Unit		CDF Test Results[a]		COAL[b]		Wood & Biomass[b]		Fuel Oil			Coal Tar Oil	
No.	Analytes	Laboratory Result (ppm)	Laboratory Comment	US EPA Literature Sources (ppm)	US EPA OAQPS Database (ppm)	US EPA Literature Sources (ppm)	US EPA OAQPS Database (ppm)	Literature[b] Sources (ppm)	OAQPS[b] Database (ppm)	Refinery ICR (ppm)[c]	AWPA P1/P13 (ppm)[d]	MSDS Coal Tar Solution (P1/P2)[e]
Physical/Fuel Characteristics												
1	Moisture	27.98	%wt	-	-	-	-	-	-	-	-	-
2	Ash	0.58	%wt (as received)	-	-	-	-	-	-	-	-	-
		0.81	%wt (moist. free)	-	-	-	-	-	-	-	-	-
3	Heat Content	6,595	Btu/lb (as received)	-	-	-	-	-	-	-	-	-
		9,157	Btu/lb (moist. free)	-	-	-	-	-	-	-	-	-
Non-HAP/Non-Metal Elements												
4	Hydrogen	57,900	-	-	-			-	-	-	-	-
5	Nitrogen	1,600	-	N/A	13,600 – 54,000	200 – 39,500	2,200 – 4,600	42 – 8,950	2,000 – 3,000	-	-	-
6	Sulfur	800	-	N/A	740 – 61,300	Non-Detect – 8,700	Non-Detect – 6,100	N/A	Non-Detect – 57,000	-	-	-
7	Fluorine	100	-	N/A	Non-Detect – 178	Non-Detect – 300	Non-Detect – 128	N/A	Non-Detect – 14	-	-	-
8	Chlorine	400	-	N/A	Non-Detect – 9,080	Non-Detect – 2,600	Non-Detect – 5,400	N/A	Non-Detect – 1,260	-	-	-
9	Oxygen (diff)	322,800	-	-	-	-	-	-	-	-	-	-
10	Carbon	527,200	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds by GC/MS												
11	Benzene	0.05	Non-Detect	Non-Detect – 38	N/A	-	-	Non-Detect – 75	N/A	40	-	1,300
12	Ethyl benzene	0.0575	-	0.7 – 5.4	N/A	-	-	22 – 1,270	N/A	530	-	400
13	Styrene	0.05	Non-Detect	1.0 – 26	N/A	-	-	Non-Detect – 320	N/A	-	-	600
14	Toluene	0.05	Non-Detect	8.6 – 56	N/A	-	-	Non-Detect – 380	N/A	810	-	1,500
15	Xylenes	0.325	(Total)	4.0 – 28	N/A	-	-	Non-Detect – 3,100	N/A	2,410	-	-
16	Cumene	0.05	Non-Detect	-	-	-	-	6,000 – 8,600	N/A	560	-	-
17	Acrolein	1	Non-Detect	-	-	-	-	-	-	-	-	-
18	Bromomethane	0.05	Non-Detect	-	-	-	-	-	-	-	-	-
19	Carbon Tetrachloride	0.05	Non-Detect	-	-	-	-	-	-	-	-	-
20	Carbon-Disulfide	0.1	Non-Detect	-	-	-	-	-	-	-	-	-
21	Chlorobenzene	0.05	Non-Detect	-	-	-	-	-	-	-	-	-
22	Methyl Isobutyl Ketone	0.1	Non-Detect	-	-	-	-	-	-	-	-	-
23	Methylene Chloride	0.1	Non-Detect	-	-	-	-	-	-	-	-	-
24	m,p-xylene	0.178	-	-	-	-	-	-	-	-	-	1,300
25	o-xylene	0.148	-	-	-	-	-	-	-	-	-	400
26	Tetrachloroethylene	0.05	Non-Detect	-	-	-	-	-	-	-	-	-
27	Trichloroethylene	0.05	Non-Detect	-	-	-	-	-	-	-	-	-
28	Vinyl Chloride	0.05	Non-Detect	-	-	-	-	-	-	-	-	-
29	n-Hexane	0.05	Non-Detect	-	-	-	-	50 – 10,000	-	300	-	-
TCLP Volatile Organics by GC/MS												
30	1,1-dichloroethylene	0.08	Non-Detect	-	-	-	-	-	-	-	-	-
31	1,2-dichloroethane	0.08	Non-Detect	-	-	-	-	-	-	-	-	-
32	1,4-dichlorobenzene	0.08	Non-Detect	-	-	-	-	-	-	-	-	-
33	Chloroform	0.07	Non-Detect	-	-	-	-	-	-	-	-	-
Selected HAPS in Condensates by GC/FID						-	-	-	-	-		
34	Acetaldehyde	1.00	Non-Detect	-	-	-	-	-	-	-	-	-
35	Methanol	1.00	Non-Detect	-	-	-	-	-	-	-	-	-
36	Propionaldehyde	1.00	Non-Detect	-	-	-	-	-	-	-	-	-

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40 CFR Part 241, Subpart B – Crosstie Derived Fuel (CDF) Petition for Non-Waste Determination

Crosstie Sample				Solid Fuel				Liquid Fuel				
Unit		CDF Test Results[a]		COAL[b]		Wood & Biomass[b]		Fuel Oil			Coal Tar Oil	
No.	Analytes	Laboratory Result (ppm)	Laboratory Comment	US EPA Literature Sources (ppm)	US EPA OAQPS Database (ppm)	US EPA Literature Sources (ppm)	US EPA OAQPS Database (ppm)	Literature[b] Sources (ppm)	OAQPS[b] Database (ppm)	Refinery ICR (ppm)[c]	AWPA P1/P13 (ppm)[d]	MSDS Coal Tar Solution (P1/P2)[e]
Semivolatile Organic Compounds by GC/MS												
37	2,4-dinitrophenol	57.4	Non-Detect	-	-	-	-	-	-	-	-	-
38	2,4-dinitrotoluene	14.6	Non-Detect	-	-	-	-	-	-	-	-	-
39	Acetophenone	29.1	Non-Detect	-	-	-	-	-	-	-	-	-
40	Aniline	14.6	Non-Detect	-	-	-	-	-	-	-	-	-
41	Biphenyl	137	-	-	-	-	-	1,000 – 1,200	N/A	1,170	6,000 – 12,000	10,300
42	Dibenzofuran	798	-	-	-	-	-	-	-	-	-	31,300
43	Hexachlorobenzene	14.6	Non-Detect	-	-	-	-	-	-	-	-	
44	Pentachlorophenol	57.4	Non-Detect	-	-	-	-	-	-	-	-	-
45	Phenol	14.6	Non-Detect	-	-	-	-	Non-Detect – 7,700	NA	-	-	600
46	Quinolines	40.2	-	-	-	-	-	-	-	-	-	9,000
TCLP Semivolatile Organic Compounds by GC/MS												
47	o-cresol	0.05	Non-Detect	-	-	-	-	-	-	-	800 – 2,500	-
48	m,p-cresol	1.51	-	-	-	-	-	-	-	-	800 – 2,500	-
49	Hexachlorobutadiene	0.05	Non-Detect	-	-	-	-	-	-	-	-	-
50	Hexachloroethane	0.03	Non-Detect	-	-	-	-	-	-	-	-	-
51	Nitrobenzene	0.04	Non-Detect	-	-	-	-	-	-	-	-	-
52	Pyridine	0.20	Non-Detect	-	-	-	-	-	-	-	-	-
53	2,4,5-trichlorophenol	0.03	Non-Detect	-	-	-	-	-	-	-	-	-
54	2,4,6-trichlorophenol	0.03	Non-Detect	-	-	-	-	-	-	-	-	-
Base Neutral Semivolatile Organic Compounds by GC/MS SIM												
55	1-Methylnaphthalene	144	-	-	-	-	-	-	-	-	-	18,000
56	2-Methylnaphthalene	251	-	-	-	-	-	-	-	-	-	48,400
57	Acenaphthene	610	-	-	-	-	-	-	-	-	40,000 – 60,000	60,000
58	Acenaphthylene	58.6	Non-Detect	-	-	-	-	-	-	-	-	-
59	Anthracene	447	-	-	-	-	-	-	-	-	20,000 – 40,000	37,600
60	Benz(a)anthracene	201	-	-	-	-	-	-	-	-	-	14,000
61	Benzo(a)pyrene	81.9	-	-	-	-	-	-	-	-	1,000 – 4,000	3,900
62	Benzo(b)fluoranthene	128	-	-	-	-	-	-	-	-	2,000 – 4,000	4,200
63	Benzo(g,h,i)perylene	29.3	Non-Detect	-	-	-	-	-	-	-	-	1,700
64	Benzo(k)fluoranthene	57.9	-	-	-	-	-	-	-	-	-	2,800
65	Chrysene	182	-	-	-	-	-	-	-	-	10,000 – 12,000	12,200
66	Dibenz(a,h)anthracene	29.3	Non-Detect	-	-	-	-	-	-	-	200 – 400	400
67	Fluoranthene	1,100	-	-	-	-	-	-	-	-	60,000 – 80,000	74,100
68	Fluorene	529	-	-	-	-	-	-	-	-	-	43,900
69	Indeno(1,2,3-cd)pyrene	29.3	Non-Detect	-	-	-	-	-	-	-	500 – 1,000	1,200
70	Naphthalene	444	-	-	-	-	-	Non-Detect – 7,330		2,850	30,000 – 80,000	161,100
71	Phenanthrene	1930	-	-	-	-	-	-	-	-	110,000 – 140,000	141,300
72	Pyrene	930	-	-	-	-	-	-	-	-	40,000– 50,000	51,400
Organochlorine Pesticides by Gas Chromatography												
73	Chlordane	0.708	Non-Detect	-	-	-	-	-	-	-	-	-
TCLP Organochlorine Pesticides by Gas Chromatography												
74	Lindane	0.2380	-	-	-	-	-	-	-	-	-	-
75	Heptachlor	0.0001	Non-Detect	-	-	-	-	-	-	-	-	-
76	Methoxychlor	0.0003	Non-Detect	-	-	-	-	-	-	-	-	-
77	Toxaphene	0.0030	Non-Detect	-	-	-	-	-	-	-	-	-
Carbonyl Compounds by High Performance Liquid Chromatography (HPLC)												
78	Formaldehyde	1.6	Non-Detect	-	-	1.6 - 27	N/A	-	-	-	-	-

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Crosstie Sample				Solid Fuel				Liquid Fuel				
Unit		CDF Test Results[a]		COAL[b]		Wood & Biomass[b]		Fuel Oil			Coal Tar Oil	
No.	Analytes	Laboratory Result (ppm)	Laboratory Comment	US EPA Literature Sources (ppm)	US EPA OAQPS Database (ppm)	US EPA Literature Sources (ppm)	US EPA OAQPS Database (ppm)	Literature[b] Sources (ppm)	OAQPS[b] Database (ppm)	Refinery ICR (ppm)[c]	AWPA P1/P13 (ppm)[d]	MSDS Coal Tar Solution (P1/P2)[e]
Trace Metal HAP:												
79	Antimony (Sb)	<5	Non-Detect	0.5 – 10	Non-Detect – 6.9	Non-Detect – 26	Non-Detect – 6.0	Non-Detect – 15.7	Non-Detect – 3.8	-	-	-
80	Arsenic (As)	<10	Non-Detect	0.5 – 80	Non-Detect – 174	Non-Detect – 6.8	Non-Detect – 298	N/A	Non-Detect – 13	-	-	-
81	Beryllium (Be)	<0.5	Non-Detect	0.1 – 15	Non-Detect – 206	N/A	Non-Detect – 10	N/A	Non-Detect – 19	-	-	-
82	Cadmium (Cd)	<0.5	Non-Detect	0.1 – 3	Non-Detect – 19	Non-Detect – 3	Non-Detect – 17	N/A	Non-Detect – 1.4	-	-	-
83	Chromium (Cr)	<2.5	Non-Detect	0.5 – 60	Non-Detect – 168	Non-Detect – 130	Non-Detect – 340	N/A	Non-Detect – 37	-	-	-
84	Cobalt (Co)	<2.5	Non-Detect	0.5 – 30	Non-Detect – 25.2	Non-Detect – 24	Non-Detect – 213	N/A	Non-Detect – 8.5	-	-	-
85	Lead (Pb)	<10	Non-Detect	2 – 80	Non-Detect – 148	Non-Detect – 340	Non-Detect – 229	Non-Detect – 56.8	Non-Detect – 52	-	-	-
86	Manganese (Mn)	63	-	5 – 300	Non-Detect – 512	Non-Detect – 840	Non-Detect – 15,800	N/A	Non-Detect – 3,200	-	-	-
87	Mercury (Hg)	0.016100	-	0.02 – 1	Non-Detect – 3.1	Non-Detect – 0.2	Non-Detect – 1.1	N/A	Non-Detect – 0.2	-	-	-
88	Nickel (Ni)	<5	Non-Detect	0.5 – 50	Non-Detect – 730	Non-Detect – 540	Non-Detect – 175	Non-Detect – 50.2	Non-Detect – 270	-	-	-
89	Selenium (Se)	<5	Non-Detect	0.02 – 10	Non-Detect – 74.3	Non-Detect – 2	Non-Detect – 9.0	NA	Non-Detect – 4	-	-	-

(a) Represents constituent/contaminant data converted to ppm as appropriate originally obtained from Columbia Analytical Services, Inc., Qualitative Laboratory Test Report, Service Request No. T1201895.

(b) Information obtained from U.S. EPA's *"Contaminant Concentrations in Traditional Fuels: Tables for Comparison"* from U.S. EPA was acquired from www.epa.gov/osw/nonhaz/define/pdfs/nhsm_cont_tf.pdf.

(c) Constituent/contaminant data obtained from Table A-1 - Refinery Average Stream Hazardous Air Pollutant Compositions—Default Values of the *Emission Estimation Protocol for Petroleum Refineries Final ICR.*

(d) Constituent/contaminant data obtained from Coopers Creek Chemical Corporate Safety Data Sheet for Coopersote Creosote Oil (AWPA P1/P13).

(e) Constituent/contaminant data obtained from Material Safety Date Sheet (MSDS) NO. US 614838 for Creosote/Coal Tar Solution and Creosote Oil.

APPENDIX B –
CONSTITUENT/CONTAMINANT RAW TESTING RESULTS

R E P O R T

EVALUATION OF USED RAILROAD TIES TREATED WITH CREOSOTE FOR POLYNUCLEAR ORGANIC MATERIAL (POM) WHICH INCLUDES POLYNUCLEAR AROMATIC HYDROCARBONS (PAH)

Prepared for

Association of American Railroads
425 Third Street S.W., Suite 1000
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January 28, 2013

URS

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TABLE OF CONTENTS

Executive Summary

The Association of American Railroads (AAR) commissioned URS Corporation to perform this study of used creosote treated railroad ties. The objective of the study was to determine the levels of Polynuclear Organic Material (POM) which includes Polynuclear Aromatic Hydrocarbons (PAH) and other organic compounds in the ties to determine how they compare to other fuels for the purpose of the recent Non-Hazardous Solid Materials (NHSM) Rule. POMs are in the list of constituents of the Hazardous Air Pollutant (HAP) of the EPA air emissions rules.

URS personnel collected three samples of processed/chipped used railroad ties from each of two facilities: National Salvage located outside of Selma, Alabama, that was processing used ties from Norfolk Southern at the time of sampling, and a Stella Jones facility located in Duluth, Minnesota, processing used ties from BNSF. All six samples of processed railroad tie chips were packaged in airtight jars and shipped overnight to the Test America, North Canton, Ohio, Laboratory, which was chosen for its past experience in extracting and analyzing difficult solid matrices, including railroad ties. URS made arrangements with the laboratory to further reduce the size of the processed ties to a manageable size (<3 mm) for analysis, and then extract the samples using SW846 Method 3540C (Soxhlet extraction). GCMS analysis was conducted using SW846 Method 8270C. The samples were analyzed for the full RCRA Target Compounds List, which includes 17 PAH compounds, and also carbazole and dibenzofuran, two additional compounds EPA considers to be in the POM category. The results were reported on an as received basis, with the laboratory also reporting the moisture content.

A summary of the results of the analyses are presented in the tables within this report; the full lab reports are included as appendices. The sum of the nineteen POM compounds is also calculated and presented. The sum total of POM compounds for the six samples ranged from a low value of 12,600,000 ug/kg for National Salvage Truck 5, up to a high of 24,500,000 ug/kg for National Salvage Truck 3, with half of the samples (3) being over 20,000,000 ug/kg. For the final NHSM rule, EPA released a document (Docket ID EPA-HQ-RCRA-2008-0329-1877(1)) containing tables of concentrations of various compounds found in traditional fuel. EPA did not report values for other compounds such as carbazole and dibenzofuran, which though polycyclic organic compounds, are not considered aromatic hydrocarbons. This EPA document indicates that the PAH concentrations in petroleum fuel oils range from 3,900,000 ug/kg on up to over 54,000,000 ug/kg. This would put used railroad ties squarely within the range of PAH concentrations found in fuel oils. Also, PAH concentrations in coal tar oil are much higher than used railroad ties.

INTRODUCTION

The AAR commissioned URS Corporation to perform this project in January 2012. The purpose of this sampling and analysis initiative was to determine whether the Polynuclear Organic Materials (POMs) content of used creosote treated railroad ties is comparable to the concentrations of these constituents in traditional fuels such as of coal tar, and fuel oils. (The POM classification appears to be an EPA defined chemical group that primarily consists of Polynuclear Aromatic Hydrocarbons (PAHs), but apparently also may include some other cyclical organic compounds that may contain non-hydrocarbon functional groups.) In the re-issue of the Non-Hazardous Solid Materials NHSM Rule, EPA has stated that the determination as to whether a material is to be classified as a solid waste (as opposed to a recycled alternative fuel) is that the composition of that material in regards to HAP listed constituents must be comparable to the composition of a traditional fuel. EPA has further stated that the constituents of the material alone are to be considered, even if it can be demonstrated that emissions from that material when used as a fuel are comparable to emissions from any traditional fuel the material might replace.

SAMPLING AT NATIONAL SALVAGE

National Salvage is a railroad tie recycling operation located outside Selma, Alabama. URS Senior Chemist Peter Ciarleglio visited that facility on February 22, 2012, to collect samples and observe the operations. The facility personnel indicated that they only process used railroad ties; they do not receive reject stock from railroad tie manufacturers or other wood materials. The majority of used railroad ties received at the facility come from the Norfolk Southern Railroad, and URS confirmed that ties from that railroad were being processed during the time of the visit. The ties arrive in railroad cars; incoming ties are given priority for processing, since the railroad must get their rolling stock back as soon as possible. If the ties cannot be immediately processed, the ties must be stacked in large storage piles at the back of the facility, and later reloaded onto a few cars remaining at the site for processing. Please see the Photologs in the back of this report which depict the facility and operations.

The first stage of processing is to segregate ties that are in good condition for direct resale to commercial fencing operations, landscapers and other users. These ties are graded as to overall condition, with the best ties fetching the highest price. Overall, the facility recycles around 25-30% of the incoming ties in this manner.

The 70 to 75% remainder of the ties are left in the railroad cars and moved on to one of the two chipper stations. On the day URS was there, one of the chippers was down for maintenance. Here, the railroad ties are wetted down using recycled water stored in a lined pond on-site, to cut down on fugitive dust from the chipper. A crane then lifts loads of about 6 to 10 railroad ties at a time, and feeds them into the chipper. The shredded material is carried by a conveyor into waiting trucks to be shipped directly to two different nearby International Paper facilities which combust the material in their boilers for energy recovery. Samples were intended to be taken from a minimum of three different trucks by plant personnel. It was noted that the first two trucks sampled were also receiving significant amounts of "mulch" from a front end loader, that is chips that had escaped the chipper and mixed with the mud and wash water from the ground around the chipper. URS was concerned that these first two trucks might not be representative of the actual Railroad Tie Derived Fuel, so an additional three trucks (NS-Trucks 3, 4, and 5) were sampled. It was later decided that the samples from these last three trucks would be sent to the laboratory for analysis.

Sampling at the Stella Jones Site in Duluth, MN

Stella Jones Company operates a railroad tie recycling operation in Duluth Minnesota. This facility currently receives used railroad ties from Burlington Northern Railroad. Chris LaNasa of the URS Minneapolis office visited the facility on February 22, 2012. At the Stella Jones site, instead of using recycled water as done by National Salvage, dust was controlled using a vacuum cyclone over the point where the chips were fed into the RTDF collection trucks. Chris had three trucks sampled by plant personnel: SJ-Trucks 1, 2, and 3. It appears that all of the ties go through the chipper and are sent to energy recovery. Please see the Photolog in the back of this report which shows the facility and operations.

Sample Handling and Preparations

Each Truck sample was collected in a clean five gallon plastic paint bucket with an airtight lid. The samples were labeled and sealed, and first shipped overnight or directly transported to the URS Franklin, TN office. It was determined that an airtight seal was sufficient and that ice preservation would not be necessary, since the ties had been exposed to the elements for years and the material coming off the chipper was still quite coarse. In the two dimensions across the wood grain, the size of the bulk of the material was generally around 1 centimeter or slightly smaller in diameter. Along the axis of the wood grain, the bulk of the material ranged from one on up to around 15 centimeters in length. (See pictures of the typical material from NS-Truck 3 and NS-Truck 4.) After arriving at the URS office, each truck sample was thoroughly mixed, and enough material from each sample was taken to completely fill two quart mason jars. The mason jars were sealed and shipped to the Test America North Canton Laboratory. The three National Salvage samples were received at the lab on Friday, February 22, 2012, and the three Stella Jones samples were received the following Tuesday, February 28, 2012. After receipt, as per agreement with URS, the laboratory further processed the entirety of each sample received (two mason jars) by further grinding it into an appropriate size for the Soxhlet extraction (approximately 3-5 mm). An aliquot of the processed material was then extracted by Method 3540C without any further processing and analyzed for all the semi-volatile organic compounds on the CLP Target Compound List (TCL) by Method 8270C. Results were reported on an "as received" basis, and the percent moisture determination results were also reported.

DISCUSSION OF RESULTS

The compounds that were detected were poly-nuclear aromatic hydrocarbons (PAH) compounds and two other compounds that EPA has included within their somewhat broader definition of poly-nuclear organic materials (POM)—carbozole and dibenzofuran. The only other detected compound in some samples was 1, 1'-biphenyl, which is not a poly-nuclear compound. (The two phenyl groups are joined by a single bond in this compound and therefore are not polycyclic.) All other compounds on the TCL list were not detected in any of the samples. This includes the compounds hexachlorobenzene and 2,4-dinitrotoluene, reported by EPA as being potential constituents of creosote treated wood in the final rule. A summary of the results for all the poly-nuclear organic materials from the Stella Jones samples can be found in Table 1, and the same summary for the National Salvage samples is contained in Table 2. The complete laboratory report from Test America North Canton is included in this report as an Appendix.

The sum total POM compounds for the six samples ranged from a low value of 12,600,000 ug/kg for National Salvage Truck 5, up to a high of 24,500,000 ug/kg for National Salvage Truck 3, with half of the samples (3) being over 20,000,000 ug/kg. The contribution of the two compounds dibenzofuran and carbozole, which are not PAHs, is less than 10% of the POM sum in every sample, so the inclusion of these compounds by EPA does not affect the overall results to any significant extent. For the final rule, EPA released a document dated 11/29/11 (Docket ID EPA-HQ-RCRA-2008-0329-1877(1)) containing tables of concentrations of various compounds found in traditional fuel.

TABLE 1

Chipped Ties, Stella Jones Facility, Duluth, MN, 2012

	Sample SJ-Truck 1	**Sample SJ-Truck 2**	**Sample SJ-Truck 3**
Analyte	**Result (ug/kg)**	**Result (ug/kg)**	**Result (ug/kg)**
2-Methylnaphthalene	860000	910000	1100000
Acenaphthene	1500000	1600000	1900000
Acenaphthylene	34000	34000	40000
Anthracene	1100000	1000000	1400000
Benzo[a]anthracene	350000	370000	430000
Benzo[a]pyrene	100000	110000	130000
Benzo[b]fluoranthene	140000	200000	200000
Benzo[g,h,i]perylene	79000	81000	90000
Benzo[k]fluoranthene	91000	79000	95000
Carbazole	390000	380000	470000
Chrysene	320000	340000	400000

TABLE 1			
Chipped Ties, Stella Jones Facility, Duluth, MN, 2012			
	Sample SJ-Truck 1	Sample SJ-Truck 2	Sample SJ-Truck 3
Analyte	**Result (ug/kg)**	**Result (ug/kg)**	**Result (ug/kg)**
Dibenz(a,h)anthracene	ND	ND	ND
Dibenzofuran	970000	1000000	1200000
Fluoranthene	2300000	2500000	2900000
Fluorene	1300000	1400000	1700000
Indeno[1,2,3-cd]pyrene	84000	84000	95000
Naphthalene	2600000	2900000	3200000
Phenanthrene	4700000	5000000	6100000
Pyrene	1400000	1500000	1700000
Total POMs	**18,318,000**	**19,488,000**	**23,150,000**

TABLE 2			
Chipped Ties, National Salvage Facility, Selma, AL, 2012			
	Sample NS-Truck 3	Sample NS-Truck 4	Sample NS-Truck 5
Analyte	**Result (ug/kg)**	**Result (ug/kg)**	**Result (ug/kg)**
2-Methylnaphthalene	1,300,000	1,500,000	490,000
Acenaphthene	2,300,000	2,100,000	840,000
Acenaphthylene	39,000	79,000	49,000
Anthracene	1,600,000	1,200,000	880,000
Benzo[a]anthracene	680,000	580,000	450,000
Benzo[a]pyrene	190,000	230,000	180,000
Benzo[b]fluoranthene	310,000	340,000	310,000
Benzo[g,h,i]perylene	57,000	76,000	62,000
Benzo[k]fluoranthene	130,000	120,000	87,000
Carbazole	680,000	390,000	300,000
Chrysene	590,000	590,000	450,000
Dibenz(a,h)anthracene	ND	ND	ND
Dibenzofuran	1,500,000	1,400,000	570,000
Fluoranthene	3,500,000	3,200,000	1,800,000
Fluorene	2,000,000	1,700,000	770,000
Indeno[1,2,3-cd]pyrene	57,000	83,000	63,000
Naphthalene	1,400,000	1,400,000	1,100,000
Phenanthrene	5,800,000	5,500,000	2,900,000
Pyrene	2,400,000	2,200,000	1,300,000
Total POM	**24,533,000**	**22,688,000**	**12,601,000**

From the EPA document of 11/29/11, Table 3 shows that the total PAH content for fuel oils ranges from 3900-54,700 mg/kg. When the analyses of this report are converted to mg/kg, they average roughly 20,000 mg/kg, in the lower half of the range for fuel oils. The PAH content of RTDF is therefore completely comparable to or even lower than the concentrations found in fuel oil.

As it turned out, these laboratory results were very similar in PAH content to lab results included in comments by International Paper to the proposed NHSM rule (Docket ID EPA-HQ-RCRA-2008-0329-1158). That document contained some laboratory data for a single sample asserted to be RTDF that was analyzed in the 1990s. The sample was identified only as "Crossett Arkansas", and it came from a company called "Wood Waste Energy".

Finally, URS was concerned that the use of recycled water for dust control at the National Salvage facility might affect the PAH results, either through additional moisture content or the accumulation of PAHs in the recycled wastewater. This does not appear to have been the case. The percent moisture content of the railroad ties as analyzed by the lab appeared to be about equal from both of the sampled facilities. Also, the PAH results from samples from both facilities were comparable, with the possible exception of sample NS-Truck 5, which was somewhat lower than the other samples.

