RAMBOLL

ENVIRONMENT
& HEALTH

Mr. William Willets, PE
Chief, Permitting Section, Division of Air Quality
NC Department of Environmental Quality
1641 Mail Service Center
Raleigh, NC 27699-1641

Re: Application for Air Quality Permit Modification
Enviva Pellets Hamlet, LLC
Hamlet, North Carolina
Richmond County
Permit No.: 10365R04
Facility ID: 7700096

Dear Mr. Willets:

Date November 26, 2019

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Enclosed please find a North Carolina Department of Environmental Quality (NC DEQ) permit application package for an air quality permit modification for Enviva Pellets Hamlet, LLC (Enviva) (NC DEQ Facility ID #7700096) in Richmond County. This permit application is being submitted in accordance with the Settlement Agreement, dated June 3, 2019, entered into by Enviva, DEQ, and Clean Air Carolina in Contested Case 19 EHR 00866.

Under the Settlement Agreement, Enviva agreed to submit a permit application within 180 days (no later than December 2, 2019) for the installation of additional control technology or an equivalent engineering alternative to control volatile organic compound (VOC) emissions from the Dry Hammermills (ES-HM-1 through 8).

As part of this application, Enviva is also requesting removal of the 85% limit on Dry Hammermill throughput that was included in Air Quality Permit No. 10365R04, and the inclusion of the existing furnace bypass stack in the permit. Implementation of the Dry Hammermill VOC control will result in a significant decrease in the VOC emissions (127 tpy) and the plant will no longer require a throughput limitation for the Dry Hammermills to be classified as a minor source with respect to PSD. The Hamlet plant will remain a synthetic minor PSD source for all PSD-regulated pollutants.

As required, three (3) copies of the complete permit application package are enclosed. The application processing fee of $970 will be paid electronically through the ePayments System.

Thank you for your prompt attention to this matter. If you have any questions regarding this request, please contact me at (225) 408-2691 or Kai Simonsen, Air Permit Engineer at Enviva, at (984) 789-3628.

Yours sincerely,

Michael Carbon
Managing Principal

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cc: Yana Kravtsova (Enviva)
Kai Simonsen (Enviva)

Enclosures: Permit Application

Prepared for
Enviva Pellets Hamlet, LLC
Richmond County, North Carolina

Prepared By
Ramboll US Corporation
Research Triangle Park, North Carolina

Date
November 2019

APPLICATION FOR AIR QUALITY PERMIT MODIFICATION

ENVIVA PELLETS HAMLET, LLC

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CONTENTS

APPENDIX

ACRONYMS AND ABBREVIATIONS

AP-42	Compilation of Air Pollutant Emission Factors
bhp	brake horsepower
BMP	Best Management Practice
CAA	Clean Air Act
CAM	Compliance Assurance Monitoring
CFR	Code of Federal Regulations
CI	Compression Ignition
CO	Carbon Monoxide
DAQ	Division of Air Quality
DENR	Department of Environment and Natural Resources
FSC	Forest Stewardship Council
HAP	Hazardous Air Pollutant
hp	horsepower
lb	Pound
MACT	Maximum Achievable Control Technology
MMBtu	Million British thermal units
NAAQS	National Ambient Air Quality Standards
NCAC	North Carolina Administrative Code
NCASI	National Council for Air and Stream Improvement
NCDEQ	North Carolina Department of Environmental Quality
NESHAP	National Emission Standards for Hazardous Air Pollutants
NNSR	Nonattainment New Source Review
NO_X	Nitrogen Oxides ($NO + NO_2$)
NSPS	New Source Performance Standards
NSR	New Source Review
ODT	Oven Dried Tons
PEFC	Programme for the Endorsement of Forest Certifications
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter Less Than 2.5 Micrometers in Aerodynamic Diameter
PM_{10}	Particulate Matter Less Than 10 Micrometers in Aerodynamic Diameter
PSD	Prevention of Significant Deterioration

PSEU	Pollutant Specific Emission Unit
RCO	Regenerative Catalytic Oxidizer
RTO	Regenerative Thermal Oxidizer
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SFI	Sustainable Forestry Initiative
TAP	Toxic Air Pollutant
tph	tons per hour
tpy	tons per year
EPA	US Environmental Protection Agency
VOC	Volatile Organic Compounds
WESP	Wet Electrostatic Precipitator

1. INTRODUCTION

Enviva Pellets Hamlet, LLC (Enviva) was initially permitted to construct a wood pellets manufacturing plant (referred to herein as "the Hamlet plant" or "the facility") in Richmond County, North Carolina under the authorization of Prevention of Significant Deterioration (PSD) Permit No. 10365R00 issued by the North Carolina Department of Environment and Natural Resources (DENR), now the NC Department of Environmental Quality (NCDEQ), Division of Air Quality (NC DAQ) on March 29, 2016.[1]

Enviva submitted a permit modification application on May 14, 2018 to authorize planned changes for the Hamlet plant in order to meet new customer softwood percentage and production rate demands and to incorporate significant emission reduction efforts to minimize emissions impacts associated with the project. NC DAQ issued Air Quality Permit No. 10365R03 on January 14, 2019 to authorize these changes. In addition, Enviva submitted a permit modification application on July 2, 2019 in accordance with a Settlement Agreement, dated June 3, 2019, entered into by Enviva, NCDEQ, and Clean Air Carolina in Contested Case 19 EHR 00866 (the "Settlement Agreement"). A copy of the Settlement Agreement is provided in Appendix A. Under the Settlement Agreement, Enviva agreed to submit an application for modification of Permit R03 to include an express 85% limit on throughput of the Dry Hammermills (DHMs) at the Facility as was contemplated by the Permit R03 application. Air Quality Permit No. 10365R04 was issued on October 30, 2019 that incorporated this throughput limit.

This permit application is being submitted in accordance with the Settlement Agreement under which Enviva agreed to submit a permit application within 180 days (no later than December 2, 2019) for the installation of additional control technology or an equivalent engineering alternative to control volatile organic compound (VOC) emissions from the Dry Hammermills (ES-HM-1 through 8). Per the Settlement Agreement, the selected control technology or engineering alternative shall consist of exhausting 100% of the Dry Hammermill emissions to one or a combination of the following options:

i. To a dedicated regenerative thermal oxidizer (RTO) or regenerative catalytic oxidizer (RCO) on the Dry Hammermills;

ii. To the pellet cooler RCO, the dryer furnace, or to the wood dryer RTO.

With this application, Enviva requests authorization from DAQ to meet the requirements of the Settlement Agreement by modifying Permit R04 to provide for either of the following two options:

Control Option 1: Recirculation of a portion of the exhaust from each Dry Hammermill back into the Dry Hammermill, with the remaining exhaust being routed through the existing baghouses and then to a new dedicated quench system and RTO/RCO to be installed downstream of the existing baghouses to control VOC emissions from the eight (8) Dry Hammermills.

[1] Permit Nos. 10365R01, 10365R02, 10365R03 were subsequently issued on April 7, 2017, June 8, 2017, and January 14, 2019, respectively.

Control Option 2: Recirculation of a portion of exhaust from each Dry Hammermill back into the Dry Hammermill, with the remaining exhaust being routed through the existing baghouses followed by a new quench system and then to either:

a. the existing furnace, wet electrostatic precipitator (WESP), and RTO;

b. directly to the existing WESP and RTO; or

c. in the event that the furnace is not operational, the exhaust would be routed directly to the existing RTO.

Under both control options, total emissions from each Dry Hammermill will still be vented to a baghouse. The purpose of the recirculation is to reduce the volume of air that is routed to the downstream control device (i.e., RTO or RTO/RCO). In this application, Enviva has evaluated potential emissions for both Control Options 1 and 2 and requests that both options be included in the air permit. Under each control option, 100% of the dry hammermill exhaust will be controlled by a baghouse and RTO or RTO/RCO. A more detailed description of each control option is provided in Section 3 of this application.

As part of this application, Enviva is also requesting removal of the 85% limit on Dry Hammermill throughput that was included in Permit R04, and the inclusion of the existing furnace bypass stack in the permit. Implementation of the proposed Dry Hammermill VOC control will result in a significant decrease in VOC emissions (127 tpy) and the plant will no longer require a throughput limitation for the Dry Hammermills to be classified as a minor source with respect to PSD. There will also be a significant decrease in total Hazardous Air Pollutant (HAP) emissions (14 tpy) as a result of the proposed changes.

With this application, there will be a decrease in PM and PM_{10} emissions and an increase in the emissions of carbon dioxide (CO), nitrogen oxides (NO_x), $PM_{2.5}$, and sulfur dioxide (SO_2). The Hamlet plant will remain a synthetic minor PSD source for all PSD-regulated pollutants.

Requested permit conditions are included in Section 2 and a description of the proposed control options is provided in Section 3. Methodologies used to quantify potential emissions associated with each control option are summarized in Section 4. Section 5 describes the applicability of federal and state permitting programs. Section 6 includes a detailed applicability analysis of both federal and state regulations. The completed air permit application forms are included in Appendix B.

2. REQUESTED PERMIT REVISIONS

With implementation of VOC control for the Dry Hammermills, Enviva requests that the requirement for at least 15% of the total facility-wide throughput to bypass the Dry Hammermills, included in Air Quality Permit No. 10365R04, be removed. Specifically, Enviva requests that the throughput limit of 531,259 oven dried tons (ODT) per year (yr) for the Dry Hammermills be revised to 625,011 ODT/yr and that the following permit conditions be removed from Air Quality Permit No. 10365R04:

- Condition 2.2(A)(2)(b)(iv): The total dry hammermill throughput shall not exceed 85% of the total facility-wide wood pellet production, on a 12-month rolling basis, rolled monthly.
- Condition 2.2(A)(2)(j): The Permittee shall monitor and record the total dry hammermill throughput, in ODT and as a percentage of total pellet production, on a monthly and 12-month rolling basis.
- Condition 2.2(A)(2)(k)(iii): The monthly and 12-month rolling total dry hammermill throughput and percentage of total pellet production.

Enviva requests that the following permit conditions be added for Control Option 1:

i. The Permittee shall operate the RTO/RCO during all periods in which any of the dry hammermill lines ("ES-HM-1" through "ES-HM-8") are in operation.

ii. Until the first VOC performance testing following utilization of an RTO/RCO to control VOC emissions from the dry hammermills, the Permittee shall operate the RTO/RCO at or above the temperature recommended by the manufacturers of the RTO/RCO. After such testing the Permittee shall maintain the combustion chamber temperature of the RTO/RCO at or above the level approved by the Division in writing. Until such approval is granted, the Permittee shall maintain the combustion chamber temperature of the RTO/RCO at or above the temperature at which testing was performed.

iii. The Permittee shall install, calibrate, operate, maintain, and inspect a continuous temperature monitoring and recording system, in accordance with the manufacturers' recommendations, to monitor the temperature in the combustion chamber (the second half of the oxidizer away from the flame zone) to ensure the average combustion temperature does not drop below the temperature range established under ii above.

Enviva requests that the following permit conditions be added for Control Option 2:

i. The Permittee shall operate the dryer line RTO during all periods in which any of the dry hammermill lines ("ES-HM-1" through "ES-HM-8") are in operation.

Enviva also requests that permit condition 2.2(A)(2)(c)(vii) be removed because the temperature at the inlet of the RCO is not relevant to destruction efficiency.

The following sections of this application include a description of the proposed new emission control options, methodologies used to quantify potential emissions, applicability of federal and state permitting programs, and a detailed applicability analysis of both federal and state regulations.

3. PROJECT DESCRIPTION

Enviva manufactures wood pellets for use as a renewable fuel for energy generation and industrial customers. Enviva's customers use wood pellets in place of coal, significantly reducing emissions of pollutants such as lifecycle CO_2/greenhouse gases, mercury, arsenic and lead. The company is dedicated to improving the environmental profile of energy generation while promoting sustainable forestry in the southeastern United States. Enviva holds certifications from the Forest Stewardship Council (FSC), Sustainable Forestry Initiative (SFI), Programme for the Endorsement of Forest Certification (PEFC), and Sustainable Biomass Program (SBP). Enviva requires that all suppliers adhere to state-developed "Best Management Practices" (BMPs) in their activities to protect water quality and sensitive ecosystems. In addition, Enviva is implementing an industry leading "track and trace" system to further ensure that all fiber resources come from responsible harvests. Enviva pays particular attention to: land use change, use and effectiveness of BMPs, wetlands, biodiversity, and certification status. All of this combined ensures that Enviva's forestry activities contribute to healthy forests both today and in the future. A detailed description of Enviva's Responsible Wood Supply Program can be found at: http://www.envivabiomass.com/sustainability/wood-sourcing/responsible-wood-supply-program/

The following sections provide a description of the sources that are relevant to this application. An area map and process flow diagram are provided in Appendices C and D, respectively.

3.1 Dry Hammermills

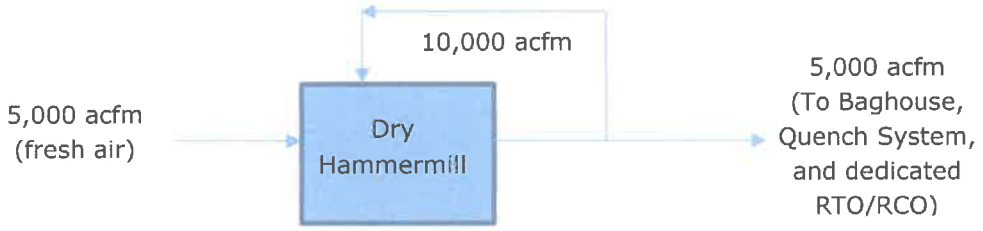
Prior to pelletization, dried wood is reduced to the appropriate size using eight (8) Dry Hammermills operating in parallel (ES-HM-1 through ES-HM-8). Each Dry Hammermill includes a product recovery cyclone for capturing additional dried wood for further processing. Particulate emissions from the eight (8) Dry Hammermills are controlled using eight (8) individual baghouses (CD-HM-BH-1 through 8). In order to control VOC emissions from the Dry Hammermills pursuant to the Settlement Agreement, Enviva is requesting to permit two emission control options as detailed below.

3.1.1 Control Option 1

Under Control Option 1, a portion of the exhaust from each Dry Hammermill will be recirculated back into the Dry Hammermill. Under the current configuration, 15,000 acfm of fresh air is pulled into the Dry Hammermill which then exhausts through the baghouse to the atmosphere. Under the revised configuration, 10,000 acfm of the exhaust from the Dry Hammermill would be recirculated back into the Dry Hammermill rather than being routed through the baghouse. Although total emissions from each Dry Hammermill will still be vented to a baghouse, recirculation results in only 5,000 acfm of fresh air being pulled into the Dry Hammermill and 5,000 acfm being routed through the baghouse. From the baghouse, the exhaust will be routed to a new dedicated quench system and RTO/RCO. The purpose of the recirculation is to reduce the volume of air that is routed to the RTO/RCO. The quench system will be installed to protect the RTO/RCO and reduce the risk of fire/explosion that would exist if a baghouse was located directly upstream of a combustion device (i.e., RTO/RCO). The RTO/RCO will provide 95% destruction efficiency of VOC, HAP, and Toxic Air Pollutant (TAP) emissions. Under this control option, 100% of the dry hammermill exhaust will be controlled by a baghouse and RTO/RCO.

Current Configuration

Revised Configuration under Control Option 1



3.1.2 Control Option 2

Similar to Control Option 1, a portion of the exhaust from each Dry Hammermill will be recirculated back into the Dry Hammermill. Under the revised configuration, 10,000 acfm of the exhaust from the Dry Hammermill will be recirculated back into the Dry Hammermill and 5,000 acfm will be routed through the baghouse. Total emissions from each Dry Hammermill will still be vented to a baghouse. From the baghouse, the exhaust will be routed to a new quench system and then to the furnace and WESP with subsequent control of VOC emissions by the dryer line RTO. Any surplus air volume, should there be any, will be routed from the quench system directly to either the existing WESP followed by RTO or directly to the RTO for control of VOC emissions. The feed screws of the Dry Hammermills will be interlocked with the RTO to prevent operation of the Dry Hammermills when the RTO is not ready to receive and control the Dry Hammermill exhaust. If the furnace is not operational, the Dry Hammermill exhaust will be routed directly from the quench system to either the WESP followed by the RTO or directly to the RTO. The RTO will provide 95% destruction efficiency of VOC, HAP, and TAP emissions. Since the Dry Hammermill exhaust may not be controlled by the WESP under this control option, potential emissions were evaluated assuming no additional control of PM emissions by the WESP. Under this control option, 100% of the dry hammermill exhaust will be controlled by a baghouse and RTO. Figures depicting the current and proposed configuration are provided below.

Current Configuration

Revised Configuration under Control Option 2

3.2 Furnace and Dryer Bypass Stacks

Bypass stacks for the furnace and dryer are used to exhaust hot gases during start-ups (for temperature control), shutdowns, and malfunctions. Specifically, the Furnace Bypass Stack is used in the following situations:

- **Cold Start-ups:** The furnace bypass stack is used when the furnace is started up from a cold shutdown until the refractory is sufficiently heated and can sustain operations at a low level (approximately 15% of the maximum heat input rate). The bypass stack is then closed, and the furnace is slowly brought up to a normal operating rate.
- **Malfunction:** The furnace itself can abort and open the bypass stack in the event of a malfunction. This may be caused by failsafe interlocks associated with the furnace or dryer and emissions control systems as well as failures of or interruptions in utility supply systems (i.e., electricity, compressed air, water/fire protection). As soon as the furnace aborts it automatically switches to "idle mode" (defined as operation at up to a maximum heat input rate of 15 MMBtu/hr). The fuel feed is then stopped and the heat input rate drops rapidly.
- **Planned Shutdown:** In the event of a planned shutdown, the furnace heat input is decreased and all remaining fuel is moved through the system to prevent a fire. The remaining fuel is combusted prior to opening the furnace bypass stack. The furnace bypass stack is not utilized until after the furnace achieves an idle state (15 MMBtu/hr or less). Until this time, emissions continue to be controlled by the WESP and RTO.

Conditions under which the dryer bypass stack is used are as follows:

- **Malfunction:** The dryer system can abort due to power failure, equipment failure, or furnace abort. If the RTO goes offline because of an interlock failure, the dryer will immediately abort. This may occur if the dryer temperature is out of range or due to equipment or power failure. Dryer abort is also triggered if a spark is detected in the dryer system.

- **Planned Shutdown:** During planned shutdowns, as the remaining fuel is combusted by the furnace, the Operator reduces the chip input to the dryer. When only a small amount of chips remain the dryer drum is emptied. The dryer bypass stack is then opened, and a purge air fan is used to ensure no explosive build-up occurs in the drum. Emissions during this time are negligible, as the furnace is directed to its abort stack (see furnace planned shutdown above) and the dryer is no longer operating.

Use of the Furnace Bypass Stack for start-up and shutdown will not exceed 50 hours per year. Additionally, the furnace may operate up to 500 hours per year in "idle mode" with emissions routed to the Furnace Bypass Stack. The purpose of operation in "idle mode" is to maintain the temperature of the fire brick lining the furnaces which may be damaged if it cools too rapidly. Operation in "idle mode" also significantly reduces the amount of time required to restart the dryer. Emissions from start-up, shutdown, and furnace idle mode operations are quantified and included in the facility-wide potential emissions presented in this permit application.

Malfunctions are infrequent, unpredictable, and minimized to the maximum extent possible. These emissions cannot reasonably be quantified and are not included in the facility-wide potential emissions.

Under Control Option 2, the Dry Hammermill baghouses will exhaust to either the furnace followed by WESP and RTO, to WESP followed by RTO, or directly to the dryer RTO if the dryer line is not operational. In the event of a furnace malfunction, emissions from the Dry Hammermills will be diverted to the WESP and RTO or directly to the dryer RTO for emissions control until the Dry Hammermills are shut down.

4. POTENTIAL EMISSIONS QUANTIFICATION

As a result of this proposed permit modification, there will be a small increase in potential CO, NO_x, SO_2, particulate matter, and GHG emissions associated with the control of Dry Hammermill emissions. There will be a significant decrease in the actual and potential VOC and HAP emissions due to the installation of controls on the Dry Hammermills under both control options. Furthermore, as discussed previously, Enviva is updating facility-wide permitted emissions to include emissions associated with Furnace Bypass Cold Start-up and idle mode operations. This section discusses quantification of potential emissions for only those sources that will be impacted by this application. The revised facility-wide potential emissions are included in Appendix E.

4.1 Dry Hammermills (ES-HM-1 through ES-HM-8)

Dry Hammermill operations generate PM, HAP, and VOC emissions during sizing of dried wood. Each of the eight (8) Dry Hammermills is equipped with a dedicated baghouse for control of PM emissions (CD-HM-BH-1 through 8). VOC, HAP, and TAP emissions from the Dry Hammermill operations will be controlled using either Control Option 1 or Control Option 2. The following subsections discuss emissions estimates for Control Options 1 and 2.

4.1.1 Control Option 1

Under Control Option 1, 10,000 acfm of the exhaust from each Dry Hammermill will be recirculated back into the Dry Hammermill to reduce the volume of air that is routed to the downstream RTO/RCO. The remaining 5,000 acfm of exhaust from each Dry Hammermill will be routed to its dedicated baghouse. Total emissions from each Dry Hammermill will still be vented to a baghouse. The eight (8) Dry Hammermill baghouses will be routed to a new quench system and RTO/RCO (CD-RCO-2) for control of VOC and HAP/TAP emissions. The oxidizer will operate in thermal mode as an RTO during catalyst cleaning. The RTO/RCO will provide 95% destruction efficiency of VOC and HAP/TAP emissions. PM emissions from the Dry Hammermills were calculated based on a maximum exit grain loading rate and the maximum exhaust flow rate for the baghouses. The $PM_{2.5}$ speciation used in the potential emissions calculations for the Dry Hammermill baghouses is being updated as part of this application. No control efficiency was applied for the quench system which is being installed for safety purposes only. Refer to Appendix E, Table 7 for detailed potential PM emissions calculations for the baghouses.

Uncontrolled VOC and HAP emissions at the outlet of the Dry Hammermill baghouses (CD-HM-BH-1 through 8) were quantified based on stack testing data from comparable Enviva plants. Controlled emissions were estimated based on a 95% destruction efficiency for the RTO/RCO. Operation in thermal mode will achieve the same control efficiency and will have no impact on the calculated emissions for all pollutants. NO_x and CO emissions resulting from thermal oxidation were calculated using AP-42 Section 1.4, *Natural Gas Combustion*[2], and the maximum high heating value of the anticipated VOC constituents. Detailed calculations are provided in Appendix E, Table 8.

Emissions of criteria pollutants, HAP, and TAP from natural gas combustion by the RTO/RCO burners were estimated using emission factors from AP-42 Section 1.4. Potential GHG emissions from natural gas combustion were quantified based on emission factors from

[2] USEPA AP-42 Section 1.4, *Natural Gas Combustion* (07/98).