PHOTOLOG

APPENDIX A
Laboratory Analytical Report Samples from Stella Jones Facility

APPENDIX B
Laboratory Analytical Report Samples from National Salvage Facility

BEFORE THE
ENVIRONMENTAL PROTECTION AGENCY

DOCKET NO. EPA-HQ-RCRA 2008-0329:
NON-HAZARDOUS SECONDARY MATERIALS
THAT ARE SOLID WASTE

COMMENTS OF
THE ASSOCIATION OF AMERICAN RAILROADS

The Association of American Railroads (AAR),[1] on behalf of itself and its member railroads, submits the following comments on EPA's proposed reconsideration of its final rule identifying non-hazardous secondary materials that are considered solid waste when combusted.[2] AAR supports EPA's proposal to add a procedure by which EPA can identify materials that are not solid wastes when combusted, but believes that should be able to be accomplished without additional rulemaking proceedings. EPA also should consider allowing entities to satisfy the legitimacy criteria by comparing the level of contaminants per Btu in a material with the level in a traditional fuel.

I. Background: Creosote-Treated Wood

AAR's principal interest in this proceeding concerns the treatment of creosote-treated wood, specifically railroad crossties. Annually, railroads remove approximately 17 million crossties from their rights-of-way, with a majority burned for energy. About a third are used for landscaping. Only about 5 percent are disposed of in landfills. The ties, themselves, typically last for decades when placed in service.

[1] AAR is a trade association whose membership includes freight railroads that operate 76 percent of the line-haul mileage, employ 93 percent of the workers, and account for 96 percent of the freight revenues of all railroads in the United States; and passenger railroads that operate intercity passenger trains and provide commuter rail service.
[2] 76 Fed. Reg. 80,452 (Dec. 23, 2011).

When issuing the original final rule, EPA concluded that "creosote treated wood, when burned, seems more like a waste than a commodity and does not meet the legitimacy criterion for contaminants and, therefore, should be considered a waste when burned as a fuel."[3] AAR believes the data, in fact, show that used crossties burned in industrial boilers should be viewed as a valuable commodity rather than as a waste. AAR also believes that the application of the legitimacy criteria, as set forth in the final rule, is unsound public policy if the result is that the burning of crossties in industrial boilers is effectively prohibited. Designating crossties as solid wastes for combustion will have counterproductive environmental effects (and cost railroads $60 million or more annually):

- Instead of burning crossties in boilers for the generation of electricity, with acceptable emissions, railroads will be forced to landfill ties. The space required would be the equivalent of a football field 70 stories high – annually.
- When disposed of in landfills, some of the ties will degrade anaerobically, producing methane, a potent greenhouse gas.
- The carbon in wood ties will necessarily return to the atmosphere, through burning or decomposition. Consequently, unlike fossil fuels, the co-generation of ties does not increase greenhouse gas emissions. However, if the ties are disposed of in landfills rather than burned as fuel, fossil fuels likely would be used instead, with an annual greenhouse-gas penalty of 1.65 million tons $CO2_{eq}$.

AAR understands that this proceeding will not address the merits of EPA's conclusion regarding crossties. However, it is important to the railroad industry that EPA adopt a viable procedure for the railroads to make a showing that EPA should permit crossties to continue to be burned in industrial boilers nationwide. Neither the existing rule nor the proposed amendments contain such a procedure.

II. The Existing Procedure For Obtaining a Non-Waste Determination Is Impractical for Nationwide Determinations

The existing procedure for obtaining a non-waste determination will be unnecessarily burdensome for the railroad industry and for EPA if it is appropriate to reach a nationwide determination that crossties should be permitted to be burned in industrial boilers. The largest railroads operate in over 20 states, generating crossties throughout their systems. Creosote-treated ties, themselves, do not differ in material respects throughout the railroad network – recently, some ties have

[3] 76 Fed. Reg. 15,456, 483 (March 21, 2011).

been treated with both creosote and borate, but otherwise creosote-treated ties are treated only with creosote.

The existing procedure requires that each facility seeking a non-waste determination petition the Regional Administrator. For the railroad industry that would mean multiple facilities would have to petition their Regional Administrator and each Administrator would be making a determination based on identical evidence. Not only is that a waste of industry and EPA resources, but there is the possibility of Regional Administrators making contradictory decisions.

III. EPA Should Not Require A Rulemaking Proceeding

AAR congratulates EPA for recognizing that there should be an avenue for seeking a nationwide determination. However, it is illogical to suggest that rulemaking proceedings be used. Rulemaking proceedings are not required under the current system for Regional decisions on a facility-specific basis. There is no reason to require rulemaking here.

AAR would not object to giving the public an opportunity to comment on a proposed determination or notice of the final determination. However, a rulemaking proceeding would inevitably take a very long time to bring to a conclusion. Should the railroad industry file for such a determination, the railroads might be forced to landfill crossties that otherwise would be burned for energy for a considerable period of time while waiting for EPA to make a decision.

AAR also suggests that EPA include a deadline for a decision on an application for a determination that a material should not be considered solid waste when combusted. A deadline of 180 days from the date of submission would be reasonable.

Consequently, AAR suggests that proposed 40 C.F.R. subsection 241.4(b) be amended as follows:

> (b) Any person may submit an application to the Administrator for a determination that non-hazardous secondary materials are not considered solid wastes when used as a fuel in a combustion unit. Contents and procedures for submittal of the petitions include the following:
>
> (1) Each application must be submitted to the Administrator by certified mail and must include:
>
> (i) The applicant's name and address;

(ii) A statement of the applicant's interest in the proposed determination;

(iii) A description of the proposed determination, including (where appropriate) suggested language for the determination; and

(iv) A statement of the need and justification for the proposed determination, including any supporting tests, studies, or other information. Where the nonhazardous secondary material does not meet the legitimacy criteria, the applicant must explain why such nonhazardous secondary material should be considered a non-waste fuel, balancing the legitimacy criteria with other relevant factors.

(2) The Administrator will make a tentative decision to grant or deny the application and will publish notice of such tentative decision in the *Federal Register* for written public comment.

(3) Upon the written request of any interested person, the Administrator may, at its discretion, hold an informal public hearing to consider oral comments on the tentative decision. A person requesting a hearing must state the issues to be raised and explain why written comments would not suffice to communicate the person's views. The Administrator may in any case decide on its own motion to hold an informal public hearing.

(4) After evaluating all public comments the Administrator will publish a final decision in the *Federal Register*.

(5) The Administrator will grant or deny an application within 180 days of submittal based on the weight of evidence showing the following:

(i) The non-hazardous secondary material is not discarded in the first instance and is legitimately used as a fuel in a combustion unit, or if discarded, has been sufficiently processed into a material that is legitimately used as a fuel.

(ii) Where any one of the legitimacy criteria in section 241.3(d)(1) is not met, that the use of the non-hazardous secondary material is integrally tied to the industrial production process, that the non-hazardous secondary material is functionally the same as the comparable traditional fuel, or other relevant factors as appropriate.

IV. The Contaminant Legitimacy Criterion Should be Modified

A. <u>EPA's Proposed Clarification</u>

EPA proposed to clarify the contaminant legitimacy criterion in paragraph 241.3(d)(1)(iii) by

- making it clear that contaminant comparisons can be made by comparing the non-hazardous material with a traditional fuel that can be burned in the boiler at issue, whether or not the boiler is actually permitted to burn that fuel;
- stating that contaminant levels for traditional fuel comparisons can be from ranges from national surveys; and
- permitting contaminant comparisons on either a contaminant-by-contaminant basis or by comparing groups of contaminants.

AAR supports these clarifications for the reasons stated in the preamble to the notice of proposed rulemaking.

AAR also supports the use of the upper end of the statistical range of contaminant levels for traditional fuels when applying the contaminant legitimacy criterion. As EPA states, using anything lower would logically result in a determination that some traditional fuels should not be burned in combustion units designed to burn those fuels.[4]

B. <u>EPA Should Consider Contaminants per BTU</u>

In the preamble to the final rule, EPA acknowledged that comparing materials on the basis of pounds of contaminants per Btu made sense, but rejected utilizing such comparisons because of a lack of data.[5] EPA should permit entities to produce data showing that a material's contaminant per Btu level is comparable to a traditional fuel.

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[4] *See* 76 Fed. Reg. 80,481.

[5] 76 Fed. Reg. 15,456, 525, (March 21, 2012).

V. Conclusion

This proceeding is important to the railroad industry. If the industry does not have a viable way of obtaining a non-waste determination and crossties are classified as solid wastes for combustion purposes, the railroads might be forced to landfill their ties, which would adversely affect the environment and cost the industry millions annually. From both EPA's and the railroads' perspectives it makes sense to adopt a practical procedure for making nationwide non-preemption determinations.

Respectfully submitted,

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February 21, 2012

TREATED WOOD COUNCIL

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April 3, 2013

BY CERTIFIED MAIL

The Honorable Bob Perciasepe
Acting Administrator
U.S. Environmental Protection Agency
Mail Code 1101 A, Ariel Rios Building
1200 Pennsylvania Ave., N.W.
Washington, DC 20460

Re: Petition for Determination Identifying Non-Hazardous Secondary Treated Wood Biomass as a Non-Waste under 40 C.F.R. §241.4 (a)

Dear Acting Administrator Perciasepe:

The Treated Wood Council (TWC) submits the following petition under 40 C.F.R. § 241.4 (b) for a determination that non-hazardous secondary treated wood biomass (NHSTWB) is, as a category, not a waste. Further, TWC requests that NHSTWB be added to the materials identified in 40 C.F.R. § 241.4 (a) as a material that is not a solid waste when used as a fuel in a combustion unit. As demonstrated below, depending on the type of NHSTWB, it has either not been discarded in the first instance or is processed and managed pursuant to proven practices comparable to those EPA has previously approved; in both cases it is legitimately used as a fuel in a combustion unit. To the extent any of the legitimacy criteria specified in 40 C.F.R. § 241.3 (d)(1) are not met, NHSTWB is functionally the same as its comparable traditional fuel, and a balancing of all relevant factors, as relied upon in previous EPA non-waste determinations, requires that NHSTWB similarly be determined to be a non-waste. Supporting data for each of the types of NHSTWB covered by this petition are provided below.

1. **Petitioner's Name and Address**

Treated Wood Council
1111 19th Street, N.W., Suite 800
Washington, DC 20036

2. Statement of Petitioner's Interest in the Proposed Action

The TWC is an international trade association of the wood treating industry, serving more than 490 companies and associations related to the production of treated wood. TWC's members have for many years generated, used, sold, or bought NHSTWB as a legitimate fuel for energy recovery. TWC submits this petition for a national determination that this longstanding, beneficial, and environmentally sound practice constitutes combustion of a non-waste fuel and can continue without interruption.

3. Description of the Proposed Action

TWC requests that the following language be added to 40 C.F.R. § 241.4 (a):

> (5) Non-hazardous secondary treated wood biomass that is transferred from the generating site or organization to the combustion site under contractual agreements throughout its transfer. Such non-hazardous secondary treated wood biomass may also be combined with other traditional fuels or other materials listed in this section. For purposes of this section, "non-hazardous secondary treated wood biomass" includes wood treated with: waterborne borate-based preservatives, waterborne organic-based preservatives, waterborne copper-based wood preservatives (ammoniacal/alkaline copper quat, copper azole, copper HDO, alkaline copper betaine, or copper naphthenate); creosote; oilborne copper naphthenate; pentachlorophenol; or dual-treated with any of the above.

The relevant industry NAICS codes for this petition are: 321113 and 321114. The functional use code is U33.

4. Need and Justification for the Proposed Action

The proposed action is needed to redress EPA's generic conclusion that the use of non-hazardous secondary materials – including NHSTWB – for combustion is categorized as the burning of a solid waste unless otherwise determined after consideration of a petition filed under 40 C.F.R. § 241.4 (b). EPA incorporated this overall conclusion into 40 C.F.R. § 241.3 (a) with the adoption of its February 2013 final rule on Non-Hazardous Secondary Materials That Are Solid Waste.[1] To the contrary, as demonstrated below, NHSTWB is a valuable fuel that either is

[1] *Commercial and Industrial Solid Waste Incineration Units: Reconsideration and Final Amendments; Non-Hazardous Secondary Materials That Are Solid Waste*; Final Rule, 78 Fed. Reg. 9112 (Feb. 7, 2013) (February 2013 Final Rule).

not discarded or is properly processed and managed, and is legitimately used as a fuel in a combustion unit.

EPA's February 2013 final rule requires that petitioners demonstrate that the secondary material used as a non-waste fuel in a combustion unit (1) has not previously been discarded or, alternatively, has been properly processed and managed, and (2) either meets the legitimacy criteria or, after balancing the legitimacy criteria with other relevant factors, is shown not to be a solid waste when used as fuel. 78 Fed. Reg. at 9158-59. The legitimacy criteria are: (a) the secondary material is managed as a valuable commodity, and storage must not exceed reasonable time frames; (b) where there is an analogous fuel, the secondary material must be managed consistently with the analogous fuel; (c) the secondary material must produce meaningful heating value; and (d) the secondary material must contain contaminants at levels comparable to those in traditional fuels.[2] EPA recognized in its February 2013 final rule that TWC had submitted information in support of a determination that NHSTWB be added as a categorical non-waste, and that, as to one type of treated wood, creosote railroad ties, sufficient evidence had been provided that EPA expects to propose a categorical listing for these materials. 78 Fed. Reg. at 9174. TWC provides the following additional information in support of its petition for the addition of NHSTWB to 40 C.F.R. § 241.4 (a).

NHSTWB Used as Combustion Fuel Has Either Not Been Discarded or Has Been Properly Processed and Managed; Also It is Managed as a Valuable Commodity and Consistently with Traditional Fuels.

Treated wood is green, virgin wood – a material EPA recognizes as a traditional fuel – that has been treated with preservative solutions that slow its deterioration and extend its useful life in applications such as building products, railroad ties, and utility poles. After its primary useful life, NHSTWB products are in demand for their energy recovery value. For example, creosote-treated railroad ties, which are impregnated with a coal tar derivative (made up of traditional fuels) are sought-after as an alternative fuel because of their higher heat (measured as British thermal units or BTU) value, affordability, and availability. Commercial arrangements have for many years channeled NHSTWB materials to cement kilns, power plants, and other facilities, where they are handled as a valuable commodity and substitute for wood, coal, or other fossil fuels. They are managed and stored similarly to traditional fuels. The Class I railroads recycle nearly 60 percent of their used ties for energy recovery (and the remainder are largely

[2] *Identification of Non-Hazardous Secondary Materials That Are Solid Waste*; Final Rule, 76 Fed. Reg. 15456, 15551 (March 21, 2011) (March 2011 Final Rule).

recycled for other purposes).[3] Approximately 20 percent of utility poles are similarly reused for energy generation (and another 45 percent for other uses).[4]

As EPA's February 2013 final rule acknowledges,[5] TWC has previously submitted evidence to the record of substantial volumes of NHSTWB used as a valuable combustion source at a co-gen facility in central Pennsylvania that was exclusively designed to burn these materials. As the table in Attachment 1 demonstrates, over the course of more than twenty years, this facility has burned 2.3 million tons of NHSTWB as part of its intrinsic process to generate electricity, under contracts with 89 commercial entities that furnish used, treated wood for energy recovery purposes.

A second company, Zwicky Processing & Recycling, Inc., has provided information describing its facility in eastern Pennsylvania that grinds NHSTWB along with construction and demolition materials, which EPA has preliminarily concluded are not waste.[6] (See Attachment 2.) These materials, once combined, are used for combustion by cement plants, paper mills, and power generation facilities. This facility also was built specifically for these materials and, to give a sense of its current scale of operations, handled 140,000 tons of secondary NHSTWB and C&D wood during the first 10 months of 2012.

A third company has explained that its facility combusts 75% NHSTWB and 25% other forms of biomass to power its operations. A sample purchase contract entered into by this company for railroad ties used as a boiler biomass energy source was attached to TWC's February 2012 Comments in this proceeding.[7] If EPA fails to categorize these materials as non-waste, this plant could face a total shut down, without the availability of NHSTWB as a fuel source for this boiler.

TWC has also provided samples in the record of numerous executed contracts showing a variety of types of purchase agreements for NHSTWB used for electricity generation and fuel combustion, and of a "Fuel Supply Agreement covering creosote-treated materials (ties, poles,

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[3]See Comment submitted by J. Gauntt, Railway Tie Association, *Wood Crossties 2008 Benchmark Tie Disposal Survey*, Docket EPA-HQ-OPP-2003-0248-0086.

[4]Morrell, J. *Disposal and Re-use of Utility Poles in the Western United States: A Survey*, Proceedings of the American Wood Protection Ass'n., vol. 104, 268-271 (May 2008).

[5]78 Fed. Reg. at 9174.

[6]78 Fed. Reg. at 9173, *citing* 76 Fed. Reg. at 15,485.

[7]See Attachment 4 to TWC's Comments of February 20, 2012 in EPA Docket EPA-HQ-RCRA-2008-0329 (TWC February 2012 Comments).

posts, piling, and timbers) purchased by Viking Energy of Michigan as boiler fuel.[8] An additional statement notes the use of copper naphthenate NHSTWB ties as a valuable fuel, for example at the DTE plant in Wisconsin, which is permitted to burn copper naphthenate, borate, and creosote-treated wood secondary materials for energy generation. (See Attachment 3.) Further, TWC's February 2012 comments cited a statement submitted to the record by the State of Michigan's Department of Natural Resources and Environment, noting that in 2009, 16,625 tons of NHSTWB, including wood treated with creosote and pentachlorophenol, were burned for energy recovery and were eligible for renewable energy or advanced cleaner energy credits under Michigan's Clean, Renewable, and Efficient Energy Act.

Collectively, these submissions provide compelling evidence that NHSTWB is either not discarded or has been properly processed and managed, and that when used as a combustion fuel, it is regarded as a valuable commodity.

NHSTWB has a Meaningful Heating Value and is Used as Fuel in a Combustion Unit that Recovers Energy.

TWC has previously placed in the record data showing the higher BTU value of treated wood compared to that of virgin wood.[9] In short, NHSTWB has a moisture content of approximately 20 percent, compared to the 50 percent moisture content of untreated wood biomass. Wood preservatives do not reduce, and some add to, the heat value of wood. Treated wood used for fuel is typically drier than milling by-products, such as chips or bark, resulting in a higher heat value at approximately 7,000 BTU/pound (300,000 BTU/cf) for waterborne, and up to 8,000 (400,000 BTU/cf) for oilborne treated wood products.

Each Type of NHSTWB is Either Not Discarded in the First Instance or is Processed and Managed Pursuant to Proven Practices; Each Type Contains Contaminants at Levels that are Comparable to or Lower than the Traditional Fuels that the Combustion Unit is Designed to Burn, or is Functionally the Same as Its Comparable Traditional Fuel, and a Balancing of All Relevant Factors Supports Its Categorization as a Non-Waste.

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[8] See Attachments 2 and 3 to TWC's February 2012 Comments.

[9] See TWC Comments of August 2, 2010 in EPA Docket EPA-HQ-RCRA-2008-0329, Table 1 (TWC August 2010 Comments).

The types of NHSTWB covered by this petition are:

(1) Wood Treated with Waterborne Borate-Based Preservatives

(2) Wood Treated with Waterborne Organic-Based or Copper-Based Preservatives

(3) Wood Treated with Creosote (oilborne)

(4) Wood Treated with Oilborne Copper Naphthenate

(5) Wood Treated with Oilborne Pentachlorophenol

(6) Wood Dual-Treated with any of the above preservatives

In the discussion below, the different forms of NHSTWB are analyzed individually.

Wood Treated with Waterborne Borate-Based Preservatives

Waterborne borate-based preservatives add no HAPs to traditional wood and contain contaminants at levels that are comparable to those of the traditional fuel that a combustion unit is designed to burn (wood). (See Table I on the following page.) Wood treated with borate-based preservatives is virtually identical to untreated wood in terms of HAP content.

In fact, EPA has already determined that borate-treated wood "meets the legitimacy criterion on the level of contaminants and comparability to traditional fuels."[10] Waterborne borate-based treated woods are equivalent to "clean construction and demolition wood," which EPA considers a traditional fuel.[11] TWC requests that EPA provide a determination for waterborne borate-based preservatives that is consistent with that for clean construction and demolition wood.

[10] 76 Fed. Reg. at 15,484.

[11] 78 Fed. Reg. at 9138.

TABLE I. HAP and Other Components in Traditional Fuels and Wood Treated with Borate Waterborne Preservatives (ppm)				
HAP Component	**Wood + Borates**	**Untreated Wood/Biomass**[i]	**#2 Fuel Oil**[i]	**Coal**[i]
Volatile metals (Hg)	1.1	1.1	0.2	3.1
Semi-volatile metals (Cd, Pb, Se)	255	255	57	241
Low-volatile metals (Sb, As, Be, Cr, Co, Mn, Ni)	16,842	16,842	3,551	1,822
Total HAP metals	**17,098**	**17,098**	**3,608**	**2,066**
Chlorine	5,400	5,400	1,260	9,080
Fluorine	128	128	14	178
Nitrogen	4,600	4,600	3,000	54,000
Sulfur	6,100	6,100	57,000	61,300
Total VOC HAP	27	27	13,745	153
Total SVOC[ii] HAP	NA[iii]	NA	8,900	NA
Total POM[iv]	**2**[v]	**2**[v]	**54,700**	**2,090**
Total known HAP[vi]	**17,127**	**17,127**	**80,953**	**4,309**

[i] Maximum values cited in EPA, *Materials Characterization Paper In Support of the Final Rulemaking: Identification of Nonhazardous Secondary Materials That Are Solid Waste Traditional Fuels and Key Derivatives* (Feb. 7, 2011) (EPA 2011a), EPA, *Contaminant Concentrations in Traditional Fuels: Tables for Comparison* (Nov. 29, 2011) (EPA 2011b).
[ii] Semi-volatile organic compounds; includes phenol, cresols, biphenyl, dibenzofuran, and quinoline.
[iii] NA = Indicates either data not available, not yet analyzed, or cannot be expressed accurately in table.
[iv] Polycyclic Organic Matter (POM) is an EPA-defined chemical group that primarily consists of polynuclear aromatic hydrocarbons (PAH) but includes some other aromatic compounds that contain heteroatoms such as N and O.
[v] Data from *J. Physics: Conference Series* 151, 012004 (2009).
[vi] HAPs listed include only those with available data.

<u>Wood Treated with Waterborne Organic-Based Preservatives and Wood Treated with Waterborne Copper-Based Preservatives</u>

Waterborne organic-based and copper-based preservatives likewise add no HAPS to traditional wood. The HAP metals listed in Table II are naturally occurring in untreated wood and are not introduced during the treating process. The only metal introduced during treatment with waterborne preservatives is copper, which is not a listed HAP metal.

EPA has also required consideration of chemicals the combustion of which will result in the formation of HAPs.[12] As Table II on the following page indicates, nitrogen content in the waterborne organic-based and copper-based preservatives is below the levels found in wood and other traditional fuels.

[12] *Id*., at 9139.

TWC requests that EPA provide a determination for waterborne organic-based and copper-based preservatives that is consistent with that for clean construction and demolition wood.

TABLE II. HAP and Other Components in Traditional Fuels and "End of Life" Wood Treated with Organic & Copper-Based Waterborne Preservatives[i] (ppm)

HAP Component	**Copper-Based[ii]**					**Organic-Based[ii]**		**Untreated Wood[iii]**	**#2 Fuel Oil[iii]**	**Coal[iv]**
	ACQ	**CA**	**CuN-W**	**CX-A**	**KDS**	**PTI**	**EL2**			
Volatile metals (Hg)	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Semi-volatile metals (Cd, Pb, Se)	255	255	255	255	255	255	255	255	255	255
Low-volatile metals (Sb, As, Be, Cr, Co, Mn, Ni)	16,842	16,842	16,842	16,842	16,842	16,842	16,842	16,842	16,842	16,842
Total HAP metals	**17,098**	**17,098**	**17,098**	**17,098**	**17,098**	**17,098**	**17,098**	**17,098**	**3,608**	**2,066**
Chlorine	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400	1,260	9,080
Fluorine	128	128	128	128	128	128	128	128	14	178
Nitrogen	23[iv]	235[iv]	235[iv]	235[iv]	235[iv]	<235[iv]	<235[iv]	4,600	3,000	54,000
Sulfur	6,100	6,100	6,100	6,100	6,100	6,100	6,100	6,100	57,000	61,300
Total VOC HAP	27	27	27	27	27	27	27	27	13,745	153
Total SVOC[v] HAP	NA[vi]	NA	NA	NA	NA	NA	NA	NA	8,900	NA
Total POM[vii]	**2[viii]**	**2[viii]**	**2[viii]**	**2[viii]**	**2[viii]**	**2[viii]**	**2[viii]**	**2[vii]**	**54,700**	**2,090**
Total known HAP[ix]	**17,127**	**17,127**	**17,127**	**17,127**	**17,127**	**17,127**	**17,127**	**17,127**	**80,953**	**4,309**

[i] Assumes same values as in EPA 2011a and EPA 2011b.
[ii] AWPA Standard U1 abbreviations for waterborne preservative systems: ACQ = alkaline copper quaternary; CA = copper azole; CuN-W = waterborne copper naphthenate; CX-A = copper HDO; KDS = alkaline copper betaine; PTI = propiconazole + tebuconazole + imidacloprid; EL2 = DCOI + imidacloprid.
[iii] Maximum values cited in EPA 2011a and EPA 2011b.
[iv] Data from Ruddick 2013; average of all samples tested. Total Nitrogen numbers assayed in weathered ACQ-treated spruce used to estimate N content in wood treated with all Cu-based preservatives containing monoethanolamine (MEA) co-solvents. Wood treated with organic-based preservatives containing no MEA will contain an unknown but lesser amount of Nitrogen. Maximum Nitrogen content in untreated wood cited by OAQPS databases is 4600 ppm.
[v] Semi-volatile organic compounds; includes phenol, cresols, biphenyl, dibenzofuran, and quinoline.
[vi] NA = Indicates either data not available, not yet analyzed, or cannot be expressed accurately in table.
[vii] Polycyclic Organic Matter (POM) is an EPA-defined chemical group that primarily consists of polynuclear aromatic hydrocarbons (PAH) but includes some other aromatic compounds that contain heteroatoms such as N and O.
[viii] Data from *J. Physics: Conference Series* 151**,** 012004 (2009).
[ix] HAPs listed include only those with available data.

Wood Treated with Creosote (oilborne)

Wood treated with creosote is the subject of a previous petition submitted by other parties, supported by data that EPA has already considered. Based on these submissions, EPA's February 2013 final rule states that "EPA also expects to propose a categorical listing for this material."[13] While the previously submitted data are focused on creosote and creosote-boron railroad ties, they also apply to creosote-treated posts, pilings, and utility poles, as demonstrated by Table III below. TWC requests that EPA provide a categorical determination for creosote-treated ties, posts, pilings, and poles that they are non-wastes when combusted for energy recovery.

TABLE III. Estimated Concentration of Selected HAP in "End of Life" Creosote Treated Wood and Traditional Fuels (ppm)

HAP Component	**Creosote-treated wood**[i]	**Untreated Wood**[ii]	**Fuel Oil**[ii]	**Coal**[ii]
Volatile metals (Hg)	1.1	1.1	0.2	3.1
Semi-volatile metals (Cd, Pb, Se)	255	255	57	241
Low-volatile metals (Sb, As, Be, Cr, Co, Mn, Ni)	16,842	16,842	3,551	1,822
Total HAP metals	**17,098**[ii]	**17,098**	**3,608**	**2,066**
Chlorine (non-HAP)	5,400[ii]	5,400	1,260	9,080
Fluorine (non-HAP)	128[ii]	128	14	178
Nitrogen (non-HAP)	4,600[ii]	4,600	3,000	54,000
Sulfur (non-HAP)	6,100[ii]	6,100	57,000	61,300
Total VOC HAP	0.4	27	13,745	153
Total SVOC[iii] HAP	966	NA[iv]	8,900	NA
Total POM[v]	**20,130**	**2**[vi]	**54,700**	**2,090**
Total HAP[vii]	**38,194**	**17,127**	**80,953**	**4,309**

[i] Data from URS 2013. Evaluation of Used Railroad Ties Treated with Creosote for Polynuclear Organic Material (POM) which includes Polynuclear Aromatic Hydrocarbons (PAH). *Report dated January 28, 2013, prepared for* Association of American Railroads.
[ii] Maximum values cited in EPA 2011a and EPA 2011b, except where noted.
[iii] Semi-volatile organic compounds; includes phenol, cresols, biphenyl, dibenzofuran, and quinoline.
[iv] Indicates either data not available, not yet analyzed, or cannot be expressed accurately in table.
[v] Polycyclic Organic Matter (POM) is an EPA-defined chemical group that primarily consists of polynuclear aromatic hydrocarbons (PAH) but includes some other aromatic compounds that contain heteroatoms such as N and O.
[vi] Data from *J. Physics: Conference Series* 151**,** 012004(2009).
[vii] HAPs listed include only those with available data.

[13] 78 Fed. Reg. at 9174.

Wood Treated with Oilborne Copper Naphthenate

Copper naphthenate treating solution is diluted with fuel oil to make a solution of approximately 1 percent copper metal by weight. The naphthenic acid, a by-product of crude oil refining, consists primarily of long-chain hydrocarbons. It combusts in the same way as fuel oil with the same emissions and fuel value as fuel oil "traditional fuel."

The fuel oil contained in oilborne copper naphthenate NHSTWB may add 10 to 20 percent more heat value than untreated wood biomass. The fuel oil contained in copper naphthenate treated wood contains contaminants comparable to those in fuel oil, a traditional fuel, and, according to EPA's prescribed analysis, wood treated with oilborne copper naphthenate should be determined to be a non-waste when combusted in units designed to burn wood and fuel oil. (See Table IV below.)

TABLE IV. Estimated Concentration of Selected HAP in "End of Life" Copper Naphthenate (CuN) Treated Wood and Traditional Fuels (ppm)

HAP Component	CuN-treated wood[i]	Untreated Wood[ii]	Fuel Oil[ii]	Coal[ii]
Volatile metals (Hg)	1.1	1.1	0.2	3.1
Semi-volatile metals (Cd, Pb, Se)	255	255	57	241
Low-volatile metals (Sb, As, Be, Cr, Co, Mn, Ni)	16,842	16,842	3,551	1,822
Total HAP metals	**17,098[ii]**	**17,098**	**3,608**	**2,066**
Chlorine (non-HAP)	5,400[ii]	5,400	1,260	9,080
Fluorine (non-HAP)	128[ii]	128	14	178
Nitrogen (non-HAP)	4,600[ii]	4,600	3,000	54,000
Sulfur (non-HAP)	6,100[ii]	6,100	57,000	61,300
Total VOC HAP	379	27	13,745	153
Total SVOC[iii] HAP	33	**NA[iv]**	8,900	NA
Total POM[v]	**414**	*2[vi]*	**54,700**	**2,090**
Total HAP[vii]	**17,924**	**17,127**	**80,953**	**4,309**

[i] 0.08 pcf Cu & 4 pcf solution retention + 32 pcf wood @ 50% treatable volume = 0.94% w/w copper naphthenate (0.11% Cu) and 4.6% oil in total freshly treated wood mass. Wood assayed after 12 years exposure showed 35% average Cu loss (IRG/WP 00-30242); calculations assume 66% organic (diluent oil) loss based on creosote loss during service (URS report to AAR, 2013).
[ii] Maximum values cited in EPA 2011a and EPA 2011b.
[iii] Semi-volatile organic compounds; includes phenol, cresols, biphenyl, dibenzofuran, and quinoline.
[iv] Indicates either data not available, not yet analyzed, or cannot be expressed accurately in table.
[vi] Polycyclic Organic Matter (POM) is an EPA-defined chemical group that primarily consists of polynuclear aromatic hydrocarbons (PAH) but includes some other aromatic compounds that contain heteroatoms such as N and O.
[vi] Data from *J. Physics: Conference Series* 151, 012004 (2009).
[vii] HAPs listed include only those with available data.

The total HAP concentration in end-of-life copper naphthenate treated wood is slightly higher (less than 5%) than the total HAP concentration in untreated wood, but considerably less than the total HAP concentration in fuel oil. TWC requests that EPA provide a categorical determination for copper naphthenate treated wood NHSTWB that they are non-wastes when combusted for energy recovery in the same type boilers approved for creosote treated wood.

Wood Treated with Pentachlorophenol

Pentachlorophenol (penta) is a pesticide chemical manufactured by reacting phenol with chlorine. Phenol is a by-product of petroleum manufacturing. Penta is sold to wood preserving plants as either a solid block or a concentrated liquid. Solid penta is dissolved in petroleum oil, typically diesel or fuel oil grades. Liquid or dissolved-solid penta is diluted to approximately 5 to 10 percent in oil for the treatment solutions. Technical penta contains 86% pentachlorophenol with the balance other chlorinated phenols.

Penta-preserved wood contains approximately 4 pcf of fuel oil, used as a carrier for the penta in treatment. The fuel oil contained in penta-treated NHSTWB may add 10 to 20 percent more heat value than untreated wood biomass. Fuel oil is a “traditional fuel.” Penta contains chlorine, but to avoid double-counting the chlorine, this has not been listed separately, as penta including the chlorine is already listed as a HAP.

The HAPS in penta-treated wood are comparable to those in the traditional fuels wood, coal, and fuel oil, except for pentachlorophenol itself, which is an EPA-listed HAP (see Table V on the following page). The total HAP concentration in end-of-life pentachlorophenol treated wood is higher (about 16 %) than the total HAP concentration in untreated wood, but considerably less that the total HAP concentration in fuel oil. Pentachlorophenol is deliberately added to the wood for its preservative properties. Its presence in no more meaningful to this type of NHSTWB’s use as a legitimate fuel than the formaldehyde (also a listed HAP) in resinated wood, similarly added to the wood product for its desirable properties. In fact, the amount of pentachlorophenol in a treated wood utility pole at the end of its service life (approximately 1800 ppm) is a small fraction of the amount of formaldehyde-containing resin in a comparable unit of resinated wood used as fuel. As noted previously, energy generators have long relied on purchasing this form of biomass as an important fuel, with contracts in the record establishing these established commercial arrangements. The State of Michigan has specifically noted the legitimate use of penta NHSTWB as a clean fuel that is eligible for renewable energy or advanced cleaner energy credit under Michigan’s Clean, Renewable, and Energy Efficiency Act.[14]

[14] Comments of Steven R. Silver, Chief, Solid Waste and Land Application Section, Environmental Resource Management Division, Michigan Department of Natural Resources & Environment, at 8 (Aug. 3, 2010), filed in EPA Docket No. EPA-HQ-RCRA-2008-0329.

EPA has determined that, despite the higher level of formaldehyde in resinated wood compared to the traditional fuel wood, the balance of factors favors a determination that resinated wood secondary materials are properly viewed as fuel when combusted for energy recovery.[15] Like resinated wood, penta-treated wood is a sought-after fuel, has a long track record of commercial dealings evidencing its established use for energy recovery, has a high BTU value, is clearly considered and managed as a valuable commodity, is used in plants designed specifically to use this material; and like resinated wood, disrupting this established commercial relationship would cause adverse economic – and also environmental – consequences.

Based on a balancing of the relevant factors, using the same type of balancing analysis that EPA has followed in considering resinated wood, EPA should conclude that penta-treated NHSTWB is a categorical non-waste.

TABLE V. Estimated Concentration of Selected HAP in "End of Life" Pentachlorophenol Treated Wood and Traditional Fuels (ppm)

HAP Component	Pentachlorophenol-Treated Wood[i]	Untreated Wood[ii]	Fuel Oil[ii]	Coal[ii]
Volatile metals (Hg)	1.1	1.1	0.2	3.1
Semi-volatile metals (Cd, Pb, Se)	255	255	57	241
Low-volatile metals (Sb, As, Be, Cr, Co, Mn, Ni)	16,842	16,842	3,551	1,822
Total HAP metals	**17,098**[ii]	**17,098**	**3,608**	**2,066**
Chlorine (non-HAP)	6,691[ii]	5,400	1,260	9,080
Fluorine (non-HAP)	128[ii]	128	14	178
Nitrogen (non-HAP)	4,600[ii]	4,600	3,000	54,000
Sulfur (non-HAP)	6,100[ii]	6,100	57,000	61,300
Total VOC HAP	379	27	13,745	153
Total SVOC[iii] HAP	1865	NA[iv]	8,900	NA
Total POM[v]	**414**	**2**[vi]	**54,700**	**2,090**
Total HAP[vii]	**19,756**	**17,127**	**80,953**	**4,309**

[i] 0.38 pcf pentachlorophenol & 4 pcf solution retention + 32 pcf wood @ 50% treatable volume = 0.55% w/w PCP and 5.0% oil in total treated wood mass. Wood assayed after 8 years exposure showed 66% penta loss (IRG/WP-00-30242); calculations assume 66% diluent oil loss based on creosote loss during service (URS report to AAR, 2013).
[ii] Maximum values cited in EPA 2011a and EPA 2011b.
[iii] Semi-volatile organic compounds; includes phenol, cresols, pentachlorophenol, biphenyl, dibenzofuran, and quinoline.
[iv] Indicates either data not available, not yet analyzed, or cannot be expressed accurately in table.
[v] Polycyclic Organic Matter (POM) is an EPA-defined chemical group that primarily consists of polynuclear aromatic hydrocarbons (PAH) but includes some other aromatic compounds that contain heteroatoms such as N and O.
[vi] Data from *J. Physics: Conference Series* 151, 012004 (2009).
[vii] HAPs listed include only those with available data.

[15] 78 Fed. Reg. at 9155-58.

TWC requests that EPA provide a categorical determination for pentachlorophenol NHSTWB that they are non-wastes when combusted for energy recovery in the same type boilers approved for creosote treated wood.

Dual-treated Wood

Combinations of preservatives may be used for some treated wood products. The analysis does not differ from the foregoing discussion of each of these individual treatment chemicals. Like the underlying NHSTWB formulations, combined treatments should also be the subject of a categorical non-waste determination.

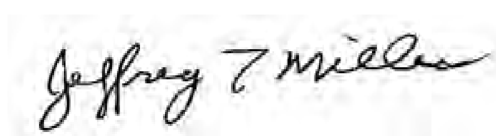
TWC requests that EPA provide a categorical determination for dual waterborne treated wood that is consistent with that for clean construction and demolition wood. TWC requests that EPA provide a categorical determination for dual treated NHSTWB using an oilborne preservative that they are non-wastes when combusted for energy recovery in the same type boilers approved for creosote treated wood.

Conclusion

Unless EPA properly classifies these materials as non-waste, they will be diverted to landfills, resulting in (1) the use instead of fossil fuels with higher net greenhouse gas emissions (GHG), and (2) the likelihood that landfilled treated wood will eventually break down to produce methane, with twenty times the comparable impact on climate change as carbon dioxide.[16]

For all the reasons set forth above, TWC requests that EPA issue a categorical determination that the specified non-hazardous secondary treated wood biomass materials are not a waste**.**

Respectfully submitted,



Jeffrey T. Miller
President & Executive Director

Cc: George Faison (Faison.george@Epa.gov)

[16] See, EPA, *Greenhouse Gas Emissions*, http://www.epa.gov/climatechange/ghgemissions/gases/ch4.html.

TREATED WOOD COUNCIL

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TWC responses to EPA request for additional information on NHSM Petition

May 20, 2013

1. List of specific preservatives under "organic waterbornes" and "copper-based waterbornes"

   Organic waterborne preservatives would include:
   - PTI (propiconazole tebuconazole imidacloprid)
   - EL2 [DCOI (4,5, dichloro-2-N-octyl-4-isothiazolin-3-one) imidacloprid/stabilizer]

   Copper-based waterborne preservatives would include:
   - ammoniacal/alkaline copper quaternary (dissolved or suspended) (ACQ)
   - copper azole (dissolved or suspended) (CA)
   - copper HDO (copper and N-cyclohexyldiazeniumdioxide)
   - alkaline copper betaine
   - waterborne copper naphthenate

2. List of end uses of the wood treated with each preservative

   a.) Waterborne borate-based preservative – interior framing and sill plates; (also see f. below)
   b.) Waterborne organic-based or copper-based preservatives – interior millwork and exterior residential dimensional lumber

applications such as decking, fencing, lattice, recreational equipment, structures.

c.) Creosote – railroad ties, utility poles, piling, agricultural fencing, bridge timbers.

d.) Oilborne Copper Naphthenate – utility poles, bridge timbers, railroad ties, pilings, fencing, cross arms

e.) Pentachlorophenol – utility poles and crossarms

f.) Dual-treated – railroad ties with borates and either creosote or oilborne copper naphthenate.

3. Chemistry detail of each preservative

Below are the chemistry details according to AWPA Standards and the NPIRS database. [EPA may be able to obtain additional information by researching the Confidential Statements of Formulae (CSF), which are part of the registration documents for each preservative on file in the EPA offices.]

AWPA Symbol	Common Name	Chemical Formula/Name(s)	CAS Number(s)	EPA PC Code
CR, CR-S	Creosote	Creosote	8001-58-9	25004
PCP	Pentachlorophenol	C_6HOCl_5	87-85-4	63001
CuN	Copper Naphthenate	Copper Naphthenate, oil-borne	1338-02-9	23102
ACQ-B	Alkaline Copper Quat Type B	$CuCO_3$ Didecyl- and dialkyl (C_8 or C_{12})-dimethylammonium chloride	1184-64-1 148788-55-0	22901 69208
ACQ-C	Alkaline Copper Quat Type C	$CuCO_3$ Alkyl (C_{12}-C_{18})benzyldimethyl-ammonium chloride	1184-64-1 68391-01-5	22901 69175
ACQ-D	Alkaline Copper Quat Type D	$CuCO_3$ Didecyl- and dialkyl (C_8 or C_{12})-dimethylammonium chloride	1184-64-1 148788-55-0	22901 69208
CBA-A	Copper azole Type A	$CuCO_3$ Boric Acid Tebuconazole	1184-64-1 10043-35-3 107534-96-3	22901 11001 128997
CA-B	Copper azole Type B	$CuCO_3$ Tebuconazole	1184-64-1 107534-96-3	22901 128997
CA-C	Copper azole Type C	$CuCO_3$ Propiconazole Tebuconazole	1184-64-1 60207-90-1 107534-96-3	22901 122101 128997

CuN-W	Waterborne Copper Naphthenate	Copper Naphthenate, waterborne	1338-02-9	23102
CX-A	Copper HDO	$CuCO_3$ Boric Acid Bis(N-Cyclohexyldiazenium-dioxy)-Copper	1184-64-1 10043-35-3 312600-89-8	22901 11001 235500
KDS	Alkaline Copper Betaine	$CuCO_3$ Boric Acid Boric acid (H_3BO_3), polymer with N-decyl-1-decanamine, oxirane and 1,2- propanediol	1184-64-1 10043-35-3 214710-34-6	22901 11001 103679
PTI	Propiconazole Tebuconazole Imidacloprid	Propiconazole Tebuconazole 1-((6-Chloro-3-pyridinyl)methyl)-N-nitro-2-imidazolidinimine	60207-90-1 107534-96-3 105827-78-9	122101 128997 129099
EL2	DCOI + Imidacloprid	4,5-Dichloro-2-N-Octyl-Isothiazolin-3-one 1-((6-Chloro-3-pyridinyl)methyl)-N-nitro-2-imidazolidinimine	64359-81-5 105827-78-9	128101 129099
SBX	Inorganic Boron Compounds, including:	Boric Acid Sodium Octaborate (DOT) Sodium Tetraborate (5 mol Borax) Sodium Tetraborate (10 mol Borax)	10043-35-3 12280-03-4 12179-04-3 1303-96-4	11001 11103 11110 11102

4. AWPA/ICC-ES Treatment Specification for each preservative

Below are the AWPA and ICC-ES treatment specifications for each preservative, in pounds per cubic foot or pcf.

AWPA Symbol	ICC-ES ESR No. = Above Grnd/Grnd Contact	Sawn Products (Lumber) AWPA UC2/UC3B/UC4A	Utility Poles (1) AWPA UC4B	Crossties/ Bridge ties AWPA (2)
CR, CR-S	NL (3)	8/8/10	7.5/9.0	7.0/7.0
PCP	NL	0.40/0.40/0.50	0.38/0.45	0.35/0.35
CuN (as Cu) (4)	NL	0.04/0.04/0.06	0.08/0.095	0.055/0.06
ACQ-B	1980 = 0.20/0.40	0.25/0.25/0.40	0.60/0.60	NL
ACQ-C	1980 = 0.20/0.40	0.25/0.25/0.40	NL	NL
ACQ-D	1980 = 0.20/0.40	0.25/0.15/0.40	NL	NL
Micronized ACQ	1980 = 0.15/0.34	NL	NL	NL
CBA-A	NL	0.20/0.20/0.41	0.61/NL	NL
CA-B	1721 = 0.10/0.15	0.10/0.10/0.21	0.31/NL	NL
CA-C	1721 = 0.06/0.14	0.06/0.06/0.15	0.31/NL	NL
Micronized CA	1721 = 0.06/0.15	NL	NL	NL
CuN-W (as Cu)	NL	0.07/0.07/0.11	NL	NL

CX-A	NL	0.206/0.206/NL	NL	NL
KDS	2500 = 0.188/0.363	0.19/0.19/0.47	NL	NL
PTI	1477 = 0.013/NL	0.013/0.013/NL	NL	NL
EL2	NL	0.019/0.019/NL	NL	NL
SBX	2667 = 0.28 (5)/NL	0.28(5)/NL/NL	NL	NL

5. Typical pathway for each preserved wood from end use to combustor – and how they are managed (stored for short period prior to combustion in enclosed area etc.; what processing occurs e.g grinding etc.

   For railroad ties and utility poles (creosote, pentachlorophenol, copper naphthenate and dual-treated), the pathways are identical. Ties and poles are often combusted together, dependent on state permits.

   a.) The user organization (railroad or utility company, or its contractor) removes the old pieces from service
   b.) The organization inspects them, sorts out pieces that might be re-used for another application, and performs an initial separation of non-combustible materials, such as spikes, plates, transmission wire and insulator bulbs
   c.) Pieces are stored in staging areas until shippable quantities are collected
   d.) Shippable quantities are transported via truck or rail to a reprocessing center
   e.) At the reprocessing center, pieces are again inspected, sorted, and non-combustible materials are removed. Re-usable pieces are separated from combustible pieces.
   f.) Combustible pieces then undergo size reduction and possible blending with compatible combustibles
   g.) Last step is to ship the final bio-material to combustion sites
   h.) The above material is obtained and sold through purchase orders, contracts, or some other written agreement. In today's market, typical commodity prices range from $15 to $20 per ton.

For all other preservative types and sources (i.e. wood treated with borate, organic and copper-based waterbornes, and other creosote, pentachlorophenol or oilborne copper naphthenate), the pathway would be the same above, except with a different starting organization.

a.) The sourcing organization (installation or demolition company, or refuse service) collects installation scraps and old pieces removed from service before entering the waste stream, together with other C&D combustible materials such as non-preserved wood
b.) The organization inspects them, sorts out pieces that might be re-used for another application, and performs an initial separation of non-combustible materials, such as nails, sheetrock, electrical wire and plastic components
c.) Pieces are placed in containers or on flatbed trailers until shippable quantities are collected
d.) Shippable quantities are transported usually via truck to a reprocessing center, usually as part of a contractual agreement
e.) At the reprocessing center, pieces are again inspected, sorted, and non-combustible materials are removed
f.) Pieces then undergo size reduction and possible blending with compatible combustibles
g.) Last step is to ship the final bio-material to combustion sites.
h.) The final material is sold through purchase orders, contracts, or some other written agreement.

6. % of each HAP in SVOC's (Semi-volatile Organic Compounds)

In Tables I through V of the TWC Petition of April 3, 2013, there is a line listing "Total SVOC HAP". EPA is seeking to determine the percentages of which HAP's are in the listed amounts of SVOC's.

In Tables I and II, there are no SVOC's added to the treated wood. The only SVOC listed value is for Fuel Oil (a traditional fuel), and the 8,900 ppm number is derived from the EPA document "Contaminant Concentrations in Traditional Fuels: Tables for Comparison", dated Nov. 29, 2011 (EPA 745-B-00-004(2000)). Table 3 of the EPA document lists only phenol and biphenyl as SVOC HAPs.

This same SVOC number for Fuel Oil is also included in Tables III, IV and V.

In Table III, the Total SVOC HAP value for creosote treated wood (966 ppm) consists of a mixture of biphenyl and dibenzofuran. The value is derived from the analytical lab results found in Appendix B of the URS report, already submitted to EPA as part of the petition covering creosote-treated railroad ties.

In Table IV, the Total SVOC HAP value for CuN treated wood (33 ppm) consists of cresols and the fuel oil diluents used in the treating process.

In Table V, the Total SVOC HAP value of pentachlorophenol treated wood (1865 ppm) consists of pentachlorophenol and the fuel oil diluents used in the treating process.

Our goal is to compare total SVOC's in treated wood to total SVOC's in traditional fuels. In all cases, the SVOC level in each treated wood is either equal to the level in untreated wood or significantly less than the level found in fuel oil, the traditional fuel.

7. Logic explanation of losses during use

EPA seeks an explanation of preservative component losses during use:

a.) For borate treated wood, Table I in the TWC petition shows no losses during use. Since no HAPs are introduced in the treatment process, we did not make an adjustment for losses.

b.) For organic and copper-based waterborne treated wood, Table II in the TWC petition shows "end of life" concentrations in the wood as determined by the 2013 Ruddick Report (attached) on 4-year old ACQ treated wood. This loss factor was applied to concentrations for organic and waterborne treated wood for the one known HAP (N) that is added as part of the treatment.

c.) For creosote, pentachlorophenol and oilborne copper naphthenate treated wood, Tables III, IV and V in the TWC petition show "end of life" concentrations in the wood based upon data in a URS 2013 report for the Association of American Railroads (attached). We calculated the loss from the original starting points for creosote due to the fuel oil carrier, and determined a loss factor. That factor was applied to these similar types of treated wood which utilize fuel oil carriers.

TAB 3

BARNES & THORNBURG LLP

1717 Pennsylvania Ave. N.W.
Suite 500
Washington, D.C. 20006-4623
202-289-1313
202-289-1330 (Fax)

April 26, 2013

Suzanne Rudzinski
Director
Office of Resource Conservation and Recovery
Office of Solid Waste and Emergency Response
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Mail Code: 5301P
Washington, DC 20460

Re: Construction and Demolition Wood Non-Waste Determination

Dear Ms. Rudzinski:

On December 7, 2012 the Biomass Power Association and the Construction Materials Recycling Association Issues and Education Fund submitted a request for a C&D wood non-waste determination. The submittal consisted of a cover letter, an Appendix A, which contained tables comparing contaminant concentrations in processed C&D wood to those in traditional fuels, and a supporting Excel file, "Traditional Fuels Comparison." The submittal also included a memorandum from Waste Management containing additional data from four C&D wood processing facilities. Prompted by questions raised by your staff about the contaminant and heating value data, we have reviewed our submittal and supporting data, made appropriate revisions, and are herewith submitting a revised Appendix A and Excel file to replace those submitted on December 7. We are also submitting a revised memorandum from Waste Management which replaces the original memorandum.

Following discussions with your staff, we took a number of actions that resulted in this revised submittal. First, we responded to the question whether values reported in the Appendix A tables and Waste Management memorandum were on a dry or wet basis by checking and correcting data as appropriate to assure all contaminant data are reported on a dry basis, and all heating value (HHV) data are reported on a wet (as-received) basis. This resulted in changes to the contaminant values for the Minnesota data (Table 1), the Massachusetts data (Table 3), the New York data (Table 4) and the data from Waste Management facilities, and changes to the HHV data for Minnesota, Washington (Table 2), New York, and the Waste Management facilities.

Second, we combined the datasets that were submitted in Appendix A and the Waste Management memorandum. This was done in an effort to create consistency among all the data in this complete submission package and to create an overall more comprehensive dataset. The Waste Management memorandum contained data from four different C&D wood fuel producers. One of the producers is located in Wisconsin, two are located in California and one is located in Massachusetts. As such, the Wisconsin facility created its own dataset table (Table 7), the two

California facilities were combined to create a single dataset table (Table 6) and the Massachusetts facility data was added to the existing Table 3. In total, Appendix A now has C&D wood fuel data from producers and/or combustors from seven different states.

Third, we obtained and reviewed data sources -- laboratory and regulatory reports -- to assure the accuracy of data reported in the Appendix A tables. From our review of the NY data lab reports, we were unable to verify some of the data on which our December submittal was based, so we decided to reconstruct the NY data (Table 4) from the beginning using all available lab reports obtained from facility files and laboratory records. We have sent Mr. Dixon an e-mail with additional explanation of what we did to prepare the revised NY data. Additionally, the Maine dataset (Table 5) was reconstructed. This was done in an effort to strengthen the supporting data documentation and to present C&D wood fuel data that is more representative of the contaminant concentrations found in C&D wood that is currently burned in Maine. This was explained in greater detail within an email sent to Mr. Dixon, as well.

Fourth, we revised the contaminant groupings in all tables to be consistent with the final NHSM rule promulgated February 7, 2013. This resulted in 1) replacing the total metals grouping with semi-volatile metal (SVM) and low volatile metal (LVM) groupings, and 2) deleting bromine from the contaminants list.

Finally, we made some wording and presentation changes that should make the tables more complete and easier to follow.

Hopefully we have addressed EPA's questions. Please contact us should you have any additional need.

Sincerely,

S. P. Bodine

Susan Parker Bodine

cc: Betsy Devlin (via email)
George Faison (via email)
Ken Dixon (via email)

Attachments
Revised Appendix A
Revised Data in Excel format
Revised Memorandum from Waste Management

April 25, 2013

TO: Ms. Susan Parker Bodine, Barnes & Thornburg
FROM: Kerry Kelly, Waste Management

Re: Revisions to Memo dated November 29, 2012:
Summary of Waste Management C&D wood fuel data

Based on review and comment from EPA of the subject memo dated November 29, 2012, WM has revised the memo. The analytical data in the memo are now provided on a dry basis except for high heating value, which is on a wet basis.

WM selected four C&D Wood production facilities to conduct a representative study of C&D Wood processing activities and the resulting characteristics of the wood fuel produced. The selected facilities and a description of the general processing activities used to generate C&D Wood fuel (fuel source) are as follows:

(W) Wisconsin Facility – Positive Sorting

(CA1) California #1 Facility – Positive Sorting

(CA2) California #2 Facility – Negative Sorting

(MA) Massachusetts Facility – Negative Sorting

Positive sorting refers to sorting material (e.g., C&D) to extract the desired materials. In a positive sort facility, machinery and staff sort the incoming feedstock to extract the clean, untreated and unpainted wood for processing into a fuel. Negative sorting refers to extracting unwanted components of the feedstock material, such as undesirable wood, inert materials and metals. The extracted material is either recycled or disposed, while the remaining desirable wood is processed into fuel.