Subpart C of 40 CFR Part 98. Emissions were converted to carbon dioxide equivalent (CO_2e) based on Global Warming Potentials from Subpart A of 40 CFR 98.

4.1.2 Control Option 2

Similar to Control Option 1, under Control Option 2 10,000 acfm of the exhaust from each of the eight (8) Dry Hammermills will be recirculated back into each Dry Hammermill to decrease the volume of air that is ultimately controlled by the dryer line RTO. The remaining 5,000 acfm of exhaust from each Dry Hammermill would be routed to the baghouse. The Dry Hammermill baghouse exhaust will be routed through a quench system and then will be routed to either 1) the inlet of the furnace with subsequent control by the WESP/RTO control system, 2) the inlet of the WESP/RTO control system, or 3) directly to the inlet of the RTO. The RTO will provide 95% destruction efficiency of VOC and HAP/TAP emissions. Since the Dry Hammermill exhaust stream may not be controlled by the WESP, PM emissions from the Dry Hammermills were calculated based on a maximum exit grain loading rate and the maximum exhaust flow rate for the proposed baghouses and no additional control was assumed for the WESP. The $PM_{2.5}e$ speciation used in the potential emissions calculations for the Dry Hammermill baghouses is being updated as part of this application. No control efficiency was applied for the quench system, which is being installed for safety purposes only. Refer to Appendix E, Table 7 for detailed potential PM emissions calculations for the baghouses and Appendix E, Table 4b for potential emissions calculations for the RTO.

Uncontrolled VOC and HAP emissions at the outlet of the Dry Hammermill baghouses (CD-HM-BH1 through 8) were quantified based on stack testing data from comparable Enviva plants. Controlled emissions were estimated based on a 95% destruction efficiency for the dryer/furnace RTO. Detailed calculations are provided in Appendix E, Table 4b.

4.2 Furnace Bypass Cold Start-up (ES-FURNACEBYPASS)

Potential emissions of CO, NO_x, SO_2, PM, VOC and HAP for furnace bypass conditions were calculated based on emission factors from AP-42 Section 1.6, *Wood Residue Combustion in Boilers*.[3] GHG emissions were calculated based on emission factors for biomass combustion from Tables C-1 and C-2 of 40 CFR Part 98 and global warming potentials from Table A-1. Emissions were based on 15% of the maximum heat input capacity of the furnace (15% of 250.4 MMBtu/hr) and 50 hours per year. Detailed potential emission calculations are included in Appendix E, Table 5.

4.3 Furnace Bypass Idle Mode (ES-FURNACEBYPASS)

The furnace will operate up to 500 hours per year in "idle mode", which is defined as operation up to a maximum heat input rate of 15 MMBtu/hr. During this time, emissions will exhaust out of the furnace bypass stack. Potential emissions of CO, NO_x, SO_2, VOC, and HAP were calculated based on emission factors from AP-42 Section 1.6, *Wood Residue Combustion in Boilers*.[4] GHG emissions were calculated based on emission factors for biomass combustion from Tables C-1 and C-2 of 40 CFR Part 98 and global warming potentials from Table A-1. Detailed potential emission calculations are included in Appendix E, Table 6.

[3] U.S. EPA AP-42 Section 1.6 *Wood Residue Combustion in Boilers* (09/03).

[4] Ibid.

5. STATE AND FEDERAL PERMITTING APPLICABILITY

The Enviva Hamlet plant is subject to federal and state air quality permitting requirements. The following sections summarize the applicability of these requirements to the proposed permit modifications.

5.1 Federal Permitting Programs

The federal New Source Review (NSR) permitting program includes requirements for construction of new sources, and modifications to existing sources, while the Title V Operating Permit Program includes requirements for operation of Title V major sources. The following sections discuss the applicability of these requirements to the Hamlet plant.

5.1.1 New Source Review

NSR is a federal pre-construction permitting program that applies to certain major stationary sources. The federal NSR permitting program is implemented in North Carolina pursuant to 15A NCAC 2D .0530 and 15A NCAC 2D .0531. The primary purpose of NSR is to support the attainment and maintenance of ambient air quality standards across the country. There are two distinct permitting programs under NSR. The particular program that applies depends on the ambient air quality in the geographic area in which the source is located. The two programs are nonattainment New Source Review (NNSR) (15A NCAC 2D .0531) and PSD (15A NCAC 2D .0530). Because NNSR and PSD requirements are pollutant-specific, a stationary source can be subject to NNSR requirements for one or more regulated NSR pollutants and to PSD requirements for the remaining regulated NSR pollutants.

NNSR permitting requirements apply to new or existing stationary sources located in an area where concentrations of a "criteria pollutant"[5] exceed the National Ambient Air Quality Standard (NAAQS) for that pollutant. PSD permitting requirements apply to stationary sources located in areas designated as attainment or unclassifiable with respect to the NAAQS.

The Hamlet plant is located in Richmond County which is classified as attainment or unclassifiable for all criteria pollutants.[6] The Hamlet plant is currently permitted as a synthetic minor PSD source because the Hamlet plant's potential emissions are limited to less than the major source threshold of 250 tpy for all PSD-regulated pollutants by federally enforceable requirements in the current permit (Air Quality Permit No. 10365R04, Condition 2.2-A.2). Addition of controls for the Dry Hammermills (ES-HM-1 through 8), removal of the Dry Hammermill throughput limitation, and addition of the existing Furnace Bypass Stack (ES-FURNACEBYPASS) will not change this status.

5.1.2 Title V Operating Permit Program

The federal Title V Operating Permit program is promulgated in 40 CFR 70 and is implemented in North Carolina via 15A NCAC 2Q .0500. The Hamlet plant is a major source with respect to the Title V Operating Permit Program because facility-wide emissions of one or more criteria pollutants exceed the major source threshold of 100 tpy. Subsequent to the proposed changes, the plant will remain a major source. Additionally, the plant is currently considered a major source of HAP due to total HAP emissions and maximum individual HAP

[5] The following are "criteria pollutants" under current NSR regulations: CO, nitrogen dioxide, SO_2, PM_{10}, $PM_{2.5}$, ozone (VOCs and NO_x), and lead.

[6] 40 CFR 81.334

emissions exceeding the major source thresholds of 25 tpy and 10 tpy, respectively. Controlling the exhaust stream from the Dry Hammermills (ES-HM-1 through 8) under Control Option 1 or 2 will result in a significant decrease in HAP emissions and the plant will no longer be considered a major source of HAP, based on the single or aggregate HAP major source criteria.

5.2 North Carolina Permitting Program

In addition to the Title V permitting requirements in 15 NCAC 02Q .0500, specific requirements for permitting of construction and operation of new and modified sources are included in 15A NCAC 02Q .0300, in accordance with North Carolina's State Implementation Plan (SIP). The proposed changes are subject to the permitting procedures under 15A NCAC 02Q .0300 and the required application forms are included as Appendix B.

6. REGULATORY APPLICABILITY

The Hamlet plant is subject to federal and state air quality regulations. The following addresses all regulations potentially applicable to the proposed permit modifications.

6.1 National Emission Standards for Hazardous Air Pollutants

National Emission Standards for Hazardous Air Pollutants (NESHAP) regulate HAP emissions and are applicable to certain major and area sources of HAP. NESHAP can be found in 40 CFR Part 63 and have been incorporated by reference in 15A NCAC 02D .1111. As previously discussed, the Hamlet plant will no longer be considered a major source of HAP after installation of Dry Hammermill controls since facility-wide total HAP emissions will not exceed 25 tpy and maximum individual HAP emissions will not exceed 10 tpy.

6.1.1 40 CFR 63 Subpart A – General Provisions

All sources subject to a NESHAP are subject to the general requirements under Subpart A unless excluded by the source-specific subpart. Subpart A includes requirements for initial notification, performance testing, recordkeeping, monitoring, and reporting. After installation of controls proposed in this application, the Dry Hammermills (ES-HM-1 through 8) will no longer be subject to Subpart A.

6.1.2 40 CFR 63 Subpart B – Requirements for Control Technology Determinations for Major Sources in Accordance with Clean Air Act Section 112(g)

Clean Air Act (CAA) Section 112(g)(2)(B) requires that a new or reconstructed major HAP stationary source that does not belong to a regulated "source category" for which a NESHAP has been promulgated must control emissions to levels that reflect "maximum achievable control technology" (MACT). Because Wood Pellet Manufacturing Plants are not a regulated source category under 40 CFR 63, the Hamlet plant was subject to 112(g) and underwent a case-by-case MACT analysis pursuant to 40 CFR 63 Subpart B as part of the initial PSD construction permitting process. The facility will no longer be a major source for HAP emissions following the implementation of Dry Hammermill controls and thus is not subject to case-by-case MACT requirements.

6.2 Compliance Assurance Monitoring

Compliance Assurance Monitoring (CAM) under 40 CFR 64 is applicable to emission units located at a Title V major source that use a control device to achieve compliance with an emission limit and whose pre-controlled emissions exceed the major source thresholds. A CAM plan is required to be submitted with the initial Title V operating permit application for emission units whose post-controlled emissions exceed the major source thresholds (i.e., large pollutant-specific emission units [PSEU]).[7] For emission units with post-controlled emissions below the major source thresholds, a CAM plan must be submitted with the first Title V permit renewal application.[8]

The Dry Hammermills (ES-HM-1 through 8) have post-controlled emissions below the major source threshold and thus, a CAM plan will not need to be addressed until the first Title V

[7] §64.5(a)
[8] §64.5(b)

permit renewal application. CAM will not be applicable to the Furnace Bypass Stack (ES-FURNACEBYPASS).

6.3 North Carolina Administrative Code

The Hamlet plant sources are subject to regulations contained within 15A NCAC 02D and 02Q. Regulations that are potentially applicable to the proposed project are addressed in the following sections.

6.3.1 15A NCAC 02D .0515 Particulates from Miscellaneous Industrial Processes

PM emissions from all industrial processes subject to permitting and for which no other emission control standards are applicable are regulated under 15A NCAC 02D .0515. This regulation limits particulate emissions based on process throughput using the equation $E = 4.10 \times P^{0.67}$, for process rates (P) less than or equal to 30 tons per hour (tph) and $E=55 \times P^{0.11}-40$ for process rates greater than 30 tph.

This requirement applies to all processes at the Hamlet plant before and after implementation of the proposed changes.

6.3.2 15A NCAC 02D .0516 Sulfur Dioxide Emissions from Combustion Sources

Emissions of SO_2 from combustion sources cannot exceed 2.3 pounds of SO_2 per MMBtu input. The Dryer furnace burner system combusts bark and wood chips and the existing RTO and proposed RTO/RCO utilize natural gas, each of which contain low amounts of sulfur and will result in SO_2 emissions well below the limit of 2.3 lb/MMBtu.

6.3.3 15A NCAC 02D .0521 Control of Visible Emissions

For sources manufactured after July 1, 1971, visible emissions cannot exceed 20 percent opacity when averaged over a six-minute period except under the following conditions:

- No six-minute period exceeds 87 percent opacity,
- No more than one six-minute period exceeds 20 percent opacity in any hour, and
- No more than four six-minute periods exceed 20 percent opacity in any 24-hour period.

This rule applies to all processes at the facility that may have visible emissions. If installed, the new RTO/RCO (CD-RCO-2) for the Dry Hammermills (ES-HM-1 through 8) and the existing Furnace Bypass Stack (ES-FURNACEBYPASS) must comply with this requirement.

6.3.4 15A NCAC 02D .1100 Control of Toxic Air Pollutants

15A NCAC 02D .1100 outlines the procedures that must be followed if a TAP permit and associated modeling are required under 15A NCAC 02Q .0700. Under 15A NCAC 02Q .0704(d), a TAP permit application is required to include an evaluation of the TAP emissions from a facility's sources, excluding exempt sources listed in Rule .0702 of this Section. The proposed changes requested in this application will not result in an increase in TAP emissions. Potential TAP emissions will decrease by 14 tpy. As such, a TAP permit and associated TAP evaluation and TAP modeling are not required.

APPENDIX A
SETTLEMENT AGREEMENT

STATE OF NORTH CAROLINA

COUNTY OF RICHMOND

IN THE OFFICE OF
ADMINISTRATIVE HEARINGS
19 EHR 00866

Clean Air Carolina, Petitioner, v. North Carolina Department of Environmental Quality, Division of Air Quality, Respondent, Enviva Pellets Hamlet, LLC, Respondent-Intervenor.	**SETTLEMENT AGREEMENT**

The North Carolina Department of Environmental Quality ("DEQ"), Division of Air Quality ("DAQ" or the "Division"), Petitioner Clean Air Carolina, ("CAC"), and Respondent-Intervenor Enviva Pellets Hamlet, LLC ("Enviva") enter into this Settlement Agreement ("Agreement") to resolve matters in controversy between them fully and finally. DAQ, CAC, and Enviva shall be referred to collectively herein as the "Parties."

The Parties hereby stipulate that:

1. On January 14, 2019, DAQ issued Permit No. 10365R03 ("Permit R03") to Enviva.

2. In its Petition for Contested Case Hearing, Docket No. 19 EHR 00866 ("Petition"), Petitioner alleges that DAQ violated the North Carolina Air Pollution Control Act, the federal Clean Air Act, implementing regulations, and other applicable law and standards by, *inter alia*: (i) improperly classifying Enviva's proposed wood pellet manufacturing facility in Hamlet, North Carolina (the "Facility") as a minor source of air pollution and therefore failing to require the Facility to obtain a major source construction permit under North Carolina's Prevention of Significant Deterioration ("PSD") Program; (ii) failing to incorporate enforceable permit conditions sufficient to limit the Facility's potential to emit below certain thresholds; (iii)

arbitrarily relying on emission estimates in the air permit application; and (iv) failing to provide a reasoned response to public comments.

3. DEQ and Enviva filed prehearing statements and denied all material allegations of the same.

4. The Parties have been correctly designated and that there is no question as to misjoinder or nonjoinder.

5. Following settlement discussions, the Parties have agreed to settle this contested case on the terms set out herein to avoid the expense and burden of further litigation.

6. Without making any admission of liability, violation, or wrongdoing, while expressly denying the same, and in the interest of resolving the contested case, Enviva agrees that it shall:

a. Within thirty (30) days after execution of this Agreement by all Parties, submit an application for modification of Permit R03 to include an express 85% limit on throughput on the dry hammermills at the Facility as was contemplated by the Permit R03 application. The application shall request the following permit conditions:

i. The Permittee shall monitor and record the total dry hammermill throughput, in terms of oven dried tons, on a monthly and 12-month rolling basis;

ii. The total dry hammermill throughput, in oven dried tons, shall not exceed 85% of the total facility-wide wood pellet production on a 12-month rolling basis, rolled monthly.

iii. Modification of Condition 2.2(A)(2)(j) of Permit R03, which governs the required semi-annual summary report, to explicitly provide that in addition to other information already identified in that permit condition, the semi-annual summary report must include the facility's monthly and 12-month

rolling total dry hammermill throughput (as required to be monitored in (i), above); monthly and 12-month rolling total facility-wide throughput (as required to be monitored by Condition 2.2(A)(2)(h) of Permit R03), and monthly hardwood/softwood mix (as required to be monitored by Condition 2.2(A)(2)(h) of Permit R03).

b. Enviva shall provide CAC with an electronic copy of each semi-annual summary report (as referred to in Paragraph 6(a)(iii)) within ten (10) days of filing such report with the Division, for a period of three (3) years from the date of execution of this Agreement.

c. Enviva shall use commercially reasonable efforts to, within one-hundred-twenty (120) days of execution of this Agreement by all Parties, submit an application for the installation of additional control technology or an equivalent engineering alternative, as set out below, to control volatile organic compound ("VOC") emissions from the Facility's dry hammermills. In any event, Enviva shall submit such application within one-hundred-eighty (180) days of execution of this Agreement by all Parties. The selected control technology or engineering alternative shall consist of exhausting 100% of the dry hammermill emissions to one or a combination of the following options:

i. To a dedicated regenerative thermal or catalytic oxidizer ("RTO" or "RCO") on the dry hammermills;

ii. To the pellet cooler RCO ("CD-RCO" under Permit R03), to the dryer furnace, or to the wood dryer RTO ("CD-RTO-1" under Permit R03).

d. The application shall further request the incorporation of the following permit conditions for whichever RTO/RCO the dry hammermill exhaust will be routed through:

i. The Permittee shall operate the [RTO/RCO] during all periods in which any of the dry hammermill lines ("ES-HM-1" through "ES-HM-8" under Permit R03) are in operation.

ii. Until the first VOC performance testing following utilization of an [RTO/RCO] to control VOC emissions from the dry hammermills, the Permittee shall operate the [RTO/RCO] at or above the temperature recommended by the manufacturers of the [RTO/RCO]. After such testing the Permittee shall maintain the combustion chamber temperature of the [RTO/RCO] at or above the level approved by the Division in writing. Until such approval is granted, the Permittee shall maintain the combustion chamber temperature of the [RTO/RCO] at or above the temperature at which testing was performed.

iii. The Permittee shall install, calibrate, operate, maintain, and inspect a continuous temperature monitoring and recording system, in accordance with the manufacturers' recommendations, to monitor the combustion chamber temperature of the [RTO/RCO] substantially similar to the requirements of Condition 2.2(A)(2)(e) of Permit R03.

e. Enviva will use commercially reasonable efforts to, within twelve (12) months of issuance of a permit authorizing the control or engineering alternative specified in Paragraph 6(c), install and commence operation of that control or engineering alternative. In any event, Enviva shall install and commence operation of that control or engineering alternative within eighteen (18) months of issuance of a permit authorizing the control or engineering alternative.

f. Within sixty (60) days of receipt of the results of the initial compliance testing required by Condition 2.2(A)(2)(c) of Permit R03, Enviva shall establish a site-specific emission

factor for VOCs for the Facility's dry hammermills, calculate its facility-wide potential emissions at the tested softwood percentage, and provide such emissions calculation to the Division with a copy to CAC. Enviva will perform this VOC emissions calculation, as well as future VOC emissions calculations for the Facility, utilizing a calculation methodology that has been approved by the Division in writing. Enviva will provide CAC with documentation of the Division's approval of such methodology within seven (7) days of receipt of such documentation from the Division. If actual VOC emissions from the Facility are estimated to be at or above 250 tons per year ("tpy"), Enviva shall curtail Facility production to stay below 250 tpy actual total VOCs until VOCs from the dry hammermills are controlled as required by Paragraph 6(c) of this Agreement. Enviva shall continue to utilize a VOC emission factor for uncontrolled emissions from the dry hammermills until Enviva conducts new performance testing following utilization of an [RTO/RCO] to control dry hammermill VOC emissions, and the Division approves a new dry hammermill emission factor based on such performance testing. Notwithstanding the above emission calculation requirement, nothing herein shall restrict any Party from utilizing credible evidence to demonstrate Enviva's compliance (or noncompliance) with applicable VOC emission limits.

7. CAC agrees not to oppose the modification of Permit R03 to the extent that such modification is addressed by, and complies with, the terms of this Agreement.

8. All notices or documents required to be provided to CAC under this Agreement shall be provided electronically to the following:

June Blotnick
Clean Air Carolina
june@cleanaircarolina.org

Heather M. Hillaker, Esq.
Southern Environmental Law Center
hhillaker@selcnc.org

Keri N Powell, Esq.
Powell Environmental Law
kpowell@powellenvironmentallaw.com

9. DAQ, which makes no admission of liability, violation, or wrongdoing, will use its best efforts to expeditiously review and process all permit applications required by this Agreement.

10. Within fourteen (14) days of execution of this Agreement by all Parties, the Parties shall jointly move to stay the Petition. Within fourteen (14) days of the effective date of a final revised permit for the Facility that satisfies Paragraphs 6(a), 6(c), and 6(d) above, CAC shall file a Voluntary Withdrawal with Prejudice of its Petition for Contested Case Hearing, Docket No. 19 EHR 00866.

11. The Parties agree that each shall bear its own costs related to any disputes covered by this Settlement Agreement. No Party shall apply for attorney fees or costs under any rule or law, and no Party shall be liable for any attorney fees, costs, or expenses incurred by the other.

12. The Parties agree that the consideration for this settlement are the promises contained herein and that this Settlement Agreement contains the whole agreement between them relating to the subject matter thereof.

13. This Settlement Agreement shall be binding upon the Parties, their successors and assigns, and is entered into knowingly, intelligently, and voluntarily upon execution by the undersigned, who represent and warrant that they are authorized to enter into this Settlement Agreement on behalf of the Parties hereto.

14. This Agreement may be executed and delivered in counterparts by electronic mail, each of which so executed and delivered counterpart is original, and such counterparts, together, shall constitute but the same instrument.

[Signature Page to Follow]

CLEAN AIR CAROLINA

By: June Blotnick
June Blotnick
Executive Director

Date: June 3, 2019

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY, DIVISION OF AIR QUALITY

By: _____
Michael Abraczinskas, Director
Division of Air Quality

Date: _____

ENVIVA PELLETS HAMLET, LLC

By: _____
Yana Kravtsova
VP, Environmental Affairs and Chief Compliance Officer

Date: May 30, 2019

CLEAN AIR CAROLINA

By: _____
June Blotnick
Executive Director

Date: _____

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY, DIVISION OF AIR QUALITY

By: _____
Michael Abraczinskas, Director
Division of Air Quality

Date: 5/30/19

ENVIVA PELLETS HAMLET, LLC

By: _____
Yana Kravtsova
VP, Environmental Affairs and Chief Compliance Officer

Date: _____

APPENDIX B
PERMIT APPLICATION FORMS

Received
DEC 0 2 2019
Air Permits Section

FORM A
GENERAL FACILITY INFORMATION

VISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — A

NOTE- APPLICATION WILL NOT BE PROCESSED WITHOUT THE FOLLOWING:

☐	Local Zoning Consistency Determination (new or modification only)	☑	Appropriate Number of Copies of Application	Application Fee (please check one option below)
☑	Responsible Official/Authorized Contact Signature	☑	P.E. Seal (if required)	☐ Not Required ☑ ePayment ☐ Check Enclosed

GENERAL INFORMATION

Legal Corporate/Owner Name:	Enviva Pellets Hamlet, LLC
Site Name:	Enviva Pellets Hamlet, LLC
Site Address (911 Address) Line 1:	1125 North NC Highway 177
Site Address Line 2:	
City: Hamlet	State: North Carolina
Zip Code: 28345	County: Richmond

CONTACT INFORMATION

Responsible Official/Authorized Contact:	***Invoice Contact:***
Name/Title: Paul Pereira, Plant Manager	Name/Title: Mat Riemenschneider, EHS Manager
Mailing Address Line 1: 1125 North NC Highway 177	Mailing Address Line 1: 1125 North NC Highway 177
Mailing Address Line 2:	Mailing Address Line 2:
City: Hamlet State: NC Zip Code: 28345	City: Hamlet State: NC Zip Code: 28345
Primary Phone No.: (919) 218-0800 Fax No.:	Primary Phone No.: (919) 616-3316 Fax No.:
Secondary Phone No.:	Secondary Phone No.:
Email Address: Paul.Pereira@envivabiomass.com	Email Address: Mat.Riemenschneider@envivabiomass.com
Facility/Inspection Contact: Mat Riemenschneider	***Permit/Technical Contact:***
Name/Title: Environmental, Health, and Safety Manager	Name/Title: Kai Simonsen
Mailing Address Line 1: 1125 North NC Highway 177	Mailing Address Line 1: 4242 Six Forks Road, Suite 1050
Mailing Address Line 2:	Mailing Address Line 2:
City: Hamlet State: NC Zip Code: 28345	City: Raleigh State: NC Zip Code: 27609
Primary Phone No.: 919-616-3316 Fax No.:	Primary Phone No.: (919) 428-0289 Fax No.:
Secondary Phone No.:	Secondary Phone No.:
ail Address: Mat.Riemenschneider@envivabiomass.com	Email Address: Kai.Simonsen@envivabiomass.com

APPLICATION IS BEING MADE FOR

☐ New Non-permitted Facility/Greenfield ☑ Modification of Facility (permitted) ☐ Renewal Title V ☐ Renewal Non-Title V
☐ Name Change ☐ Ownership Change ☐ Administrative Amendment ☐ Renewal with Modification

FACILITY CLASSIFICATION AFTER APPLICATION (Check Only One)

☐ General ☐ Small ☐ Prohibitory Small ☐ Synthetic Minor ☑ Title V

FACILITY (Plant Site) INFORMATION

Wood pellet manufacturing facility

	Facility ID No. 7700096
Primary SIC/NAICS Code: 2499 (Wood Products, not elsewhere classified	Current/Previous Air Permit No. 10365R04 Expiration Date: 02/28/2021
Facility Coordinates: Latitude: 34 degrees, 56 minutes, 2.4 seconds	Longitude: 79 degrees, 36 minutes, 3.3 seconds
Does this application contain confidential data? ☐ YES ☑ NO	***If yes, please contact the DAQ Regional Office prior to submitting this application.*** (See Instructions)

PERSON OR FIRM THAT PREPARED APPLICATION

Person Name: Michael Carbon		Firm Name: Ramboll US Corporaqtion	
Mailing Address Line 1: 8234 YMCA Plaza Drive		Mailing Address Line 2:	
City: Baton Rouge	State: Louisiana	Zip Code: 70810	County:
Phone No.: (225) 408-2691	Fax No.:	Email Address: mcarbon@ramboll.com	

SIGNATURE OF RESPONSIBLE OFFICIAL/AUTHORIZED CONTACT

Name (typed): Royal Smith	Title: Executive VP of Operations
X Signature(Blue Ink):	Date: 11/18/19

Attach Additional Sheets As Necessary

FORM A (continued, page 2 of 2)
GENERAL FACILITY INFORMATION

SECTION AA1 - APPLICATION FOR NON-TITLE V PERMIT RENEWAL

_____ (Company Name) hereby formally requests renewal of Air Permit No. _____

There have been no modifications to the originally permitted facility or the operations therein that would require an air permit since the last permit was issued.

Is your facility subject to 40 CFR Part 68 "Prevnetion of Accidental Releases" - Section 112(r) of the Clean Air Act? ☐ YES ☐ NO

If yes, have you already submitted a Risk Manage Plan (RMP) to EPA? ☐ YES ☐ NO Date Submitted: _____

Did you attach a current emissions inventory? ☐ YES ☐ NO

If no, did you submit the inventory via AERO or by mail? ☐ Via AERO ☐ Mailed Date Mailed: _____

SECTION AA2- APPLICATION FOR TITLE V PERMIT RENEWAL

In accordance with the provisions of Title 15A 2Q .0513, the responsible official of _____ (Company Name) hereby formally requests renewal of Air Permit No. _____ (Air Permit No.) and further certifies that:

(1) The current air quality permit identifies and describes all emissions units at the above subject facility, except where such units are exempted under the North Carolina Title V regulations at 15A NCAC 2Q .0500;

(2) The current air quality permit cits all applicable requirements and provides the method or methods for determing compliance with the applicable requirements;

(3) The facility is currently in compliance, and shall continue to comply, with all applicable requiremetns. (Note: As provided under 15A NCAC 2Q .0512 compliance with the conditions of the permit shall be deemed compliance with the applicable requirements specifically identified in the permit);

(4) For applicable requirements that become effective during the term of the renewed permit that the facility shall comply on a timely basis;

(5) The facility shall fulfill applicable enhanced monitoring requirements and submit a compliance certification as required by 40 CFR Part 64.

The responsible official (signature on page 1) certifies under the penalty of law that all information and statements provided above, based on information and belief formed after reasonable inquiry, are true, accurate, and complete.

SECTION AA3- APPLICATION FOR NAME CHANGE

New Facility Name: _____

Former Facility Name: _____

An official facility name change is requested as described above for the air permit mentioned on page 1 of this form. Complete the other sections if there have been modifications to the originally premitted facility that would requie an air quality permit since the last permit was issued and if ther has been an ownership change associated with this name change.

SECTION AA4- APPLICATION FOR AN OWNERSHIP CHANGE

By this application we hereby request transfer of Air Quality Permit No. _____ from the former owner to the new owner as described below. Transfer of permit responsibility, coverage and liability shall be effective _____ (immediately or insert date.) The legal ownership of the facility described on page 1 of this form has been or will be transferred on _____ (date). There have been no modifications to the originally permitted facility that would require an air quality permit since the last permit was issued.

Signature of New (Buyer) Responsible Official/Authorized Contact (as typed on page 1):

X Signature (Blue Ink): _____

Date:

New Facility Name:

Former Facility Name:

Signature of Former (Seller) Responsible Official/Authorized Contact:

Name (typed or print):

Title:

X Signature (Blue Ink): _____

Date:

Former Legal Corporate/Owner Name:

In lieu of the seller's signature on this form, a letter may be submitted with the seller's signature indicating the ownership change

SECTION AA5- APPLICATION FOR ADMINISTRATIVE AMENDMENT

Describe the requested administrative amendment here (attach additional documents as necessary):

FORMs A2, A3

EMISSION SOURCE LISTING FOR THIS APPLICATION - A2

112r APPLICABILITY INFORMATION - A3

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — A2

EMISSION SOURCE LISTING: New, Modified, Previously Unpermitted, Replaced, Deleted			
EMISSION SOURCE ID NO.	EMISSION SOURCE DESCRIPTION	CONTROL DEVICE ID NO.	CONTROL DEVICE DESCRIPTION
Equipment To Be ADDED By This Application (New, Previously Unpermitted, or Replacement)			
ES-FURNACEBYPASS	Furnace Bypass Stacks	N/A	
Existing Permitted Equipment To Be MODIFIED By This Application			
ES-HM-1 through 8 (Control Option 1)	Eight (8) Dry Hammermills	CD-HM-BH-1 through 8, CD-RCO-2	Baghouses, RTO/RCO
ES-HM-1 through 8 (Control Option 2)	Eight (8) Dry Hammermills	CD-HM-BH-1 through 8, CD-RTO-1	Baghouses, RTO
Equipment To Be DELETED By This Application			
N/A			

112(r) APPLICABILITY INFORMATION — A 3

Is your facility subject to 40 CFR Part 68 "Prevention of Accidental Releases" - Section 112(r) of the Federal Clean Air Act? ☐ Yes ☑ No

If No, please specify in detail how your facility avoided applicability: The Hamlet plant will not store any regulated substances in excess of their threshold quantities, as determined under §68.115.

If your facility is Subject to 112(r), please complete the following:

A. Have you already submitted a Risk Management Plan (RMP) to EPA Pursuant to 40 CFR Part 68.10 or Part 68.150?

☐ Yes ☐ No Specify required RMP submittal date: _____ If submitted, RMP submittal date: _____

B. Are you using administrative controls to subject your facility to a lesser 112(r) program standard?

☐ Yes ☐ No If yes, please specify: _____

C. List the processes subject to 112(r) at your facility:

PROCESS DESCRIPTION	PROCESS LEVEL (1, 2, or 3)	HAZARDOUS CHEMICAL	MAXIMUM INTENDED INVENTORY (LBS)

Attach Additional Sheets As Necessary

FORM D1

FACILITY-WIDE EMISSIONS SUMMARY

REVISED 09/22/16 — **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** — D1

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

AIR POLLUTANT EMITTED	EXPECTED ACTUAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr
PARTICULATE MATTER (PM)	**See Emission Calculations in Appendix E**		
PARTICULATE MATTER < 10 MICRONS (PM_{10})			
PARTICULATE MATTER < 2.5 MICRONS ($PM_{2.5}$)			
SULFUR DIOXIDE (SO_2)			
NITROGEN OXIDES (NOx)			
CARBON MONOXIDE (CO)			
VOLATILE ORGANIC COMPOUNDS (VOC)			
LEAD			
GREENHOUSE GASES (GHG) (SHORT TONS)			
OTHER			

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

HAZARDOUS AIR POLLUTANT EMITTED	CAS NO.	EXPECTED ACTUAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr
		See Emission Calculations in Appendix E		

TOXIC AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

INDICATE REQUESTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS. EMISSIONS ABOVE THE TOXIC PERMIT EMISSION RATE (TPER) IN 15A NCAC 2Q .0711 MAY REQUIRE AIR DISPERSION MODELING. USE NETTING FORM D2 IF NECESSARY.

TOXIC AIR POLLUTANT EMITTED	CAS NO.	lb/hr	lb/day	lb/year	Modeling Required ? Yes	No
		See Emission Calculations in Appendix E				

COMMENTS:

Attach Additional Sheets As Necessary

FORM D4

EXEMPT AND INSIGNIFICANT ACTIVITIES SUMMARY

ACTIVITIES EXEMPTED PER 2Q .0102 OR INSIGNIFICANT ACTIVITIES PER 2Q .0503 FOR TITLE V SOURCES		
DESCRIPTION OF EMISSION SOURCE	**SIZE OR PRODUCTION RATE**	**BASIS FOR EXEMPTION OR INSIGNIFICANT ACTIVITY**

Attach Additional Sheets As Necessary

FORM D5
TECHNICAL ANALYSIS TO SUPPORT PERMIT APPLICATION

PROVIDE DETAILED TECHNICAL CALCULATIONS TO SUPPORT ALL EMISSION, CONTROL, AND REGULATORY DEMONSTRATIONS MADE IN THIS APPLICATION. INCLUDE A COMPREHENSIVE PROCESS FLOW DIAGRAM AS NECESSARY TO SUPPORT AND CLARIFY CALCULATIONS AND ASSUMPTIONS. ADDRESS THE FOLLOWING SPECIFIC ISSUES ON SEPARATE PAGES:

A **SPECIFIC EMISSIONS SOURCE (EMISSION INFORMATION) (FORM B and B1 through B9)** - SHOW CALCULATIONS USED, INCLUDING EMISSION FACTORS, MATERIAL BALANCES, AND/OR OTHER METHODS FROM WHICH THE POLLUTANT EMISSION RATES IN THIS APPLICATION WERE DERIVED. INCLUDE CALCULATION OF POTENTIAL BEFORE AND, WHERE APPLICABLE, AFTER CONTROLS. CLEARLY STATE ANY ASSUMPTIONS MADE AND PROVIDE ANY REFERENCES AS NEEDED TO SUPPORT MATERIAL BALANCE CALCULATIONS.

B **SPECIFIC EMISSION SOURCE (REGULATORY INFORMATION)(FORM E2 - TITLE V ONLY)** -PROVIDE AN ANALYSIS OF ANY REGULATIONS APPLICABLE TO INDIVIDUAL SOURCES AND THE FACILITY AS A WHOLE. INCLUDE A DISCUSSION OUTING METHODS (e.g. FOR TESTING AND/OR MONITORING REQUIREMENTS) FOR COMPLYING WITH APPLICABLE REGULATIONS, PARTICULARLY THOSE REGULATIONS LIMITING EMISSIONS BASED ON PROCESS RATES OR OTHER OPERATIONAL PARAMETERS. PROVIDE JUSTIFICATION FOR AVOIDANCE OF ANY FEDERAL REGULATIONS (PREVENTION OF SIGNIFICANT DETERIORATION (PSD), NEW SOURCE PERFORMANCE STANDARDS (NSPS), NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS), TITLE V), INCLUDING EXEMPTIONS FROM THE FEDERAL REGULATIONS WHICH WOULD OTHERWISE BE APPLICABLE TO THIS FACILITY. SUBMIT ANY REQUIRED INFORMATION TO DOCUMENT COMPLIANCE WITH ANY REGULATIONS. INCLUDE EMISSION RATES CALCULATED IN ITEM "A" ABOVE, DATES OF MANUFACTURE, CONTROL EQUIPMENT, ETC. TO SUPPORT THESE CALCULATIONS.

C **CONTROL DEVICE ANALYSIS (FORM C and C1 through C9)** -PROVIDE A TECHNICAL EVALUATION WITH SUPPORTING REFERENCES FOR ANY CONTROL EFFICIENCIES LISTED ON SECTION C FORMS, OR USED TO REDUCE EMISSION RATES IN CALCULATIONS UNDER ITEM "A" ABOVE. INCLUDE PERTINENT OPERATING PARAMETERS (e.g. OPERATING CONDITIONS, MANUFACTURING RECOMMENDATIONS, AND PARAMETERS AS APPLIED FOR IN THIS APPLICATION) CRITICAL TO ENSURING PROPER PERFORMANCE OF THE CONTROL DEVICES). INCLUDE AND LIMITATIONS OR MALFUNCTION POTENTIAL FOR THE PARTICULAR CONTROL DEVICES AS EMPLOYED AT THIS FACILITY, DETAIL PROCEDURES FOR ASSURING PROPER OPERATION OF THE CONTROL DEVICE INCLUDING MONITORING SYSTEMS AND MAINTENANCE TO BE PERFORMED.

D **PROCESS AND OPERATIONAL COMPLIANCE ANALYSIS - (FORM E3 - TITLE V ONLY)**- SHOWING HOW COMPLIANCE WILL BE ACHIEVED WHEN USING PROCESS, OPERATIONAL, OR OTHER DATA TO DEMONSTRATE COMPLIANCE. REFER TO COMPLIANCE REQUIREMENTS IN THE REGULATORY ANALYSIS IN ITEM "B" WHERE APPROPRIATE. LIST ANY CONDITIONS OR PARAMETERS THAT CAN BE MONITORED AND REPORTED TO DEMONSTRATE COMPLIANCE WITH THE APPLICABLE REGULATIONS.

E **PROFESSIONAL ENGINEERING SEAL** - PURSUANT TO 15A NCAC 2Q .0112 "APPLICATION REQUIRING A PROFESSIONAL ENGINEERING SEAL," A PROFESSIONAL ENGINEER REGISTERED IN NORTH CAROLINA SHALL BE REQUIRED TO SEAL TECHNICAL PORTIONS OF THIS APPLICATION FOR NEW SOURCES AND MODIFICATIONS OF EXISTING SOURCES. (SEE INSTRUCTIONS FOR FURTHER APPLICABILITY).

I, **Russell Kemp** *attest that this application for* **Enviva Pellets Hamlet, LLC** *has been reviewed by me and is accurate, complete and consistent with the information supplied in the engineering plans, calculations, and all other supporting documentation to the best of my knowledge. I further attest that to the best of my knowledge the proposed design has been prepared in accordance with the applicable regulations. Although certain portions of this submittal package may have been developed by other professionals, inclusion of these materials under my seal signifies that I have reviewed this material and have judged it to be consistent with the proposed design. Note: In accordance with NC General Statutes 143-215.6A and 143-215.6B, any person who knowingly makes any false statement, representation, or certification in any application shall be guilty of a Class 2 misdemeanor which may include a fine not to exceed $10,000 as well as civil penalties up to $25,000 per violation.*

Received
DEC 0 2 2019
Air Permits Section

(PLEASE USE BLUE INK TO COMPLETE THE FOLLOWING)

NAME:	Russell Kemp, MS, PE
DATE:	20 NOVEMBER 2019
COMPANY:	REUS Engineers, P.C.
ADDRESS:	1600 Parkwood Circle, Suite 310, Atlanta, GA 30339
TELEPHONE:	(678) 388-1654
SIGNATURE:	
PAGES CERTIFIED:	Forms A, B, B9, C1, C3
	Appendix E with emission calculations
	Application Narrative

(IDENTIFY ABOVE EACH PERMIT FORM AND ATTACHMENT THAT IS BEING CERTIFIED BY THIS SEAL)

PLACE NORTH CAROLINA SEAL HERE

NORTH CAROLINA PROFESSIONAL SEAL 19628 ENGINEER RUSSELL STEPHEN KEMP

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — B

EMISSION SOURCE DESCRIPTION: **Eight (8) Hammermills**	EMISSION SOURCE ID NO: **ES-HM-1 through 8**
	CONTROL DEVICE ID NO(S): **CD-HM-BH-1 through 8, CD-RCO-2**
OPERATING SCENARIO **1** OF **2**	EMISSION POINT (STACK) ID NO(S): **EP-11**

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Dried materials are reduced to the appropriate size needed for pelletization using eight hammermills.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

☐ Coal,wood,oil, gas, other burner (Form B1)	☐ Woodworking (Form B4)	☐ Manuf. of chemicals/coatings/inks (Form B7)
☐ Int.combustion engine/generator (Form B2)	☐ Coating/finishing/printing (Form B5)	☐ Incineration (Form B8)
☐ Liquid storage tanks (Form B3)	☐ Storage silos/bins (Form B6)	☑ Other (Form B9)

START CONSTRUCTION DATE: **TBD**	DATE MANUFACTURED: **TBD**
MANUFACTURER / MODEL NO.: **TBD**	EXPECTED OP. SCHEDULE: **24** HR/DAY **7** DAY/WK **52** WK/YR
IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?):	☐ NESHAP (SUBPARTS?):
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB **25%** MAR-MAY **25%** JUN-AUG **25%** SEP-NOV **25%**	

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)							
PARTICULATE MATTER<10 MICRONS (PM_{10})							
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)							
SULFUR DIOXIDE (SO2)							
NITROGEN OXIDES (NOx)							
CARBON MONOXIDE (CO)							
VOLATILE ORGANIC COMPOUNDS (VOC)							
LEAD							
OTHER							

See Emission Calculations in Appendix E

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr

See Emission Calculations in Appendix E

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr

See Emission Calculations in Appendix E

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9
EMISSION SOURCE (OTHER)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B9**

EMISSION SOURCE DESCRIPTION:	EMISSION SOURCE ID NO: **ES-HM-1 through 8**
Eight (8) Hammermills	CONTROL DEVICE ID NO(S): **CD-HM-BH-1 through 8, CD-RCO-2**
OPERATING SCENARIO: 1 OF 2	EMISSION POINT (STACK) ID NO(S): **EP-11**

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):
Dried materials are reduced to the appropriate size needed for pelletization using eight hammermills.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/HR)	LIMITATION(UNIT/HR)
Dried Wood	**ODT**	**80**	**80**

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/BATCH)	LIMITATION (UNIT/BATCH)

MAXIMUM DESIGN (BATCHES / HOUR):	
REQUESTED LIMITATION (BATCHES / HOUR):	(BATCHES/YR):
FUEL USED: **N/A**	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): **N/A**
MAX. CAPACITY HOURLY FUEL USE: **N/A**	REQUESTED CAPACITY ANNUAL FUEL USE: **N/A**

COMMENTS:

Attach Additional Sheets as Necessary

FORM C1
CONTROL DEVICE (FABRIC FILTER)

REVISED 09/22/16 — **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** — C1

CONTROL DEVICE ID NO: **CD-HM-BH-1 through 8**	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): **ES-HM-1 through 8**
EMISSION POINT (STACK) ID NO(S): **EP-11**	POSITION IN SERIES OF CONTROLS NO. **1** OF **2** UNITS
OPERATING SCENARIO:	
1 OF 2	P.E. SEAL REQUIRED (PER 2q .0112)? ☑ YES ☐ NO

DESCRIBE CONTROL SYSTEM:
Eight (8) identical baghouses are utilized for emission control on the eight dry hammermill cyclones. For each dry hammermill, 10,000 acfm will be recirculated back to the dry hammermill and the remaining 5,000 acfm will be routed to the baghouse. The exhaust gas will then be passed through a dedicated quench system to CD-RCO-2. The quench system will be installed for safety purposes only and is not a control device. All emissions from the dry hammermills will be controlled by a baghouse. The purpose of the recirculation is to reduce the volume of air routed to CD-RCO-2.

	PM	PM_{10}	$PM_{2.5}$	
POLLUTANTS COLLECTED:	PM	PM_{10}	$PM_{2.5}$	
BEFORE CONTROL EMISSION RATE (LB/HR):				
CAPTURE EFFICIENCY:	%	%	%	%
CONTROL DEVICE EFFICIENCY:	~99.9 %	~99.9 %	~99.9 %	%
CORRESPONDING OVERALL EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL AFTER CONTROL EMISSION RATE (LB/HR):	**See calculations in Appendix E**			

PRESSURE DROP (IN H_20): MIN: MAX:**TBD** GAUGE? ☑ YES ☐ NO		
BULK PARTICLE DENSITY (LB/FT^3): **TBD**	INLET TEMPERATURE (°F): **TBD**	
POLLUTANT LOADING RATE: **0.004** ☐ LB/HR ☑ GR/FT^3	OUTLET TEMPERATURE (°F) **TBD**	
INLET AIR FLOW RATE (ACFM): **5,000 each**	FILTER OPERATING TEMP (°F): **N/A**	
NO. OF COMPARTMENTS: **TBD**	NO. OF BAGS PER COMPARTMENT: **TBD**	LENGTH OF BAG (IN.): **TBD**
NO. OF CARTRIDGES: **TBD**	FILTER SURFACE AREA PER CARTRIDGE (FT^2): **TBD**	DIAMETER OF BAG (IN.): **TBD**
TOTAL FILTER SURFACE AREA (FT^2): **TBD**	AIR TO CLOTH RATIO: **TBD**	
DRAFT TYPE: ☑ INDUCED/NEGATIVE ☐ FORCED/POSITIVE	FILTER MATERIAL: ☐ WOVEN ☑ FELTED	

DESCRIBE CLEANING PROCEDURES

- ☑ AIR PULSE
- ☐ REVERSE FLOW
- ☐ MECHANICAL/SHAKER
- ☐ OTHER:
- ☐ SONIC
- ☐ SIMPLE BAG COLLAPSE
- ☐ RING BAG COLLAPSE

DESCRIBE INCOMING AIR STREAM:
The air stream contains wood dust particles. Larger particles are removed by the upstream cyclone for product recovery.