WM Study Procedures and Results

WM used a testing protocol to ensure, to the highest degree, that a representative set of samples were collected for analysis. The study protocol required that each plant collect representative daily composite samples over the course of one work week, as well as maintain a detailed description of the incoming material and processing practices at each facility. The daily composite samples were shipped to NELAC-certified laboratories where each sample was homogenized to further ensure representative results. This was achieved by freeze drying and crushing each individual composite sample in accordance with the laboratory's detailed standard operating procedures. In addition to the quality assurance procedures of the NELAC laboratory, one sample from each facility was analyzed in triplicate to evaluate the repeatability of the laboratory analysis. The attached tables provide a contaminant comparison of the analytical results to EPA's dataset of traditional wood and biomass fuels. For each analyzed contaminant, WM applied EPA software, ProUCL (version 4.0), to determine the 90 percent upper prediction limit and compared this value to the maximum value from the EPA database.[1]

Impacts of Processing on Contaminant Comparisons

The table below displays the average concentration of formaldehyde for each of the facilities during the testing period.

Table 1 Average Formaldehyde Concentrations For Each Tested Facility

Pollutant	W	CA1	CA2	MA
Formaldehyde [ppm]	74.6	22.3	17.6	68.2
Sorting	Positive	Positive	Negative	Negative

These results indicate that variations in formaldehyde are not based on the type of sorting conducted at these facilities.

Likewise, the table below displaying the average concentrations of arsenic, chromium and lead at each facility during the testing period indicates similar results.

Table 2 Average Concentrations For Each Tested Facility

Pollutant	W	CA1	CA2	MA
Arsenic (ppm)	3.2	6.0	3.1	142
Chromium (ppm)	5.3	12.2	10.3	168
Lead (ppm)	149	89.6	58.4	260
Sorting Type	Positive	Positive	Negative	Negative

[1] Contaminant Concentrations in Traditional Fuels: Tables for Comparison, November 29, 2011, http://www.epa.gov/osw/nonhaz/define/pdfs/nhsm_cont_tf.pdf

Impact of Incoming Material Variations on Contaminant Comparisons

As previously discussed, the variation of processing methods at each individual facility did not noticeably contribute to the differences in contaminant concentrations observed in each facility's finished fuel product. However, the variation in incoming materials at each facility has a recognizable effect on the final contaminant concentrations. Some facilities receive a much higher percentage of untreated or "clean wood" as a component of their feedstock for processing. Higher percentages of untreated wood may come from, for example, woody biomass used to mix with the C&D wood in the final fuel product, pre-sorted materials delivered from construction sites, from landfills with wood separation programs, or from new construction sites, which tend to have a smaller percentage of unused treated or painted wood. Revisiting Table 2 above, it is clear that the MA Facility had significantly higher average arsenic, chromium, and lead concentrations. When reviewing the types of materials that were processed during the sampling study, it becomes evident that these contaminant levels are largely influenced by incoming materials to the facility. Table 3 below displays the variation of incoming materials seen by CA2 and MA over the week of sampling and the calculated concentrations (see attached tables for details).

Table 3 Incoming Materials Comparison

Incoming Material Type	CA2	MA
Mixed C&D Materials	43.7 %	95.5 %
Clean Untreated Wood	56.3 %	4.5 %
Average Arsenic (ppm)	3.06	142
Average Chromium (ppm)	10.3	168
Average Lead (ppm)	58.4	260

C&D Materials includes standard C&D materials, as well as pallets, construction wood, fencing, decking, etc.

As seen, CA2 had a considerably higher percentage of clean wood in its incoming materials and a lower mixed C&D portion. C&D materials that have not yet been processed can potentially have a significant concentration of copper chromium arsenate (CCA) treated wood, painted wood, as well as other resinated woods, which are the primary sources of arsenic, lead, chromium and other contaminants. As a result of these varying proportions of clean and resinated wood, CA2's finalized product had a cleaner feedstock to process into a wood fuel.

Analysis of High Lead Values

In the previous submittal, the comparison of lead was based on a wet basis. That has since been updated. In that comparison, the lead content was essentially equal to or lower than the traditional wood/biomass fuel listed in the OAQPS database. Revising the wet basis data to be on a dry basis, we find that the lead content of two facilities, W and MA, had 90% UPL values of lead that exceeded the maximum value listed in the OAQPS database.

Lead sample measurements at the W facility were 482, 323, 67.2, 54.6, 44.1, 39.5, and 32.0 ppm. Of the five sampling days from the W facility, one day produced a value of 482 ppm which is above the maximum lead value in the OAQPS database (340 ppm). All of the remaining values are lower than the maximum value reported in the OAQPS database and significantly below the value of 482 ppm. Presuming a normal distribution of sampling data, the statistics of the 6 samples other than 482 ppm, have an upper 99 percent t-test range of 474 ppm. Assuming a 6-sample t-test, for a one sided tail at 99%, the t-value equals 3.365. With an average lead concentration of 93.39 ppm and a standard deviation of 113.12, the upper range yields a value of 474 ppm (93.39 + 3.365 * (113.12). Thus, the value of 482 ppm is above the 99% t-test and therefore, it can be argued that this value is non-normal and not representative of the typical lead values from the C&D wood from this facility.

Analyzing this value a bit further; lead belongs in the semi-volatile metals category along with cadmium and selenium. The 90% UPL for both of these metals, cadmium and selenium, are significantly less in the W dataset than they are in the OAQPS dataset. While the difference between the two datasets still does not create a SVM grouping comparison below the OAQPS dataset because the relative concentrations of cadmium and selenium are less than lead, the grouping lessens the difference between the two groups to just over 20%, as determined from the data in Table 4.

Of the five sampling days from the MA facility, two of the days produced a value above the maximum lead value in the OAQPS database. These two days had lead concentrations, by dry weight, of 407 and 437 ppm. The other three days of testing shows an average lead concentration of 193 ppm. While these high values are likely not outliers, it is safe to say that the range of lead concentrations from this facility does span a wide range, with a majority of the values being lower than the maximum value reported in the OAQPS database.

When doing a grouping comparison of semi-volatile metals, a similar scenario to the W dataset is shown. The significantly lower cadmium and selenium values create about a 20% difference between the MA facility SVM grouping and the OAQPS SVM grouping. Also, as shown in Table 3 of Appendix A in the complete submittal, when combined with the other existing Massachusetts data, the 90% UPL of the complete dataset shows a value less than the maximum reported for traditional fuels.

Conclusion

The WM facilities evaluated represent C&D wood processing locations across the U.S. and represent the various processing practices that are common across the industry. Thus, the pollutant comparisons for each individual facility and the comparison for the combined datasets were conducted to provide assurance that all C&D processing facilities are anticipated to produce similar values.

Table 4 90% UPL Comparison

SUMMARY OF WASTE MANAGEMENT C&D WOOD FUEL STUDY							
Compound	Units	EPA Data Wood and Biomass[1]	Waste Management C&D Wood (90% UPL)[2,3]				
		Max	W	CA1	CA2	MA	All facilities
Antimony (Sb)	ppm	26	0.59	12.0	2.76	5.5	10.1
Arsenic (As)	ppm	298	5.74	25.4	5.60	273	200
Beryllium (Be)	ppm	10	*	0.1	0.07	0.16	0.08
Cadmium (Cd)	ppm	17	0.83	0.3	0.42	1.2	0.96
Chromium (Cr)	ppm	340	8.77	25.0	15.5	301	224
Cobalt (Co)	ppm	213	0.6	2.5	2.5	2.72	2.52
Lead (Pb)	ppm	340	449	212.0	134.8	443	357
Manganese (Mn)	ppm	15800	72.3	125.3	129.5	139	116
Mercury (Hg)	ppm	1.1	0.34	0.2	0.23	0.68	0.30
Nickel (Ni)	ppm	540	3.43	10.7	11.0	27.4	13.0
Selenium (Se)	ppm	9.0	*	*	*	*	*
Total SVM+	**ppm**	**366**	**449**	**213**	**136**	**444**	**357**
Total LVM+	**ppm**	**17227**	**83.4**	**171**	**160**	**669**	**518**
Chloride	ppm	5400	364.9	3366	1272	2848	1750
Fluoride	ppm	300	67	171	172	46	144
Total Halogens+	**ppm**	**5700**	**400**	**3436**	**1388**	**2659**	**1881**
Formaldehyde	ppm	27.0	149	61.5	27.8	151	105
Nitrogen	wt %	3.95	1.00	0.66	1.10	1.11	0.96
Sulfur	wt %	0.87	0.05	0.10	0.18	0.21	0.15

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.
[2] (W) Wisconsin. Sampling Occurred Between 7/30/2012 – 8/6/2012, (CA1) California. Sampling Occurred Between 7/23/2012 – 8/1/2012, (CA2) California Sampling Occurred Between 7/30/2012 – 8/3/2012, (MA) Massachusetts. Sampling Occurred Between 7/30/2012 – 8/3/2012. All results reported on Dry Basis.
[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.
* - non-detect. Only one distinct observation value in the data set, resulting in "0" variance. Therefore, no statistical analysis can be performed
SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co, Mn, Ni)
+ C&D samples, Total Min., Max, Avg., and 90% UPL are selected from the individual samples and not the combination of sample values.

Compound	Units	Literary Sources[1] Wood and Biomass		OAQPS Databases[1] Wood and Biomass			C&D Samples from W[2]			
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	26	ND	6.0	0.9	0.18	0.53	0.39	0.59 (a)
Arsenic (As)	ppm	ND	6.8	ND	298	6.3	1.15	5.72	3.2	5.74 (a)
Beryllium (Be)	ppm	--	--	ND	10	0.3	0.010	0.011	0.010	*
Cadmium (Cd)	ppm	ND	3	ND	17	0.6	0.24	0.95	0.43	0.83 (b)
Chromium (Cr)	ppm	ND	130	ND	340	5.9	2.11	9.52	5.30	8.77 (a)
Cobalt (Co)	ppm	ND	24	ND	213	6.5	0.19	0.54	0.39	0.6 (a)
Lead (Pb)	ppm	ND	340	ND	229	4.5	32.0	482.3	149.0	449 (b)
Manganese (Mn)	ppm	7.9	840	ND	15800	302	55.8	74.18	63.6	72.3 (a)
Mercury (Hg)	ppm	ND	0.2	ND	1.1	0.03	0.053	0.416	0.16	0.34 (b)
Nickel (Ni)	ppm	ND	540	ND	175	2.8	0.47	3.43	1.01	3.43 (c)
Selenium (Se)	ppm	ND	2	ND	9.0	1.1	0.34	0.34	0.34	*
Total SVM+	**ppm**	**ND**	**345**	**ND**	**255**	**6.2**	**32.7**	**483**	**150**	**449 (b)**
Total LVM+	**ppm**	**7.9**	**1567**	**ND**	**16842**	**324.7**	**65.2**	**85.4**	**73.9**	**83.4 (a)**
Chloride	ppm	ND	2600	ND	5400	259	205	386	257.2	364.9 (a)
Fluoride	ppm	ND	300	ND	128	32.4	14	67	21.9	67 (a)
Total Halogens+	**ppm**	**ND**	**2900**	**ND**	**5528**	**291.4**	**219**	**400**	**279**	**400 (c)**
Formaldehyde	ppm	1.6	27.0	--	--	--	25.3	171.3	74.6	149.4 (a)
Moisture	wt %	--	--	--	--	--	17.00	24.13	20.33	23.78 (a)
Ash	wt %	--	--	--	--	--	0.63	1.04	0.85	1.084 (a)
Volatile Matter	wt %	--	--	--	--	--	79.63	80.36	80.09	80.51 (a)
Nitrogen	wt %	0.02	3.95	0.22	0.46	0.346	0.42	1.00	0.54	1.00 (c)
Sulfur	wt %	ND	0.87	ND	0.61	0.070	0.02	0.05	0.03	0.05 (c)
HHV	Btu/lb	--	--	--	--	--	5920	7061	6685	7319 (a)

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.
[2] Sampling Occurred Between 7/30/2012 – 8/6/2012. All results reported on Dry Basis. HHV reported on As Received basis.
[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.
Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics
* - non-detect. Only one distinct observation value in the data set, resulting in "0" variance. Therefore, no statistical analysis can be performed
HHV – High Heat Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co, Mn, Ni)
+ C&D samples, Total Min., Max, Avg., and 90% UPL are selected from the individual samples and not the combination of sample values.

Compound	Units	Literary Sources[1] Wood and Biomass		OAQPS Databases[1] Wood and Biomass			C&D Samples from CA1[2]			
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	26	ND	6.0	0.9	0.29	12.0	5.02	12.0 (c)
Arsenic (As)	ppm	ND	6.8	ND	298	6.3	1.30	25.4	6.03	25.4 (c)
Beryllium (Be)	ppm	--	--	ND	10	0.3	0.05	0.07	0.06	0.1 (a)
Cadmium (Cd)	ppm	ND	3	ND	17	0.6	0.18	0.32	0.24	0.3 (a)
Chromium (Cr)	ppm	ND	130	ND	340	5.9	4.54	29.1	12.23	25.0 (a)
Cobalt (Co)	ppm	ND	24	ND	213	6.5	0.59	2.95	1.39	2.5 (a)
Lead (Pb)	ppm	ND	340	ND	229	4.5	16.7	252.2	89.6	212.0 (a)
Manganese (Mn)	ppm	7.9	840	ND	15800	302	59.2	137.1	86.5	125.3 (a)
Mercury (Hg)	ppm	ND	0.2	ND	1.1	0.03	0.021	0.25	0.10	0.2 (a)
Nickel (Ni)	ppm	ND	540	ND	175	2.8	2.76	12.1	6.08	10.7 (a)
Selenium (Se)	ppm	ND	2	ND	9.0	1.1	0.32	0.38	0.34	*
Total SVM+	**ppm**	**ND**	**345**	**ND**	**255**	**6.2**	**17.2**	**253**	**90.2**	**213 (a)**
Total LVM+	**ppm**	**7.9**	**1567**	**ND**	**16842**	**324.7**	**76.4**	**180**	**117**	**171 (a)**
Chloride	ppm	ND	2600	ND	5400	259	402	3366	956	3366 (c)
Fluoride	ppm	ND	300	ND	128	32.4	69	157	123	171 (a)
Total Halogens+	**ppm**	**ND**	**2900**	**ND**	**5528**	**291.4**	**495**	**3436**	**1079**	**3436 (c)**
Formaldehyde	ppm	1.6	27.0	--	--	--	4.1	68.2	22.3	61.5 (b)
Moisture	wt %	--	--	--	--	--	16.85	28.86	21.11	28.86 (c)
Ash	wt %	--	--	--	--	--	1.26	5.4	3.89	6.31 (a)
Volatile Matter	wt %	--	--	--	--	--	75.98	80.31	77.39	79.88 (a)
Nitrogen	wt %	0.02	3.95	0.22	0.46	0.346	0.23	0.65	0.46	0.66 (a)
Sulfur	wt %	ND	0.87	ND	0.61	0.070	0.04	0.09	0.07	0.10 (a)
HHV	Btu/lb	--	--	--	--	--	5930	7103	6520	7314 (a)

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.
[2] Sampling Occurred Between 7/23/2012 – 8/1/2012. All results reported on Dry Basis. HHV reported on As Received basis.
[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.
Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics
* - non-detect. Only one distinct observation value in the data set, resulting in "0" variance. Therefore, no statistical analysis can be performed
HHV – High Heat Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co, Mn, Ni)
+ C&D samples, Total Min., Max, Avg., and 90% UPL are selected from the individual samples and not the combination of sample values.

Compound	Units	Literary Sources[1]		OAQPS Databases[1]			C&D Samples from CA2[2]			
		Wood and Biomass		Wood and Biomass						
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	26	ND	6.0	0.9	0.24	3.10	1.12	2.76 (a)
Arsenic (As)	ppm	ND	6.8	ND	298	6.3	1.40	5.65	3.06	5.60 (a)
Beryllium (Be)	ppm	--	--	ND	10	0.3	0.05	0.07	0.06	0.07 (a)
Cadmium (Cd)	ppm	ND	3	ND	17	0.6	0.18	0.45	0.27	0.42 (a)
Chromium (Cr)	ppm	ND	130	ND	340	5.9	5.47	13.92	10.3	15.5 (a)
Cobalt (Co)	ppm	ND	24	ND	213	6.5	1.09	2.39	1.72	2.5 (a)
Lead (Pb)	ppm	ND	340	ND	229	4.5	11.3	138.3	58.4	134.8 (a)
Manganese (Mn)	ppm	7.9	840	ND	15800	302	68.6	126.6	95.9	129.5 (a)
Mercury (Hg)	ppm	ND	0.2	ND	1.1	0.03	0.03	0.192	0.13	0.23 (a)
Nickel (Ni)	ppm	ND	540	ND	175	2.8	4.07	10.70	7.22	11.0 (a)
Selenium (Se)	ppm	ND	2	ND	9.0	1.1	0.35	0.35	0.35	*
Total SVM+	**ppm**	**ND**	**345**	**ND**	**255**	**6.2**	**11.9**	**139**	**59.1**	**136 (a)**
Total LVM+	**ppm**	**7.9**	**1567**	**ND**	**16842**	**324.7**	**83.8**	**155**	**119.4**	**160 (a)**
Chloride	ppm	ND	2600	ND	5400	259	748	1272	1132	1272 (a)
Fluoride	ppm	ND	300	ND	128	32.4	52	145	107	172 (a)
Total Halogens+	**ppm**	**ND**	**2900**	**ND**	**5528**	**291.4**	**799**	**1388**	**1240**	**1388 (c)**
Formaldehyde	ppm	1.6	27.0	--	--	--	10.3	27.2	17.6	27.8 (a)
Moisture	wt %	--	--	--	--	--	14.70	31.45	21.91	33.29 (a)
Ash	wt %	--	--	--	--	--	3.34	11.54	5.85	10.02 (a)
Volatile Matter	wt %	--	--	--	--	--	70.49	78.41	75.33	79.45 (a)
Nitrogen	wt %	0.02	3.95	0.22	0.46	0.346	0.48	1.12	0.80	1.10 (a)
Sulfur	wt %	ND	0.87	ND	0.61	0.070	0.07	0.20	0.12	0.18 (a)
HHV	Btu/lb	--	--	--	--	--	5673	7169	6434	7353 (a)

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.
[2] Sampling Occurred Between 7/30/2012 – 8/3/2012. All results reported on Dry Basis. HHV reported on As Received basis.
[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.

Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics

* - non-detect. Only one distinct observation value in the data set, resulting in "0" variance. Therefore, no statistical analysis can be performed

HHV – High Heat Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co, Mn, Ni)

+ C&D samples, Total Min., Max, Avg., and 90% UPL are selected from the individual samples and not the combination of sample values.

Compound	Units	Literary Sources[1]		OAQPS Databases[1]			C&D Samples from MA[2]			
		Wood and Biomass		Wood and Biomass						
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	26	ND	6.0	0.9	0.85	4.72	3.25	5.5 (a)
Arsenic (As)	ppm	ND	6.8	ND	298	6.3	8.63	218	142	273 (a)
Beryllium (Be)	ppm	--	--	ND	10	0.3	0.05	0.16	0.08	0.16 (c)
Cadmium (Cd)	ppm	ND	3	ND	17	0.6	0.32	1.29	0.68	1.2 (a)
Chromium (Cr)	ppm	ND	130	ND	340	5.9	14.8	245	168	301 (a)
Cobalt (Co)	ppm	ND	24	ND	213	6.5	0.61	3.53	1.32	2.72 (b)
Lead (Pb)	ppm	ND	340	ND	229	4.5	167	437	260	443 (b)
Manganese (Mn)	ppm	7.9	840	ND	15800	302	56.9	157	91.0	139 (b)
Mercury (Hg)	ppm	ND	0.2	ND	1.1	0.03	0.05	0.68	0.19	0.68 (c)
Nickel (Ni)	ppm	ND	540	ND	175	2.8	1.46	27.4	5.79	27.4 (c)
Selenium (Se)	ppm	ND	2	ND	9.0	1.1	0.33	0.33	0.33	*
Total SVM+	**ppm**	**ND**	**345**	**ND**	**255**	**6.2**	**168**	**438**	**261**	**444 (a)**
Total LVM+	**ppm**	**7.9**	**1567**	**ND**	**16842**	**324.7**	**83.4**	**551**	**411**	**669 (a)**
Chloride	ppm	ND	2600	ND	5400	259	113	1580	811	2848 (b)
Fluoride	ppm	ND	300	ND	128	32.4	4	46	15.2	46 (c)
Total Halogens+	**ppm**	**ND**	**2900**	**ND**	**5528**	**291.4**	**159**	**1583**	**826**	**2659 (b)**
Formaldehyde	ppm	1.6	27.0	--	--	--	13.2	176.8	68.2	151 (a)
Moisture	wt %	--	--	--	--	--	15.16	20.78	18.18	20.9 (a)
Ash	wt %	--	--	--	--	--	0.81	6.79	3.25	7.061 (a)
Volatile Matter	wt %	--	--	--	--	--	77.47	82.53	79.53	82.58 (a)
Nitrogen	wt %	0.02	3.95	0.22	0.46	0.346	0.28	1.10	0.63	1.11 (a)
Sulfur	wt %	ND	0.87	ND	0.61	0.070	0.01	0.20	0.11	0.21 (a)
HHV	Btu/lb	--	--	--	--	--	6714	7091	6869	7067 (a)

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.

[2] Sampling Occurred Between 7/30/2012 – 8/3/2012. All results reported on Dry Basis. HHV reported on As Received basis.

[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.

Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics

* - non-detect. Only one distinct observation value in the data set, resulting in "0" variance. Therefore, no statistical analysis can be performed

HHV – High Heat Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co, Mn, Ni)

+ C&D samples, Total Min., Max, Avg., and 90% UPL are selected from the individual samples and not the combination of sample values.

Appendix A

[Revision Submission: April 25, 2013]

I. Contaminant Comparison of C&D Wood to Traditional Fuels

A comparison of the contaminants found in C&D wood was made with two traditional fuels – wood & biomass and coal. This was done by comparing the 90% UPL (Upper Prediction Limit) of the individual contaminants and groups of contaminants in C&D wood with the maximum values reported in EPA's traditional fuel database.[1] This method was chosen following the guidance of EPA, as stated in the draft rule preamble:

> *Given data for a particular traditional fuel, it makes intuitive sense to base the traditional fuel comparison value on the upper end of its statistical range. Anything less could result in ''traditional fuel'' samples being considered solid waste if burned in the very combustion units designed to burn them…(76 Fed Reg 80481)*

The comparisons are presented in the tables located in Section IV, sorted by the State that was the source of the C&D wood or data. Results demonstrate that C&D wood contains concentrations of contaminants or groups of contaminants that are comparable to or lower than the two traditional fuels.

The 90% UPL value for formaldehyde exceeds the database maximum values. An explanation for this occurrence and comparison to traditional fuels is discussed in Section II, below. As well, the 90% UPL value for lead data collected at one facility in Wisconsin exceeds the maximum value in the EPA database. We believe that this value is not representative of C&D wood fuel produced at this facility. Please refer to the related Waste Management memo dated April 25, 2013 for a more detailed explanation and discussion of this value.

II. Comparability of Formaldehyde Levels in C&D Wood

The contaminant comparison set forth below shows formaldehyde levels in wood and biomass at a maximum of 27 ppm, no data on formaldehyde levels in coal, and formaldehyde levels in C&D wood at a maximum of 177 ppm. Despite these differences, we believe contaminant levels in C&D wood are comparable to coal and to wood and biomass.

First, EPA allows groups of contaminants in the relevant traditional fuels to be compared to groups of contaminants in NHSM when making a contaminant comparison. Groupings are suggested in Table 8 of EPA's December 2011 proposed rule, but a party may use other technically reasonable approaches to groupings. 76 Fed. Reg. at 80477. We have chosen to group VOCs and SVOCs together. According to EPA this grouping is technically reasonable because EPA groups volatile hydrocarbons and semi-volatile hydrocarbons when setting standards under the Clean Air Act. *Id.*

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[1] "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011. It should be noted that there is a far greater database of coal contaminant levels that was not included in this comparison due to it not being included in the EPA traditional fuel database.

We note that other than formaldehyde, which, if not an artifact of the test method,[2] is likely derived from resinated wood products mixed with the C&D wood, the remaining hazardous air pollutants have been tested and found to be below or near detection limits in C&D wood (see Minnesota data). When the PAH levels in coal are grouped with other VOCs and SVOC and compared to the levels of this contaminant grouping in C&D wood, as demonstrated in the attached Minnesota C&D data, the levels are comparable to coal.

Second, based on process knowledge, we are aware of no sources of formaldehyde in C&D wood other than the formaldehyde found in clean cellulosic biomass and resinated wood.[3] To the extent that formaldehyde is present on C&D wood from resinated wood products, it is a VOC from non-waste materials because EPA has clearly asserted in the initial rule and the revised final rule that resinated wood that is combusted is not a waste (*See* 76 Fed. Reg. at 80483 and 78 Fed. Reg. at 9213).

In support of the fuel content value of formaldehyde, EPA has asserted,

> *Resinated wood is highly valued within the wood products industry for its high fuel value relative to other wood fuels generated and burned at these facilities for energy recovery. Many facilities rely on mixing of these low moisture content wood materials with higher moisture materials. Resinated wood residuals are routinely transferred between either intra- or inter- company facilities and used as either ''furnish'' (i.e., raw materials) or fuel at the receiving facilities. The material being transferred off-site is used and handled in the same manner that resinated wood residuals are used when generated on- site. In general, the motivation to use the resinated wood as a fuel, even with the slightly higher formaldehyde levels, predominates over the motivation to dispose of the formaldehyde. See American Petroleum Institute v. EPA, 216 F.3d 50, 58 (DC Cir. 2000) (in declaring reclaimed oily wastewater to be a waste, the EPA failed to explain why the discard motivation predominated the recycling motivation).* ***Indeed, discard of the formaldehyde is a very distant second to the fuel product use of the resinated wood.***

C&D wood should be considered a mixture of wood that EPA has already determined to be a non-waste, and wood for which that determination is pending. Based on the contaminant analysis herein, EPA can determine that, for that component of C&D wood not already addressed by EPA's non-waste determination for resinated wood, the contaminant levels are comparable to traditional wood and biomass fuel and therefore C&D wood meets the contaminant comparison legitimacy criterion whether or not it is combusted in a boiler that is designed to burn coal.

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[2] These tests indicating formaldehyde in the range of 9.3 to 130 ppm in C&D wood were measured by EPA Method 8315a. This method applies a dinitrophenylhydrazine (DNPH) derivatization technique. The DNPH solution is acidic and reactive and is suspected to create formaldehyde, especially from bound formaldehyde in cured resins and potentially creates formaldehyde from wood sugars. Word, David, NCASI, personal communication to Karl Seltzer – Koogler and Associates, Inc., September 2012.

[3] EPA agrees that combustors may rely on process knowledge when making contaminant comparisons. 76 Fed. Reg. at 80477.

Third, formaldehyde is an organic compound that is readily volatilized to become a VOC under standard temperature and pressure having a boiling point at -19 degree C. Traditional biomass includes numerous forms of organic compounds in a solid/liquid matrix that which can emit/volatilize minor fractions of VOCs including formaldehyde and other listed hazardous air pollutants under standard temperature and pressure. By increasing temperature and/or the pressure, but not to the point of combustion, traditional biomass can further release such VOCs in increasing fractions. Given the highly complex nature of the organic compounds which comprise traditional wood, identification of the series of chemical reactions or lack of reaction for this process continues to generate extensive research. Wood that is processed to create construction lumber wood, which eventually becomes C&D wood, must be dried. There is research indicating that virgin wood can generate significant amounts of VOCs through the drying process.