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1	**Unknown**	
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

COMMENTS:

Attach Additional Sheets As Necessary

FORM C3
CONTROL DEVICE (THERMAL OR CATALYTIC)

REVISED 09/22/16 | **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** | **C3**

AS REQUIRED BY 15A NCAC 2Q .0112, THIS FORM MUST BE SEALED BY A PROFESSIONAL ENGINEER (P.E.) LICENSED IN NORTH CAROLINA.

CONTROL DEVICE ID NO: **CD-RCO-2**	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): **ES-HM-1 through 8**
EMISSION POINT (STACK) ID NO(S): **EP-11**	POSITION IN SERIES OF CONTROLS NO. **2** OF **2** UNITS
MANUFACTURER: **TBD**	MODEL NO: **TBD**
OPERATING SCENARIO: 1 OF 2	

TYPE | AFTERBURNER | REGENERATIVE THERMAL OXIDATION | RECUPERATIVE THERMAL OXIDATION | ✓ CATALYTIC OXIDATION

EXPECTED LIFE OF CATALYST (YRS): **TBD**	METHOD OF DETECTING WHEN CATALYST NEEDS REPLACMENT: **Annual sampling and analysis**

CATALYST MASKING AGENT IN AIR STREAM ☐ HALOGEN ☐ SILICONE ☐ PHOSPHOROUS COMPOUND ☐ HEAVY METAL ☐ SULFUR COMPOUND ☑ OTHER (SPECIFY) **TBD** ☐ NONE

TYPE OF CATALYST: **TBD**	CATALYST VOL (FT^3): **TBD**	VELOCITY THROUGH CATALYST (FPS): **TBD**
SCFM THROUGH CATALYST: **TBD**		

DESCRIBE CONTROL SYSTEM, INCLUDING RELATION TO OTHER CONTROL DEVICES AND SOURCES, AND ATTACH DIAGRAM OF SYSTEM:
Emissions leaving the Dry Hammermill baghouses (CD-HM-BH-1 through 8) will pass through a quench system and enter the RCO (with thermal mode backup) prior to being emitted to the atmosphere.

POLLUTANT(S) COLLECTED:	**VOC**			
BEFORE CONTROL EMISSION RATE (LB/HR):				
CAPTURE EFFICIENCY:	%	%	%	%
CONTROL DEVICE EFFICIENCY:	**95** %	%	%	%
CORRESPONDING OVERALL EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL AFTER CONTROL EMISSION RATE (LB/HR) :	**See calculations in Appendix E**			

PRESSURE DROP (IN. H_2O): MIN MAX **TBD**	OUTLET TEMPERATURE (°F): TBD MIN TBD MAX
INLET TEMPERATURE (°F): MIN MAX **TBD**	RESIDENCE TIME (SECONDS): **TBD**
INLET AIR FLOW RATE (ACFM): **TBD** (SCFM): **TBD**	COMBUSTION TEMPERATURE (°F): **TBD**
COMBUSTION CHAMBER VOLUME (FT^3): **TBD**	INLET MOISTURE CONTENT (%): **TBD**
% EXCESS AIR: **TBD**	CONCENTRATION (ppmv) TBD INLET TBD OUTLET
AUXILIARY FUEL USED: **Natural Gas**	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): **24.8**

DESCRIBE MAINTENANCE PROCEDURES:
As per manufacturer's specifications

DESCRIBE ANY AUXILIARY MATERIALS INTRODUCED INTO THE CONTROL SYSTEM:
N/A

COMMENTS:

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

EVISED 09/22/16 — **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** — **B**

EMISSION SOURCE DESCRIPTION: **Eight (8) Hammermills**	EMISSION SOURCE ID NO: **ES-HM-1 through 8**
	CONTROL DEVICE ID NO(S): **CD-HM-BH-1 through 8, CD-RTO-1**
OPERATING SCENARIO **2** OF **2**	EMISSION POINT (STACK) ID NO(S): **EP-1**

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Dried materials are reduced to the appropriate size needed for pelletization using eight hammermills.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

☐ Coal,wood,oil, gas, other burner (Form B1)	☐ Woodworking (Form B4)	☐ Manuf. of chemicals/coatings/inks (Form B7)
☐ Int.combustion engine/generator (Form B2)	☐ Coating/finishing/printing (Form B5)	☐ Incineration (Form B8)
☐ Liquid storage tanks (Form B3)	☐ Storage silos/bins (Form B6)	☑ Other (Form B9)

START CONSTRUCTION DATE: **TBD**	DATE MANUFACTURED: **TBD**
MANUFACTURER / MODEL NO.: **TBD**	EXPECTED OP. SCHEDULE: **24** HR/DAY **7** DAY/WK **52** WK/YR
IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?):	☐ NESHAP (SUBPARTS?):
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB **25%** MAR-MAY **25%** JUN-AUG **25%** SEP-NOV **25%**	

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	**See Emission Calculations in Appendix E**						
PARTICULATE MATTER<10 MICRONS (PM_{10})							
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)							
SULFUR DIOXIDE (SO2)							
NITROGEN OXIDES (NOx)							
CARBON MONOXIDE (CO)							
VOLATILE ORGANIC COMPOUNDS (VOC)							
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
		See Emission Calculations in Appendix E						

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr
		See Emission Calculations in Appendix E			

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9
EMISSION SOURCE (OTHER)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B9**

EMISSION SOURCE DESCRIPTION:	EMISSION SOURCE ID NO: **ES-HM-1 through 8**
Eight (8) Hammermills	CONTROL DEVICE ID NO(S): **CD-HM-BH-1 through 8, CD-RTO-1**
OPERATING SCENARIO: 1 OF 2	EMISSION POINT (STACK) ID NO(S): **EP-1**

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):
Dried materials are reduced to the appropriate size needed for pelletization using eight hammermills.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/HR)	LIMITATION(UNIT/HR)
Dried Wood	**ODT**	**80**	**80**

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/BATCH)	LIMITATION (UNIT/BATCH)

MAXIMUM DESIGN (BATCHES / HOUR):	
REQUESTED LIMITATION (BATCHES / HOUR):	(BATCHES/YR):
FUEL USED: **N/A**	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): **N/A**
MAX. CAPACITY HOURLY FUEL USE: **N/A**	REQUESTED CAPACITY ANNUAL FUEL USE: **N/A**

COMMENTS:

Attach Additional Sheets as Necessary

FORM C1
CONTROL DEVICE (FABRIC FILTER)

REVISED 09/22/16 | **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** | **C1**

CONTROL DEVICE ID NO: **CD-HM-BH-1 through 8**	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): **ES-HM-1 through 8**
EMISSION POINT (STACK) ID NO(S): **EP-1**	POSITION IN SERIES OF CONTROLS NO. **1** OF **2** UNITS
OPERATING SCENARIO:	
2 OF **2**	P.E. SEAL REQUIRED (PER 2q .0112)? ☑ YES ☐ NO

DESCRIBE CONTROL SYSTEM:
Eight (8) baghouses are utilized for emission control on the eight dry hammermill cyclones. For each dry hammermill, 10,000 acfm would be recirculated back to the dry hammermill and the remaining 5,000 acfm would be routed to the baghouse followed by a new quench system and then to either:

a. The existing furnace, CD-WESP, and CD-RTO-1;
b. Directly to CD-WESP and CD-RTO-1; or
c. In the event that the furnace is not operational, the exhaust would be routed directly to CD-RTO-1.

All emissions from the dry hammermills will be controlled by a baghouse. The purpose of the recirculation is to reduce the volume of air routed to CD-RTO-1.

	PM	PM_{10}	$PM_{2.5}$	
POLLUTANTS COLLECTED:	PM	PM_{10}	$PM_{2.5}$	
BEFORE CONTROL EMISSION RATE (LB/HR):				
CAPTURE EFFICIENCY:	%	%	%	%
CONTROL DEVICE EFFICIENCY:	**~99.9** %	**~99.9** %	**~99.9** %	%
CORRESPONDING OVERALL EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL AFTER CONTROL EMISSION RATE (LB/HR):	**See calculations in Appendix E**			

PRESSURE DROP (IN H_20): MIN: MAX:**TBD** GAUGE? ☑ YES ☐ NO		
BULK PARTICLE DENSITY (LB/FT^3): **TBD**	INLET TEMPERATURE (^oF): **TBD**	
POLLUTANT LOADING RATE: **0.004** ☐ LB/HR ☑ GR/FT^3	OUTLET TEMPERATURE (^oF) **TBD**	
INLET AIR FLOW RATE (ACFM): **5,000 each**	FILTER OPERATING TEMP (^oF): **N/A**	
NO. OF COMPARTMENTS: **TBD**	NO. OF BAGS PER COMPARTMENT: **TBD**	LENGTH OF BAG (IN.): **TBD**
NO. OF CARTRIDGES: **TBD**	FILTER SURFACE AREA PER CARTRIDGE (FT^2): **TBD**	DIAMETER OF BAG (IN.): **TBD**
TOTAL FILTER SURFACE AREA (FT^2): **TBD**	AIR TO CLOTH RATIO: **TBD**	
DRAFT TYPE: ☑ INDUCED/NEGATIVE ☐ FORCED/POSITIVE	FILTER MATERIAL: ☐ WOVEN ☑ FELTED	

DESCRIBE CLEANING PROCEDURES

☑ AIR PULSE ☐ SONIC
☐ REVERSE FLOW ☐ SIMPLE BAG COLLAPSE
☐ MECHANICAL/SHAKER ☐ RING BAG COLLAPSE
☐ OTHER:

DESCRIBE INCOMING AIR STREAM:
The air stream contains wood dust particles. Larger particles are removed by the upstream cyclone for product recovery.

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1	**Unknown**	
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

COMMENTS:

Attach Additional Sheets As Necessary

FORM C3
CONTROL DEVICE (THERMAL OR CATALYTIC)

REVISED 09/22/16 | **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** | C3

AS REQUIRED BY 15A NCAC 2Q .0112, THIS FORM MUST BE SEALED BY A PROFESSIONAL ENGINEER (P.E.) LICENSED IN NORTH CAROLINA.

CONTROL DEVICE ID NO: **CD-RTO-1**	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): **ES-DRYER, ES-DHM-1 through 8, and ES-GHM-1 through 3**
EMISSION POINT (STACK) ID NO(S): **EP-1**	POSITION IN SERIES OF CONTROLS NO. 2 OF 2 UNITS
MANUFACTURER: **Lundberg**	MODEL NO: **TBD**
OPERATING SCENARIO: 2 OF 2	

TYPE: ☐ AFTERBURNER ☑ REGENERATIVE THERMAL OXIDATION ☐ RECUPERATIVE THERMAL OXIDATION ☐ CATALYTIC OXIDATION

EXPECTED LIFE OF CATALYST (YRS): **TBD** | METHOD OF DETECTING WHEN CATALYST NEEDS REPLACMENT: **Annual sampling and analysis**

CATALYST MASKING AGENT IN AIR STREAM: ☐ HALOGEN ☐ SILICONE ☐ PHOSPHOROUS COMPOUND ☐ HEAVY METAL ☐ SULFUR COMPOUND ☑ OTHER (SPECIFY) **TBD** ☐ NONE

TYPE OF CATALYST: **TBD** | CATALYST VOL (FT^3): **TBD** | VELOCITY THROUGH CATALYST (FPS): **TBD**

SCFM THROUGH CATALYST: **TBD**

DESCRIBE CONTROL SYSTEM, INCLUDING RELATION TO OTHER CONTROL DEVICES AND SOURCES, AND ATTACH DIAGRAM OF SYSTEM:
Emissions leaving the dry hammermill baghouses will enter the RTO prior to being emitted to the atmosphere.

POLLUTANT(S) COLLECTED:	**VOC**			
BEFORE CONTROL EMISSION RATE (LB/HR):				
CAPTURE EFFICIENCY:	%	%	%	%
CONTROL DEVICE EFFICIENCY:	**95** %	%	%	%
CORRESPONDING OVERALL EFFICIENCY:	%	%	%	%
EFFICIENCY DETERMINATION CODE:				
TOTAL AFTER CONTROL EMISSION RATE (LB/HR) :	**See calculations in Appendix E**			

PRESSURE DROP (IN. H_2O): MIN MAX **TBD**	OUTLET TEMPERATURE (°F): TBD MIN TBD MAX
INLET TEMPERATURE (°F): MIN MAX **TBD**	RESIDENCE TIME (SECONDS): **TBD**
INLET AIR FLOW RATE (ACFM): **TBD** (SCFM): **TBD**	COMBUSTION TEMPERATURE (°F): **TBD**
COMBUSTION CHAMBER VOLUME (FT^3): **TBD**	INLET MOISTURE CONTENT (%): **TBD**
% EXCESS AIR: **TBD**	CONCENTRATION (ppmv) TBD INLET TBD OUTLET
AUXILIARY FUEL USED: **Natural Gas**	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): **32**

DESCRIBE MAINTENANCE PROCEDURES:
As per manufacturer's specifications

DESCRIBE ANY AUXILIARY MATERIALS INTRODUCED INTO THE CONTROL SYSTEM:
N/A

COMMENTS:

Attach Additional Sheets As Necessary

APPENDIX C
AREA MAP

RAMBOLL

DRAFTED BY: FXP | DATE: 11/2019

SITE LOCATION MAP
ENVIVA HAM, LLC
HAMLET, NORTH CAROLINA

FIGURE
1

1690006061

APPENDIX D
PROCESS FLOW DIAGRAM

Table 1
Calculation Inputs
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Operational Data	
Green Hammermills, Dryers, Pellet Coolers	
Short-Term Maximum Throughput (ODT/hr)	80
Annual Throughput (ODT/yr)	625,011
Hours of Operation (hr/yr)	8,760
Softwood Composition	85%
Dry Hammermills	
Short-Term Maximum Throughput (ODT/hr)	80
Annual Throughput (ODT/yr)	625,011
Hours of Operation (hr/yr)	8,760
Softwood Composition	85%

Table 2a
Summary of Facility-wide Potential Emissions
Control Option 1
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Emission Unit ID	Source Description	Control Device ID	Control Device Description	CO (tpy)	NO_x (tpy)	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	VOC (tpy)	CO_2e (tpy)
IES-CHIP-1	Log Chipping	--	--	--	--	--	--	--	--	1.56	--
IES-BARKHOG	Bark Hog	--	--	--	--	0.23	0.13	--	--	0.28	--
ES-DRYER	250.4 MMBtu/hr Wood-fired Direct Heat Drying System	CD-WESP CD-RTO-1	WESP; RTO	219	219	33.3	33.3	33.3	27.4	38.7	243,754
ES-GHM-1 through 3	Three (3) Green Wood Hammermills										
ES-FURNACEBYPASS	Furnace Bypass Stack	--	--	2.81	1.03	2.71	2.42	2.10	0.12	0.080	17,160
ES-HM-1 through 8[1]	Eight (8) Dry Hammermills	CD-HM-BH1 through 8 CD-RCO-2	Eight (8)-baghouses; RTO/RCO	9.19	10.9	6.07	6.07	3.04	0.064	8.55	12,720
ES-HMC	Hammermill Collection Conveyor	CD-HMC-BH	One (1) baghouse	--	--	0.23	0.23	0.23	--	--	--
ES-PCHP	Pellet Cooler HP Fines Relay System	CD-PCHP-BH	One (1) baghouse	--	--	0.075	0.075	0.075	--	--	--
ES-PCLP	Pellet Cooler LP Fines Relay System	CD-PCLP-BH	One (1) baghouse	--	--	0.47	0.47	0.47	--	--	--
ES-PMFS	Pellet Mill Feed Silo	CD-PMFS-BH	One (1) baghouse	--	--	0.37	0.37	0.37	--	--	--
ES-CLR-1 through 6[2]	Six (6) Pellet Coolers	CD-WSB CD-RCO-1	One (1) wet scrubber; RCO	12.3	14.6	14.6	4.57	1.48	0.082	24.1	16,412
ES-DCTB	Pellet Dust Collection Transfer Bin	CD-PDCTB-BH	One (1) baghouse	--	--	0.45	0.45	0.45	--	--	--
ES-FPH	Finished Product Handling	CD-FPH-BH	One (1) baghouse	--	--	1.28	1.16	0.022	--	--	--
ES-PB-1 and 2	Two (2) Pellet Loadout Bins										
ES-DWH	Dried Wood Handling Operations	CD-DWH-BH1 and 2	Two (2) baghouses	--	--	0.30	0.30	0.30	--	38.8	--
ES-ADD	Additive Handling and Storage	CD-ADD-BH	One (1) baghouse	--	--	0.15	0.15	0.15	--	--	--
IES-GWH	Green Wood Handling Operations	--	--	--	--	0.085	0.040	0.0061	--	--	--
IES-TK-1	1,000 gallon Diesel Storage Tank	--	--	--	--	--	--	--	--	5.8E-04	--
IES-TK-2	185 gallon Diesel Storage Tank	--	--	--	--	--	--	--	--	1.6E-04	--
IES-TK-3	5,000 gallon Diesel Storage Tank	--	--	--	--	--	--	--	--	0.0033	--
IES-GWSP-1 through 5	Green Wood Storage Piles	--	--	--	--	13.5	6.73	1.01	--	7.02	--
IES-BFSP-1 and 2	Bark Fuel Storage Piles	--	--	--	--	0.56	0.28	0.042	--	0.29	--
IES-DRYSHAVE	Dry Shaving Material Handling	--	--	--	--	0.054	0.025	0.0039	--	--	--
IES-DEBARK-1	Debarker	--	--	--	--	1.08	0.59	--	--	--	--
IES-BFB[3]	Bark Fuel Bin	--	--	--	--	--	--	--	--	--	--
IES-GN	500 kW Diesel-fired Emergency Generator	--	--	0.14	2.46	0.0078	0.0078	0.0078	6.6E-04	1.68	179
IES-FWP	250 hp Diesel-fired Fire Water Pump	--	--	0.070	0.18	0.0092	0.0092	0.0092	4.8E-04	0.0081	50.4
--	Paved Roads	--	--	--	--	16.3	3.26	0.80	--	--	--
--	Unpaved Roads	--	--	--	--	5.12	1.46	0.15	--	--	--
			Total Emissions:	**243**	**248**	**96.8**	**62.1**	**44.0**	**27.7**	**121**	**290,275**
			Total Excluding Fugitives[4]:	**243**	**248**	**61.3**	**50.3**	**42.0**	**27.7**	**114**	**290,275**
			PSD Major Source Threshold:	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**--**

Notes:

1. The dry hammermills are equipped with eight (8) baghouses for PM control. In addition, the dry hammermills will be equipped with an RCO for VOC and HAP control that will operate primarily in catalytic mode with thermal (RTO) mode as a backup. The RTO and RCO modes have the same control efficiency so there will be no impact on emissions during thermal mode usage.
2. The pellet coolers are equipped with a single wet scrubber for PM control. In addition, the pellet coolers are equipped with an RCO for VOC control that will operate primarily in catalytic mode with thermal (RTO) mode as a backup. The RTO and RCO modes have the same control efficiency so there will be no impact on emissions during thermal mode usage.
3. Bark is transferred from the primary Bark Fuel Storage Pile by walking floor to covered conveyors which transfer the bark into the fully enclosed Bark Fuel Bin. There are no emissions expected from transfer of material into the bin.
4. Fugitive emissions are not included in comparison against the major source threshold because the facility is not on the list of 28 source categories in 40 CFR 52.21.

Abbreviations:

ES - Emission Source
IES - Insignificant Emission Source
CO - carbon monoxide
CO_2e - carbon dioxide equivalent
NO_x - nitrogen oxides
PM - particulate matter
PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2.5 microns or le
RTO - Regenerative Thermal Oxidizer
SO_2 - sulfur dioxide
tpy - tons per year
VOC - volatile organic compounds
WESP - Wet Electrostatic Precipitator

Table 2b
Summary of Facility-wide Potential Emissions
Control Option 2
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Emission Unit ID	Source Description	Control Device ID	Control Device Description	CO (tpy)	NO_x (tpy)	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	VOC (tpy)	CO_2e (tpy)
IES-CHIP-1	Log Chipping	--	--	--	--	--	--	--	--	1.56	--
IES-BARKHOG	Bark Hog	--	--	--	--	0.23	0.13	--	--	0.28	--
ES-DRYER	250.4 MMBtu/hr Wood-fired Direct Heat Drying System	CD-WESP CD-RTO-1	WESP; RTO	219	219	39.3	39.3	35.8	27.4	46.7	243,754
ES-GHM-1 through 3	Three (3) Green Wood Hammermills										
ES-HM-1 through 8[1]	Eight (8) Dry Hammermills	CD-HM-BH1 through 8 CD-RTO-1	Eight (8) baghouses; RTO								
ES-FURNACEBYPASS	Furnace Bypass Stacks	--	--	2.81	1.03	2.71	2.42	2.10	0.12	0.080	17,160
ES-HMC	Hammermill Collection Conveyor	CD-HMC-BH	One (1) baghouse	--	--	0.23	0.23	0.23	--	--	--
ES-PCHP	Pellet Cooler HP Fines Relay System	CD-PCHP-BH	One (1) baghouse	--	--	0.075	0.075	0.075	--	--	--
ES-PCLP	Pellet Cooler LP Fines Relay System	CD-PCLP-BH	One (1) baghouse	--	--	0.47	0.47	0.47	--	--	--
ES-PMFS	Pellet Mill Feed Silo	CD-PMFS-BH	One (1) baghouse	--	--	0.37	0.37	0.37	--	--	--
ES-CLR-1 through 6[2]	Six (6) Pellet Coolers	CD-WSB CD-RCO-1	One (1) wet scrubber; RCO	12.3	14.6	14.6	4.57	1.48	0.082	24.1	16,412
ES-DCTB	Pellet Dust Collection Transfer Bin	CD-PDCTB-BH	One (1) baghouse	--	--	0.45	0.45	0.45	--	--	--
ES-FPH	Finished Product Handling	CD-FPH-BH	One (1) baghouse	--	--	1.28	1.16	0.022	--	--	--
ES-PB-1 and 2	Two (2) Pellet Loadout Bins										
ES-DWH	Dried Wood Handling Operations	CD-DWH-BH1 and 2	Two (2) baghouses	--	--	0.30	0.30	0.30	--	38.8	--
ES-ADD	Additive Handling and Storage	CD-ADD-BH	One (1) baghouse	--	--	0.15	0.15	0.15	--	--	--
IES-GWH	Green Wood Handling Operations	--	--	--	--	0.085	0.040	0.0061	--	--	--
IES-TK-1	1,000 gallon Diesel Storage Tank	--	--	--	--	--	--	--	--	0.00058	--
IES-TK-2	185 gallon Diesel Storage Tank	--	--	--	--	--	--	--	--	0.00016	--
IES-TK-3	5,000 gallon Diesel Storage Tank	--	--	--	--	--	--	--	--	0.0033	--
IES-GWSP-1 through 5	Green Wood Storage Piles	--	--	--	--	13.5	6.73	1.01	--	7.02	--
IES-BFSP-1 and 2	Bark Fuel Storage Piles	--	--	--	--	0.56	0.28	0.042	--	0.29	--
IES-DRYSHAVE	Dry Shaving Material Handling	--	--	--	--	0.054	0.025	0.0039	--	--	--
IES-DEBARK-1	Debarker	--	--	--	--	1.08	0.59	--	--	--	--
IES-BFB[3]	Bark Fuel Bin	--	--	--	--	--	--	--	--	--	--
IES-GN	500 kW Diesel-fired Emergency Generator	--	--	0.14	2.46	0.0078	0.0078	0.0078	6.6E-04	1.68	179
IES-FWP	250 hp Diesel-fired Fire Water Pump	--	--	0.070	0.18	0.0092	0.0092	0.0092	4.8E-04	0.0081	50.4
--	Paved Roads	--	--	--	--	16.3	3.26	0.80	--	--	--
--	Unpaved Roads	--	--	--	--	5.12	1.46	0.15	--	--	--
			Total Emissions:	**235**	**238**	**96.8**	**62.0**	**43.5**	**27.6**	**121**	**277,556**
			Total Excluding Fugitives[4]:	**235**	**238**	**61.2**	**50.2**	**41.5**	**27.6**	**113**	**277,556**
			PSD Major Source Threshold:	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**--**

Notes:

1. The dry hammermills are equipped with eight (8) baghouses for PM control. The Dry Hammermill baghouse exhaust will be routed to either the furnace/WESP/RTO, directly to the WESP/RTO, or directly to the RTO. The RTO will provide 95% control of VOC and HAP emissions.
2. The pellet coolers are equipped with a single wet scrubber for PM control. In addition, the pellet coolers are equipped with an RCO for VOC control that will operate primarily in catalytic mode with thermal (RTO) mode as a backup. The RTO and RCO modes have the same control efficiency so there will be no impact on emissions during thermal mode usage.
3. Bark is transferred from the primary Bark Fuel Storage Pile by walking floor to covered conveyors which transfer the bark into the fully enclosed Bark Fuel Bin. There are no emissions expected from transfer of material into the bin.
4. Fugitive emissions are not included in comparison against the major source threshold because the facility is not on the list of 28 source categories in 40 CFR 52.21.

Abbreviations:

ES - Emission Source
IES - Insignificant Emission Source
CO - carbon monoxide
CO_2e - carbon dioxide equivalent
NO_x - nitrogen oxides
PM - particulate matter
PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2.5 microns or les
RTO - Regenerative Thermal Oxidizer
SO_2 - sulfur dioxide
tpy - tons per year
VOC - volatile organic compounds
WESP - Wet Electrostatic Precipitator

Table 3a
Summary of Facility-wide HAP Emissions
Control Option 1
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Pollutant	CD-RTO-1[1] (tpy)	ES-FURNACEBYPASS (tpy)	CD-RCO-1[2] (tpy)	CD-RCO-2[3] (tpy)	ES-DWH (tpy)	IES-GN (tpy)	IES-FWP (tpy)	IES-BARKHOG (tpy)	IES-CHIP-1 (tpy)	Total HAP (tpy)
Acetaldehyde	1.79	0.0039	0.13	0.14	--	9.0E-04	1.8E-04	--	--	2.07
Acetophenone	1.8E-07	1.5E-08	--	--	--	--	--	--	--	1.9E-07
Acrolein	1.00	0.019	0.79	0.17	--	1.1E-04	2.1E-05	--	--	1.98
Antimony and compounds	6.3E-04	3.7E-05	--	--	--	--	--	--	--	6.7E-04
Arsenic and compounds	0.0018	1.0E-04	2.7E-05	2.1E-05	--	--	--	--	--	0.0019
Benzene	0.23	0.020	2.9E-04	2.2E-04	--	0.0011	2.1E-04	--	--	0.25
Benzo(a)pyrene	1.4E-04	1.2E-05	1.6E-07	1.3E-07	--	2.2E-07	4.3E-08	--	--	1.6E-04
Beryllium metal	8.9E-05	5.2E-06	1.6E-06	1.3E-06	--	--	--	--	--	9.7E-05
Butadiene, 1,3-	--	--	--	--	--	4.6E-05	9.0E-06	--	--	5.5E-05
Cadmium Metal	4.8E-04	1.9E-05	1.5E-04	1.2E-04	--	--	--	--	--	7.6E-04
Carbon tetrachloride	0.0025	2.1E-04	--	--	--	--	--	--	--	0.0027
Chlorine	0.87	0.0037	--	--	--	--	--	--	--	0.87
Chlorobenzene	0.0018	1.5E-04	--	--	--	--	--	--	--	0.0020
Chloroform	0.0015	1.3E-04	--	--	--	--	--	--	--	0.0017
Chromium VI	4.7E-04	1.6E-05	1.9E-04	1.5E-04	--	--	--	--	--	8.3E-04
Chromium-Other compounds	0.0014	8.2E-05	--	--	--	--	--	--	--	0.0015
Cobalt compounds	5.3E-04	3.0E-05	1.2E-05	8.9E-06	--	--	--	--	--	5.8E-04
Dichlorobenzene	1.6E-04	--	1.6E-04	1.3E-04	--	--	--	--	--	4.6E-04
Dichloroethane, 1,2-	0.0016	1.4E-04	--	--	--	--	--	--	--	0.0017
Dichloropropane, 1,2-	0.0018	1.5E-04	--	--	--	--	--	--	--	0.0020
Dinitrophenol, 2,4-	9.9E-06	8.4E-07	--	--	--	--	--	--	--	1.1E-05
Di(2-ethylhexyl)phthalate	2.6E-06	2.2E-07	--	--	--	--	--	--	--	2.8E-06
Ethyl benzene	0.0017	1.5E-04	--	--	--	--	--	--	--	0.0018
Formaldehyde	0.94	0.021	0.50	0.13	0.26	0.0014	2.7E-04	--	--	1.85
Hexane	0.25	--	0.25	0.19	--	--	--	--	--	0.69
Hydrochloric acid	2.08	0.089	--	--	--	--	--	--	--	2.17
Lead and lead compounds	0.0039	2.3E-04	6.9E-05	5.3E-05	--	--	--	--	--	0.0042
Manganese and compounds	0.13	0.0075	5.2E-05	4.0E-05	--	--	--	--	--	0.13
Mercury, vapor	3.1E-04	1.6E-05	3.6E-05	2.8E-05	--	--	--	--	--	3.9E-04
Methanol	2.06	--	3.75	0.081	0.61	--	--	0.057	0.31	6.86
Methyl bromide	8.2E-04	7.0E-05	--	--	--	--	--	--	--	8.9E-04
Methyl chloride	0.0013	1.1E-04	--	--	--	--	--	--	--	0.0014
Methylene chloride	0.016	--	--	--	--	--	--	--	--	0.016
Naphthalene	0.0054	4.5E-04	8.4E-05	6.5E-05	--	1.0E-04	1.9E-05	--	--	0.0061
Nickel metal	0.0029	1.5E-04	2.9E-04	2.2E-04	--	--	--	--	--	0.0036
Nitrophenol, 4-	6.0E-06	5.2E-07	--	--	--	--	--	--	--	6.5E-06
Pentachlorophenol	5.6E-05	2.4E-07	--	--	--	--	--	--	--	5.6E-05
Perchloroethylene	0.042	1.8E-04	--	--	--	--	--	--	--	0.042
Phenol	1.28	2.4E-04	0.39	0.064	--	--	--	--	--	1.73
Phosphorus metal, yellow or white	0.0021	1.3E-04	--	--	--	--	--	--	--	0.0023
Polychlorinated biphenyls	4.5E-07	3.8E-08	--	--	--	--	--	--	--	4.9E-07
Propionaldehyde	0.45	2.9E-04	0.17	0.29	--	--	--	--	--	0.92
Selenium compounds	2.3E-04	1.3E-05	3.3E-06	2.6E-06	--	--	--	--	--	2.4E-04
Styrene	0.10	0.0089	--	--	--	--	--	--	--	0.11
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	4.7E-10	4.0E-11	--	--	--	--	--	--	--	5.1E-10
Toluene	0.0509	0.0043	4.7E-04	3.6E-04	--	4.8E-04	9.4E-05	--	--	0.057
Total PAH (POM)	0.14	5.9E-04	9.6E-05	7.4E-05	--	2.0E-04	3.9E-05	--	--	0.14
Trichloroethane, 1,1,1-	0.034	1.5E-04	--	--	--	--	--	--	--	0.034
Trichloroethylene	0.0016	1.4E-04	--	--	--	--	--	--	--	0.0018
Trichlorophenol, 2,4,6-	1.2E-06	1.0E-07	--	--	--	--	--	--	--	1.3E-06
Vinyl chloride	9.9E-04	8.4E-05	--	--	--	--	--	--	--	0.0011
Xylene	0.0014	1.2E-04	--	--	--	3.3E-04	6.5E-05	--	--	0.0019
Total HAP Emissions[4] (tpy)	**11.5**	**0.18**	**5.98**	**1.08**	**0.87**	**0.0045**	**8.9E-04**	**0.057**	**0.31**	**20.0**
Maximum Individual HAP (tpy)	**Hydrochloric acid**	**Hydrochloric acid**	**Methanol**	**Propionaldehyde**	**Methanol**	**Formaldehyde**	**Formaldehyde**	**Methanol**	**Methanol**	**Methanol**
Maximum Individual HAP Emissions (tpy)	**2.08**	**0.089**	**3.75**	**0.29**	**0.61**	**0.0014**	**2.7E-04**	**0.057**	**0.31**	**6.86**

Notes:

1. Includes emissions at outlet of RTO-1 stack as well as the HAP combustion emissions resulting from natural gas combustion by the RTO-1 burners. RTO-1 controls emissions from the dryer (ES-DRYER) and green hammermills (ES-GHM-1 through 3).
2. Includes emissions at outlet of RCO stack as well as the HAP combustion emissions resulting from natural gas combustion by the RCO burners. RCO controls emissions from the pellet coolers and pellet mill (ES-CLR-1 through 6). The pellet coolers will be equipped with an RCO that will operate primarily in catalytic mode with thermal (RTO) mode as a backup. The RTO and RCO modes have the same control efficiency so there will be no impact on emissions during thermal mode usage.
3. Includes emissions at outlet of RTO/RCO stack as well as the HAP combustion emissions resulting from natural gas combustion by the RTO/RCO burners. RTO/RCO controls emissions from the dry hammermills (ES-DHM-1 through 8). The dry hammermills will be equipped with an RTO/RCO that will operate primarily in catalytic mode with thermal (RTO) mode as a backup. The RTO and RCC modes have the same control efficiency so there will be no impact on emissions during thermal mode usage.
4. Because benzo(a)pyrene and naphthalene emissions were presented individually and as components of total PAH emissions, the total HAP emissions presented here do not match the sum of all pollutant emissions to avoid double counting benzo(a)pyrene and naphthalene emissions.

Abbreviations:

HAP - hazardous air pollutant
RCO - regenerative catalytic oxidizer
RTO - regenerative thermal oxidizer
tpy - tons per year

Table 3b
Summary of Facility-wide HAP Emissions
Control Option 2
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Pollutant	CD-RTO-1[1] (tpy)	ES-FURNACEBYPASS (tpy)	CD-RCO-1[2] (tpy)	ES-DWH (tpy)	IES-GN (tpy)	IES-FWP (tpy)	IES-BARKHOG (tpy)	IES-CHIP-1 (tpy)	Total HAP (tpy)
Acetaldehyde	1.79	0.0039	0.13	--	9.0E-04	1.8E-04	--	--	1.92
Acetophenone	1.8E-07	1.5E-08	--	--	--	--	--	--	1.9E-07
Acrolein	1.00	0.019	0.79	--	1.1E-04	2.1E-05	--	--	1.81
Antimony and compounds	6.3E-04	3.7E-05	--	--	--	--	--	--	6.7E-04
Arsenic and compounds	0.0018	1.0E-04	2.7E-05	--	--	--	--	--	0.0019
Benzene	0.23	0.020	2.9E-04	--	0.0011	2.1E-04	--	--	0.25
Benzo(a)pyrene	1.4E-04	1.2E-05	1.6E-07	--	2.2E-07	4.3E-08	--	--	1.6E-04
Beryllium metal	8.9E-05	5.2E-06	1.6E-06	--	--	--	--	--	9.6E-05
Butadiene, 1,3-	--	--	--	--	4.6E-05	9.0E-06	--	--	5.5E-05
Cadmium Metal	4.8E-04	1.9E-05	1.5E-04	--	--	--	--	--	6.5E-04
Carbon tetrachloride	0.0025	2.1E-04	--	--	--	--	--	--	0.0027
Chlorine	0.87	0.0037	--	--	--	--	--	--	0.87
Chlorobenzene	0.0018	1.5E-04	--	--	--	--	--	--	0.0020
Chloroform	0.0015	1.3E-04	--	--	--	--	--	--	0.0017
Chromium VI	4.7E-04	1.6E-05	1.9E-04	--	--	--	--	--	6.8E-04
Chromium-Other compounds	0.0014	8.2E-05	--	--	--	--	--	--	0.0015
Cobalt compounds	5.3E-04	3.0E-05	1.2E-05	--	--	--	--	--	5.7E-04
Dichlorobenzene	1.6E-04	--	1.6E-04	--	--	--	--	--	3.3E-04
Dichloroethane, 1,2-	0.0016	1.4E-04	--	--	--	--	--	--	0.0017
Dichloropropane, 1,2-	0.0018	1.5E-04	--	--	--	--	--	--	0.0020
Dinitrophenol, 2,4-	9.9E-06	8.4E-07	--	--	--	--	--	--	1.1E-05
Di(2-ethylhexyl)phthalate	2.6E-06	2.2E-07	--	--	--	--	--	--	2.8E-06
Ethyl benzene	0.0017	1.5E-04	--	--	--	--	--	--	0.0018
Formaldehyde	0.94	0.021	0.50	0.26	0.0014	2.7E-04	--	--	1.72
Hexane	0.25	--	0.25	--	--	--	--	--	0.49
Hydrochloric acid	2.08	0.089	--	--	--	--	--	--	2.17
Lead and lead compounds	0.0039	2.3E-04	6.9E-05	--	--	--	--	--	0.0042
Manganese and compounds	0.13	0.0075	5.2E-05	--	--	--	--	--	0.13
Mercury, vapor	3.1E-04	1.6E-05	3.6E-05	--	--	--	--	--	3.7E-04
Methanol	2.06	--	3.75	0.61	--	--	0.057	0.31	6.78
Methyl bromide	8.2E-04	7.0E-05	--	--	--	--	--	--	8.9E-04
Methyl chloride	0.0013	1.1E-04	--	--	--	--	--	--	0.0014
Methylene chloride	0.016	--	--	--	--	--	--	--	0.016
Naphthalene	0.0054	4.5E-04	8.4E-05	--	1.0E-04	1.9E-05	--	--	0.0061
Nickel metal	0.0029	1.5E-04	2.9E-04	--	--	--	--	--	0.0034
Nitrophenol, 4-	6.0E-06	5.2E-07	--	--	--	--	--	--	6.5E-06
Pentachlorophenol	5.6E-05	2.4E-07	--	--	--	--	--	--	5.6E-05
Perchloroethylene	0.042	1.8E-04	--	--	--	--	--	--	0.042
Phenol	1.28	2.4E-04	0.39	--	--	--	--	--	1.67
Phosphorus metal, yellow or white	0.0021	1.3E-04	--	--	--	--	--	--	0.0023
Polychlorinated biphenyls	4.5E-07	3.8E-08	--	--	--	--	--	--	4.9E-07
Propionaldehyde	0.45	2.9E-04	0.17	--	--	--	--	--	0.62
Selenium compounds	2.3E-04	1.3E-05	3.3E-06	--	--	--	--	--	2.4E-04
Styrene	0.10	0.0089	--	--	--	--	--	--	0.11
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	4.7E-10	4.0E-11	--	--	--	--	--	--	5.1E-10
Toluene	0.0509	0.0043	4.7E-04	--	4.8E-04	9.4E-05	--	--	0.0563
Total PAH (POM)	0.14	5.9E-04	9.6E-05	--	2.0E-04	3.9E-05	--	--	0.14
Trichloroethane, 1,1,1-	0.034	1.5E-04	--	--	--	--	--	--	0.034
Trichloroethylene	0.0016	1.4E-04	--	--	--	--	--	--	0.0018
Trichlorophenol, 2,4,6-	1.2E-06	1.0E-07	--	--	--	--	--	--	1.3E-06
Vinyl chloride	9.9E-04	8.4E-05	--	--	--	--	--	--	0.0011
Xylene	0.0014	1.2E-04	--	--	3.3E-04	6.5E-05	--	--	0.0019
Total HAP Emissions[4] (tpy)	**11.5**	**0.18**	**5.98**	**0.87**	**0.0045**	**8.9E-04**	**0.057**	**0.31**	**18.9**
Maximum Individual HAP (tpy)	**Hydrochloric acid**	**Hydrochloric acid**	**Methanol**	**Methanol**	**Formaldehyde**	**Formaldehyde**	**Methanol**	**Methanol**	**Methanol**
Maximum Individual HAP Emissions (tpy)	**2.08**	**0.089**	**3.75**	**0.61**	**0.0014**	**2.7E-04**	**0.057**	**0.31**	**6.78**

Notes:

1. Includes emissions at outlet of RTO-1 stack as well as the HAP combustion emissions resulting from natural gas combustion by the RTO-1 burners. RTO-1 controls emissions from the dryer (ES-DRYER), dry hammermills (ES-DHM-1 through 8), and green hammermills (ES-GHM-1 through 3).
2. Includes emissions at outlet of RCO stack as well as the HAP combustion emissions resulting from natural gas combustion by the RCO burners. RCO controls emissions from the pellet coolers and pellet mill (ES-CLR-1 through 6). The pellet coolers will be equipped with an RCO that will operate primarily in catalytic mode with thermal (RTO) mode as a backup. The RTO and RCO modes have the same control efficiency so there will be no impact on emissions during thermal mode usage.
3. Because benzo(a)pyrene and naphthalene emissions were presented individually and as components of total PAH emissions, the total HAP emissions presented here do not match the sum of all pollutant emissions to avoid double counting benzo(a)pyrene and naphthalene emissions.

Abbreviations:

HAP - hazardous air pollutant
RCO - regenerative catalytic oxidizer
RTO - regenerative thermal oxidizer
tpy - tons per year

Table 4a
Potential Emissions at Outlet of RTO-1 Stack
Control Option 1
ES-DRYER and ES-GHM-1 through 3
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Calculation Basis

Maximum Hourly Throughput	80 ODT/hr
Annual Throughput	625,011 ODT/yr
Hourly Heat Input Capacity	250.4 MMBtu/hr
Annual Heat Input Capacity	2,193,504 MMBtu/yr
Hours of Operation	8,760 hr/yr
Number of RTO Burners	4 burners
RTO Burner Rating	8 MMBtu/hr
RTO Control Efficiency	95%

Potential Criteria Pollutant and Greenhouse Gas Emissions from Furnace/Dryer and Green Hammermills

Pollutant	Controlled Emission Factor	Units	Emissions at RTO-1 Outlet[1]	
			(lb/hr)	(tpy)
CO	50	lb/hr[2]	50	219
NO_x	50	lb/hr[2]	50	219
SO_2	0.025	lb/MMBtu[3]	6.26	27.4
VOC	0.12	lb/ODT[4]	9.91	38.7
$PM/PM_{10}/PM_{2.5}$ (Filterable + Condensable)	7.6	lb/hr[2]	7.6	33.3
CO_2	780	lb/ODT[5]	62,400	243,754

Notes:

1. Exhaust from the dryer (ES-DRYER) and green hammermills (ES-GHM-1 through 3) is routed to a WESP and then RTO for control of VOC, HAP, and particulates.
2. Emission rate based on data provided by RTO vendor (Lundberg) and include thermal emissions from the use of the RTO.
3. No emission factor is provided in AP-42, Section 10.6.2 for SO_2 for rotary dryers. Enviva has conservatively calculated SO_2 emissions based on AP-42, Section 1.6 - Wood Residue Combustion in Boilers, 09/03.
4. VOC emission factor based on source test results from similar Enviva facilities.
5. Emission factor for CO_2 from AP-42, Section 10.6.1 for rotary dryer with RTO control device. Enviva has conservatively calculated the CO_2 emissions using the hardwood emission factor because the dryer at Hamlet uses a combination of hardwood and softwood and the hardwood emission factor is greater than the softwood emission factor.