EPA has data demonstrating that some traditional virgin wood does have VOCs within the wood itself, prior to drying, and that this amount can be as high as 20,000 ppm.[4] In addition, there are ample data on the emissions of VOCs from the process of drying construction lumber wood. For example, according to scientists from Oregon State University, drying ponderosa pine wood, dryers emit between 1.6 and 3.0 pounds of VOCs per thousand board feet (mbf) (3330 lb[5]) or 480 to 900 part per million mass basis, depending on the temperature of the dryer.[6] The corresponding amount of measured VOC hazardous air pollutants (study includes methanol, formaldehyde, acetaldehyde, propionaldehyde, and acrolein) from ponderosa pine wood dryers ranged from 0.0833 to 0.189 lb/mbf (25 to 57 ppm mass basis). Similar measurements show clean wood dryers generating 0.96 pounds per oven dried ton of methanol (i.e., 0.048 percent methanol per ton of dried wood).[7] These are VOC HAPs that are no longer available to be released from the kiln-dried lumber which is source material for construction wood and eventually C&D wood. Accordingly, EPA could conclude that the VOC HAP levels in C&D wood are not in concentrations "not normally associated with virgin biomass material," making C&D wood clean cellulosic biomass: a traditional fuel. *See* 40 C.F.R. 241.2.

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[4] *See* EPA-HQ-RCRA-2008-0329-1866 (AF&PA data on organic contaminants in traditional fuel showing that Virginia pine can contain 2% turpentine, which is a VOC). Terpenes such as turpentine have the potential to form formaldehyde in the atmosphere. *See* Milota, Michael R., Emissions from Wood Drying, The science and the issues, Forest Products Journal, June 1, 2000, at 19, available at http://www.nrem.iastate.edu/class/assets/for486/Readings/Emissions%20from%20Wood%20Drying.pdf. Thus, these VOCs can be grouped with formaldyde when considering contaminent levels. This approach is consistent with how EPA is proposing to address other potential presursors. *See* 76 Fed. Reg. at 80480.

[5] AP-42, Appendix A, 40 lb/ft3 – based on density of pine, (1 mbf = 83.3 ft3)

[6] Milota and Mosher, Emissions of hazardous air pollutants from lumber drying, Forest Products Journal, July/August 2008, Vol. 58, No. 7/8, at 52. Available at http://www.deq.idaho.gov/media/591021-milota_mosher_emissions_study.pdf

[7] EPA, AP-42, 5th edition, Table 10.6.3-3, http://www.epa.gov/ttn/chief/ap42/ch10/final/c10s0603.pdf

III. State-by-State Sample Background

The discussion on contaminant comparability to traditional fuels and how it relates to C&D wood fuel has largely focused on the processing involved to create the fuel, the type of incoming materials into the processing facilities and the requirements set forth by the combustor. The following discussion will touch base on each provided state-wide C&D wood fuel database to explain where the samples came from and how they were processed.

The samples that comprise the Minnesota were all collected from a single supplier over the course of one week. All of the materials that are processed for C&D wood fuel are C&D materials and, of the incoming amount, typically 20% becomes wood fuel, which was sampled for this study. The C&D processing includes several size separations, which eliminate the fines to become landfill cover and helps ensure the most efficient separation. The C&D wood fuels materials are positively picked from the processing lines and grinded to an approximate size of 1.5 inches.

The Washington dataset were also from a single processing facility that collected samples over nearly two weeks. The facility receives co-mingled construction and demolition debris. Prior to materials being accepted for processing, a rigorous inspection process is carried out, including documentation showing that the building was inspected for asbestos containing materials if it was from a demolition or renovation project, visual inspections and a lead based paint testing through X-Ray Fluorescence (XRF). The materials processing includes machine sorting, magnetic separation, manual sorting, shredding, and a final inspection.

The Massachusetts dataset was a combination of two separate datasets. The first dataset used in this table was from a study that took place at a single processing facility. This facility accepts a wide range of C&D mixed materials that includes, but is not limited to ferrous and non-ferrous metals, aggregate, OCC (old corrugated cardboard), plastics, gypsum, wood, and fines. For the purposes of the project that compiled the report which was used for this dataset, all wood was positively picked from the conveyor line during sampling. This includes lumber, painted wood, treated wood, plywood, laminated wood, etc. The second facility that contributed to the Massachusetts dataset accepts a wide range of materials, as well. However, during the week of sampling, a majority of its incoming materials was composed of C&D wood, with a very low composition of untreated wood (< 5%). This facility utilizes fines removal, size reduction and negative sorting techniques in their process. The C&D wood fuel that does come from this facility is negatively picked.

The New York dataset came from sampling and analyses of processed C&D wood combusted in a biomass-to-energy boiler located at a facility in New York State over the period 2005-2012. The wood was obtained from approximately 25 different suppliers located in the Western New York region and Ontario, Canada. Samples consisted primarily of mixtures of as-fired C&D wood taken from the boiler feed hopper conveyor, with a minor number of samples taken from storage piles representing individual suppliers. Some samples may have included insignificant amounts of non-C&D wood. Sampling and analyses were performed in accordance with the facility's Alternate Fuels Quality Assurance/Quality Control Plan (QA/QC Plan) required under the fuel testing provisions of the facility's Title V permit. The QA/QC Plan also includes requirements on C&D processor procedures, provisions for material receipt and selection, storage, and inspection, training of both processor and combustion facility personnel, and recordkeeping.

The Maine dataset was compiled by the Maine Department of Environmental Protection in a report that detailed the substitution of wood from construction and demolition debris for conventional fuels in a biomass boiler. This was initiated due to the increased demand for these types of materials as a partial replacement of clean wood and biomass. In total, 12 different facilities were evaluated and the quality of the C&D fuels was analyzed. From these 12, four of the facilities utilized a negative picking technique, three facilities utilized a positive pick technique and five of the facilities utilized source separation. Source separation entails the sorting of the usable elements of C&D at the point of generation or collection. It should be noted that the values in the report represent 100% C&D wood fuel, and not the <50% C&D wood fuel blended with clean biomass that is required in the state of Maine.

The California dataset was a combination of two separate datasets. The first facility utilizes numerous processing techniques that include positive picking, multiple screening steps, size reduction and fines removal. Milled white wood, painted wood, cardboard and scrap metals are some of the material classifications that are targeted in the positive sorting system. The C&D wood fuel materials are chipped prior to shipment and rarely remain onsite for longer than 2-3 days. The second facility that comprised the California dataset utilizes a negative pick technique. This facility processes all the materials through two separate negative pick conveyors where trash, metals, OCC, etc. are removed. Following the negative pick, the materials are screened to a ¾ inch minus sizing, thus removing fines. The materials that make it through this screening process are crushed and then ready for shipment as C&D wood fuel. Approximately half of the incoming materials into the facility are made up of C&D materials, while the other half is made up of clean, untreated wood.

The Wisconsin dataset came from a single sampling period at a single processing facility. Prior to a positive picking line, all of the materials are screened to remove fines (approximately 3 inch minus materials). This level of fines removal is larger than other facilities, where fines removal consists of a lower fines threshold. The remaining materials are then passed through a positive pick line to remove the C&D wood fuel materials and other materials such as cardboard, concrete, etc. The positively picked C&D wood fuel materials are then shred and stored until shipment.

IV. C&D Wood Contaminant Comparisons with Traditional Fuels

Table 1 – Minnesota Dataset C&D Analysis.
Compiled from Analyses of C&D Wood Samples from Generator Located in Minnesota.

Contaminant	Units	Literary Sources[1]		OAQPS Databases[1]						**C&D Samples from Minnesota[2]**				
		Wood and Biomass		Wood and Biomass			Coal							
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	No.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	26	ND	6.0	0.9	ND	6.9	1.7	7	0.20	0.67	0.41	0.67 (a)
Arsenic (As)	ppm	ND	6.8	ND	298	6.3	ND	174	8.2	7	2.29	74.7	26.7	70.3 (a)
Beryllium (Be)	ppm	--	--	ND	10	0.3	ND	206	1.9	7	0.009	0.01	0.01	*
Cadmium (Cd)	ppm	ND	3	ND	17	0.6	ND	19	0.6	7	0.15	0.28	0.18	0.28 (b)
Chromium (Cr)	ppm	ND	130	ND	340	5.9	ND	168	13.4	7	3.54	83.2	31.6	80.5 (a)
Cobalt (Co)	ppm	ND	24	ND	213	6.5	ND	25.2	6.9	7	0.43	1.76	0.71	1.76 (c)
Lead (Pb)	ppm	ND	340	ND	229	4.5	ND	148	8.7	7	10.2	110	38.1	98.4 (b)
Manganese (Mn)	ppm	7.9	840	ND	15800	302	ND	512	26.2	7	44.9	180	68.5	180 (c)
Mercury (Hg)	ppm	ND	0.2	ND	1.1	0.03	ND	3.1	0.09	7	0.02	0.06	0.03	0.06 (a)
Nickel (Ni)	ppm	ND	540	ND	175	2.8	ND	730	21.5	7	1.23	5.83	2.44	4.90 (b)
Selenium (Se)	ppm	ND	2	ND	9.0	1.1	ND	74.3	3.4	7	0.31	0.36	0.32	0.36 (c)
Total SVM[+]	ppm	ND	345	ND	255	6.2	ND	241	12.7	7	10.7	111	38.6	98.5 (b)
Total LVM[+]	ppm	7.9	1567	ND	16842	325	ND	1822	80	7	60	316	130	280 (b)
Chloride	ppm	ND	2600	ND	5400	259	ND	9080	992	7	104	150	118	145 (a)
Fluoride	ppm	ND	300	ND	128	32.4	ND	178	64.0	7	6	29	19.2	29.4 (c)
Total Halogens[+]	ppm	ND	2900	ND	5528	291.4	ND	9258	1056	7	111	179	138	179 (a)
Formaldehyde**	ppm	1.6	27.0	--	--	--	--	--	--	7	10.8	127	36.3	87.9 (b)
Nitrogen	wt %	0.02	3.95	0.22	0.46	0.346	13.6	54.0	15.1	7	0.22	0.34	0.27	0.33 (a)
Sulfur	wt %	ND	0.87	ND	0.61	0.070	0.74	61.3	13.6	7	0.01	0.02	0.02	0.03 (a)
HHV	Btu/lb	--	--	--	--	--	--	--	--	7	6919	7620	7315	7708 (a)
Moisture	wt %	--	--	--	--	--	--	--	--	7	12.05	15.2	13.8	15.47 (a)

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.
[2] Minnesota. Sampling Occurred Between 8/13/2012 – 8/17/2012. All values reported as Dry Basis. HHV reported on As Received basis.
[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.
Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics
* non-detect - Only one distinct observation value in the data set, resulting in "0" variance. Therefore, no statistical analysis can be performed
** - See above discussion of volatile organics from clean wood in comparison to C&D wood formaldehyde (pages 2-4)
HHV – High Heating Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co, Mn, Ni)
+ C&D samples, Total Min., Max, Avg., and 90% UPL are selected from the individual samples and not the combination of sample values.

Table 2 - Washington Dataset C&D Analysis.
Compiled from Analyses of C&D Wood Samples from Generator Located in Washington.

Contaminant	Units	Literary Sources[1]		OAQPS Databases[1]						**C&D Samples from Washington[2]**				
		Wood and Biomass		Wood and Biomass			Coal							
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	No.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	26	ND	6.0	0.9	ND	6.9	1.7	10	0.6	16.6	4.47	11.3 (b)
Arsenic (As)	ppm	ND	6.8	ND	298	6.3	ND	174	8.2	10	3.6	26.2	10.42	19.9 (a)
Beryllium (Be)	ppm	--	--	ND	10	0.3	ND	206	1.9	10	0.03	0.17	0.088	0.2 (a)
Cadmium (Cd)	ppm	ND	3	ND	17	0.6	ND	19	0.6	10	0.18	0.51	0.31	0.4 (a)
Chromium (Cr)	ppm	ND	130	ND	340	5.9	ND	168	13.4	10	5.51	46	16.27	34.6 (b)
Cobalt (Co)	ppm	ND	24	ND	213	6.5	ND	25.2	6.9	10	0.67	1.63	1.16	1.7 (a)
Lead (Pb)	ppm	ND	340	ND	229	4.5	ND	148	8.7	10	3.8	26	10.60	20.1 (b)
Manganese (Mn)	ppm	7.9	840	ND	15800	302	ND	512	26.2	10	54.6	127	74.66	104.4 (b)
Mercury (Hg)	ppm	ND	0.2	ND	1.1	0.03	ND	3.1	0.09	10	0.019	0.143	0.06	0.1 (a)
Nickel (Ni)	ppm	ND	540	ND	175	2.8	ND	730	21.5	10	1.26	12.2	3.47	7.0 (b)
Selenium (Se)	ppm	ND	2	ND	9.0	1.1	ND	74.3	3.4	3	0.60	0.6	0.60	*
Total SVM+	ppm	ND	345	ND	255	6.2	ND	241	12.7	10	4.0	26.3	11.1	20.6 (b)
Total LVM+	ppm	7.9	1567	ND	16842	325	ND	1822	80	10	72.1	197	110.5	163.3 (b)
Chloride	ppm	ND	2600	ND	5400	259	ND	9080	992	10	179	1960	908.4	1725 (a)
Fluoride	ppm	ND	300	ND	128	32.4	ND	178	64.0	4	37	47	43.25	**
Total Halogens+	ppm	ND	2900	ND	5528	291.4	ND	9258	1056	10	179	2007	925.7	1746 (a)
Formaldehyde***	ppm	1.6	27.0	--	--	--	--	--	--	10	29.0	130.0	61.1	108.4 (b)
Nitrogen	wt %	0.02	3.95	0.22	0.46	0.346	13.6	54.0	15.1	10	0.27	1.26	0.63	1.0 (a)
Sulfur	wt %	ND	0.87	ND	0.61	0.070	0.74	61.3	13.6	10	0.14	0.731	0.49	0.7 (a)
HHV	Btu/lb	--	--	--	--	--	--	--	--		--	--	--	--
Moisture	wt %	--	--	--	--	--	--	--	--		--	--	--	--

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.
[2] Washington. Sampling Occurred Between 3/21/2012 – 4/3/2012. All values reported as Dry Basis.
[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.
Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics
* non-detect - Only one distinct observation value in the data set, resulting in "0" variance. Therefore, no statistical analysis can be performed
** - Data set is too small to compute reliable statistics and estimates
*** - See above discussion of volatile organics from clean wood in comparison to C&D wood formaldehyde (pages 2-4)
HHV – High Heating Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co, Mn, Ni)
+ C&D samples, Total Min., Max, Avg., and 90% UPL are selected from the individual samples and not the combination of sample values.

Table 3 - Massachusetts Dataset C&D Analysis.
Compiled from Analyses of C&D Wood Samples from Two Generators Located in Massachusetts.

Contaminant	Units	Literary Sources[1] Wood and Biomass		OAQPS Databases[1] Wood and Biomass			OAQPS Databases[1] Coal			**C&D Samples from Massachusetts[2]**				
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	No.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	26	ND	6.0	0.9	ND	6.9	1.7	12	0.9	4.7	2.9	4.5 (a)
Arsenic (As)	ppm	ND	6.8	ND	298	6.3	ND	174	8.2	67	1.1	261	84	207 (c)
Beryllium (Be)	ppm	--	--	ND	10	0.3	ND	206	1.9	12	0.1	0.3	0.2	0.3 (c)
Cadmium (Cd)	ppm	ND	3	ND	17	0.6	ND	19	0.6	37	0.3	1.3	0.5	0.6 (c)
Chromium (Cr)	ppm	ND	130	ND	340	5.9	ND	168	13.4	67	0.6	283	93	225 (c)
Cobalt (Co)	ppm	ND	24	ND	213	6.5	ND	25.2	6.9	12	0.6	3.5	1.2	2.8 (c)
Lead (Pb)	ppm	ND	340	ND	229	4.5	ND	148	8.7	67	2.2	437	75	190 (b)
Manganese (Mn)	ppm	7.9	840	ND	15800	302	ND	512	26.2	12	37	157	83	128 (b)
Mercury (Hg)	ppm	ND	0.2	ND	1.1	0.03	ND	3.1	0.09	67	0.1	0.7	0.1	0.12 (c)
Nickel (Ni)	ppm	ND	540	ND	175	2.8	ND	730	21.5	12	1.2	27	3.9	20.3 (c)
Selenium (Se)	ppm	ND	2	ND	9.0	1.1	ND	74.3	3.4	12	0.3	1.3	0.6	1.3 (c)
Total SVM+	ppm	ND	345	ND	255	6.2	ND	241	12.7	67	2.2	438	75.4	191 (b)
Total LVM+	ppm	7.9	1567	ND	16842	325	ND	1822	80	67	1.7	561	193	509 (c)
Chloride	ppm	ND	2600	ND	5400	259	ND	9080	992	27	59	1580	306	1549 (c)
Fluoride	ppm	ND	300	ND	128	32.4	ND	178	64.0	37	4	46	23	39 (a)
Total Halogens+	ppm	ND	2900	ND	5528	291.4	ND	9258	1056	37	15.0	1583	246	651 (c)
Formaldehyde**	ppm	1.6	27.0	--	--	--	--	--	--	7	13.2	176.8	68.2	151.1
Nitrogen	wt %	0.02	3.95	0.22	0.46	0.346	13.6	54.0	15.1	37	0.1	1.1	0.23	0.6 (c)
Sulfur	wt %	ND	0.87	ND	0.61	0.070	0.74	61.3	13.6	37	0.01	0.2	0.2	0.2 (c)
HHV	Btu/lb	--	--	--	--	--	--	--	--	37	5468	7713	6804	7424 (a)
Moisture	wt %	--	--	--	--	--	--	--	--	67	9.12	31.9	18.2	24.8 (a)

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.

[2] Massachusetts table contains two separate databases combined. Sampling at the first processing facility occurred between 4/2007 – 5/2007. Sampling at the second processing facility occurred between 7/30/2012 – 8/3/2012. All values reported as Dry Basis. HHV reported on As Received basis.

[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.

Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics

* non-detect - Only one distinct observation value in the data set, resulting in "0" variance. Therefore, no statistical analysis can be performed

** - See above discussion of volatile organics from clean wood in comparison to C&D wood formaldehyde (pages 2-4)

HHV – High Heating Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co, Mn, Ni)

+ C&D samples, Total Min., Max, Avg., and 90% UPL are selected from the individual samples and not the combination of sample values.

Table 4 – New York Dataset C&D Analysis.
Compiled from Analyses of C&D Wood Samples Combusted in New York Facility.

Contaminant	Units	Literary Sources[1] Wood and Biomass		OAQPS Databases[1] Wood and Biomass			OAQPS Databases[1] Coal			**C&D Samples from New York[2]**				
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	No.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	26	ND	6.0	0.9	ND	6.9	1.7	--	--	--	--	--
Arsenic (As)	ppm	ND	6.8	ND	298	6.3	ND	174	8.2	104	0.29	110.1	12.6	31.6 (b)
Beryllium (Be)	ppm	--	--	ND	10	0.3	ND	206	1.9	--	--	--	--	--
Cadmium (Cd)	ppm	ND	3	ND	17	0.6	ND	19	0.6	32	0.01	0.67	0.16	0.41 (b)
Chromium (Cr)	ppm	ND	130	ND	340	5.9	ND	168	13.4	107	0.20	144.6	26.0	68.3 (b)
Cobalt (Co)	ppm	ND	24	ND	213	6.5	ND	25.2	6.9	--	--	--	--	--
Lead (Pb)	ppm	ND	340	ND	229	4.5	ND	148	8.7	107	0.4	261.4	32.2	83.3 (c)
Manganese (Mn)	ppm	7.9	840	ND	15800	302	ND	512	26.2	--	--	--	--	--
Mercury (Hg)	ppm	ND	0.2	ND	1.1	0.03	ND	3.1	0.09	75	0.005	0.31	0.08	0.17 (c)
Nickel (Ni)	ppm	ND	540	ND	175	2.8	ND	730	21.5	--	--	--	--	--
Selenium (Se)	ppm	ND	2	ND	9.0	1.1	ND	74.3	3.4	--	--	--	--	--
Total SVM+	ppm	ND	345	ND	255	6.2	ND	241	12.7	107	0.4	261	32	83 (c)
Total LVM+	ppm	7.9	1567	ND	16842	325	ND	1822	80	107	0.4	221	38	79 (c)
Chloride	ppm	ND	2600	ND	5400	259	ND	9080	992	108	310	3521	975	1631 (b)
Fluoride	ppm	ND	300	ND	128	32.4	ND	178	64.0	17	4	313	60.4	161 (b)
Total Halogens+	ppm	ND	2900	ND	5528	291.4	ND	9258	1056	108				
Formaldehyde**	ppm	1.6	27.0	--	--	--	--	--	--	--	--	--	--	--
Nitrogen	wt %	0.02	3.95	0.22	0.46	0.346	13.6	54.0	15.1	--	--	--	--	--
Sulfur	wt %	ND	0.87	ND	0.61	0.070	0.74	61.3	13.6	108	0.01	0.29	0.09	0.18 (c)
HHV	Btu/lb	--	--	--	--	--	--	--	--	108	4464	9649	6498	7590 (a)
Moisture	wt %	--	--	--	--	--	--	--	--	108	6.93	41.9	22.1	31.7 (a)

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.
[2] New York. Sampling Occurred Between 02/2005 – 10/2012. All values reported as Dry Basis. HHV reported on As Received basis.
[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.
Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics
* non-detect - Only one distinct observation value in the data set, resulting in "0" variance. Therefore, no statistical analysis can be performed
** - See above discussion of volatile organics from clean wood in comparison to C&D wood formaldehyde (pages 2-4)
HHV – High Heating Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co, Mn, Ni)
+ C&D samples, Total Min., Max, Avg., and 90% UPL are selected from the individual samples and not the combination of sample values.

Table 5 - Maine Dataset C&D Analysis.
Compiled from Analyses of C&D Wood Samples Submitted in a Report to Maine Department of Environmental Protection

Contaminant	Units	Literary Sources[1]		OAQPS Databases[1]						C&D Samples from Maine[2]				
		Wood and Biomass		Wood and Biomass			Coal							
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	No.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	26	ND	6.0	0.9	ND	6.9	1.7	--	--	--	--	--
Arsenic (As)	ppm	ND	6.8	ND	298	6.3	ND	174	8.2	12	14.8	110	52.6	92.5 (a)
Beryllium (Be)	ppm	--	--	ND	10	0.3	ND	206	1.9	--	--	--	--	--
Cadmium (Cd)	ppm	ND	3	ND	17	0.6	ND	19	0.6	--	--	--	--	--
Chromium (Cr)	ppm	ND	130	ND	340	5.9	ND	168	13.4	--	--	--	--	--
Cobalt (Co)	ppm	ND	24	ND	213	6.5	ND	25.2	6.9	--	--	--	--	--
Lead (Pb)	ppm	ND	340	ND	229	4.5	ND	148	8.7	12	24	314	95.5	200 (b)
Manganese (Mn)	ppm	7.9	840	ND	15800	302	ND	512	26.2	--	--	--	--	--
Mercury (Hg)	ppm	ND	0.2	ND	1.1	0.03	ND	3.1	0.09	--	--	--	--	--
Nickel (Ni)	ppm	ND	540	ND	175	2.8	ND	730	21.5	--	--	--	--	--
Selenium (Se)	ppm	ND	2	ND	9.0	1.1	ND	74.3	3.4	--	--	--	--	--
Total SVM+	ppm	ND	345	ND	255	6.2	ND	241	12.7	--	--	--	--	--
Total LVM+	ppm	7.9	1567	ND	16842	325	ND	1822	80	--	--	--	--	--
Chloride	ppm	ND	2600	ND	5400	259	ND	9080	992	--	--	--	--	--
Fluoride	ppm	ND	300	ND	128	32.4	ND	178	64.0	--	--	--	--	--
Total Halogens+	ppm	ND	2900	ND	5528	291.4	ND	9258	1056	--	--	--	--	--
Formaldehyde**	ppm	1.6	27.0	--	--	--	--	--	--	--	--	--	--	--
Nitrogen	wt %	0.02	3.95	0.22	0.46	0.346	13.6	54.0	15.1	--	--	--	--	--
Sulfur	wt %	ND	0.87	ND	0.61	0.070	0.74	61.3	13.6	--	--	--	--	--
HHV	Btu/lb	--	--	--	--	--	--	--	--	--	--	--	--	--
Moisture	wt %	--	--	--	--	--	--	--	--	--	--	--	--	--

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.
[2] From Report by Maine Department of Environmental Protection. April 2007. Table 4. Samples taken in 2006.
[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.
Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics
* non-detect - Only one distinct observation value in the data set, resulting in "0" variance. Therefore, no statistical analysis can be performed
** - See above discussion of volatile organics from clean wood in comparison to C&D wood formaldehyde (pages 2-4)
HHV – High Heating Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co, Mn, Ni)
+ Due to the limited number of constituents tested in the report, a grouping comparison was not capable of being carried out.

Table 6 - California Dataset C&D Analysis.
Compiled from Analyses of C&D Wood Samples from Two Generators Located in California.

Contaminant	Units	Literary Sources[1]		OAQPS Databases[1]						**C&D Samples from California[2]**				
		Wood and Biomass		Wood and Biomass			Coal							
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	No.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	26	ND	6.0	0.9	ND	6.9	1.7	14	0.2	12.0	3.1	11.5 (c)
Arsenic (As)	ppm	ND	6.8	ND	298	6.3	ND	174	8.2	14	1.3	25.4	4.6	16.5 (c)
Beryllium (Be)	ppm	--	--	ND	10	0.3	ND	206	1.9	14	0.1	0.1	0.1	0.1 (a)
Cadmium (Cd)	ppm	ND	3	ND	17	0.6	ND	19	0.6	14	0.2	0.5	0.3	0.4 (a)
Chromium (Cr)	ppm	ND	130	ND	340	5.9	ND	168	13.4	14	4.5	29.1	11.3	19.8 (b)
Cobalt (Co)	ppm	ND	24	ND	213	6.5	ND	25.2	6.9	14	0.6	3.0	1.6	2.5 (a)
Lead (Pb)	ppm	ND	340	ND	229	4.5	ND	148	8.7	14	11	252	74.0	190 (b)
Manganese (Mn)	ppm	7.9	840	ND	15800	302	ND	512	26.2	14	59	137	91.2	124 (a)
Mercury (Hg)	ppm	ND	0.2	ND	1.1	0.03	ND	3.1	0.09	14	0.02	0.3	0.1	0.2 (a)
Nickel (Ni)	ppm	ND	540	ND	175	2.8	ND	730	21.5	14	2.8	12.2	6.7	10.9 (b)
Selenium (Se)	ppm	ND	2	ND	9.0	1.1	ND	74.3	3.4	14	0.3	0.4	0.4	0.4 (c)
Total SVM+	ppm	ND	345	ND	255	6.2	ND	241	12.7	14	76	180	118	128 (b)
Total LVM+	ppm	7.9	1567	ND	16842	325	ND	1822	80	14	102	329	193	405 (a)
Chloride	ppm	ND	2600	ND	5400	259	ND	9080	992	14	402	3366	1044	1918 (b)
Fluoride	ppm	ND	300	ND	128	32.4	ND	178	64.0	14	51.7	156.9	115	151 (c)
Total Halogens+	ppm	ND	2900	ND	5528	291.4	ND	9258	1056	14	495	3436	1159	2021 (b)
Formaldehyde**	ppm	1.6	27.0	--	--	--	--	--	--	14	4.1	68.2	19.9	40.2 (b)
Nitrogen	wt %	0.02	3.95	0.22	0.46	0.346	13.6	54.0	15.1	14	0.23	1.12	0.63	0.96 (a)
Sulfur	wt %	ND	0.87	ND	0.61	0.070	0.74	61.3	13.6	14	0.04	0.20	0.10	0.15 (a)
HHV	Btu/lb	--	--	--	--	--	--	--	--	14	5673	7169	6477	7229 (a)
Moisture	wt %	--	--	--	--	--	--	--	--	14	14.7	31.5	21.5	30.9 (b)

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.
[2] California table contains two separate databases combined. Sampling at the first processing facility occurred between 7/23/2012 – 8/1/2012. Sampling at the second processing facility occurred between 7/30/2012 – 8/3/2012. All values reported as Dry Basis. HHV reported on As Received basis.
[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.
Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics
* non-detect - Only one distinct observation value in the data set, resulting in "0" variance. Therefore, no statistical analysis can be performed
** - See above discussion of volatile organics from clean wood in comparison to C&D wood formaldehyde (pages 2-4)
HHV – High Heating Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co, Mn, Ni)
+ C&D samples, Total Min., Max, Avg., and 90% UPL are selected from the individual samples and not the combination of sample values.

Table 7 - Wisconsin Dataset C&D Analysis.
Compiled from Analyses of C&D Wood Samples from Generator Located in Wisconsin.

Contaminant	Units	Literary Sources[1]		OAQPS Databases[1]						**C&D Samples from Wisconsin[2]**				
		Wood and Biomass		Wood and Biomass			Coal							
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	No.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	26	ND	6.0	0.9	ND	6.9	1.7	7	0.18	0.53	0.39	0.59 (a)
Arsenic (As)	ppm	ND	6.8	ND	298	6.3	ND	174	8.2	7	1.15	5.72	3.2	5.7 (a)
Beryllium (Be)	ppm	--	--	ND	10	0.3	ND	206	1.9	7	0.01	0.01	0.01	*
Cadmium (Cd)	ppm	ND	3	ND	17	0.6	ND	19	0.6	7	0.24	0.95	0.4	0.8 (b)
Chromium (Cr)	ppm	ND	130	ND	340	5.9	ND	168	13.4	7	2.1	9.5	5.3	8.8 (a)
Cobalt (Co)	ppm	ND	24	ND	213	6.5	ND	25.2	6.9	7	0.2	0.5	0.4	0.6 (a)
Lead (Pb)	ppm	ND	340	ND	229	4.5	ND	148	8.7	7	32	482	149	449 (b)
Manganese (Mn)	ppm	7.9	840	ND	15800	302	ND	512	26.2	7	56	74.2	64	72.3 (a)
Mercury (Hg)	ppm	ND	0.2	ND	1.1	0.03	ND	3.1	0.09	7	0.05	0.42	0.2	0.34 (b)
Nickel (Ni)	ppm	ND	540	ND	175	2.8	ND	730	21.5	7	0.5	3.4	1.0	3.4 (c)
Selenium (Se)	ppm	ND	2	ND	9.0	1.1	ND	74.3	3.4	7	0.3	0.3	0.3	*
Total SVM[+]	ppm	ND	345	ND	255	6.2	ND	241	12.7	7	32.7	483	150	449 (b)
Total LVM[+]	ppm	7.9	1567	ND	16842	325	ND	1822	80	7	65.2	85.4	73.9	83.4 (a)
Chloride	ppm	ND	2600	ND	5400	259	ND	9080	992	7	205	386	257	365 (a)
Fluoride	ppm	ND	300	ND	128	32.4	ND	178	64.0	7	14	67	22	67 (a)
Total Halogens[+]	ppm	ND	2900	ND	5528	291.4	ND	9258	1056	7	219	400	279	400 (c)
Formaldehyde**	ppm	1.6	27.0	--	--	--	--	--	--	7	25.3	171.3	74.6	149.4 (a)
Nitrogen	wt %	0.02	3.95	0.22	0.46	0.346	13.6	54.0	15.1	7	0.42	1.0	0.54	1.0 (c)
Sulfur	wt %	ND	0.87	ND	0.61	0.070	0.74	61.3	13.6	7	0.02	0.05	0.03	0.5 (c)
HHV	Btu/lb	--	--	--	--	--	--	--	--	7	5920	7061	6685	7319 (a)
Moisture	wt %	--	--	--	--	--	--	--	--	7	17.0	24.1	20.3	23.8 (a)

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.
[2] Wisconsin. Sampling Occurred Between 7/30/2012 – 8/6/2012. All values reported as Dry Basis.
[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.
Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics
* non-detect - Only one distinct observation value in the data set, resulting in "0" variance. Therefore, no statistical analysis can be performed
** - See above discussion of volatile organics from clean wood in comparison to C&D wood formaldehyde (pages 2-4)
HHV – High Heating Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co, Mn, Ni)
+ C&D samples, Total Min., Max, Avg., and 90% UPL are selected from the individual samples and not the combination of sample values.

Table 8 - Compilation Dataset C&D Analysis.
Compilation of Minnesota, Washington, Massachusetts, New York and Maine C&D Datasets.

Contaminant	Units	Literary Sources[1]		OAQPS Databases[1]						**Compilation of C&D All Datasets[2]**				
		Wood and Biomass		Wood and Biomass			Coal							
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	No.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	26	ND	6.0	0.9	ND	6.9	1.7	50	0.18	16.6	2.6	7.1 (c)
Arsenic (As)	ppm	ND	6.8	ND	298	6.3	ND	174	8.2	221	0.29	261	35.9	91.8 (b)
Beryllium (Be)	ppm	--	--	ND	10	0.3	ND	206	1.9	50	0.01	0.3	0.1	0.23 (c)
Cadmium (Cd)	ppm	ND	3	ND	17	0.6	ND	19	0.6	107	0.01	1.3	0.3	0.53 (c)
Chromium (Cr)	ppm	ND	130	ND	340	5.9	ND	168	13.4	212	0.2	283	45	116 (b)
Cobalt (Co)	ppm	ND	24	ND	213	6.5	ND	25.2	6.9	50	0.2	3.5	1.1	2.1 (b)
Lead (Pb)	ppm	ND	340	ND	229	4.5	ND	148	8.7	224	0.4	482	53.9	136 (b)
Manganese (Mn)	ppm	7.9	840	ND	15800	302	ND	512	26.2	50	37.2	180	78.8	115 (b)
Mercury (Hg)	ppm	ND	0.2	ND	1.1	0.03	ND	3.1	0.09	180	0.01	0.7	0.1	0.16 (c)
Nickel (Ni)	ppm	ND	540	ND	175	2.8	ND	730	21.5	50	0.5	27.4	4.0	8.6 (b)
Selenium (Se)	ppm	ND	2	ND	9.0	1.1	ND	74.3	3.4	43	0.3	1.3	0.4	1.0 (c)
Total SVM+	ppm	ND	345	ND	255	6.2	ND	241	12.7	212	0.4	438	52.2	136 (b)
Total LVM+	ppm	7.9	1567	ND	16842	325	ND	1822	80	212	0.4	561	110	310 (b)
Chloride	ppm	ND	2600	ND	5400	259	ND	9080	992	173	59	3521	809	1567 (c)
Fluoride	ppm	ND	300	ND	128	32.4	ND	178	64.0	86	4	313	45.9	139 (c)
Total Halogens+	ppm	ND	2900	ND	5528	291.4	ND	9258	1056	183	15	3521	786	1558 (c)
Formaldehyde**	ppm	1.6	27.0	--	--	--	--	--	--	45	4.1	176.8	47.6	104.2 (b)
Nitrogen	wt %	0.02	3.95	0.22	0.46	0.346	13.6	54.0	15.1	75	0.1	1.26	0.39	0.80 (c)
Sulfur	wt %	ND	0.87	ND	0.61	0.070	0.74	61.3	13.6	183	0.01	0.73	0.13	0.22 (c)
HHV	Btu/lb	--	--	--	--	--	--	--	--	183	4464	9649	6639	7541 (c)
Moisture	wt %	--	--	--	--	--	--	--	--	203	6.9	41.9	20.5	29.6 (b)

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.
[2] Minnesota. Sampling Occurred Between 8/13/2012 – 8/17/2012; Washington. Sampling Occurred Between 3/21/2012 – 4/3/2012; Massachusetts table contains two separate databases combined. Sampling at the first processing facility occurred between 4/2007 – 5/2007. Sampling at the second processing facility occurred between 7/30/2012 – 8/3/2012.; New York. Sampling Occurred Between 02/2005 – 10/2012; Maine. Sampling Occurred in 2006. California table contains two separate databases combined. Sampling at the first processing facility occurred between 7/23/2012 – 8/1/2012. Sampling at the second processing facility occurred between 7/30/2012 – 8/3/2012. Wisconsin. Sampling Occurred Between 7/30/2012 – 8/6/2012. All values reported as Dry Basis.
[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.
Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics
* non-detect - Only one distinct observation value in the data set, resulting in "0" variance. Therefore, no statistical analysis can be performed
** - See above discussion of volatile organics from clean wood in comparison to C&D wood formaldehyde (pages 2-4)
HHV – High Heating Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co, Mn, Ni)
+ C&D samples, Total Min., Max, Avg., and 90% UPL are selected from the individual samples and not the combination of sample values.

Fuel Comparison Charts (April 25, 2013)

Minnesota C&D SUMMARY

*all results reported as moisture free
*all results pooled from all 7 samples

	MDL	Monday 8/13		Tuesday 8/14		Wednesday 8/15		Wednesday 8/15 (a)		Wednesday 8/15 (b)		Thursday 8/16		Friday 8/17		Non-Detect	Average	Standard Deviation	Range		90% UPL Results*
																			Low	High	
Components		as received	Moist. Free	as received	Moist. Free	as received	Moist. Free	as received	Moist. Free	as received	Moist. Free	as received	Moist. Free	as received	Moist. Free						
Moisture (wt%)	--	12.05		13.03		15.2		14.91		14.1		13.87		13.45		0	13.80	1.09	12.05	15.2	15.47
Ash (wt%)	--	0.56	0.64	0.56	0.65	0.59	0.7	0.58	0.68	0.6	0.7	0.54	0.63	0.45	0.52	0	0.65	0.06	0.52	0.7	0.741
Volatile Matter (wt%)	--	71.45	81.24	70.08	80.57	68.59	80.89	69.24	81.37	69.96	81.44	69.98	81.24	70.31	81.24	0	81.14	0.31	80.57	81.44	81.61
Fixed Carbon (wt%)	--	15.95	18.13	16.34	18.78	15.62	18.42	15.28	17.96	15.34	17.85	15.62	18.13	15.78	18.24	0	18.22	0.31	17.85	18.78	18.69
Hydrogen (wt%)	--	6.12		6		5.99		6		5.98		5.99		5.95		0	6.00	0.05	5.95	6.12	6.12***
Carbon (wt%)	--	50.56		50.57		50.5		50.72		50.53		50.48		50.2		0	50.51	0.16	50.20	50.72	50.75
Nitrogen (wt%)	--	0.25		0.2		0.22		0.23		0.19		0.29		0.23		0	0.23	0.03	0.19	0.29	0.28
Nitrogen (wt%) DRY BASIS	--	0.28		0.23		0.26		0.27		0.22		0.34		0.27		0	0.27	0.04	0.22	0.336700337	0.33
Oxygen (wt%)	--	42.41		42.58		42.57		42.36		42.57		42.6		43.08		0	42.60	0.23	42.36	43.08	43.08***
Sulfur (wt%)	--	0.018		0.01		0.015		0.009		0.021		0.014		0.018		0	0.02	0.00	0.01	0.021	0.022
Sulfur (wt%) DRY BASIS	--	0.020		0.011		0.018		0.011		0.024		0.016		0.021		0	0.02	0.01	0.01	0.024447031	0.025
Heating Value (BTU/lb)	--	7602	8644	7179	8254	7142	8423	7338	8624	7408	8624	6919	8033	7620	8805	0	7315	255	6919	7620	7708
Metals (mg/kg)																					
Antimony (HAP)	0.08	0.59		0.18		0.37		0.17		0.41		0.35		0.43		0	0.36	0.15	0.17	0.59	0.58
Arsenic (HAP)	0.12	65.7		2.21		16.9		1.95		11.2		13.8		50.4		0	23.17	24.87	1.95	65.7	61.44
Beryllium (HAP)	0.008	0.008		0.008		0.008		0.008		0.008		0.008		0.008		0	0.008	0.000	0.008	0.008	n.d.
Cadmium (HAP)	0.007	0.25		0.18		0.14		0.13		0.14		0.13		0.14		0	0.16	0.04	0.13	0.25	0.3
Chromium (HAP)	0.02	73.2		4.1		21.2		3.01		14		16.2		60.1		0	27.40	27.83	3.01	73.2	70.24
Cobalt (HAP)	0.04	0.38		0.41		0.46		0.51		0.41		0.62		1.52		0	0.62	0.41	0.38	1.52	1.52***
Lead (HAP)	0.13	96.8		41.3		12.5		34.6		8.78		15.7		22		0	33.10	30.47	8.8	96.8	85.9**
Manganese (HAP)	0.009	41.5		55.3		39.4		44.1		38.6		39.1		156		0	59.14	43.10	38.6	156	156***
Mercury (HAP)	0.003	0.049		0.04		0.017		0.032		0.015		0.02		0.027		0	0.03	0.01	0.015	0.049	0.048
Nickel (HAP)	0.04	2.44		2.34		1.2		1.31		1.35		1.06		5.05		0	2.11	1.41	1.06	5.05	4.27**
Selenium (HAP)	0.27	0.29		0.27		0.27		0.27		0.27		0.31		0.27		0	0.28	0.02	0.27	0.31	0.31***
Total Metals (mg/kg)	--	**281.2**		**106.3**		**92.5**		**86.1**		**75.2**		**87.3**		**295.9**		--	**146.36**	**97.7**	**75.18**	**295.95**	**295.9*** **
Metals (mg/kg) DRY WEIGHT																					
Antimony (HAP)		0.67		0.21		0.44		0.20		0.48		0.41		0.50		0	0.41	0.17	0.20	0.670835702	0.67
Arsenic (HAP)		74.70		2.54		19.93		2.29		13.04		16.02		58.23		0	26.68	28.36	2.29	74.70153496	70.32
Beryllium (HAP)		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0	0.009	0.000	0.009	0.01	n.d.
Cadmium (HAP)		0.28		0.21		0.17		0.15		0.16		0.15		0.16		0	0.18	0.05	0.15	0.284252416	0.284**
Chromium (HAP)		83.23		4.71		25.00		3.54		16.30		18.81		69.44		0	31.58	31.75	3.54	83.22910745	80.45
Cobalt (HAP)		0.43		0.47		0.54		0.60		0.48		0.72		1.76		0	0.71	0.47	0.43	1.756210283	1.756***
Lead (HAP)		110.06		47.49		14.74		40.66		10.22		18.23		25.42		0	38.12	34.53	10.2	110.1	98.35**
Manganese (HAP)		47.19		63.59		46.46		51.83		44.94		45.40		180.24		0	68.52	49.69	44.9	180.2426343	180.2***
Mercury (HAP)		0.06		0.05		0.02		0.04		0.02		0.02		0.03		0	0.03	0.01	0.017	0.056	0.055
Nickel (HAP)		2.77		2.69		1.42		1.54		1.57		1.23		5.83		0	2.44	1.62	1.23	5.834777585	4.898**
Selenium (HAP)		0.33		0.31		0.32		0.32		0.31		0.36		0.31		0	0.32	0.02	0.31	0.35992105	0.36***
Total Metals (mg/kg) DRY WEIGHT	--	**319.7**		**122.3**		**109.0**		**101.2**		**87.5**		**101.4**		**341.9**		--	**169.00**	**111.2**	**87.52**	**341.94**	**341.9*** **
Total Semi-Volatile Metals (mg/kg) DRY WEIGHT	--	**110.7**		**48.0**		**15.2**		**41.1**		**10.7**		**18.7**		**25.9**		--	**38.62**	**34.6**	**10.70**	**110.68**	**98.46** **
Total Low Volatile Metals (mg/kg) DRY WEIGHT	--	**209.0**		**74.2**		**93.8**		**60.0**		**76.8**		**82.6**		**316.0**		--	**130.35**	**96.0**	**60.00**	**316.01**	**279.9** **
Formaldehyde (ug/kg)																					
Formaldehyde	420	15000		34000		18000		16000		17000		9300		110000		0	31328.57	35510.88	9300	110000	76060**
Formaldehyde (ug/kg) DRY WEIGHT																					
Formaldehyde		17055		39094		21226		18804		19790		10798		127094		0	36265.91	40983.77	10798	127094.1652	87927**
Ions																					
Bromide (mg/kg)	6	6		6		6		7		6		6		6		0	6.14	0.38	6	7	7***
Chloride (mg/kg)	40	110		95		90		110		90		90		130		0	102.14	15.24	90	130	125.6
Fluoride (mg/kg)	6	25		24		5		25		6		6		25		0	16.57	10.21	5	25	25***
Total Halogens (mg/kg)	--	**141.0**		**125.0**		**101.0**		**142.0**		**102.0**		**102.0**		**161.0**		--	**124.86**	**24.07**	**101.00**	**161.00**	**161.9**
Ions DRY WEIGHT																					
Bromide (mg/kg)		7		7		7		8		7		7		7		0	7.13	0.49	7	8	8.227***
Chloride (mg/kg)		125		109		106		129		105		104		150		0	118.45	17.26	104	150	145.0
Fluoride (mg/kg)		28		28		6		29		7		7		29		0	19.16	11.75	6	29	29.38***
Total Halogens (mg/kg) DRY WEIGHT	--	**153.5**		**136.8**		**112.0**		**158.7**		**111.8**		**111.5**		**179.1**		--	**137.62**	**27.15**	**111.46**	**179.09**	**179.4**

Washington C&D SUMMARY

*all results reported as moisture free
*all results pooled from all 7 samples

	MDL	21-Mar	22-Mar	23-Mar	26-Mar	27-Mar	28-Mar	29-Mar	30-Mar	2-Apr	3-Apr	Non-Detect	Average	Standard Deviation	Range		90% UPL Results*
															Low	High	
Components		as received Moist. Free	as received Moist. Free	as received Moist. Free	as received Moist. Free	as received Moist. Free	as received Moist. Free	as received Moist. Free	as received Moist. Free	as received Moist. Free	as received Moist. Free						
Nitrogen (wt%)	--	0.77	1.26	0.7	0.76	0.55	0.39	0.27	0.42	0.63	0.55	0	0.63	0.28	0.27	1.26	1.03
Sulfur (wt%)	--	0.455	0.516	0.608	0.625	0.486	0.394	0.136	0.731	0.61	0.355	0	0.49	0.17	0.14	0.731	0.738
Heating Value (BTU/lb)	--	7600	7620	7310	7140	6820	7170	7920	6460	6770	7900	0	7271.00	493.05	6820	7900	7986
Metals (mg/kg)																	
Antimony (HAP)	0.08	16.6	3.6	4.2	2.9	2.4	1.8	0.6	3.5	7.4	1.7	0	4.47	4.64	0.60	16.6	11.28**
Arsenic (HAP)	0.12	8.2	6.8	8.9	3.6	14.3	11.6	6.3	26.2	5.1	13.2	0	10.42	6.54	3.60	26.2	19.91
Beryllium (HAP)	0.008	0.03	0.03	0.17	0.08	0.11	0.04	0.07	0.17	0.13	0.05	0	0.088	0.054	0.030	0.17	0.167
Cadmium (HAP)	0.007	0.26	0.27	0.31	0.33	0.51	0.34	0.18	0.33	0.32	0.26	0	0.31	0.09	0.18	0.51	0.435
Chromium (HAP)	0.02	12.3	10.2	10.8	5.51	46	14.4	6.86	34.3	7.2	15.1	0	16.27	13.26	5.51	46	34.56**
Cobalt (HAP)	0.04	0.83	0.77	1.37	1.34	1.63	1.18	0.67	1.58	1.45	0.78	0	1.16	0.37	0.67	1.63	1.69
Lead (HAP)	0.13	26	10.6	5.5	12.2	11.6	7.8	3.8	13.2	7	8.3	0	10.60	6.20	3.8	26.0	20.05**
Manganese (HAP)	0.009	54.6	62.6	79.3	69.4	78.3	65.5	56.3	127	90.5	63.1	0	74.66	21.49	54.6	127	104.4**
Mercury (HAP)	0.003	0.143	0.0188	0.0778	0.0284	0.051	0.0468	0.0367	0.0632	0.0733	0.0614	0	0.06	0.03	0.019	0.143	0.110
Nickel (HAP)	0.04	2.65	1.26	2.93	2.16	12.2	2.78	1.29	4.18	2.74	2.49	0	3.47	3.18	1.26	12.2	6.971**
Selenium (HAP)	0.27	--	--	0.6	--	0.6	0.6	--	--	--	--	7	0.60	0.00	0.60	0.6	n.d.
Total Metals (mg/kg)	--	**121.6**	**96.1**	**114.2**	**97.5**	**167.7**	**106.1**	**76.1**	**210.5**	**121.9**	**105.0**	--	**121.68**	**39.3**	**76.11**	**210.52**	**178.7**
Total Semi Volatile Metals (mg/kg)	--	**26.3**	**10.9**	**6.4**	**12.5**	**12.7**	**8.7**	**4.0**	**13.5**	**7.3**	**8.6**	--	**11.09**	**6.1**	**3.98**	**26.26**	**20.58****
Total Low Volatile Metals (mg/kg)	--	**95.2**	**85.3**	**107.7**	**85.0**	**154.9**	**97.3**	**72.1**	**196.9**	**114.5**	**96.4**	--	**110.53**	**37.8**	**72.09**	**196.93**	**163.3****
Formaldehyde (µg/kg)																	
Formaldehyde	420	49000	130000	46000	46000	29000	60000	35000	44000	62000	110000	0	61100.00	32908.80	29000	130000	108359**
Ions																	
Chloride (mg/kg)	40	1120	797	660	1340	1960	1530	179	516	597	385	0	908.40	563.16	179	1960	1725.0
Fluoride (mg/kg)	6	--	--	37	--	47	--	--	47	42	--	6	43.25	4.79	37	47	n.d.
Total Halogens (mg/kg)	--	**1120.0**	**797.0**	**697.0**	**1340.0**	**2007.0**	**1530.0**	**179.0**	**563.0**	**639.0**	**385.0**	--	**925.70**	**565.32**	**179.00**	**2007**	**1746.0**

* All 90% UPL Results reported as Normal
** 90% UPL Result reported as Lognormal
*** 90% UPL Result Non-Parametric
-- = Non-Detect
n.d. = Only 1 Distinct Value, therefore no variance.

MRL = Method Reporting Limit
MDL = Method Detection Limit
HAP = Hazardous Air Pollutant
OH = Organic Halogen
N = Nitrogenated

= Nondetect; Reported as MDL

*all results reported as moisture free
*all results pooled from all 7 samples

	5/22 Re Grab	Monday 7/30	Tuesday 7/31	Wednesday 8/1	Wednesday 8/1	Wednesday 8/1	Thursday 8/2	Friday 8/3	Non-Detect	Average	Standard Deviation	Range Low	Range High	90% UPL Results*
Components														
Moisture (wt%)	17.5	19.24	20.78	18.33	18.41	18.43	15.16	16.91		18.20	5.03	9.12	31.9	24.76
Ash (wt%)		0.66 0.81	2.12 2.68	5.54 6.79	4.67 5.73	3.81 4.67	0.9 1.07	0.83 1		1.12	1.13	0.49	5.54	
Nitrogen (wt%)		0.27	0.87	0.45	0.52	0.42	0.85	0.23		0.19	0.19	0.08	0.87	
Nitrogen (wt%) - DRY WEIGHT		0.33	1.10	0.55	0.64	0.51	1.00	0.28		0.23	0.24	0.10	1.10	0.568***
Sulfur (wt%)		0.06	0.122	0.082	0.136	0.162	0.005	0.048		0.16	0.04	0.01	0.19	
Sulfur (wt%) - DRY WEIGHT		0.074	0.154	0.100	0.167	0.199	0.006	0.058		0.19	0.05	0.01	0.22	0.215***
Heating Value (BTU/lb) - AS RECEIVED		6963	6714	6800	6800	6797	6920	7091		6804	471.45	5468	7713	7428
Metals (mg/kg)														
Antimony (HAP)		2.35	3.45	3.71	2.75	3.85	1.67	0.71		2.37	0.92	0.71	3.85	
Arsenic (HAP)	6.1	92.2	39.1	178	167	163	168	7.17		69.22	62.08	0.94	220	
Beryllium (HAP)		0.13	0.13	0.04	0.04	0.04	0.05	0.04		0.12	0.08	0.04	0.2	
Cadmium (HAP)		1.04	0.82	0.43	0.38	0.44	0.48	0.27		0.43	0.13	0.27	1.04	
Chromium (HAP)	5.3	112	80.3	195	181	175	208	12.3		76.52	66.84	0.49	240	
Cobalt (HAP)		1	2.8	0.91	0.79	0.93	0.52	0.53		0.95	0.60	0.52	2.8	
Lead (HAP)	2.4	329	346	176	167	143	142	178		61.28	82.71	2.00	346	
Manganese (HAP)		72.5	124	70.7	69.1	68.8	66.4	47.3		67.32	22.70	31.00	124	
Mercury (HAP)	0.08	0.546	0.259	0.059	0.058	0.054	0.046	0.055		0.10	0.09	0.05	0.58	
Nickel (HAP)		3.13	21.7	1.94	1.58	1.64	1.24	1.24		3.12	5.89	0.98	21.7	
Selenium (HAP)		0.27	0.27	0.27	0.27	0.27	0.27	0.27		0.52	0.32	0.27	1	
Total Metals (mg/kg)	**13.9**	**614.2**	**618.8**	**627.1**	**590.0**	**557.0**	**588.7**	**247.9**		**220.69**	**176.1**	**8.01**	**627**	
Total Semi Volatile Metals (mg/kg)	**2.4**	**330.3**	**347.1**	**176.7**	**167.7**	**143.7**	**142.8**	**178.5**		**61.61**	**82.9**	**2.00**	**347**	
Total Low Volatile Metals (mg/kg)	**11.4**	**283.3**	**271.5**	**450.3**	**422.3**	**413.3**	**445.9**	**69.3**		**158.97**	**138.2**	**1.43**	**450**	
Metals (mg/kg) - DRY BASIS														
Antimony (HAP)		2.91	4.35	4.54	3.37	4.72	1.97	0.85		2.92	1.15	0.85	4.7	4..541
Arsenic (HAP)	7.39	114.17	49.36	217.95	204.68	199.83	198.02	8.63		83.80	73.92	1.14	261.0	207.3***
Beryllium (HAP)		0.16	0.16	0.05	0.05	0.05	0.06	0.05		0.15	0.09	0.05	0.3	0.257***
Cadmium (HAP)		1.29	1.04	0.53	0.47	0.54	0.57	0.32		0.52	0.16	0.32	1.3	0.577***
Chromium (HAP)	6.42	138.68	101.36	238.77	221.84	214.54	245.17	14.80		92.53	79.33	0.59	282.7	224.6***
Cobalt (HAP)		1.24	3.53	1.11	0.97	1.14	0.61	0.64		1.17	0.77	0.61	3.5	2.846***
Lead (HAP)	2.91	407.38	436.76	215.50	204.68	175.31	167.37	214.23		75.04	101.23	2.20	436.8	190.4**
Manganese (HAP)		89.77	156.53	86.57	84.69	84.34	78.26	56.93		82.64	29.03	37.17	156.5	128.1**
Mercury (HAP)	0.10	0.68	0.33	0.07	0.07	0.07	0.05	0.07		0.13	0.12	0.05	0.7	0.122***
Nickel (HAP)		3.88	27.39	2.38	1.94	2.01	1.46	1.49		3.88	7.44	1.16	27.4	20.34***
Selenium (HAP)		0.33	0.34	0.33	0.33	0.33	0.32	0.32		0.64	0.39	0.32	1.3	1.236***
Total Metals (mg/kg)	**16.8**	**760.5**	**781.2**	**767.8**	**723.1**	**682.9**	**693.9**	**298.3**		**268.16**	**213.5**	**9.71**	**781**	
Total Semi Volatile Metals (mg/kg)	**2.9**	**409.0**	**438.1**	**216.4**	**205.5**	**176.2**	**168.3**	**214.9**		**75.44**	**101.5**	**2.20**	**438**	**190.8****
Total Low Volatile Metals (mg/kg)	**13.8**	**350.8**	**342.7**	**551.4**	**517.5**	**506.6**	**525.6**	**83.4**		**192.59**	**165.3**	**1.73**	**561**	**508.8*****
Formaldehyde (μg/kg) - DRY WEIGHT														
Formaldehyde		61912	94673	47753	41672	41682	176803	13239		68247.70	53821.96	13239	176803	151088
Ions														
Chloride (mg/kg)		158	335	1290	1260	1280	215	94		248.83	375.23	47	1290	
Fluoride (mg/kg)		12	3	3	3	3	26	38		18.76	9.77	3	38	
Total Halogens (mg/kg)		**170.0**	**338.0**	**1293.0**	**1263.0**	**1283.0**	**241.0**	**132.0**		**200.34**	**333.0**	**13.30**	**1293**	
Ions - DRY BASIS														
Chloride (mg/kg)		196	423	1580	1544	1569	253	113		306.00	459.55	59	1580	1549***
Fluoride (mg/kg)		15	4	4	4	4	31	46		22.91	11.83	4	46	39
Total Halogens (mg/kg)		**210.5**	**426.7**	**1583.2**	**1548.0**	**1572.9**	**284.1**	**158.9**		**246.21**	**408.0**	**15.01**	**1583**	**650.9*****