Table 4a
Potential Emissions at Outlet of RTO-1 Stack
Control Option 1
ES-DRYER and ES-GHM-1 through 3
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Potential HAP and TAP Emissions

Pollutant	HAP	NC TAP	VOC	Emission Factor	Units	Footnote	Potential Emissions	
							(lb/hr)	(tpy)
Furnace Biomass Combustion and Green Hammermills								
Acetaldehyde	Y	Y	Y	5.7E-03	lb/ODT	1	0.46	1.79
Acrolein	Y	Y	Y	3.2E-03	lb/ODT	1	0.26	1.00
Formaldehyde	Y	Y	Y	3.0E-03	lb/ODT	1	0.24	0.92
Methanol	Y	N	Y	6.6E-03	lb/ODT	1	0.53	2.06
Phenol	Y	Y	Y	4.1E-03	lb/ODT	1	0.33	1.28
Propionaldehyde	Y	N	Y	1.4E-03	lb/ODT	1	0.12	0.45
Acetophenone	Y	N	Y	3.2E-09	lb/MMBtu	1	4.0E-08	1.8E-07
Antimony and compounds	Y	N	N	7.9E-06	lb/MMBtu	2,4	1.4E-04	6.3E-04
Arsenic	Y	Y	N	2.2E-05	lb/MMBtu	2,4	4.0E-04	0.0017
Benzene	Y	Y	Y	4.2E-03	lb/MMBtu	2,3	0.053	0.23
Benzo(a)pyrene	Y	Y	Y	2.6E-06	lb/MMBtu	2,3	3.3E-05	1.4E-04
Beryllium	Y	Y	N	1.1E-06	lb/MMBtu	2,4	2.0E-05	8.7E-05
Cadmium	Y	Y	N	4.1E-06	lb/MMBtu	2,4	7.4E-05	3.3E-04
Carbon tetrachloride	Y	Y	Y	4.5E-05	lb/MMBtu	2,3	5.6E-04	0.0025
Chlorine	Y	Y	N	7.9E-04	lb/MMBtu	2	0.20	0.87
Chlorobenzene	Y	Y	Y	3.3E-05	lb/MMBtu	2,3	4.1E-04	0.0018
Chloroform	Y	Y	Y	2.8E-05	lb/MMBtu	2,3	3.5E-04	0.0015
Chromium VI	-[5]	Y	N	3.5E-06	lb/MMBtu	2,4,5	6.4E-05	2.8E-04
Chromium-Other compounds	Y	N	N	1.8E-05	lb/MMBtu	2,4	3.2E-04	0.0014
Cobalt compounds	Y	N	N	6.5E-06	lb/MMBtu	2,4	1.2E-04	5.2E-04
Dichloroethane, 1,2-	Y	Y	Y	2.9E-05	lb/MMBtu	2,3	3.6E-04	0.0016
Dichloropropane, 1,2-	Y	N	Y	3.3E-05	lb/MMBtu	2,3	4.1E-04	0.0018
Dinitrophenol, 2,4-	Y	N	Y	1.8E-07	lb/MMBtu	2,3	2.3E-06	9.9E-06
Di(2-ethylhexyl)phthalate	Y	Y	Y	4.7E-08	lb/MMBtu	2,3	5.9E-07	2.6E-06
Ethyl benzene	Y	N	Y	3.1E-05	lb/MMBtu	2,3	3.9E-04	0.0017
Hexachlorodibenzo-p-dioxin, 1,2,3,6,7,8-	N	Y	Y	1.8E-11	lb/MMBtu	2,3	2.2E-10	9.8E-10
Hydrochloric acid	Y	Y	N	1.9E-02	lb/MMBtu	2,6	0.48	2.1
Lead and lead compounds	Y	N	N	4.8E-05	lb/MMBtu	2,4	8.7E-04	0.0038
Manganese and compounds	Y	Y	N	1.6E-03	lb/MMBtu	2,4	0.029	0.13
Mercury, vapor	Y	Y	N	3.5E-06	lb/MMBtu	2,4	6.4E-05	2.8E-04
Methyl bromide	Y	N	Y	1.5E-05	lb/MMBtu	2,3	1.9E-04	8.2E-04
Methyl chloride	Y	N	Y	2.3E-05	lb/MMBtu	2,3	2.9E-04	0.0013
Methyl ethyl ketone	N	Y	Y	5.4E-06	lb/MMBtu	2,3	6.8E-05	3.0E-04
Methylene chloride	Y	Y	Y	2.9E-04	lb/MMBtu	2,3	0.0036	0.016
Naphthalene	Y	N	Y	9.7E-05	lb/MMBtu	2,3	0.0012	0.0053
Nickel metal	Y	Y	N	3.3E-05	lb/MMBtu	2,4	6.0E-04	0.0026
Nitrophenol, 4-	Y	N	Y	1.1E-07	lb/MMBtu	2,3	1.4E-06	6.0E-06
Pentachlorophenol	Y	Y	N	5.1E-08	lb/MMBtu	2	1.3E-05	5.6E-05
Perchloroethylene	Y	Y	N	3.8E-05	lb/MMBtu	2	0.0095	0.042
Phosphorus metal, yellow or white	Y	N	N	2.7E-05	lb/MMBtu	2,4	4.9E-04	0.0021
Polychlorinated biphenyls	Y	Y	Y	8.2E-09	lb/MMBtu	2,3	1.0E-07	4.5E-07
Polycyclic Organic Matter	Y	N	N	1.3E-04	lb/MMBtu	2	0.031	0.14
Selenium compounds	Y	N	N	2.8E-06	lb/MMBtu	2,4	5.1E-05	2.2E-04
Styrene	Y	Y	Y	1.9E-03	lb/MMBtu	2,3	0.024	0.10
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	Y	Y	Y	8.6E-12	lb/MMBtu	2,3	1.1E-10	4.7E-10
Toluene	Y	Y	Y	9.2E-04	lb/MMBtu	2,3	0.012	0.050
Trichloroethane, 1,1,1-	Y	Y	N	3.1E-05	lb/MMBtu	2	0.0078	0.034
Trichloroethylene	Y	Y	Y	3.0E-05	lb/MMBtu	2,3	3.8E-04	0.0016
Trichlorofluoromethane	N	Y	Y	4.1E-05	lb/MMBtu	2,3	5.1E-04	0.0022
Trichlorophenol, 2,4,6-	Y	N	Y	2.2E-08	lb/MMBtu	2,3	2.8E-07	1.2E-06
Vinyl chloride	Y	Y	Y	1.8E-05	lb/MMBtu	2,3	2.3E-04	9.9E-04
Xylene	Y	Y	Y	2.5E-05	lb/MMBtu	2,3	3.1E-04	0.0014
					Total HAP Emissions		**2.77**	**11.2**
					Total TAP Emissions		**2.09**	**8.56**

Table 4a
Potential Emissions at Outlet of RTO-1 Stack
Control Option 1
ES-DRYER and ES-GHM-1 through 3
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Pollutant	HAP	NC TAP	VOC	Emission Factor	Units	Footnote	Potential Emissions	
							(lb/hr)	(tpy)
RTO Burners - Natural Gas Combustion								
2-Methylnaphthalene	Y	N	Y	2.4E-05	lb/MMscf	7	7.5E-07	3.3E-06
3-Methylchloranthrene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
7,12-Dimethylbenz(a)anthracene	Y	N	Y	1.6E-05	lb/MMscf	7	5.0E-07	2.2E-06
Acenaphthene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Acenaphthylene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Acetaldehyde	Y	Y	Y	1.5E-05	lb/MMscf	7	4.8E-07	2.1E-06
Acrolein	Y	Y	Y	1.8E-05	lb/MMscf	7	5.6E-07	2.5E-06
Ammonia	N	Y	N	3.2	lb/MMscf	7	0.10	0.44
Anthracene	Y	N	Y	2.4E-06	lb/MMscf	7	7.5E-08	3.3E-07
Arsenic	Y	Y	N	2.0E-04	lb/MMscf	7	6.3E-06	2.7E-05
Benz(a)anthracene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Benzene	Y	N	Y	2.1E-03	lb/MMscf	7	6.6E-05	2.9E-04
Benzo(a)pyrene	Y	Y	Y	1.2E-06	lb/MMscf	7	3.8E-08	1.6E-07
Benzo(b)fluoranthene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Benzo(g,h,i)perylene	Y	N	Y	1.2E-06	lb/MMscf	7	3.8E-08	1.6E-07
Benzo(k)fluoranthene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Beryllium	Y	Y	N	1.2E-05	lb/MMscf	7	3.8E-07	1.6E-06
Cadmium	Y	Y	N	1.1E-03	lb/MMscf	7	3.5E-05	1.5E-04
Chromium VI	Y	N	N	1.4E-03	lb/MMscf	7	4.4E-05	1.9E-04
Chrysene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Cobalt	Y	N	N	8.4E-05	lb/MMscf	7	2.6E-06	1.2E-05
Dibenzo(a,h)anthracene	Y	N	Y	1.2E-06	lb/MMscf	7	3.8E-08	1.6E-07
Dichlorobenzene	Y	Y	Y	1.2E-03	lb/MMscf	7	3.8E-05	1.6E-04
Fluoranthene	Y	N	Y	3.0E-06	lb/MMscf	7	9.4E-08	4.1E-07
Fluorene	Y	N	Y	2.8E-06	lb/MMscf	7	8.8E-08	3.8E-07
Formaldehyde	Y	Y	Y	7.5E-02	lb/MMscf	7	0.0024	0.010
Hexane	Y	Y	Y	1.8	lb/MMscf	7	0.056	0.25
Indeno(1,2,3-cd)pyrene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Lead	Y	N	N	5.0E-04	lb/MMscf	7	1.6E-05	6.9E-05
Manganese	Y	Y	N	3.8E-04	lb/MMscf	7	1.2E-05	5.2E-05
Mercury	Y	Y	N	2.6E-04	lb/MMscf	7	8.2E-06	3.6E-05
Naphthalene	Y	N	Y	6.1E-04	lb/MMscf	7	1.9E-05	8.4E-05
Nickel	Y	Y	N	2.1E-03	lb/MMscf	7	6.6E-05	2.9E-04
Phenanthrene	Y	N	Y	1.7E-05	lb/MMscf	7	5.3E-07	2.3E-06
Pyrene	Y	N	Y	5.0E-06	lb/MMscf	7	1.6E-07	6.9E-07
Selenium	Y	N	N	2.4E-05	lb/MMscf	7	7.5E-07	3.3E-06
Toluene	Y	Y	Y	3.4E-03	lb/MMscf	7	1.1E-04	4.7E-04
				Total HAP Emissions (natural gas)			**0.059**	**0.26**
				Total TAP Emissions (natural gas)			**0.16**	**0.70**

Notes:

1. Emission factor derived based on stack testing data from comparable Enviva facilities.
2. Emission factors (criteria and HAP/TAP) for wood combustion in a stoker boiler from NCDAQ Wood Waste Combustion Spreadsheet/AP-42, Fifth Edition, Volume 1, Chapter 1.6 - Wood Residue Combustion in Boilers, 09/03.
3. The control efficiency of 95% for the RTO is applied to all VOC hazardous and toxic pollutants for those emission factors that are not derived from Enviva stack test data.
4. The control efficiency of the wet electrostatic precipitator (WESP) for filterable particulate matter is applied to all metal hazardous and toxic pollutants. Actual design filterable efficiency is estimated to 96.4%, but 92.75% is assumed for toxics permitting.
5. Chromium VI is a subset of chrome compounds, which is accounted for separately as a HAP. As such, Chromium VI is only calculated as a TAP.
6. The WESP employs a caustic solution in its operation in which hydrochloric acid will have high water solubility. This caustic solution will neutralize the acid and effectively control it by 90%, per conversation on October 18, 2011 with Steven A. Jaasund, P.E. of Lundberg Associates, a manufacturer of WESPs.
7. Emission factors for natural gas combustion are from NCDAQ Natural Gas Combustion Spreadsheet and AP-42, Fifth Edition, Volume 1, Chapter 1.4 - Natural Gas Combustion, 07/98 for small boilers. The emission factors for acetaldehyde, acrolein, and ammonia are cited in the NCDAQ spreadsheet as being sourced from the USEPA's WebFIRE database.

Abbreviations:

CAS - chemical abstract service
CH_4 - methane
CO - carbon monoxide
CO2 - carbon dioxide
CO_2e - carbon dioxide equivalent
HAP - hazardous air pollutant
hr - hour
kg - kilogram
lb - pound
MMBtu - Million British thermal units
NC - North Carolina
NO_x - nitrogen oxides
N_2O - nitrous oxide
ODT - oven dried tons
PM - particulate matter
PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2.5 microns or less
RTO - regenerative thermal oxidizer
SO_2 - sulfur dioxide
TAP - toxic air pollutant
tpy - tons per year
VOC - volatile organic compound
WESP - wet electrostatic precipitator
yr - year

Table 4b
Potential Emissions at Outlet of RTO-1 Stack
Control Option 2
ES-DRYER, ES-GHM-1 through 3, ES-DHM-1 through 8
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Calculation Basis

Maximum Hourly Throughput	80 ODT/hr
Annual Throughput	625,011 ODT/yr
Hourly Heat Input Capacity	250.4 MMBtu/hr
Annual Heat Input Capacity	2,193,504 MMBtu/yr
Hours of Operation	8,760 hr/yr
Number of RTO Burners	4 burners
RTO Burner Rating	8 MMBtu/hr
RTO Control Efficiency	95%

Total Potential Emissions at RTO/RCO Stack

Pollutant	Potential Emissions[1]	
	(lb/hr)	(tpy)
CO	50.1	219
NO_x	50.1	219
SO_2	6.26	27.4
VOC	12.0	46.7
PM	8.97	39.3
PM_{10}	8.97	39.3
$PM_{2.5}$	8.18	35.8
CO_2	62,400	243,754

Notes:
1. Total emissions from the furnace/dryer, green hammermills, dry hammermills, and natural gas combustion by the RTO burners. Detailed calculations are provided below.

Potential Criteria Pollutant and Greenhouse Gas Emissions from Dryer/Furnace and Green Hammermills

Pollutant	Controlled Emission Factor	Units	Potential Emissions[1]	
			(lb/hr)	(tpy)
CO	50	lb/hr[2]	50	219
NO_x	50	lb/hr[2]	50	219
SO_2	0.025	lb/MMBtu[3]	6.26	27.4
VOC	0.12	lb/ODT[4]	9.91	38.7
$PM/PM_{10}/PM_{2.5}$ (Filterable + Condensable)	7.6	lb/hr[2]	7.6	33.3
CO_2	780	lb/ODT[5]	62,400	243,754

Notes:
1. Exhaust from the dryer (ES-DRYER) and green hammermills (ES-GHM-1 through 3) are routed to a WESP and then RTO for control of VOC, HAP, and particulates. Additional emissions routed to the RTO from the Dry Hammermills are shown in the tables below.
2. Emission rate based on data provided by RTO vendor (Lundberg).
3. No emission factor is provided in AP-42, Section 10.6.2 for SO_2 for rotary dryers. Enviva has conservatively calculated SO_2 emissions based on AP-42, Section 1.6 - Wood Residue Combustion in Boilers, 09/03.
4. VOC emission factor based on source test results from similar Enviva facilities.
5. Emission factor for CO_2 from AP-42, Section 10.6.1 for rotary dryer with RTO control device. Enviva has conservatively calculated the CO_2 emissions using the hardwood emission factor because the dryer at Hamlet uses a combination of hardwood and softwood and the hardwood emission factor is greater than the softwood emission factor.

Potential Criteria Pollutant Emissions from Dry Hammermills

Pollutant	Controlled Emission Factor	Units	Potential Emissions[1]	
			(lb/hr)	(tpy)
TSP	--	--[2]	1.37	6.01
PM_{10}	--	--[2]	1.37	6.01
$PM_{2.5}$	--	--[2]	0.58	2.55
VOC	0.026	lb/ODT[3]	2.04	7.97

Notes:
1. Exhaust from the dry hammermill baghouses (ES-DHM-1 through 8) will be controlled by the RTO.
2. Refer to Table 7 for detailed calculations of particulate emissions from the dry hammermill baghouses.
3. The VOC emission factor is based on stack testing data from comparable Enviva facilities.

Table 4b
Potential Emissions at Outlet of RTO-1 Stack
Control Option 2
ES-DRYER, ES-GHM-1 through 3, ES-DHM-1 through 8
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Thermal Generated Potential Criteria Pollutant Emissions from Dry Hammermills

Maximum high heating value of VOC constituents	0.018	MMBtu/lb
Uncontrolled VOC emissions	159	tons/yr
Heat input of uncontrolled VOC emissions	5,896	MMBtu/yr

Pollutant	Emission Factor	Units	Potential Emissions	
			(lb/hr)	(tpy)
CO	0.082	lb/MMBtu[1]	0.055	0.24
NO_x	0.10	lb/MMBtu[1]	0.066	0.29

Notes:
[1] Emission factors from AP-42, Section 1.4 - Natural Gas Combustion, 07/98. Emission factors converted from lb/MMscf to lb/MMBtu based on assumed heating value of 1,020 Btu/scf for natural gas per AP-42 Section 1.4.

Potential HAP and TAP Emissions

Pollutant	HAP	NC TAP	VOC	Emission Factor	Units	Footnote	Potential Emissions	
							(lb/hr)	(tpy)
Furnace Biomass Combustion, Green Hammermills, and Dry Hammermills								
Acetaldehyde	Y	Y	Y	0.0062	lb/ODT	1	0.49	1.93
Acrolein	Y	Y	Y	0.0038	lb/ODT	1	0.30	1.17
Formaldehyde	Y	Y	Y	0.0034	lb/ODT	1	0.27	1.05
Methanol	Y	N	Y	0.0068	lb/ODT	1	0.55	2.14
Phenol	Y	Y	Y	0.0043	lb/ODT	1	0.34	1.34
Propionaldehyde	Y	N	Y	0.0024	lb/ODT	1	0.19	0.75
Acetophenone	Y	N	Y	3.2E-09	lb/MMBtu	1	4.0E-08	1.8E-07
Antimony and compounds	Y	N	N	7.9E-06	lb/MMBtu	2,4	1.4E-04	6.3E-04
Arsenic	Y	Y	N	2.2E-05	lb/MMBtu	2,4	4.0E-04	0.0017
Benzene	Y	Y	Y	0.0042	lb/MMBtu	2,3	0.053	0.23
Benzo(a)pyrene	Y	Y	Y	2.6E-06	lb/MMBtu	2,3	3.3E-05	1.4E-04
Beryllium	Y	Y	N	1.1E-06	lb/MMBtu	2,4	2.0E-05	8.7E-05
Cadmium	Y	Y	N	4.1E-06	lb/MMBtu	2,4	7.4E-05	3.3E-04
Carbon tetrachloride	Y	Y	Y	4.5E-05	lb/MMBtu	2,3	5.6E-04	0.0025
Chlorine	Y	Y	N	7.9E-04	lb/MMBtu	2	0.20	0.87
Chlorobenzene	Y	Y	Y	3.3E-05	lb/MMBtu	2,3	4.1E-04	0.0018
Chloroform	Y	Y	Y	2.8E-05	lb/MMBtu	2,3	3.5E-04	0.0015
Chromium VI	-[5]	Y	N	3.5E-06	lb/MMBtu	2,4,5	6.4E-05	2.8E-04
Chromium-Other compounds	Y	N	N	1.8E-05	lb/MMBtu	2,4	3.2E-04	0.0014
Cobalt compounds	Y	N	N	6.5E-06	lb/MMBtu	2,4	1.2E-04	5.2E-04
Dichloroethane, 1,2-	Y	Y	Y	2.9E-05	lb/MMBtu	2,3	3.6E-04	0.0016
Dichloropropane, 1,2-	Y	N	Y	3.3E-05	lb/MMBtu	2,3	4.1E-04	0.0018
Dinitrophenol, 2,4-	Y	N	Y	1.8E-07	lb/MMBtu	2,3	2.3E-06	9.9E-06
Di(2-ethylhexyl)phthalate	Y	Y	Y	4.7E-08	lb/MMBtu	2,3	5.9E-07	2.6E-06
Ethyl benzene	Y	N	Y	3.1E-05	lb/MMBtu	2,3	3.9E-04	0.0017
Hexachlorodibenzo-p-dioxin, 1,2,3,6,7,8-	N	Y	Y	1.8E-11	lb/MMBtu	2,3	2.2E-10	9.8E-10
Hydrochloric acid	Y	Y	N	0.019	lb/MMBtu	2,6	0.48	2.08
Lead and lead compounds	Y	N	N	4.8E-05	lb/MMBtu	2,4	8.7E-04	0.0038
Manganese and compounds	Y	Y	N	0.0016	lb/MMBtu	2,4	0.029	0.13
Mercury, vapor	Y	Y	N	3.5E-06	lb/MMBtu	2,4	6.4E-05	2.8E-04
Methyl bromide	Y	N	Y	1.5E-05	lb/MMBtu	2,3	1.9E-04	8.2E-04
Methyl chloride	Y	N	Y	2.3E-05	lb/MMBtu	2,3	2.9E-04	0.0013
Methyl ethyl ketone	N	Y	Y	5.4E-06	lb/MMBtu	2,3	6.8E-05	3.0E-04
Methylene chloride	Y	Y	Y	2.9E-04	lb/MMBtu	2,3	0.0036	0.016
Naphthalene	Y	N	Y	9.7E-05	lb/MMBtu	2,3	0.0012	0.0053
Nickel metal	Y	Y	N	3.3E-05	lb/MMBtu	2,4	6.0E-04	0.0026
Nitrophenol, 4-	Y	N	Y	1.1E-07	lb/MMBtu	2,3	1.4E-06	6.0E-06
Pentachlorophenol	Y	Y	N	5.1E-08	lb/MMBtu	2	1.3E-05	5.6E-05
Perchloroethylene	Y	Y	N	3.8E-05	lb/MMBtu	2	0.0095	0.042
Phosphorus metal, yellow or white	Y	N	N	2.7E-05	lb/MMBtu	2,4	4.9E-04	0.0021
Polychlorinated biphenyls	Y	Y	Y	8.2E-09	lb/MMBtu	2,3	1.0E-07	4.5E-07
Polycyclic Organic Matter	Y	N	N	1.3E-04	lb/MMBtu	2	0.031	0.14
Selenium compounds	Y	N	N	2.8E-06	lb/MMBtu	2,4	5.1E-05	2.2E-04
Styrene	Y	Y	Y	0.0019	lb/MMBtu	2,3	0.024	0.10
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	Y	Y	Y	8.6E-12	lb/MMBtu	2,3	1.1E-10	4.7E-10
Toluene	Y	Y	Y	9.2E-04	lb/MMBtu	2,3	0.012	0.050
Trichloroethane, 1,1,1-	Y	Y	N	3.1E-05	lb/MMBtu	2	0.0078	0.034
Trichloroethylene	Y	Y	Y	3.0E-05	lb/MMBtu	2,3	3.8E-04	0.0016
Trichlorofluoromethane	N	Y	Y	4.1E-05	lb/MMBtu	2,3	5.1E-04	0.0022
Trichlorophenol, 2,4,6-	Y	N	Y	2.2E-08	lb/MMBtu	2,3	2.8E-07	1.2E-06
Vinyl chloride	Y	Y	Y	1.8E-05	lb/MMBtu	2,3	2.3E-04	9.9E-04
Xylene	Y	Y	Y	2.5E-05	lb/MMBtu	2,3	3.1E-04	0.0014
					Total HAP Emissions		**2.99**	**12.1**
					Total TAP Emissions		**2.22**	**9.06**

Table 4b
Potential Emissions at Outlet of RTO-1 Stack
Control Option 2
ES-DRYER, ES-GHM-1 through 3, ES-DHM-1 through 8
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Pollutant	HAP	NC TAP	VOC	Emission Factor	Units	Footnote	Potential Emissions	
							(lb/hr)	(tpy)
Natural Gas Source								
2-Methylnaphthalene	Y	N	Y	2.4E-05	lb/MMscf	7	7.5E-07	3.3E-06
3-Methylchloranthrene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
7,12-Dimethylbenz(a)anthracene	Y	N	Y	1.6E-05	lb/MMscf	7	5.0E-07	2.2E-06
Acenaphthene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Acenaphthylene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Acetaldehyde	Y	Y	Y	1.5E-05	lb/MMscf	7	4.8E-07	2.1E-06
Acrolein	Y	Y	Y	1.8E-05	lb/MMscf	7	5.6E-07	2.5E-06
Ammonia	N	Y	N	3.2	lb/MMscf	7	0.10	0.44
Anthracene	Y	N	Y	2.4E-06	lb/MMscf	7	7.5E-08	3.3E-07
Arsenic	Y	Y	N	2.0E-04	lb/MMscf	7	6.3E-06	2.7E-05
Benz(a)anthracene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Benzene	Y	N	Y	0.0021	lb/MMscf	7	6.6E-05	2.9E-04
Benzo(a)pyrene	Y	Y	Y	1.2E-06	lb/MMscf	7	3.8E-08	1.6E-07
Benzo(b)fluoranthene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Benzo(g,h,i)perylene	Y	N	Y	1.2E-06	lb/MMscf	7	3.8E-08	1.6E-07
Benzo(k)fluoranthene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Beryllium	Y	Y	N	1.2E-05	lb/MMscf	7	3.8E-07	1.6E-06
Cadmium	Y	Y	N	0.0011	lb/MMscf	7	3.5E-05	1.5E-04
Chromium VI	Y	N	N	0.0014	lb/MMscf	7	4.4E-05	1.9E-04
Chrysene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Cobalt	Y	N	N	8.4E-05	lb/MMscf	7	2.6E-06	1.2E-05
Dibenzo(a,h)anthracene	Y	N	Y	1.2E-06	lb/MMscf	7	3.8E-08	1.6E-07
Dichlorobenzene	Y	Y	Y	0.0012	lb/MMscf	7	3.8E-05	1.6E-04
Fluoranthene	Y	N	Y	3.0E-06	lb/MMscf	7	9.4E-08	4.1E-07
Fluorene	Y	N	Y	2.8E-06	lb/MMscf	7	8.8E-08	3.8E-07
Formaldehyde	Y	Y	Y	0.0750	lb/MMscf	7	0.0024	0.010
Hexane	Y	Y	Y	1.8	lb/MMscf	7	0.056	0.25
Indeno(1,2,3-cd)pyrene	Y	N	Y	1.8E-06	lb/MMscf	7	5.6E-08	2.5E-07
Lead	Y	N	N	5.0E-04	lb/MMscf	7	1.6E-05	6.9E-05
Manganese	Y	Y	N	3.8E-04	lb/MMscf	7	1.2E-05	5.2E-05
Mercury	Y	Y	N	2.6E-04	lb/MMscf	7	8.2E-06	3.6E-05
Naphthalene	Y	N	Y	6.1E-04	lb/MMscf	7	1.9E-05	8.4E-05
Nickel	Y	Y	N	0.0021	lb/MMscf	7	6.6E-05	2.9E-04
Phenanthrene	Y	N	Y	1.7E-05	lb/MMscf	7	5.3E-07	2.3E-06
Pyrene	Y	N	Y	5.0E-06	lb/MMscf	7	1.6E-07	6.9E-07
Selenium	Y	N	N	2.4E-05	lb/MMscf	7	7.5E-07	3.3E-06
Toluene	Y	Y	Y	0.0034	lb/MMscf	7	1.1E-04	4.7E-04
				Total HAP Emissions (natural gas)			**0.059**	**0.26**
				Total TAP Emissions (natural gas)			**0.16**	**0.70**

Notes:

1. Emission factor derived based on stack testing data from comparable Enviva facilities.
2. Emission factors (criteria and HAP/TAP) for wood combustion in a stoker boiler from NCDAQ Wood Waste Combustion Spreadsheet/AP-42, Fifth Edition, Volume 1, Chapter 1.6 - Wood Residue Combustion in Boilers, 09/03.
3. The control efficiency of 95% for the RTO is applied to all VOC hazardous and toxic pollutants for those emission factors that are not derived from Enviva stack test data.
4. The control efficiency of the wet electrostatic precipitator (WESP) for filterable particulate matter is applied to all metal hazardous and toxic pollutants. Actual design filterable efficiency is estimated to 96.4%, but 92.75% is assumed for toxics permitting.
5. Chromium VI is a subset of chrome compounds, which is accounted for separately as a HAP. As such, Chromium VI is only calculated as a TAP.
6. The WESP employs a caustic solution in its operation in which hydrochloric acid will have high water solubility. This caustic solution will neutralize the acid and effectively control it by 90%, per conversation on October 18, 2011 with Steven A. Jaasund, P.E. of Lundberg Associates, a manufacturer of WESPs.
7. Emission factors for natural gas combustion are from NCDAQ Natural Gas Combustion Spreadsheet and AP-42, Fifth Edition, Volume 1, Chapter 1.4 - Natural Gas Combustion, 07/98 for small boilers. The emission factors for acetaldehyde, acrolein, and ammonia are cited in the NCDAQ spreadsheet as being sourced from the USEPA's WebFIRE database.

Abbreviations:

CAS - chemical abstract service
CH_4 - methane
CO - carbon monoxide
CO2 - carbon dioxide
CO_2e - carbon dioxide equivalent
HAP - hazardous air pollutant
hr - hour
kg - kilogram
lb - pound
MMBtu - Million British thermal units
NC - North Carolina
NO_x - nitrogen oxides
N_2O - nitrous oxide
ODT - oven dried tons
PM - particulate matter
PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2.5 microns or less
RTO - regenerative thermal oxidizer
SO_2 - sulfur dioxide
TAP - toxic air pollutant
tpy - tons per year
VOC - volatile organic compound
WESP - wet electrostatic precipitator
yr - year

Table 5
Potential Emissions for Furnace Bypass (Cold Start-up)[1]
Control Options 1 and 2
ES-FURNACEBYPASS
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Calculation Basis

Hourly Heat Input Capacity (HHV)	37.6 MMBtu/hr
Annual Heat Input Capacity	1,878 MMBtu/yr
Maximum Hourly Throughput	80 ODT/hr
Hours of Operation[1]	50 hr/yr

Potential Criteria Pollutant and Greenhouse Gas Emissions from Dryer Line Cold Start-up

Pollutant	Emission Factor	Units	Potential Emissions	
			Maximum (lb/hr)	Annual (tpy)
CO	0.60	lb/MMBtu[2]	22.5	0.56
NO_x	0.22	lb/MMBtu[2]	8.26	0.21
SO_2	0.025	lb/MMBtu[2]	0.94	0.023
VOC	0.017	lb/MMBtu[2]	0.64	0.016
Total PM	0.58	lb/MMBtu[2]	21.7	0.54
Total PM_{10}	0.52	lb/MMBtu[2]	19.4	0.49
Total $PM_{2.5}$	0.45	lb/MMBtu[2]	16.8	0.42
CO_2	780	lb/ODT[3]	62,400	1,560

Notes:

1. During cold start-ups, the furnace bypass stack is used until the refractory is sufficiently heated and can sustain operations at a low level (approximately 15% of the maximum heat input rate). The furnace bypass stack is then closed, and the furnace is slowly brought up to a normal operating rate.
2. CO, NO_x, SO_2, PM, and VOC emission rates based on AP-42, Chapter 1.6 - Wood Residue Combustion in Boilers, 09/03 for bark/bark and wet wood/wet wood-fired boilers. VOC emission factor excludes formaldehyde.
3. Emission factor for CO_2 from AP-42, Section 10.6.1 for rotary dryer with RTO control device. Enviva has conservatively calculated the CO_2 emissions using the hardwood emission factor because the dryer at Hamlet uses a combination of hardwood and softwood and the hardwood emission factor is greater than the softwood emission factor.

Table 5
Potential Emissions for Furnace Bypass (Cold Start-up)[1]
Control Options 1 and 2
ES-FURNACEBYPASS
Enviva Pellets Hamlet, LLC

Potential HAP and TAP Emissions from Dryer Line Cold Start-up

Pollutant	HAP	NC TAP	Emission Factor	Units	Footnote	Potential Emissions	
						Maximum (lb/hr)	Annual (tpy)
Acetaldehyde	Y	Y	8.30E-04	lb/MMBtu	1	0.031	7.8E-04
Acrolein	Y	Y	0.0040	lb/MMBtu	1	0.15	0.0038
Formaldehyde	Y	Y	0.0044	lb/MMBtu	1	0.17	0.0041
Phenol	Y	Y	5.10E-05	lb/MMBtu	1	0.0019	4.8E-05
Propionaldehyde	Y	N	6.10E-05	lb/MMBtu	1	0.0023	5.7E-05
Acetophenone	Y	N	3.2E-09	lb/MMBtu	1	1.2E-07	3.0E-09
Antimony and compounds	Y	N	7.9E-06	lb/MMBtu	1	3.0E-04	7.4E-06
Arsenic	Y	Y	2.2E-05	lb/MMBtu	1	8.3E-04	2.1E-05
Benzene	Y	Y	0.0042	lb/MMBtu	1	0.16	0.0039
Benzo(a)pyrene	Y	Y	2.6E-06	lb/MMBtu	1	9.8E-05	2.4E-06
Beryllium	Y	Y	1.1E-06	lb/MMBtu	1	4.1E-05	1.0E-06
Cadmium	Y	Y	4.1E-06	lb/MMBtu	1	1.5E-04	3.8E-06
Carbon tetrachloride	Y	Y	4.5E-05	lb/MMBtu	1	0.0017	4.2E-05
Chlorine	Y	Y	7.9E-04	lb/MMBtu	1	0.030	7.4E-04
Chlorobenzene	Y	Y	3.3E-05	lb/MMBtu	1	0.0012	3.1E-05
Chloroform	Y	Y	2.8E-05	lb/MMBtu	1	0.0011	2.6E-05
Chromium VI	Y	Y	3.5E-06	lb/MMBtu	1	1.3E-04	3.3E-06
Chromium-Other compounds	Y	N	1.8E-05	lb/MMBtu	1	6.6E-04	1.6E-05
Cobalt compounds	Y	N	6.5E-06	lb/MMBtu	1	2.4E-04	6.1E-06
Dinitrophenol, 2,4-	Y	N	1.8E-07	lb/MMBtu	1	6.8E-06	1.7E-07
Di(2-ethylhexyl)phthalate	Y	Y	4.7E-08	lb/MMBtu	1	1.8E-06	4.4E-08
Ethyl benzene	Y	N	3.1E-05	lb/MMBtu	1	0.0012	2.9E-05
Dichloroethane, 1,2-	Y	Y	2.9E-05	lb/MMBtu	1	0.0011	2.7E-05
Hydrochloric acid	Y	Y	0.019	lb/MMBtu	1	0.71	0.018
Lead	Y	N	4.8E-05	lb/MMBtu	1	0.0018	4.5E-05
Manganese	Y	Y	0.0016	lb/MMBtu	1	0.060	0.0015
Mercury	Y	Y	3.5E-06	lb/MMBtu	1	1.3E-04	3.3E-06
Methyl bromide	Y	N	1.5E-05	lb/MMBtu	1	5.6E-04	1.4E-05
Methyl chloride	Y	N	2.3E-05	lb/MMBtu	1	8.6E-04	2.2E-05
Trichloroethane, 1,1,1-	Y	Y	3.1E-05	lb/MMBtu	1	0.0012	2.9E-05
Naphthalene	Y	N	9.7E-05	lb/MMBtu	1	0.0036	9.1E-05
Nickel	Y	Y	3.3E-05	lb/MMBtu	1	0.0012	3.1E-05
Nitrophenol, 4-	Y	N	1.1E-07	lb/MMBtu	1	4.1E-06	1.0E-07
Pentachlorophenol	Y	Y	5.1E-08	lb/MMBtu	1	1.9E-06	4.8E-08
Perchloroethylene	Y	Y	3.8E-05	lb/MMBtu	1	0.0014	3.6E-05
Phosphorus metal, yellow or white	Y	N	2.7E-05	lb/MMBtu	1	0.0010	2.5E-05
Polychlorinated biphenyls	Y	Y	8.1E-09	lb/MMBtu	1	3.1E-07	7.6E-09
Polycyclic Organic Matter	Y	N	1.2E-04	lb/MMBtu	1	0.0047	1.2E-04
Dichloropropane, 1,2-	Y	N	3.3E-05	lb/MMBtu	1	0.0012	3.1E-05
Selenium compounds	Y	N	2.8E-06	lb/MMBtu	1	1.1E-04	2.6E-06
Styrene	Y	Y	0.0019	lb/MMBtu	1	0.071	0.0018
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	Y	Y	8.6E-12	lb/MMBtu	1	3.2E-10	8.1E-12
Toluene	Y	Y	9.2E-04	lb/MMBtu	1	0.035	8.6E-04
Trichloroethylene	Y	Y	3.0E-05	lb/MMBtu	1	0.0011	2.8E-05
Trichlorophenol, 2,4,6-	Y	N	2.2E-08	lb/MMBtu	1	8.3E-07	2.1E-08
Vinyl chloride	Y	Y	1.8E-05	lb/MMBtu	1	6.8E-04	1.7E-05
Xylene	Y	Y	2.5E-05	lb/MMBtu	1	9.4E-04	2.3E-05
Total HAP Emissions (Biomass Combustion)						**1.41**	**0.035**
Total TAP Emissions (Biomass Combustion)						**1.39**	**0.035**

Notes:
1. Emission factors for wood combustion in a stoker boiler from AP-42, Section 1.6 - Wood Residue Combustion in Boilers, 09/03.

Abbreviations:
CH_4 - methane
CO - carbon monoxide
CO2 - carbon dioxide
CO_2e - carbon dioxide equivalent
HAP - hazardous air pollutant
hr - hour
lb - pound
MMBtu - Million British thermal units
NO_x - nitrogen oxides
N_2O - nitrous oxide
ODT - oven dried tons
PM - particulate matter
PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2.5 microns or less
SO_2 - sulfur dioxide
TAP - toxic air pollutant
tpy - tons per year
VOC - volatile organic compound
yr - year

Reference:
AP-42, Section 1.6 - Wood Residue Combustion in Boilers, 09/03

Table 6
Potential Emissions for Furnace Bypass (Idle Mode)[1]
Control Options 1 and 2
ES-FURNACEBYPASS
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Calculation Basis

Hourly Heat Input Capacity (HHV)	15.0 MMBtu/hr
Annual Heat Input Capacity	7,500 MMBtu/yr
Maximum Hourly Throughput	80 ODT/hr
Hours of Operation[1]	500 hr/yr

Potential Criteria Pollutant and Greenhouse Gas Emissions from Furnace Idle Mode

Pollutant	Emission Factor	Units	Potential Emissions	
			Maximum (lb/hr)	Annual (tpy)
CO	0.60	lb/MMBtu[2]	9.00	2.25
NO_x	0.22	lb/MMBtu[2]	3.30	0.83
SO_2	0.025	lb/MMBtu[2]	0.38	0.094
VOC	0.017	lb/MMBtu[2]	0.26	0.064
Total PM	0.58	lb/MMBtu[2]	8.66	2.16
Total PM_{10}	0.52	lb/MMBtu[2]	7.76	1.94
Total $PM_{2.5}$	0.45	lb/MMBtu[2]	6.71	1.68
CO_2	780	lb/ODT[3]	62,400	15,600

Notes:

1. As part of this submittal, Enviva is requesting a limit of 500 hours per year of "idle mode" for the furnace. Idle mode is defined as operation up to 15 MMBtu/hr.
2. CO, NO_x, SO_2, PM, and VOC emission rates based on AP-42, Chapter 1.6 - Wood Residue Combustion in Boilers, 09/03 for bark/bark and wet wood/wet wood-fired boilers. VOC emission factor excludes formaldehyde.
3. Emission factor for CO_2 from AP-42, Section 10.6.1 for rotary dryer with RTO control device. Enviva has conservatively calculated the CO_2 emissions using the hardwood emission factor because the dryer at Hamlet uses a combination of hardwood and softwood and the hardwood emission factor is greater than the softwood emission factor.

Table 6
Potential Emissions for Furnace Bypass (Idle Mode)[1]
Control Options 1 and 2
ES-FURNACEBYPASS
Enviva Pellets Hamlet, LLC

Potential HAP and TAP Emissions from Furnace Idle Mode

Pollutant	HAP	NC TAP	Emission Factor	Units	Footnote	Potential Emissions	
						Maximum (lb/hr)	Annual (tpy)
Acetaldehyde	Y	Y	8.30E-04	lb/MMBtu	1	0.012	0.0031
Acrolein	Y	Y	0.0040	lb/MMBtu	1	0.060	0.015
Formaldehyde	Y	Y	0.0044	lb/MMBtu	1	0.066	0.017
Phenol	Y	Y	5.10E-05	lb/MMBtu	1	7.7E-04	1.9E-04
Propionaldehyde	Y	N	6.10E-05	lb/MMBtu	1	9.2E-04	2.3E-04
Acetophenone	Y	N	3.2E-09	lb/MMBtu	1	4.8E-08	1.2E-08
Antimony and compounds	Y	N	7.9E-06	lb/MMBtu	1	1.2E-04	3.0E-05
Arsenic	Y	Y	2.2E-05	lb/MMBtu	1	3.3E-04	8.3E-05
Benzene	Y	Y	0.0042	lb/MMBtu	1	0.063	0.016
Benzo(a)pyrene	Y	Y	2.6E-06	lb/MMBtu	1	3.9E-05	9.8E-06
Beryllium	Y	Y	1.1E-06	lb/MMBtu	1	1.7E-05	4.1E-06
Cadmium	Y	Y	4.1E-06	lb/MMBtu	1	6.2E-05	1.5E-05
Carbon tetrachloride	Y	Y	4.5E-05	lb/MMBtu	1	6.8E-04	1.7E-04
Chlorine	Y	Y	7.9E-04	lb/MMBtu	1	0.012	0.0030
Chlorobenzene	Y	Y	3.3E-05	lb/MMBtu	1	5.0E-04	1.2E-04
Chloroform	Y	Y	2.8E-05	lb/MMBtu	1	4.2E-04	1.1E-04
Chromium VI	Y	Y	3.5E-06	lb/MMBtu	1	5.3E-05	1.3E-05
Chromium-Other compounds	Y	N	1.8E-05	lb/MMBtu	1	2.6E-04	6.6E-05
Cobalt compounds	Y	N	6.5E-06	lb/MMBtu	1	9.8E-05	2.4E-05
Dinitrophenol, 2,4-	Y	N	1.8E-07	lb/MMBtu	1	2.7E-06	6.8E-07
Di(2-ethylhexyl)phthalate	Y	Y	4.7E-08	lb/MMBtu	1	7.1E-07	1.8E-07
Ethyl benzene	Y	N	3.1E-05	lb/MMBtu	1	4.7E-04	1.2E-04
Dichloroethane, 1,2-	Y	Y	2.9E-05	lb/MMBtu	1	4.4E-04	1.1E-04
Hydrochloric acid	Y	Y	0.019	lb/MMBtu	1	0.29	0.071
Lead	Y	N	4.8E-05	lb/MMBtu	1	7.2E-04	1.8E-04
Manganese	Y	Y	0.0016	lb/MMBtu	1	0.024	0.0060
Mercury	Y	Y	3.5E-06	lb/MMBtu	1	5.3E-05	1.3E-05
Methyl bromide	Y	N	1.5E-05	lb/MMBtu	1	2.3E-04	5.6E-05
Methyl chloride	Y	N	2.3E-05	lb/MMBtu	1	3.5E-04	8.6E-05
Trichloroethane, 1,1,1-	Y	Y	3.1E-05	lb/MMBtu	1	4.7E-04	1.2E-04
Naphthalene	Y	N	9.7E-05	lb/MMBtu	1	0.0015	3.6E-04
Nickel	Y	Y	3.3E-05	lb/MMBtu	1	5.0E-04	1.2E-04
Nitrophenol, 4-	Y	N	1.1E-07	lb/MMBtu	1	1.7E-06	4.1E-07
Pentachlorophenol	Y	Y	5.1E-08	lb/MMBtu	1	7.7E-07	1.9E-07
Perchloroethylene	Y	Y	3.8E-05	lb/MMBtu	1	5.7E-04	1.4E-04
Phosphorus metal, yellow or white	Y	N	2.7E-05	lb/MMBtu	1	4.1E-04	1.0E-04
Polychlorinated biphenyls	Y	Y	8.1E-09	lb/MMBtu	1	1.2E-07	3.1E-08
Polycyclic Organic Matter	Y	N	1.2E-04	lb/MMBtu	1	0.0019	4.7E-04
Dichloropropane, 1,2-	Y	N	3.3E-05	lb/MMBtu	1	5.0E-04	1.2E-04
Selenium compounds	Y	N	2.8E-06	lb/MMBtu	1	4.2E-05	1.1E-05
Styrene	Y	Y	0.0019	lb/MMBtu	1	0.029	0.0071
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	Y	Y	8.6E-12	lb/MMBtu	1	1.3E-10	3.2E-11
Toluene	Y	Y	9.2E-04	lb/MMBtu	1	0.014	0.0035
Trichloroethylene	Y	Y	3.0E-05	lb/MMBtu	1	4.5E-04	1.1E-04
Trichlorophenol, 2,4,6-	Y	N	2.2E-08	lb/MMBtu	1	3.3E-07	8.3E-08
Vinyl chloride	Y	Y	1.8E-05	lb/MMBtu	1	2.7E-04	6.8E-05
Xylene	Y	Y	2.5E-05	lb/MMBtu	1	3.8E-04	9.4E-05
Total HAP Emissions (Biomass Combustion)						**0.58**	**0.14**
Total TAP Emissions (Biomass Combustion)						**0.57**	**0.14**

Notes:

1. Emission factors for wood combustion in a stoker boiler from AP-42, Section 1.6 - Wood Residue Combustion in Boilers, 09/03.