* All 90% UPL Results reported as Normal
** 90% UPL Result reported as Lognormal
*** 90% UPL Result Non-Parametric

*all results reported as moisture free
*all results pooled from all 7 samples

	MDL	4/5/2007	4/13/2007	4/18/2007	4/20/2007	4/20/2007	5/1/2007	5/1/2007	5/1/2007	5/1/2007	No.	Average	Standard Deviation	Range Low	Range High	90% UPL Results*
Components DRY BASIS																
Moisture (wt%)	96	41.88	10.68	10.53	9.1	17.5	22.73	15.09	21.75	18.03	108	22.14	7.40	6.93	41.88	31.73
Ash (wt%)	96	5.59	0.93	2.13	2.62	3.4	3.86	3.69	4.5	4.13	108	6.17	3.68	0.39	19.99	11.71**
Sulfur (wt%)	96	0.09	0.06	0.04	0.04	0.05	0.02	0.02	0.11	0.05	108	0.09	0.06	0.01	0.29	0.181***
Heating Value (BTU/lb)	96	4801	7696	7360	7567	6976	6462	7067	6575	6794	108	6497.92	842.63	4464.00	9649	7590
Metals (mg/kg) DRY BASIS																
Arsenic (HAP)	95	19.99	7.8	2.86	1	76.77	0.78	2.08	19.99	2.8	104	12.63	16.22	0.29	110.05	31.55**
Cadmium (HAP)	32										32	0.16	0.16	0.01	0.6745	0.406**
Chromium (HAP)	95	24.06	17.04	6.5	2.59	144.56	2.66	4.36	32.81	9.34	107	25.74	26.10	0.20	144.56	68.28**
Lead (HAP)	95	224.36	0.56	7.78	4.03	7.72	5.03	4.95	66.63	96.45	107	32.15	41.88	0.38	261.39	83.3***
Mercury (HAP)	63	0.164000	0.020000	0.022000	0.012000	0.013000	0.015000	0.010000	0.071000	0.155000	75	0.08	0.07	0.005	0.31	0.166***
Total Metals (mg/kg)	--	**268.6**	**25.4**	**17.2**	**7.6**	**229.1**	**8.5**	**11.4**	**119.5**	**108.7**	--	**69.62**	**61.1**	**0.03**	**328**	**161.9*****
Total Semi Volatile Metals (mg/kg)	--	**224.4**	**0.6**	**7.8**	**4.0**	**7.7**	**5.0**	**5.0**	**66.6**	**96.5**	--	**32.20**	**41.9**	**0.38**	**261.4**	**82.9*****
Total Low Volatile Metals (mg/kg)	--	**44.1**	**24.8**	**9.4**	**3.6**	**221.3**	**3.4**	**6.4**	**52.8**	**12.1**	--	**38.02**	**39.0**	**0.43**	**221.3**	**78.6*****
Ions DRY BASIS																
Chloride (mg/kg)	96	1889.0	633.0	409.0	1253.0	517.0	443.0	740.0	1250.0	1049.0	108	975.30	539.44	310	3521	1631**
Fluoride (mg/kg)	6	14.78	4	7.15	10.21	14.34		14	15	20	17	60.43	82.49	4.000	312.93	161**
Total Halogens (mg/kg)	--	**1903.8**	**637.0**	**416.2**	**1263.2**	**531.3**	**443.0**	**754.0**	**1265.0**	**1069.0**	--	**984.81**	**540.7**	**310.00**	**3521**	**1649****

* All 90% UPL Results reported as Normal
** 90% UPL Result reported as Lognormal
*** 90% UPL Result Non-Parametric
-- = Non-Detect
n.d. = Only 1 Distinct Value, therefore no variance.

MRL = Me
MDL = Me
HAP = Ha
OH = Org
N = Nitrog

Maine C&D SUMMARY

	MDL	ERRCO(NH)	LL&S(NH)	KTI(ME)	ARC(ME)	Pond View.(RI)	NER(MA)	Simpson(ME)	Plan-It(ME)	Old Town(ME)	WMI(ME)	Augusta(ME)	Boothbay(ME)	Non-Detect	Average	Standard Deviation	Range Low	Range High	90% UPL Results*
Metals (mg/kg)																			
Arsenic (HAP)	--	81.0	14.8	77.0	67.0	41.5	110	51.8	23.2	55.3	51.2	17.9	40.2	23.0	52.58	28.10	14.80	110.00	92.46
Lead (HAP)	--	44	314	24	119	82	44	56	139	78	46	124	76	23	95.50	77.63	24.0	314.0	199.8**
Total Semi Volatile Metals (mg/kg)	--	**44.0**	**314.0**	**24.0**	**119.0**	**82.0**	**44.0**	**56.0**	**139.0**	**78.0**	**46.0**	**124.0**	**76.0**	--	**95.50**	**77.6**	**24.00**	**314**	
Total Low Volatile Metals (mg/kg)	--	**81.0**	**14.8**	**77.0**	**67.0**	**41.5**	**110.0**	**51.8**	**23.2**	**55.3**	**51.2**	**17.9**	**40.2**	--	**52.58**	**28.1**	**14.80**	**110**	

* All 90% UPL Results reported as Normal
** 90% UPL Result reported as Lognormal
*** 90% UPL Result Non-Parametric
-- = Non-Detect
n.d. = Only 1 Distinct Value, therefore no variance.

MRL = Method Reporting Limit
MDL = Method Detection Limit
HAP = Hazardous Air Pollutant
OH = Organic Halogen
N = Nitrogenated

CALIFORNIA C&D SUMMARY

*all results reported as moisture free
*all results pooled from all 7 samples

Components	MDL	Monday 7/23 (as received / Moist. Free)	Wednesday 7/25 (as received / Moist. Free)	Wednesday 7/25 (as received / Moist. Free)	Wednesday 7/25 (as received / Moist. Free)	Thursday 7/26 (as received / Moist. Free)	Friday 7/27 (as received / Moist. Free)	Wednesday 8/1 (as received / Moist. Free)	Monday 7/30 (as received / Moist. Free)	Tuesday 7/31 (as received / Moist. Free)	Wednesday 8/1 (as received / Moist. Free)	Wednesday 8/1 (as received / Moist. Free)	Wednesday 8/1 (as received / Moist. Free)	Thursday 8/2 (as received / Moist. Free)	Friday 8/3 (as received / Moist. Free)	Non-Detect	Average	Range Low	Range High	90% UPL Results*
Moisture (wt%)	--	17.54	16.85	16.85	16.85	24.16	28.86	26.69	31.45	26.56	14.7	14.7	14.7	21.62	29.62		21.51	14.70	31.45	30.92**
Ash (wt%)	--	1.04 1.26	4.16 5	4.3 5.17	3.7 4.45	4.1 5.4	2.57 3.61	1.73 2.36	2.71 3.95	3.95 5.38	3.97 4.66	5.13 6.01	9.84 11.54	2.62 3.34	4.28 6.08		4.87	1.26	11.54	
Volatile Matter (wt%)	--	66.22 80.31	63.51 76.38	63.18 75.98	63.67 76.57	57.63 75.99	55.58 78.13	57.45 78.37	53.29 77.74	56.3 76.66	64.08 75.12	62.89 73.73	60.13 70.49	61.46 78.41	52.88 75.14		76.36	70.49	80.31	
Fixed Carbon (wt%)	--	15.21 18.44	15.48 18.62	15.67 18.84	15.78 18.97	14.11 18.6	12.99 18.25	14.13 19.28	12.56 18.32	13.19 17.96	17.24 20.21	17.28 20.26	15.34 17.98	14.3 18.25	13.22 18.78		18.77	17.96	20.26	
Hydrogen (wt%)	--	5.93	5.75	5.66	5.75	5.79	5.87	5.93	5.82	5.85	5.69	5.69	5.57	5.89	5.75		5.78	5.57	5.93	
Carbon (wt%)	--	50.79	49.63	48.71	49.72	48.66	49.79	49.96	49.00	49.65	48.99	48.87	47.95	49.88	48.86		49.32	47.95	50.79	
Nitrogen (wt%)	--	0.19	0.41	0.41	0.31	0.49	0.36	0.36	0.77	0.54	0.61	0.71	0.78	0.38	0.55		0.49	0.19	0.78	
Nitrogen (wt%) DRY BASIS		0.23	0.49	0.49	0.37	0.65	0.51	0.49	1.12	0.74	0.72	0.83	0.91	0.48	0.78		0.63	0.23	1.12326769	0.96
Oxygen (wt%)	--	39.67	33.28	36.98	37.96	38.67	37.23	39.93	39.70	37.32	37.74	36.67	36.98	38.54	36.96		37.69	33.28	39.93	
Sulfur (wt%)	--	0.061	0.05	0.062	0.071	0.066	0.055	0.03	0.095	0.075	0.094	0.100	0.081	0.054	0.142		0.07	0.03	0.142	
Sulfur (wt%) DRY BASIS		0.074	0.060	0.075	0.085	0.087	0.077	0.041	0.139	0.102	0.110	0.117	0.095	0.069	0.202		0.10	0.04	0.20176186	0.15
Heating Value (BTU/lb)	--	6383 7741	6990 8407	7103 8543	7051 8480	5995 7905	5930 8335	6185 8436	5673 8275	6195 8435	7169 8404	6969 8170	6840 8019	6471 8256	5720 8127		6477	5673	7169	7229
Metals (mg/kg)																				
Antimony (HAP)	0.08	0.24	10	8.33	9.17	0.42	0.61	0.26	0.88	2.28	0.38	1.63	0.28	0.19	0.35		2.50	0.19	10	
Arsenic (HAP)	0.12	1.07	1.56	1.43	1.81	1.59	18.1	5.57	3.87	1.03	2.79	4.18	2.12	1.17	1.58		3.42	1.03	18.1	
Beryllium (HAP)	0.008	0.05	0.04	0.05	0.05	0.05	0.05	0.04	0.05	0.04	0.05	0.05	0.05	0.05	0.05		0.05	0.04	0.05	
Cadmium (HAP)	0.007	0.15	0.16	0.19	0.23	0.19	0.23	0.18	0.15	0.13	0.38	0.29	0.24	0.15	0.15		0.20	0.13	0.38	
Chromium (HAP)	0.02	3.74	6.17	7.33	11.7	5.37	20.7	10.7	9.41	4.02	10.2	10	7.55	5.19	9.8		8.71	3.74	20.7	
Cobalt (HAP)	0.04	0.49	0.78	1.33	2.45	0.89	0.89	0.88	0.88	0.8	1.88	1.59	1.65	1.02	1.68		1.23	0.49	2.45	
Lead (HAP)	0.13	208	13.9	66.6	62.4	90	41.8	19	20.7	22.9	118	89	68.5	8.88	9.41		59.94	8.88	208	
Manganese (HAP)	0.009	55.1	49.2	77.5	114	66.3	57.1	59.9	55.2	50.4	108	94.7	95.5	58.6	68.9		72.17	49.20	114	
Mercury (HAP)	0.003	0.017	0.205	0.116	0.085	0.051	0.07	0.026	0.023	0.126	0.135	0.164	0.157	0.042	0.094		0.09	0.02	0.205	
Nickel (HAP)	0.04	2.28	3.59	5.95	10.1	4.49	3.74	3.68	3.19	2.99	9.13	7.16	7.12	4.47	6.09		5.28	2.28	10.1	
Selenium (HAP)	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27		0.27	0.27	0.27	
Total Low Volatile Metals (mg/kg)	--	63.0	71.3	101.9	149.3	79.1	101.2	81.0	73.5	61.6	132.4	119.3	114.3	70.7	88.5		93.36	61.56	149.28	
Total Metals (mg/kg)	--	271.4	85.9	169.1	212.3	169.6	143.6	100.5	94.6	85.0	251.2	209.0	183.4	80.0	98.4		153.86	80.03	271.41	
Metals (mg/kg) DRY BASIS																				
Antimony (HAP)		0.29	12.03	10.02	11.03	0.55	0.86	0.35	1.28	3.10	0.45	1.91	0.33	0.24	0.50		3.07	0.24	12.03	11.53***
Arsenic (HAP)		1.30	1.88	1.72	2.18	2.10	25.44	7.60	5.65	1.40	3.27	4.90	2.49	1.49	2.24		4.55	1.30	25.44	16.52***
Beryllium (HAP)		0.06	0.05	0.06	0.06	0.07	0.07	0.05	0.07	0.05	0.06	0.06	0.06	0.06	0.07		0.06	0.05	0.07	0.07
Cadmium (HAP)		0.18	0.19	0.23	0.28	0.25	0.32	0.25	0.22	0.18	0.45	0.34	0.28	0.19	0.21		0.25	0.18	0.45	0.36
Chromium (HAP)		4.54	7.42	8.82	14.07	7.08	29.10	14.60	13.73	5.47	11.96	11.72	8.85	6.62	13.92		11.28	4.54	29.10	19.82**
Cobalt (HAP)		0.59	0.94	1.60	2.95	1.17	1.25	1.20	1.28	1.09	2.20	1.86	1.93	1.30	2.39		1.55	0.59	2.95	2.45
Lead (HAP)		252.24	16.72	80.10	75.05	118.67	58.76	25.92	30.20	31.18	138.34	104.34	80.30	11.33	13.37		74.04	11.33	252.24	190.4**
Manganese (HAP)		66.82	59.17	93.21	137.10	87.42	80.26	81.71	80.53	68.63	126.61	111.02	111.96	74.76	97.90		91.22	59.17	137.10	123.6
Mercury (HAP)		0.02	0.25	0.14	0.10	0.07	0.10	0.04	0.03	0.17	0.16	0.19	0.18	0.05	0.13		0.12	0.02	0.25	0.21
Nickel (HAP)		2.76	4.32	7.16	12.15	5.92	5.26	5.02	4.65	4.07	10.70	8.39	8.35	5.70	8.65		6.65	2.76	12.15	10.93**
Selenium (HAP)		0.33	0.32	0.32	0.32	0.36	0.38	0.37	0.39	0.37	0.32	0.32	0.32	0.34	0.38		0.35	0.32	0.39	0.389***
Total Semi Volatile Metals (mg/kg)	--	252.8	17.2	80.6	75.6	119.3	59.5	26.5	30.8	31.7	139.1	105.0	80.9	11.9	14.0		74.64	11.87	252.75	
Total Low Volatile Metals (mg/kg)	--	76.4	85.8	122.6	179.5	104.3	142.2	110.5	107.2	83.8	155.3	139.9	134.0	90.2	125.7		118.38	76.36	179.53	190**
Total Metals (mg/kg)	--	329.1	103.3	203.4	255.3	223.7	201.8	137.1	138.0	115.7	294.5	245.1	215.0	102.1	139.8		193.13	102.11	329.14	160.2
Formaldehyde (µg/kg)																				
Formaldehyde	420	3400	10000	9300	9600	20000	16000	50000	16000	20000	8800	11000	12000	10000	16000		15150.00	3400	50000	
Formaldehyde (µg/kg) DRY BASIS																				
Formaldehyde		4123	12026	11185	11545	26371	22491	68204	23341	27233	10317	12896	14068	12758	22734		19949.38	4123	68204	40244**
Ions																				
Bromide (mg/kg)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3		3.00	3.00	3	
Chloride (mg/kg)	15	2776	433	474	452	480	466	295	689	549	1020	1060	1060	997	860		829.36	295.00	2776	
Fluoride (mg/kg)	3	57	103	116	119	119	96	68	60	38	111	118	124	43	101		90.93	38.00	124	
Total Halogens (mg/kg)	--	2836.0	539.0	593.0	574.0	602.0	565.0	366.0	752.0	590.0	1134.0	1181.0	1187.0	1043.0	964.0		923.29	366.00	2836.00	
Ions DRY BASIS																				
Bromide (mg/kg)		4	4	4	4	4	4	4	4	4	4	4	4	4	4		3.84	3.52	4.38	
Chloride (mg/kg)		3366	521	570	544	633	655	402	1005	748	1196	1243	1243	1272	1222		1044.21	402.40	3366.48	1918**
Fluoride (mg/kg)		69	124	140	143	157	135	93	88	52	130	138	145	55	144		115.12	51.74	156.91	151.1***
Total Halogens (mg/kg)	--	3435.6	644.6	709.6	686.7	789.8	790.0	495.2	1092.6	799.3	1325.9	1381.0	1388.0	1326.9	1365.4		1159.33	495.16	3435.61	2021**
Volatile Compounds (µg/kg)																				
1,1,2,2-Tetrachloroethane (HAP/OH)	var	2.31	2.13	2.26	2.26	2.31	2.35	2.31	4.8	4.8	4.61	4.61	4.43	4.61	4.61		3.46	2.13	4.8	
1,1,2-Trichloroethane (HAP/OH)	var	3.91	3.62	3.83	3.83	3.91	3.98	3.91	8.13	8.13	7.81	7.81	7.5	7.81	7.81		5.86	3.62	8.13	
1,2,4-Trichlorobenzene (HAP/OH)	var	1.3	1.21	1.28	1.28	1.3	1.33	1.3	2.71	2.71	2.6	2.6	2.5	2.6	2.6		1.95	1.21	2.71	
1,4-Dichlorobenzene(p) (HAP/OH)	var	1	0.926	0.981	0.981	1	1.03	1	2.09	2.09	2	2	1.93	2	2		1.50	0.93	2.09	
Acetonitrile (HAP/N)	var	31	28.8	30.4	30.4	31	31.7	31	64.6	64.6	62	62	59.7	62	62		46.51	28.80	64.6	
Acrolein (HAP)	var	69	63.9	67.7	67.7	69	70.5	69	144	144	138	138	133	138	138		103.56	63.90	144	
Acrylonitrile (HAP/N)	var	26	24.1	25.5	25.5	26	26.6	26	54.2	54.2	52	52	50	52	52		39.01	24.10	54.2	
Allyl chloride (HAP/OH)	var	3.6	3.34	3.53	3.53	3.6	3.68	3.6	7.51	7.51	7.2	7.2	6.93	7.2	7.2		5.40	3.34	7.51	
Benzene (HAP)	var	1.71	1.58	1.67	1.67	1.71	1.74	1.71	3.55	3.55	3.41	3.41	3.27	3.41	3.41		2.56	1.58	3.55	
Bromoform (HAP/OH)	var	3.41	3.15	3.34	3.34	3.41	3.47	3.41	7.09	7.09	6.81	6.81	6.54	6.81	6.81		5.11	3.15	7.09	
Chlorobenzene (HAP/OH)	var	1.41	1.3	1.38	1.38	1.41	1.43	1.41	2.92	20.8	2.81	2.81	2.7	2.81	2.81		3.38	1.30	20.8	
Chloroform (HAP/OH)	var	1.8	1.67	1.77	1.77	1.8	1.84	1.8	3.76	3.76	3.6	3.6	3.47	3.6	3.6		2.70	1.67	3.76	
Chloroprene (HAP/OH)	var	2.31	2.13	2.26	2.26	2.31	2.35	2.31	4.8	4.8	4.61	4.61	4.43	4.61	4.61		3.46	2.13	4.8	
Ethyl benzene (HAP)	var	13.7	10.6	11	1.18	11.4	1.23	1.2	2.5	2.5	2.4	2.4	2.31	2.4	2.4		4.80	1.18	13.7	
Hexachlorobutadiene (HAP/OH)	var	2.31	2.13	2.26	2.26	2.31	2.35	2.31	4.8	4.8	4.61	4.61	4.43	4.61	4.61		3.46	2.13	4.8	
Isopropylbenzene (HAP)	var	1.41	1.3	1.38	1.38	1.41	1.43	1.41	2.92	2.92	2.81	2.81	2.7	2.81	2.81		2.11	1.30	2.92	
m,p-Xylenes (HAP)	var	22.3	18.1	16.3	11.4	14	13.5	2.1	7.71	5.63	4.2	6.2	4.04	5.8	6.6		9.85	2.10	22.3	
Methyl methacrylate (HAP)	var	3.91	3.62	3.83	3.83	3.91	3.98	3.91	8.13	8.13	7.81	7.81	7.5	7.81	7.81		5.86	3.62	8.13	
Methyl tert butyl ether (HAP)	var	2.6	2.41	2.55	2.55	2.6	2.66	2.6	5.42	5.42	5.2	5.2	5	5.2	5.2		3.90	2.41	5.42	
Methylene chloride (HAP/OH)	var	59.7	511	148	298	95.1	196	128	238	232	267	230	228	169	178		212.70	59.70	511	
Naphthalene (HAP)	var	139	93	77.7	40	101	53.4	49.5	19	18.3	34.2	31.2	32.9	19.4	57.6		54.73	18.30	139	
n-Hexane (HAP)	var	3.5	2.97	3.14	3.14	3.2	3.27	3.2	12.5	6.67	12	11.8	11.2	11.6	10.2		7.03	2.97	12.5	
o-Xylenes (HAP)	var	1.6	1.49	6.47	1.57	5	1.64	1.6	3.75	14.2	3.2	3.2	3.08	3.2	3.2		3.80	1.49	14.2	
Styrene (HAP)	var	80.6	111	115	109	141	161	106	28.5	30.6	9.4	10.2	9.04	32.6	37.4		70.10	9.04	161	
Tetrachloroethylene (HAP/OH)	var	2.5	2.32	2.46	2.46	2.5	2.56	2.5	5.21	5.21	5	5	4.81	5	5		3.75	2.32	5.21	
Toluene (HAP)	var	50.4	30.1	32.3	27.8	79.4	54.2	32	11.5	34.4	11.6	11.8	12.9	8.6	8.4		28.96	8.40	79.4	
Vinyl chloride	var	2.6	2.41	2.55	2.55	2.6	2.66	2.6	5.42	5.42	5.2	5.2	5	5.2	5.2		3.90	2.41	5.42	
Total Volatile Compounds (µg/kg)	--	534.9	930.3	570.8	653.0	614.2	651.9	487.7	665.5	704.2	672.1	634.9	619.3	580.7	631.9		639.39	487.69	930.31	
Semi-Volatile Compounds (µg/kg)																				
1,2,4-Trichlorobenzene (HAP/OH)	var	860	788	945	676	485	610	676	945	860	860	945	860	900	945		811.07	485.00	945	
1,4-Dichlorobenzene (HAP/OH)	var	560	513	615	440	316	397	440	615	560	560	615	560	586	615		528.00	316.00	615	
1-Methylnaphthalene	var	900	1150	990	708	508	639	708	990	900	900	990	900	943	990		872.57	508.00	1150	
2,4,5-Trichlorophenol (HAP/OH)	var	778	713	855	611	439	552	611	855	778	778	855	778	815	855		733.79	439.00	855	
2,4,6-Trichlorophenol (HAP/OH)	var	682	625	750	536	385	484	536	750	682	682	750	682	715	750		643.50	385.00	750	
2,4-Dinitrophenol (HAP/N)	var	314	288	345	247	177	223	247	345	314	314	345	314	329	345		296.21	177.00	345	
2,4-Dinitrotoluene (HAP/N)	var	560	513	615	440	316	397	440	615	560	560	615	560	586	615		528.00	316.00	615	
2-Methylnaphthalene	var	805	1200	885	633	454	571	633	885	805	805	885	805	843	885		792.43	454.00	1200	
3,3-Dichlorobenzidene (HAP/OH/N)	var	1160	1070	1280	911	654	823	911	1280	1160	1160	1280	1160	1220	1280		1096.36	654.00	1280	
4-Nitrophenol (HAP/N)	var	764	700	840	600	431	542	600	840	764	764	840	764	800	840		720.64	431.00	840	
Acenaphthene	var	723	663	795	568	408	513	568	795	723	723	795	723	758	795		682.14	408.00	795	
Acenaphthylene	var	641	588	705	504	362	455	504	705	641	641	705	641	672	705		604.93	362.00	705	
Acetophenone	var	628	575	690	493	354	446	493	690	628	628	690	628	658	690		592.21	354.00	690	
Aniline	var	1100	1000	1200	858	616	775	858	1200	1100	1100	1200	1100	1150	1200		1032.64	616.00	1200	
Anthracene	var	587	538	645	461	331	417	461	645	587	587	645	587	615	645		553.64	331.00	645	
Benzo(a)anthracene	var	641	588	705	504	362	455	504	705	641	641	705	641	672	705		604.93	362.00	705	
Benzo(a)pyrene	var	505	463	555	397	285	359	397	555	505	505	555	505	529	555		476.43	285.00	555	