Abbreviations:

CH_4 - methane
CO - carbon monoxide
CO2 - carbon dioxide
CO_2e - carbon dioxide equivalent
HAP - hazardous air pollutant
hr - hour
lb - pound
MMBtu - Million British thermal units
NO_x - nitrogen oxides
N_2O - nitrous oxide
ODT - oven dried tons
PM - particulate matter
PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2.5 microns or less
SO_2 - sulfur dioxide
TAP - toxic air pollutant
tpy - tons per year
VOC - volatile organic compound
yr - year

Reference:

AP-42, Section 1.6 - Wood Residue Combustion in Boilers, 09/03

Table 7
Summary of Potential Emissions from Baghouses and Scrubber
Control Options 1 and 2
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Emission Unit ID	Source Description	Control Device ID	Control Device Description	Exhaust Flow Rate[1]	Exit Grain Loading	Particulate Speciation		Potential Emissions					
								PM		PM_{10}		$PM_{2.5}$	
				(cfm)	(gr/cf)	PM_{10} (% of PM)	$PM_{2.5}$ (% of PM)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
ES-HM-1	One (1) Dry Hammermill	CD-HM-BH1	One (1) baghouse[2, 3]	5,000	0.004	100%	42.5%	0.17	0.75	0.17	0.75	0.073	0.32
ES-HM-2	One (1) Dry Hammermill	CD-HM-BH2	One (1) baghouse[2, 3]	5,000	0.004	100%	42.5%	0.17	0.75	0.17	0.75	0.073	0.32
ES-HM-3	One (1) Dry Hammermill	CD-HM-BH3	One (1) baghouse[2, 3]	5,000	0.004	100%	42.5%	0.17	0.75	0.17	0.75	0.073	0.32
ES-HM-4	One (1) Dry Hammermill	CD-HM-BH4	One (1) baghouse[2, 3]	5,000	0.004	100%	42.5%	0.17	0.75	0.17	0.75	0.073	0.32
ES-HM-5	One (1) Dry Hammermill	CD-HM-BH5	One (1) baghouse[2, 3]	5,000	0.004	100%	42.5%	0.17	0.75	0.17	0.75	0.073	0.32
ES-HM-6	One (1) Dry Hammermill	CD-HM-BH6	One (1) baghouse[2, 3]	5,000	0.004	100%	42.5%	0.17	0.75	0.17	0.75	0.073	0.32
ES-HM-7	One (1) Dry Hammermill	CD-HM-BH7	One (1) baghouse[2, 3]	5,000	0.004	100%	42.5%	0.17	0.75	0.17	0.75	0.073	0.32
ES-HM-8	One (1) Dry Hammermill	CD-HM-BH8	One (1) baghouse[2, 3]	5,000	0.004	100%	42.5%	0.17	0.75	0.17	0.75	0.073	0.32
ES-HMC	Hammermill Collection Conveyor	CD-HMC-BH	One (1) baghouse[2, 4]	1,500	0.004	100%	100%	0.051	0.23	0.051	0.23	0.051	0.23
ES-PCHP	Pellet Cooler HP Fines Relay System	CD-PCHP-BH	One (1) baghouse[2, 4]	500	0.004	100%	100%	0.017	0.075	0.017	0.075	0.017	0.075
ES-PCLP	Pellet Cooler LP Fines Relay System	CD-PCLP-BH	One (1) baghouse[2, 4]	3,102	0.004	100%	100%	0.11	0.47	0.11	0.47	0.11	0.47
ES-PMFS	Pellet Mill Feed Silo	CD-PMFS-BH	One (1) baghouse[2, 4]	2,444	0.004	100%	100%	0.084	0.37	0.084	0.37	0.084	0.37
ES-CLR-1 through ES-CLR-6	Pellet Coolers	CD-CLR-WSB	One (1) scrubber[5]	90,000	0.004	26.1%	3.2%	3.09	13.5	0.81	3.53	0.099	0.43
ES-DCTB	Pellet Dust Collection Transfer Bin	CD-PDCTB-BH	One (1) baghouse[2, 4]	3,000	0.004	100%	100%	0.10	0.45	0.10	0.45	0.10	0.45
ES-FPH	Finished Product Handling	CD-FPH-BH	One (1) baghouse[3,6]	8,500	0.004	91%	1.7%	0.29	1.3	0.27	1.2	0.0050	0.022
ES-PB-1 and 2	Two (2) Pellet Loadout Bins												
ES-DWH	Dried Wood Handling Operations (conveyors)	CD-DWH-BH1	One (1) baghouse[2, 4]	1,000	0.004	100%	100%	0.034	0.15	0.034	0.15	0.034	0.15
		CD-DWH-BH2	One (1) baghouse[2, 4]	1,000	0.004	100%	100%	0.034	0.15	0.034	0.15	0.034	0.15
ES-ADD	Additive Handling and Storage	CD-ADD-BH	One (1) baghouse[2, 4]	1,000	0.004	100%	100%	0.034	0.15	0.034	0.15	0.034	0.15

Notes:

1. Control device flow rate (cfm) based on data provided by Enviva. Under both Control Options 1 and 2 for the Dry Hammermills, 10,000 cfm of the total 15,000 cfm from each Dry Hammermill will be recirculated back into the Dry Hammermill to reduce the volume of air that will be routed to CD-RTO-1 or CD-RCO-2. This will result in only 5,000 cfm from each Dry Hammermill exhausting through the baghouse. All emissions from the Dry Hammermills will be controlled by a baghouse. This table reflects total filterable and condesable emissions at the baghouse.
2. No speciation data is available for PM_{10}. Therefore, it is conservatively assumed to be equal to total PM.
3. Dry Hammermills and finished product handling $PM_{2.5}$ speciation is based on engineering estimate.
4. No speciation data is available for $PM_{2.5}$. Therefore, it is conservatively assumed to be equal to total PM.
5. Exaust flow rate and exit grain loading rate provided by Enviva. The scrubber will exhaust through CD-RCO-1.
6. Finished product handling PM_{10} speciation based on emission factors for wet wood combustion controlled by a mechanical separator from AP-42, Section 1.6 - Wood Residue Combustion in Boilers, 09/03. Because the particle size of particulate matter from finished product handling is anticipated to be larger than flyash, this factor is believed to be a conservative indicator of speciation.

Abbreviations:

cf - cubic feet
cfm - cubic feet per minute
ES - Emission Sources
IES - Insignificant Emission Source
gr - grain
hr - hour
lb - pound
PM - particulate matter
PM_{10} - particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ - particulate matter with an aerodynamic diameter of 2.5 microns or less
tpy - tons per year

Table 8
Dry Hammermill Potential Emissions at Outlet of Dry Hammermill RTO/RCO Stack
Control Option 1
ES-HM-1 through 8
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Calculation Basis

Maximum Hourly Throughput	80 ODT/hr
Annual Throughput	625,011 ODT/yr
Hours of Operation	8,760 hr/yr
Number of Burners	4 burners
RTO/RCO Burner Rating	6.2 MMBtu/hr
RTO/RCO Control Efficiency	95%

Total Potential Emissions at RTO/RCO Stack

Pollutant	Potential Emissions[1]	
	(lb/hr)	(tpy)
CO	2.10	9.19
NO_x	2.50	10.9
SO_2	0.015	0.064
VOC	2.17	8.55
PM	1.38	6.07
PM_{10}	1.38	6.07
$PM_{2.5}$	0.69	3.04

Notes:
1. Total emissions from the dry hammermills and natural gas combustion by the RTO/RCO burners. Detailed calculations are provided below and in Table 7a (particulate emissions from dry hammermill baghouses).

Potential VOC and HAP Emissions from Dry Hammermills

Pollutant	CAS No.	NC TAP	VOC	Uncontrolled Emission Factor[1]	Dry Hamermill Emissions at RTO/RCO Outlet[2]	
				(lb/ODT)	(lb/hr)	(tpy)
Acetaldehyde	75-07-0	Y	Y	0.0091	0.036	0.14
Acrolein	107-02-8	Y	Y	0.011	0.043	0.17
Formaldehyde	50-00-0	Y	Y	0.0080	0.032	0.13
Methanol	67-56-1	N	Y	0.0052	0.021	0.081
Phenol	108-95-2	Y	Y	0.0041	0.016	0.064
Propionaldehyde	123-38-6	N	Y	0.019	0.075	0.29
				Total HAP Emissions	**0.22**	**0.88**
				Total TAP Emissions	**0.13**	**0.50**
Total VOC	--	--	Y	0.51	2.04	7.97

Notes:
1. Emission factors are based on stack testing data from comparable Enviva facilities.
2. A 95% control efficiency is applied to the potential VOC and HAP emissions for the RTO/RCO. The Dry Hammermills will be equipped with an RCO that will operate primarily in catalytic mode with thermal (RTO) mode as a backup. The RTO and RCO modes have the same control efficiency so there will be no impact on emissions during thermal mode usage.

Thermal Generated Potential Criteria Pollutant Emissions

Maximum high heating value of VOC constituents	1.8E-02 MMBtu/lb
Uncontrolled VOC emissions	159 tons/yr
Heat input of uncontrolled VOC emissions	5,896 MMBtu/yr

Pollutant	Emission Factor	Units	Potential Emissions	
			(lb/hr)	(tpy)
CO	0.082	lb/MMBtu[1]	0.055	0.24
NO_x	0.098	lb/MMBtu[1]	0.066	0.29

Natural Gas Combustion Potential Criteria Pollutant and Greenhouse Gas Emissions

Pollutant	Emission Factor	Units	Potential Emissions	
			(lb/hr)	(tpy)
CO	0.082	lb/MMBtu[1]	2.04	8.95
NO_x	0.098	lb/MMBtu[1]	2.43	10.6
SO_2	5.9E-04	lb/MMBtu[1]	0.015	0.064
VOC	0.0054	lb/MMBtu[1]	0.13	0.59
PM	0.0075	lb/MMBtu[1]	0.18	0.81
PM_{10}	0.0075	lb/MMBtu[1]	0.18	0.81
$PM_{2.5}$	0.0075	lb/MMBtu[1]	0.18	0.81
CO_2	53.06	kg/MMBtu[2]	2,901	12,707
CH_4	0.0010	kg/MMBtu[2]	0.055	0.24
N_2O	1.0E-04	kg/MMBtu[2]	0.0055	0.024
CO_2e			2,904	12,720

Table 8
Dry Hammermill Potential Emissions at Outlet of Dry Hammermill RTO/RCO Stack
Control Option 1
ES-HM-1 through 8
Enviva Pellets Hamlet, LLC
Hamlet, Richmond County, North Carolina

Natural Gas Combustion Potential HAP and TAP Emissions

Pollutant	HAP	NC TAP	VOC	Emission Factor	Units	Footnote	Potential Emissions (lb/hr)	Potential Emissions (tpy)
RTO/RCO Burners								
2-Methylnaphthalene	Y	N	Y	2.4E-05	lb/MMscf	3	5.8E-07	2.6E-06
3-Methylchloranthrene	Y	N	Y	1.8E-06	lb/MMscf	3	4.4E-08	1.9E-07
7,12-Dimethylbenz(a)anthracene	Y	N	Y	1.6E-05	lb/MMscf	3	3.9E-07	1.7E-06
Acenaphthene	Y	N	Y	1.8E-06	lb/MMscf	3	4.4E-08	1.9E-07
Acenaphthylene	Y	N	Y	1.8E-06	lb/MMscf	3	4.4E-08	1.9E-07
Acetaldehyde	Y	Y	Y	1.5E-05	lb/MMscf	3	3.7E-07	1.6E-06
Acrolein	Y	Y	Y	1.8E-05	lb/MMscf	3	4.4E-07	1.9E-06
Ammonia	N	Y	N	3.2	lb/MMscf	3	0.078	0.34
Anthracene	Y	N	Y	2.4E-06	lb/MMscf	3	5.8E-08	2.6E-07
Arsenic	Y	Y	N	2.0E-04	lb/MMscf	3	4.9E-06	2.1E-05
Benz(a)anthracene	Y	N	Y	1.8E-06	lb/MMscf	3	4.4E-08	1.9E-07
Benzene	Y	N	Y	0.0021	lb/MMscf	3	5.1E-05	2.2E-04
Benzo(a)pyrene	Y	Y	Y	1.2E-06	lb/MMscf	3	2.9E-08	1.3E-07
Benzo(b)fluoranthene	Y	N	Y	1.8E-06	lb/MMscf	3	4.4E-08	1.9E-07
Benzo(g,h,i)perylene	Y	N	Y	1.2E-06	lb/MMscf	3	2.9E-08	1.3E-07
Benzo(k)fluoranthene	Y	N	Y	1.8E-06	lb/MMscf	3	4.4E-08	1.9E-07
Beryllium	Y	Y	N	1.2E-05	lb/MMscf	3	2.9E-07	1.3E-06
Cadmium	Y	Y	N	0.0011	lb/MMscf	3	2.7E-05	1.2E-04
Chromium VI	Y	N	N	0.0014	lb/MMscf	3	3.4E-05	1.5E-04
Chrysene	Y	N	Y	1.8E-06	lb/MMscf	3	4.4E-08	1.9E-07
Cobalt	Y	N	N	8.4E-05	lb/MMscf	3	2.0E-06	8.9E-06
Dibenzo(a,h)anthracene	Y	N	Y	1.2E-06	lb/MMscf	3	2.9E-08	1.3E-07
Dichlorobenzene	Y	Y	Y	0.0012	lb/MMscf	3	2.9E-05	1.3E-04
Fluoranthene	Y	N	Y	3.0E-06	lb/MMscf	3	7.3E-08	3.2E-07
Fluorene	Y	N	Y	2.8E-06	lb/MMscf	3	6.8E-08	3.0E-07
Formaldehyde	Y	Y	Y	0.075	lb/MMscf	3	0.0018	0.0080
Hexane	Y	Y	Y	1.8	lb/MMscf	3	0.044	0.19
Indeno(1,2,3-cd)pyrene	Y	N	Y	1.8E-06	lb/MMscf	3	4.4E-08	1.9E-07
Lead	Y	N	N	5.0E-04	lb/MMscf	3	1.2E-05	5.3E-05
Manganese	Y	Y	N	3.8E-04	lb/MMscf	3	9.2E-06	4.0E-05
Mercury	Y	Y	N	2.6E-04	lb/MMscf	3	6.3E-06	2.8E-05
Naphthalene	Y	N	Y	6.1E-04	lb/MMscf	3	1.5E-05	6.5E-05
Nickel	Y	Y	N	0.0021	lb/MMscf	3	5.1E-05	2.2E-04
Phenanathrene	Y	N	Y	1.7E-05	lb/MMscf	3	4.1E-07	1.8E-06
Pyrene	Y	N	Y	5.0E-06	lb/MMscf	3	1.2E-07	5.3E-07
Selenium	Y	N	N	2.4E-05	lb/MMscf	3	5.8E-07	2.6E-06
Toluene	Y	Y	Y	0.0034	lb/MMscf	3	8.3E-05	3.6E-04
				Total HAP Emissions (natural gas combustion)			**0.046**	**0.20**
				Total TAP Emissions (natural gas combustion)			**0.12**	**0.54**

Notes:

1. Emission factors from AP-42, Section 1.4 - Natural Gas Combustion, 07/98. Emission factors converted from lb/MMscf to lb/MMBtu based on assumed heating value of 1,020 Btu/scf for natural gas per AP-42 Section 1.4.
2. Emission factors for natural gas combustion by the burners obtained from Table C-1 and C-2 of 40 CFR Part 98 and Global Warming Potentials from Table A-1.
3. Emission factors for natural gas combustion are from NCDAQ Natural Gas Combustion Spreadsheet and AP-42, Fifth Edition, Volume 1, Chapter 1.4 - Natural Gas Combustion, 07/98 for small boilers. The emission factors for acetaldehyde, acrolein, and ammonia are cited in the NCDAQ spreadsheet as being sourced from the USEPA's WebFIRE database.

Abbreviations:

CAS - chemical abstract service
HAP - hazardous air pollutant
hr - hour
lb - pound
NC - North Carolina
ODT - oven dried tons
RCO - regenerative catalytic oxidizer
RTO - regenerative thermal oxidizer
TAP - toxic air pollutant
tpy - tons per year
VOC - volatile organic compound
yr - year

Figure 2. Process Flow Diagram - Control Option 1
Enviva Pellets Hamlet, LLC – Richmond County, NC

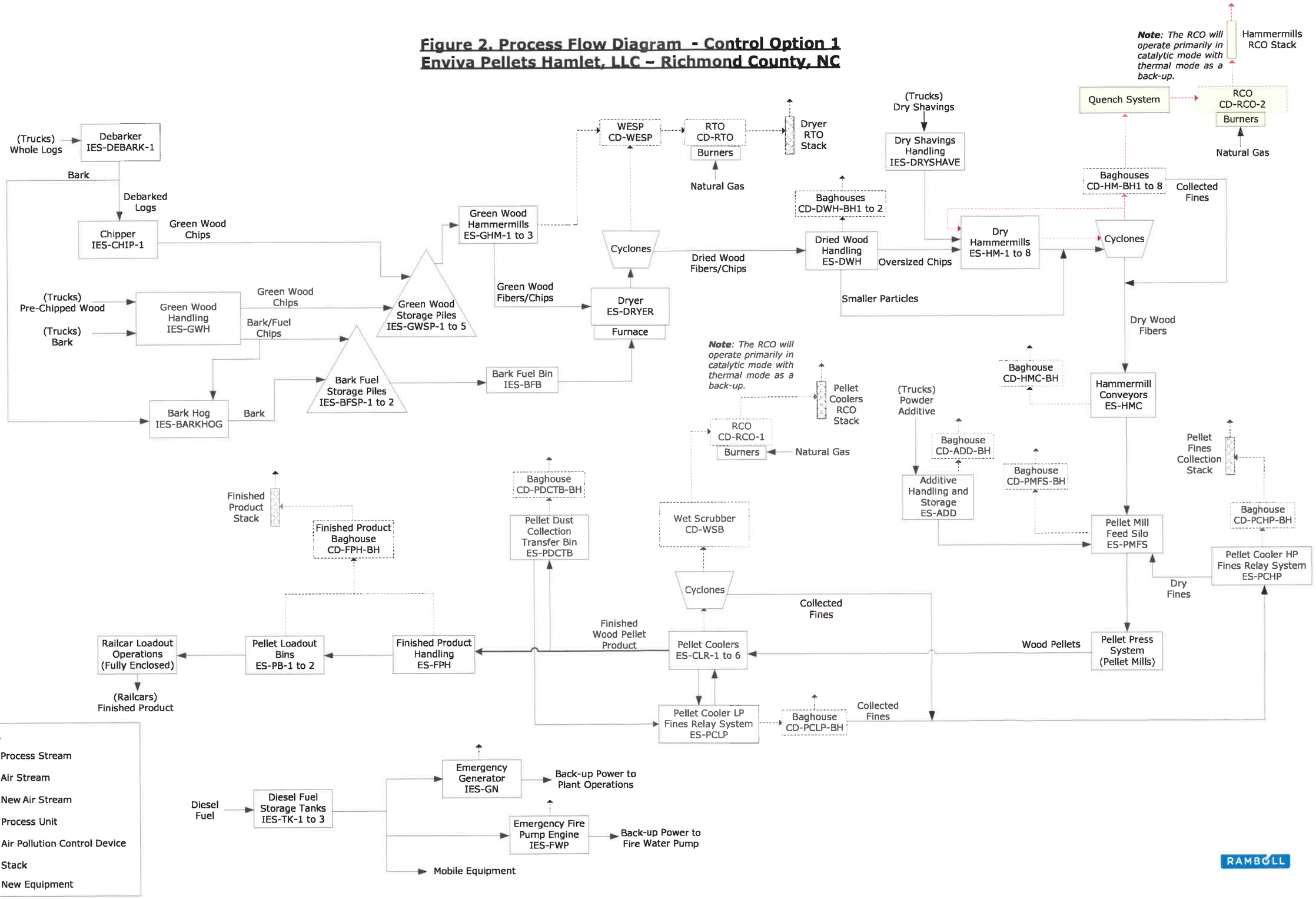
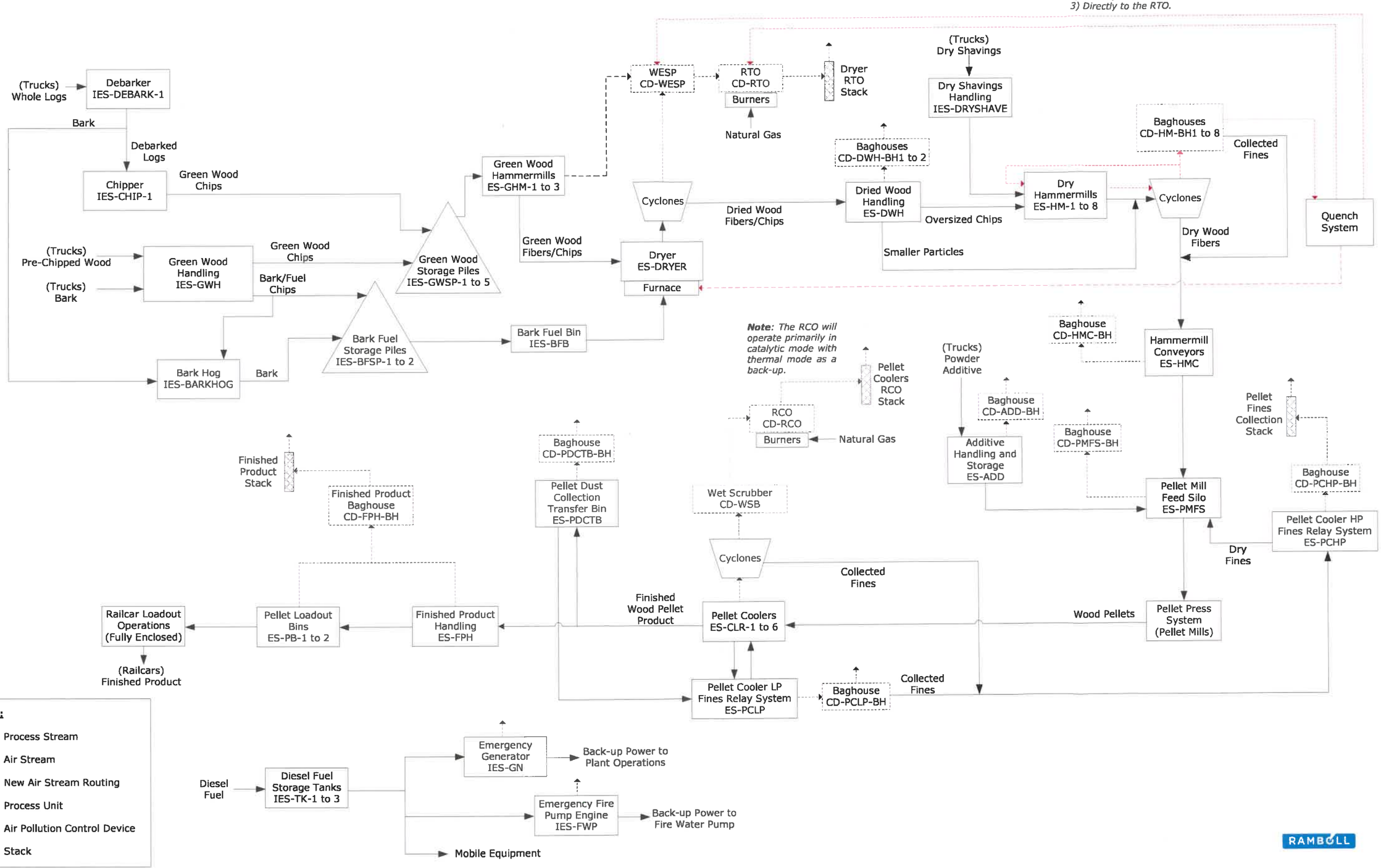


Figure 2. Process Flow Diagram – Control Option 2
Enviva Pellets Hamlet, LLC – Richmond County, NC

***Note**: Emissions from the Dry Hammermills will go to either:*
1) The dryer furnace, WESP, and RTO;
2) Directly to the existing WESP and RTO; or
3) Directly to the RTO.



RAMBOLL