Benzo(b)fluoranthene	var	355	325	390	279	201	252	279	390	355	355	390	355	372	390		334.86	201.00	390	
Benzo(g,h,i)perylene	var	710	650	780	558	401	504	558	780	710	710	780	710	743	780		669.57	401.00	780	
Benzo(k)fluoranthene	var	805	738	885	633	454	571	633	885	805	805	885	805	843	885		759.43	454.00	885	
Biphenyl (HAP)	var	362	425	425	333	242	333	268	615	560	560	615	560	586	615		464.21	242.00	615	
Bis(2-ethylhexyl)phthalate (HAP)	var	1280	5970	3930	3940	2450	1030	1000	3880	4990	29100	7210	7240	629	2990		5402.79	629.00	29100	
Chrysene	var	614	563	675	483	347	436	483	675	614	614	675	614	643	675		579.36	347.00	675	
Dibenz(a,h)anthracene	var	628	575	690	493	354	446	493	690	628	628	690	628	658	690		592.21	354.00	690	
Dibenzofurans (D/F)	var	628	575	690	493	354	446	493	690	628	628	690	628	658	690		592.21	354.00	690	
Dimethyl phthalate (HAP)	var	723	663	795	568	408	513	5568	795	723	723	795	723	758	795		1039.29	408.00	5568	
Fluoranthene	var	655	600	720	515	370	465	515	720	655	655	720	655	686	720		617.93	370.00	720	
Fluorene	var	641	588	705	504	362	455	504	705	641	641	705	641	672	705		604.93	362.00	705	
Hexachlorobenzene (HAP/OH)	var	655	600	720	515	370	465	515	720	655	655	720	655	686	720		617.93	370.00	720	
Hexachlorobutadiene (HAP/OH)	var	750	688	825	590	424	533	590	825	750	750	825	750	786	825		707.93	424.00	825	
Hexachlorocyclopentadiene (HAP/OH)	var	1810	425	510	365	262	330	365	510	464	464	510	464	486	510		533.93	262.00	1810	
Hexachloroethane	var	423	388	465	333	239	300	333	465	423	423	465	423	443	465		399.14	239.00	465	
Indeno(1,2,3-cd)pyrene	var	560	513	615	440	316	397	440	615	560	560	615	560	586	615		528.00	316.00	615	
Naphthalene (HAP)	var	669	613	735	525	377	475	525	735	669	669	735	669	700	735		630.79	377.00	735	
Nitrobenzene (HAP/N)	var	532	488	585	418	301	378	418	585	532	532	585	532	558	585		502.07	301.00	585	
Pentachlorophenol (HAP/OH)	var	2340	438	525	376	4140	10300	3620	1730	1730	1250	1400	478	500	1660		2177.64	376.00	10300	
Phenanthrene	var	573	525	630	451	579	407	451	630	573	573	630	573	600	630		558.93	407.00	630	
Phenol	var	628	1290	845	1140	354	446	493	690	628	1900	1970	1950	658	690		977.29	354.00	1970	
Pyrene	var	628	575	690	493	354	446	493	690	628	628	690	628	658	690		592.21	354.00	690	
Total Semi-Volatile Compounds (µg/kg)	--	**27757**	**28889**	**29685**	**22916**	**19741**	**27579**	**27508**	**30875**	**29709**	**54611**	**35155**	**32029**	**25214**	**29915**		**30113.07**	**19741.00**	**54611.00**	

* All 90% UPL Results reported as Normal
** 90% UPL Result reported as Lognormal
*** 90% UPL Result Non-Parametric
-- = Non-Detect
n.d. = No Data

MRL = Method Reporting Limit
MDL = Method Detection Limit
HAP = Hazardous Air Pollutant
OH = Organic Halogen
N = Nitrogenated

= Nondetect; Reported as MDL

WISCONSIN C&D SUMMARY

*all results reported as moisture free
*all results pooled from all 7 samples

	MDL	Monday 7/30	Tuesday 7/31	Wednesday 8/1	Wednesday 8/1	Wednesday 8/1	Monday 8/6	Friday 8/3	Non-Detect	Average	Standard Deviation	Range Low	Range High	90% UPL Results*
Components		as received / Moist. Free	as received / Moist. Free	as received / Moist. Free	as received / Moist. Free	as received / Moist. Free	as received / Moist. Free	as received / Moist. Free						
Moisture (wt%)	--	17.00	18.31	20.66	20.66	20.66	24.13	20.87	0	20.33	2.24	17.00	24.13	23.78
Ash (wt%)	--	0.52 / 0.63	0.6 / 0.74	0.68 / 0.84	0.83 / 1.04	0.68 / 0.86	0.79 / 1.04	0.66 / 0.83	0	0.85	0.15	0.63	1.04	1.084
Volatile Matter (wt%)	--	66.62 / 80.26	65.27 / 79.9	63.76 / 80.36	63.42 / 79.93	63.18 / 79.63	60.89 / 80.26	63.53 / 80.29	0	80.09	0.27	79.63	80.36	80.51
Fixed Carbon (wt%)	--	15.85 / 19.1	15.82 / 19.36	14.91 / 18.79	15.1 / 19.03	15.5 / 19.53	14.19 / 18.7	14.95 / 18.89	0	19.06	0.30	18.7	19.53	19.52
Hydrogen (wt%)	--	5.92	5.94	5.9	5.89	5.92	5.89	5.98	0	5.92	0.03	5.89	5.98	5.969
Carbon (wt%)	--	49.84	50.5	49.83	49.94	50.32	49.64	50.6	0	50.10	0.37	49.64	50.6	50.67
Nitrogen (wt%)	--	0.45	0.35	0.38	0.37	0.34	0.76	0.33	0	0.43	0.15	0.33	0.76	0.66
Nitrogen (wt%) DRY BASIS		0.54	0.43	0.48	0.47	0.43	1.00	0.42	0	0.54	0.21	0.42	1.00	1.0***
Oxygen (wt%)	--	37.29	39.23	39.56	39.61	39.76	38.77	40.22	0	39.21	0.96	37.29	40.22	40.68
Sulfur (wt%)	--	0.024	0.019	0.042	0.012	0.039	0.021	0.014	0	0.02	0.01	0.01	0.042	0.043
Sulfur (wt%) DRY BASIS		0.029	0.023	0.053	0.015	0.049	0.028	0.018	0	0.03	0.01	0.02	0.053	0.0549***
Heating Value (BTU/lb)	--	6972 / 8400	7061 / 8644	5920 / 7461	6784 / 8551	6843 / 8625	6321 / 8332	6891 / 8709	0	6685	412	5920	7061	7319
Metals (mg/kg)														
Antimony (HAP)	0.08	0.15	0.29	0.34	0.38	0.42	0.38	0.23	0	0.31	0.10	0.15	0.42	0.46
Arsenic (HAP)	0.12	1.4	4.67	3.43	1.93	2.15	0.87	3.46	0	2.56	1.34	0.87	4.67	4.62
Beryllium (HAP)	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0	0.008	0.000	0.008	0.008	n.d.
Cadmium (HAP)	0.007	0.2	0.48	0.25	0.28	0.28	0.72	0.19	0	0.34	0.19	0.19	0.72	0.646**
Chromium (HAP)	0.02	1.75	4.62	7.55	3.87	4.35	2.93	4.44	0	4.22	1.79	1.75	7.55	6.97
Cobalt (HAP)	0.04	0.45	0.38	0.15	0.24	0.23	0.38	0.33	0	0.31	0.11	0.15	0.45	0.5
Lead (HAP)	0.13	55.8	394	25.4	31.3	35	245	43.2	0	118.53	144.19	25.4	394.0	356**
Manganese (HAP)	0.009	54.7	51.4	48.1	49.4	50.4	42.3	58.7	0	50.71	5.16	42.3	58.7	58.7
Mercury (HAP)	0.003	0.112	0.113	0.085	0.095	0.1	0.313	0.042	0	0.12	0.09	0.042	0.313	0.259**
Nickel (HAP)	0.04	0.4	0.43	0.54	0.57	0.61	2.6	0.37	0	0.79	0.80	0.37	2.6	2.6***
Selenium (HAP)	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0	0.27	0.00	0.27	0.27	n.d.
Total Low Volatile Metals (mg/kg)	--	**58.9**	**61.8**	**60.1**	**56.4**	**58.2**	**49.5**	**67.5**	--	**58.91**	**5.5**	**49.47**	**67.54**	**64.34***
Total Metals (mg/kg)	--	**115.2**	**456.7**	**86.1**	**88.3**	**93.8**	**295.8**	**111.2**	--	**178.17**	**143.5**	**86.12**	**456.66**	**456.7*****
Metals (mg/kg) DRY BASIS														
Antimony (HAP)		0.18	0.36	0.43	0.48	0.53	0.50	0.29	0	0.39	0.13	0.18	0.52936728	0.59
Arsenic (HAP)		1.69	5.72	4.32	2.43	2.71	1.15	4.37	0	3.20	1.65	1.15	5.71673399	5.74
Beryllium (HAP)		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0.010	0.000	0.010	0.01054435	n.d.
Cadmium (HAP)		0.24	0.59	0.32	0.35	0.35	0.95	0.24	0	0.43	0.26	0.24	0.9489917	0.832**
Chromium (HAP)		2.11	5.66	9.52	4.88	5.48	3.86	5.61	0	5.30	2.25	2.11	9.51600706	8.77
Cobalt (HAP)		0.54	0.47	0.19	0.30	0.29	0.50	0.42	0	0.39	0.13	0.19	0.54216867	0.6
Lead (HAP)		67.23	482.31	32.01	39.45	44.11	322.92	54.59	0	148.95	179.64	32.0	482.3	448.7**
Manganese (HAP)		65.90	62.92	60.63	62.26	63.52	55.75	74.18	0	63.60	5.63	55.8	74.1817263	72.3
Mercury (HAP)		0.13	0.14	0.11	0.12	0.13	0.41	0.05	0	0.16	0.12	0.053	0.413	0.336**
Nickel (HAP)		0.48	0.53	0.68	0.72	0.77	3.43	0.47	0	1.01	1.07	0.47	3.42691446	3.43***
Selenium (HAP)		0.33	0.33	0.34	0.34	0.34	0.36	0.34	0	0.34	0.01	0.33	0.35587189	0.36***
Total Semi Volatile Metals (mg/kg)	--	**67.8**	**483.2**	**32.7**	**40.1**	**44.8**	**324.2**	**55.2**	--	**149.72**	**179.8**	**32.67**	**483.23**	**449.0**
Total Low Volatile Metals (mg/kg)	--	**70.9**	**75.6**	**75.8**	**71.1**	**73.3**	**65.2**	**85.4**	--	**73.90**	**6.2**	**65.20**	**85.35**	**83.3**
Total Metals (mg/kg)	--	**138.8**	**559.0**	**108.5**	**111.3**	**118.2**	**389.8**	**140.6**	--	**223.77**	**178.5**	**108.55**	**559.02**	**558.7*****
Formaldehyde (µg/kg)														
Formaldehyde	420	47000	25000	67000	62000	60000	130000	20000	0	58714.29	36367.18	20000	130000	114689
Formaldehyde (µg/kg) DRY BASIS														
Formaldehyde		56627	30604	84447	78145	75624	171346	25275	0	74580.84	48583.28	25275	171345.723	149358
Ions														
Bromide (mg/kg)	3	3	3	3	3	3	3	3	0	3.00	0.00	3	3	n.d.
Chloride (mg/kg)	15	202	315	169	163	163	173	253	0	205.43	58.11	163	315	295.8**
Fluoride (mg/kg)	3	12	12	11	11	12	11	53	0	17.43	15.69	11	53	53***
Total Halogens (mg/kg)	--	**217.0**	**330.0**	**183.0**	**177.0**	**178.0**	**187.0**	**309.0**	--	**225.86**	**65.65**	**177.00**	**330.00**	**330*****
Ions DRY BASIS														
Bromide (mg/kg)		4	4	4	4	4	4	4	0	3.77	0.11	4	4	3.93
Chloride (mg/kg)		243	386	213	205	205	228	320	0	257.23	69.22	205	386	364.9
Fluoride (mg/kg)		14	15	14	14	15	14	67	0	21.93	19.87	14	67	67
Total Halogens (mg/kg)	--	**257.8**	**400.3**	**226.9**	**219.3**	**220.6**	**242.5**	**386.7**	--	**279.16**	**79.36**	**219.31**	**400.29**	**400**
Volatile Compounds (µg/kg)														
1,1,2,2-Tetrachloroethane (HAP/OH)	var	4.8	4.61	4.43	4.61	4.61	4.43	4.43	0	4.6	0.1	4.43	4.8	4.774
1,1,2-Trichloroethane (HAP/OH)	var	8.13	7.81	7.5	7.81	7.81	7.5	7.5	0	7.7	0.2	7.50	8.13	8.088
1,2,4-Trichlorobenzene (HAP/OH)	var	2.71	2.60	2.5	2.6	2.6	2.5	2.5	0	2.6	0.1	2.50	2.71	2.694
1,4-Dichlorobenzene(p) (HAP/OH)	var	2.09	2.00	1.93	2	2	22.9	1.93	0	5.0	7.9	1.93	22.9	22.9***
Acetonitrile (HAP/N)	var	64.6	62.0	59.7	62	62	59.7	59.7	0	61.4	1.8	59.7	64.6	64.2
Acrolein (HAP)	var	144	138	133	138	138	133	133	0	136.7	4.1	133	144	143
Acrylonitrile (HAP/N)	var	54.2	52	50	52	52	50	50	0	51.5	1.6	50.0	54.2	53.87
Allyl chloride (HAP/OH)	var	7.51	7.20	6.93	7.2	7.2	6.93	6.93	0	7.1	0.2	6.9	7.51	7.461
Benzene (HAP)	var	5	4.80	3.65	3.41	3.41	3.27	9.81	0	4.8	2.3	3.270	9.810	9.81***
Bromoform (HAP/OH)	var	7.09	6.81	6.54	6.81	6.81	6.54	6.54	0	6.7	0.2	6.54	7.09	7.053
Chlorobenzene (HAP/OH)	var	2.92	2.81	2.7	2.81	2.81	2.7	2.7	0	2.8	0.1	2.70	2.92	2.907
Chloroform (HAP/OH)	var	3.76	3.60	3.47	3.6	3.6	3.47	3.47	0	3.6	0.1	3.47	3.76	3.732

Chloroprene (HAP/OH)	var	4.8	4.61	4.43	4.61	4.61	4.43	4.43	0	4.6	0.1	4.43	4.80	4.774
Ethyl benzene (HAP)	var	6.25	2.40	2.31	3.4	2.4	2.31	2.31	0	3.1	1.5	2.31	6.25	6.25***
Hexachlorobutadiene (HAP/OH)	var	4.8	4.61	4.43	4.61	4.61	4.43	4.43	0	4.6	0.1	4.43	4.8	4.774
Isopropylbenzene (HAP)	var	2.92	2.81	2.7	2.81	2.81	2.7	2.7	0	2.8	0.1	2.70	2.92	2.9
m,p-Xylenes (HAP)	var	10.8	12.4	11.9	10.6	10	19.4	7.88	0	11.9	3.6	7.88	19.4	17.4
Methyl methacrylate (HAP)	var	8.13	94.2	7130	5610	5070	7.5	7.5	0	2561.0	3217.4	7.50	7130	7130***
Methyl tert butyl ether (HAP)	var	5.42	5.20	5	5.2	5.2	5	5	0	5.1	0.2	5.00	5.42	5.387
Methylene chloride (HAP/OH)	var	22.5	30.6	21.7	16.2	18.8	17.9	13.8	0	20.2	5.5	13.8	30.6	28.64
Naphthalene (HAP)	var	138	253	106	107	110	161	60.2	0	133.6	61.2	60.20	253	227.7
n-Hexane (HAP)	var	6.67	6.40	6.16	6.4	6.4	6.16	6.16	0	6.3	0.2	6.16	6.67	6.628
o-Xylenes (HAP)	var	3.34	6.40	6.35	5.8	6	13.1	5	0	6.6	3.1	3.34	13.1	11.38**
Styrene (HAP)	var	44.2	5.40	13.7	11.6	12.6	11.5	13.7	0	16.1	12.7	5.4	44.2	34.6**
Tetrachloroethylene (HAP/OH)	var	5.21	5.00	4.81	5	5	4.81	4.81	0	4.9	0.1	4.8	5.21	5.178
Toluene (HAP)	var	210	213	74	57.8	62.2	92.1	94.8	0	114.8	67.5	57.8	213.0	230.8**
Vinyl chloride	var	5.42	5.20	5	5.2	5.2	5	5	0	5.1	0.2	5.00	5.42	5.387
Total Volatile Compounds (µg/kg)	--	**785.3**	**945.5**	**7680.8**	**6149.1**	**5618.7**	**660.3**	**526.2**	--	**3195.12**	**3139.5**	**526.23**	**7680.8**	**11460*** **
Semi-Volatile Compounds (µg/kg)														
1,2,4-Trichlorobenzene (HAP/OH)	var	860	900	727	995	727	900	945	0	864.9	103.2	727	995	1024
1,4-Dichlorobenzene (HAP/OH)	var	560	586	474	648	474	586	615	0	563.3	66.9	474	648	666.2
1-Methylnaphthalene	var	900	943	762	1050	762	943	990	0	907.1	109.6	762	1050	1076
2,4,5-Trichlorophenol (HAP/OH)	var	778	815	658	900	658	815	855	0	782.7	93.3	658	900	926.3
2,4,6-Trichlorophenol (HAP/OH)	var	682	715	577	790	577	715	750	0	686.6	82.0	577	790	812.8
2,4-Dinitrophenol (HAP/N)	var	314	329	266	364	266	329	345	0	316.1	37.6	266	364	374
2,4-Dinitrotoluene (HAP/N)	var	560	586	474	648	474	586	615	0	563.3	66.9	474	648	666.2
2-Methylnaphthalene	var	805	843	681	932	681	843	885	0	810.0	96.6	681	932	958.7
3,3-Dichlorobenzidene (HAP/OH/N)	var	1160	1220	981	1350	981	1220	1280	0	1170.3	142.0	981	1350	1389
4-Nitrophenol (HAP/N)	var	764	800	647	885	647	800	840	0	769.0	91.5	647	885	909.8
Acenaphthene	var	723	758	612	837	612	758	795	0	727.9	86.7	612	837	861.3
Acenaphthylene	var	641	672	543	743	543	672	705	0	645.6	76.9	543	743	763.9
Acetophenone	var	628	658	531	727	531	658	690	0	631.9	75.5	531	727	748
Aniline	var	1100	1150	924	1270	924	1150	1200	0	1102.6	132.8	924	1270	1307
Anthracene	var	587	615	497	679	497	615	645	0	590.7	70.1	497	679	698.6
Benzo(a)anthracene	var	641	672	543	743	543	672	705	0	645.6	76.9	543	743	763.9
Benzo(a)pyrene	var	505	529	427	585	427	529	555	0	508.1	60.8	427	585	601.7
Benzo(b)fluoranthene	var	355	372	300	411	300	372	390	0	357.1	42.7	300	411	422.9
Benzo(g,h,i)perylene	var	710	743	600	822	600	743	780	0	714.0	85.4	600	822	845.4
Benzo(k)fluoranthene	var	805	843	681	932	681	843	885	0	810.0	96.6	681	932	958.7
Biphenyl (HAP)	var	560	586	474	648	474	586	615	0	563.3	66.9	474	648	666.2
Bis(2-ethylhexyl)phthalate (HAP)	var	17600	4600	14600	31500	11100	22000	660	0	14580.0	10455.8	660	31500	30673
Chrysene	var	614	643	520	711	520	643	675	0	618.0	73.5	520	711	731
Dibenz(a,h)anthracene	var	628	658	531	727	531	658	690	0	631.9	75.5	531	727	748
Dibenzofurans (D/F)	var	628	1800	531	727	531	658	690	0	795.0	449.4	531	1800	1800***
Dimethyl phthalate (HAP)	var	723	758	612	837	612	758	795	0	727.9	86.7	612	837	861.3
Fluoranthene	var	655	1450	881	758	554	686	720	0	814.9	297.3	554	1450	1252**
Fluorene	var	641	672	543	743	543	672	705	0	645.6	76.9	543	743	763.9
Hexachlorobenzene (HAP/OH)	var	655	686	554	758	554	686	720	0	659.0	78.6	554	758	779.9
Hexachlorobutadiene (HAP/OH)	var	750	786	635	869	635	786	825	0	755.1	90.0	635	869	893.7
Hexachlorocyclopentadiene (HAP/OH)	var	464	486	393	537	393	486	510	0	467.0	55.4	393	537	552.3
Hexachloroethane	var	423	443	358	490	358	443	465	0	425.7	50.7	358	490	503.8
Indeno(1,2,3-cd)pyrene	var	560	586	474	648	474	586	615	0	563.3	66.9	474	648	666.2
Naphthalene (HAP)	var	669	700	566	774	566	700	735	0	672.9	80.0	566	774	796
Nitrobenzene (HAP/N)	var	532	558	450	616	450	558	585	0	535.6	64.0	450	616	634.1
Pentachlorophenol (HAP/OH)	var	3230	2260	108000	101000	126000	41500	525	0	54645.0	55642.5	525	126000	140288
Phenanthrene	var	641	6150	1520	664	500	610	630	0	1530.7	2065.7	500	6150	6150***
Phenol	var	2080	8400	1940	2130	1680	4600	3100	0	3418.6	2414.3	1680	8400	7076**
Pyrene	var	628	1190	677	727	531	658	690	0	728.7	212.6	531	1190	1040**
Total Semi-Volatile Compounds (µg/kg)	--	**45339**	**46675**	**144963**	**160532**	**157710**	**91537**	**28860**	--	**96517**	**57584**	**28860**	**160532**	**185147*** **

* All 90% UPL Results reported as Normal
** 90% UPL Result reported as Lognormal
*** 90% UPL Result Non-Parametric
-- = Non-Detect
n.d. = Only 1 Distinct Value, therefore no variance.

MRL = Method Reporting Limit
MDL = Method Detection Limit
HAP = Hazardous Air Pollutant
OH = Organic Halogen
N = Nitrogenated

= Nondetect; Reported as MDL

June 6, 2013

Rule language:

40 C.F.R. 241.4(a)(5)

"(5) Construction and demolition wood that has been obtained from suppliers that employ construction and demolition processing practices that are proven to result in the production of non-waste fuel, and is combusted by persons that conduct, or demonstrate that a third party conducts, an initial and an annual review to verify such practices are being employed.

Add to definitions:

40 C.F.R. 241.2:

Construction and demolition processing practices that are proven to result in the production of non-waste fuel are:

(1) separation of contaminants through either positive sorting or negative sorting by removing non-wood material and wood treated with pentachlorophenol, chromated copper arsenic, or other copper, chromium or arsenical preservatives (such as copper naphthenate and ammoniacal copper arsenate, and alkaline copper quaternary), and
(2) separation of lead through the separation of lead-painted wood or through the removal of fines generated during the process.

Preamble language.

C&D wood fuel is a commercial commodity that is created by C&D wood processors and combusted by combustors that have biomass boilers. The agency is proposing to list construction and demolition wood that has been processed in accordance with industry practices that have been proven to produce a wood product that is a non-waste fuel.

C&D wood can be obtained directly from a construction or demolition site or from a contractor that has collected mixed C&D material.[1] It is also obtained from landfill operators or transfer stations that divert, collect and segregate C&D wood at their operations (diversion is required by law in some states, including California and Massachusetts). While many C&D wood processors have facilities that are dedicated to that purpose, landfill operators, transfer stations, material recovery facilities, wood yards, and combustion facilities, both municipal and commercial, also can process C&D wood. Processing even can occur at the construction or demolition site. A processing facility may be paid a tipping fee to receive mixed C&D material. However, after receipt the C&D wood processor then invests significant time and effort into processing the C&D wood into a valuable fuel commodity.

[1] C&D wood that does not require processing because it does not contain contaminants at concentrations not normally associated with virgin wood, (e.g., trimmings from framing at a construction site or clean dimensional lumber recovered from carefully deconstructed buildings), is clean cellulosic biomass and could be combusted as traditional fuel. 40 C.F.R. 241.2.

The industry practices that are proven to produce non-waste fuel are the sorting of C&D material to separate the following contaminants: non-wood material, wood treated with pentachlorophenol, chromated copper arsenic, or other copper, chromium or arsenical preservatives (such as copper naphthenate and ammoniacal copper arsenate, and alkaline copper quaternary) and the separation of lead (through the separation of either lead-painted wood or fines generated during the process). The Agency also notes that a number of states regulate C&D wood processing or combustion and these regulations provide additional safeguards on the quality of C&D wood that is combusted.

Separation by a processor generally takes place either through positive sorting or through negative sorting, with either method producing a fuel product that meets the legitimacy criteria. The material that cannot be processed into non-waste fuel is either recycled or disposed in accordance with applicable law, while the remaining wood that is a non-waste fuel is further processed by sizing it to meet combustion specifications.

Separation also can take place at the construction or demolition site itself. The Agency notes that under the Clean Air Act, the demolition contractor must inspect for asbestos containing material prior to the demolition of a building and properly dispose of any such material that is found. As a result of these regulatory requirements, the Agency does not anticipate contamination of C&D wood by asbestos.

The determination by the Agency that these practices are proven to produce non-waste fuel is supported by information in the record on the contaminant concentrations in C&D wood that has been processed in accordance with these practices. These data demonstrate that such wood has contaminant concentrations comparable to clean cellulosic biomass, other than concentrations of formaldehyde. The possible sources of formaldehyde in processed C&D wood are naturally occurring formaldehyde in clean cellulosic biomass, which is a traditional fuel, and formaldehyde found in some resinated wood products,[2] which the Agency has already determined to be a non-waste fuel. Thus, the formaldehyde levels in C&D wood are not indicators that C&D wood is combusted for the purpose of disposal.

The data also include three data points out of 224 for lead concentrations that exceed levels found in virgin wood. However, three data points are not evidence that C&D wood is combusted for the purpose of discarding lead. In fact, the record demonstrates that both C&D wood processors and combustors take significant steps, and invest significant resources, to make sure that C&D wood has been processed to remove lead and other contaminants. This is evidence that neither the processor nor the combustor has any intent to discard contaminants through the combustion of C&D wood.

Combustion facilities generally ensure the quality of the C&D wood they combust by reviewing the C&D wood supplier both before initially obtaining C&D wood from that supplier and annually thereafter, to ensure that the supplier is carrying out proven C&D processing practices. In some states (such as Maine) a third party conducts these reviews. Combustion facilities also

[2] Many manufactured wood products contain resins and adhesives. These wood products are components of the wood obtained from construction and demolition sites.

employ contract or purchasing agreement specifications that, while site specific, ensure the materials received meet the quality required for use as fuel. Quality assurance/ quality control (QA/QC) procedures at combustion facilities include measures to ensure that those contract or purchasing agreement specifications are met, such as periodic visual inspection of C&D wood as it is received from the supplier. These specifications and QA/QC measures by the combustor provide further evidence that no discard is taking place when C&D wood is combusted.

The management of C&D wood also is evidence that no discard is taking place. C&D wood is transported typically to an energy recovery facility, in covered chip vans or semi-trailers. At the energy recovery facility, the C&D wood is stored in the plant's wood fuel storage yard or building. These storage and management practices are the same as those used for wood and biomass that are traditional fuels. Energy recovery facilities also must comply with all applicable federal, state and local permits and other requirements, including applicable air pollution control requirements.

Thus, the record clearly shows that C&D wood that has been obtained from suppliers that employ proven construction and demolition processing practices and that are subject to an annual review to verify such practices are being employed is a legitimate non-waste fuel.

Individual combustors can demonstrate that C&D wood is a non-waste fuel with the following records:

a. A copy of a contract, purchase order, or other document that requires a supplier of C&D wood to process and manage C&D wood consistent with the practices described herein or a certification from the supplier that the practices described herein were followed, and
b. A record of the initial and annual review of the C&D wood processing facility, or evidence that such a review is conducted by a third party.

Reliance on such records is consistent with how EPA proposes to implement its non-waste determination for tires from established tire collection programs. Combustion facilities that combust tires are allowed to rely on certifications that the tires that are combusted are from established tire collection programs and were not discarded. 40 C.F.R. 60.2740(v). EPA recognizes that such a certification can be based on a contractual arrangement and has defined "established tire collection programs" to include "a contractual arrangement that ensures that scrap tires are not discarded and are handled as valuable commodities through arrival at the combustion facility."40 C.F.R. 241.2. Once that certification is made, EPA does not intend to require the combustor to have perfect knowledge of the source of a secondary fuel and does not require the combustor to test that fuel. "Rather, it is sufficient that the ultimate user verify that it is obtaining tires from an established tire collection program, which program can provide the user with reasonable assurance that it manages tires carefully from point of collection to point of burning and which does not receive tires which have been abandoned in landfills or otherwise." 76 Fed. Reg. 28318, 28322 (May 17, 2011). The Agency proposes to implement its non-waste determination for C&D wood in a similar manner.